2021-2022 Graduate School Catalog

Patricia Perry
University of Maine Graduate School

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President's Message

Welcome to the University of Maine, which is located in the homeland of the Penobscot Nation.

UMaine is student-centered and community-engaged, with a foundational commitment to diversity, equity and inclusive excellence.

Kudos for pursuing an advanced degree at this extraordinary time!

You're joining a 140-year-plus legacy of exceptional graduate scholarship. And you've got some amazing role models, including those who have earned Fulbrights, Switzer Fellowships, and National Science Foundation Graduate Research Fellowships.

Graduate students from more than 67 counties are providing outstanding leadership during the pandemic, as they conduct vital research to inform public health, contribute to the greater good, and stimulate the economy. Their scholarship spans 140 programs - from biomedical engineering to business administration, from history to horticulture, and from marine sciences to music performance.

Our graduate scholars have worked with faculty researchers on innovation projects leading to startups and patents; conducted psychology research to better understand pandemic-related health and safety behavior; served on a subcommittee that contributed to the Maine Climate Council's "Maine Won't Wait" report; studied the value and meaning of reuse in rural communities; fathomed new offshore wind technology; and explored the connection between Alzheimer's disease and a specific gene. And so much more.

Our world-renowned faculty will empower you in your chosen academic pursuits, and in your research and scholarship that will lead to new knowledge, deeper understanding and contributions to the greater good. At UMaine, the state's research university, that can happen almost anywhere - in one of our 18 major research centers, at a field site in North Woods or on the Gulf of Maine coast, or on an expedition half a world away.

You're here at a particularly transformational time. The Harold Alfond Foundation's $240 million pledge to the University of Maine System includes $90 million for Black Bear athletic facilities, $75 million for a multi-university Maine College of Engineering, Computing and Information Science, $55 million for the Maine Graduate and Professional Center, and $20 million for student success and retention.

As a former researcher and professor of mathematics, I believe that education is our highest and best hope to improve lives and forge a healthier, more sustainable and more equitable future. And I know that the expertise, experiences and connections that you gain here will prepare and inspire you to do just that.

Please let me know how we can help make your graduate educational experience an even more meaningful, robust and rewarding one.

Joan Ferrini-Mundy
President

University Overview
The University of Maine, established in Orono in 1865 under the provisions of the Morrill Act, is located on Marsh Island in the homeland of the Penobscot Nation. UMaine's regional coastal campus, the University of Maine at Machias, is located in the Passamaquoddy homeland. The universities are student-centered and community-engaged, with a foundational commitment to diversity, equity and inclusive excellence.

UMaine is the state's land grant, sea grant and space grant institution. As Maine's research university, UMaine has a statewide mission of teaching, research and community engagement, with four agricultural field stations - Aroostook, Highmoor and Rogers farms, and J.F. Witter Teaching and Research Center - and one marine sciences research facility at Darling Marine Center; 17 interdisciplinary research centers and institutes; and University of Maine Cooperative Extension offices, camps and learning centers serving the 16 counties. UMaine Machias has an integral regional focus in Down East Maine, including a marine sciences field station at Downeast Institute. The universities extend the resources of the learning communities to address educational, economic, cultural and social needs of Maine, the nation and the world.

UMaine is the flagship institution of the University of Maine System, broadening opportunities for students, faculty and staff statewide. In 2020, the University of Maine System received a $240 million investment from the Harold Alfond Foundation - the largest gift ever given to a public institution of higher education in New England. The grant - $90 million for Black Bear athletics, $75 million for a Maine College of Engineering, Computing and Information Science, $55 million for the Maine Graduate and Professional Center, and $20 million for student success and retention - will propel UMaine to new heights as the state's largest educational, research, innovation and talent development asset. It aligns with UMS unified accreditation goals and UMaine Strategic Vision and Values, which focus on fostering student success, discovering and innovating, and growing and advancing partnerships.

UMaine is a vibrant community of more than 11,700 students from Maine, the United States and the world, offering more than 90 undergraduate and 100 graduate programs taught by world-class faculty and grounded in research about how people best learn. It is featured in multiple national guides of best colleges and is one of the nation's top 50 green colleges. UMaine Machias offers its nearly 500 students baccalaureate degrees within an active and diverse community of learners who share a commitment to exploration, leadership, collaboration, interdisciplinary problem solving and the Washington County region.

UMaine has the Maine Business School and five colleges - College of Engineering; College of Natural Sciences, Forestry, and Agriculture; College of Education and Human Development; College of Liberal Arts and Sciences; and Honors College. The Honors College offers one of the longest established programs in the country. UMaine Machias offers two-year and four-year programs through its divisions of Environmental and Biological Sciences; Professional Studies; and Arts and Letters.

Among the state's public universities, UMaine awards 39% of all four-year degrees, 44% of all master's degrees, and 87% of the state's Ph.D.s and Ed.D.s. The newest graduates join approximately 110,000 alumni worldwide.

UMaine is home to Maine's only Division I athletics program with 17 sports. The Black Bears boast numerous team and individual conference championships, many trips to the NCAA Tournament, academic champions, and two National Championships in Men's Ice Hockey. Maine Athletics has developed student-athletes who have gone on to achieve much success, both in sports and in their chosen professions, including several professional athletes, Super Bowl Champions, Stanley Cup Champions and Olympians.
Fogler Library, the state's largest library, is a regional depository for federal government publications, and official depository for Canadian federal and Maine state government publications. It also is the designated State Research Library for Business, Science and Technology, and is the only Patent and Trademark Resource Center in Maine.

UMaine is a cultural hub for the state - with the Zillman Art Museum, Hudson Museum and Page Farm and Home Museum; visual and performing arts events at the Lord Hall Galleries, Collins Center for the Arts and School of Performing Arts; Versant Power Astronomy Center and more - that enhances and advances community engagement, learning for all ages, diversity and inclusion.

For more than a century, UMaine has conducted research of global and local relevance, contributing to the greater good in Maine and beyond. Faculty, staff and students have conducted nationally and internationally recognized research and scholarship in every county in Maine, on all continents and in all the oceans of the world. UMaine's impact comes through research and innovation in climate change, engineering, advanced structures and composites, advanced manufacturing, forestry, marine sciences, agriculture, and the arts and humanities.

UMaine and UMaine Machias partner with the private and public sectors to stimulate and support the state's economic growth and development. With a sustained focus on research, innovation and entrepreneurship, and annual research expenditures exceeding $165 million, UMaine is advancing on its path to achieve the highest Carnegie Classification as a doctoral university with very high research activity (R1) through the outstanding work of faculty and students.

The UMaine student experience in and out of the classroom reflects the breadth and depth of a research university, with interdisciplinary, immersive learning opportunities and mentoring by faculty and graduate students who are leaders in their fields. Those opportunities begin in the first year with the new Research Learning Experience at UMaine and UMaine Machias focused on education through creation, with students engaged in research, creativity and community - building a mindset that will help undergraduates solve problems for life. Immersive learning and community engagement - from volunteerism and capstone projects to internships - ignite passion in students, and help address issues globally and locally.

UMaine and UMaine Machias are committed to accessible lifelong learning for learners of all ages, the creation of new knowledge and research-based problem solving to address needs and inform the future, and comprehensive outreach to improve lives and communities. Providing opportunities in an atmosphere that honors heritage and diversity are cornerstones of our mission. Through integrated teaching, research, and outreach, UMaine and its regional campus improve the quality of life for people in Maine and around the world, and promote responsible stewardship of human, natural and financial resources.

## Academic Calendar

<p>| Classes begin | Monday, August 30 |</p>
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Last day to add classes</td>
<td>Sunday, September 5</td>
</tr>
<tr>
<td>NO Classes Labor Day</td>
<td>Monday, September 6</td>
</tr>
<tr>
<td>Last day to drop classes for refund **</td>
<td>Monday, September 13</td>
</tr>
<tr>
<td>Classes dropped on or before this date will not appear on transcript</td>
<td>Wednesday, September 29, 4:30 p.m.</td>
</tr>
<tr>
<td>Application for Graduate filing deadline (Dec)</td>
<td>Friday, October 1</td>
</tr>
<tr>
<td>Fall break begins</td>
<td>Monday, October 11</td>
</tr>
<tr>
<td>Classes Resume</td>
<td>Wednesday, October 13</td>
</tr>
<tr>
<td>Enrollment for Spring 2022 (tentative)</td>
<td>Monday, October 25</td>
</tr>
<tr>
<td>No Classes Veterans' Day</td>
<td>Thursday, November 11</td>
</tr>
<tr>
<td>Last day to withdraw from a class and receive 'W' grade (Withdrawn classes after this date will receive failing grade.)</td>
<td>Friday, November 12, 4:30 p.m.</td>
</tr>
<tr>
<td>Thanksgiving break begins</td>
<td>Wednesday, November 24</td>
</tr>
<tr>
<td>Classes Resume</td>
<td>Monday, November 29</td>
</tr>
<tr>
<td>Classes end</td>
<td>Friday, December 10</td>
</tr>
<tr>
<td>Final exams begin</td>
<td>Monday, December 13</td>
</tr>
<tr>
<td>Final exams end</td>
<td>Friday, December 17</td>
</tr>
<tr>
<td>Final grades due</td>
<td>Friday, December 24</td>
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</tbody>
</table>

**Winter Session:** Monday, December 27, 2021 - Friday, January 14, 2022 (tentative)

https://umaine.edu/wintersession/

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Spring Semester 2022</td>
<td></td>
</tr>
<tr>
<td>Classes begin</td>
<td>Tuesday, January 18</td>
</tr>
<tr>
<td>Last day to add classes</td>
<td>Monday, January 24</td>
</tr>
<tr>
<td>Last day to drop classes for refund **</td>
<td>Monday, January 31</td>
</tr>
<tr>
<td>Application for Graduation filing deadline (May)</td>
<td>Tuesday, February 1</td>
</tr>
<tr>
<td>Classes dropped on or before this date will not appear on transcript</td>
<td>Wednesday, February 16, 4:30 p.m.</td>
</tr>
<tr>
<td>Event</td>
<td>Date</td>
</tr>
<tr>
<td>--------------------------------------</td>
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</tr>
<tr>
<td>No Classes Presidents' Day</td>
<td>Monday, February 21</td>
</tr>
<tr>
<td>Spring break begins</td>
<td>Monday, March 14</td>
</tr>
<tr>
<td>Classes resume</td>
<td>Monday, March 21</td>
</tr>
<tr>
<td>Enrollment for Fall 2022 (tentative)</td>
<td>Monday, March 28</td>
</tr>
<tr>
<td>Last day to withdraw from a class and receive 'W' grade (Withdrawn classes after this date will receive failing grade.)</td>
<td>Wednesday, April 6, 4:30 p.m.</td>
</tr>
<tr>
<td>Maine Day- no classes</td>
<td>Wednesday, April 27</td>
</tr>
<tr>
<td>Classes end</td>
<td>Friday, April 29</td>
</tr>
<tr>
<td>Final exams begin</td>
<td>Monday, May 2</td>
</tr>
<tr>
<td>Final exams end</td>
<td>Friday, May 6</td>
</tr>
<tr>
<td>Commencement</td>
<td>Friday, May 6- Graduate Saturday, May 7- Undergraduate</td>
</tr>
<tr>
<td>Final grades due</td>
<td>Friday, May 13</td>
</tr>
</tbody>
</table>

**Summer University:** Monday, May 9 - Friday, August 19, 2022 (tentative)

For information and schedule of summer sessions please visit [https://umaine.edu/summeruniversity/](https://umaine.edu/summeruniversity/)

*No classes except classes that meet once per week.

**Class information is based on full semester classes.

Summer University classes have variable start and end dates.

MaineStreet provides information on non-standard dated classes.

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**Faculty Index**

**Officers and Faculty of the University**
Admission

Consideration for admission to the Graduate School will be given to applicants holding a bachelor's degree from an accredited institution, or the equivalent. Applicants for admission must present evidence that they have had the necessary academic preparation to enable them to pursue the graduate program for which they are applying. The Graduate School has no fixed minimum grade point average requirement for admission; however, the applicant should have a strong undergraduate record. Students who have undertaken graduate work at another institution must be in good standing at that institution to be eligible for admission to The University of Maine.

Specific requirements and deadlines for admission differ by program, as described elsewhere in this catalog. Applicants should consult with the program's graduate coordinator to confirm that all departmental admission requirements have been met. All material submitted as part of an application receives careful consideration. Contact the Graduate School for further information concerning general admission criteria.

Application Procedures

An applicant for admission must submit the following materials directly to the Graduate School, 5775 Stodder Hall, Room 42, University of Maine, Orono, ME 04469-5775.

- An Application for Admission submitted electronically.
- An official transcript from each institution attended, showing the grades earned in all of the applicant's previous academic work (graduate and undergraduate), and degree(s) earned. International transcripts, if not in English, must have an official translation, either from the institution or a public company such as World Education Services. (WES.org)
- Letters of recommendation from persons in a position to judge the applicant's preparation for and ability to undertake graduate study (e.g. previous instructors or co-workers). Individual programs may waive this requirement. Letters should be sent directly by the writer to the Graduate School through the online form request portal. On-line submission of recommendation letters through the on-line Graduate School's graduate application is preferred.
- A non-refundable application fee.
- Official report of scores achieved on the Graduate Record Examination (GRE). Exceptions to this requirement are as follows: Applicants to the MBA program must submit scores on the Graduate Management Admission Test (GMAT) in lieu of the GRE. Graduate School does not require GRE, but some programs do. Many of the University of Maine master's degree programs will waive the test score requirement. Please consult the individual department web site pages. Contact information is listed on the
Graduate School's website under "Programs". Applicants to the Educational Specialist (Ed.S.) programs in Education and the Certificate of Advanced Study (CAS) in Nursing are also excluded from the test score requirement. Applicants to the Master of Music program must take departmental entrance exams in lieu of the GRE. In limited cases, Graduate Record Examination scores may not be required for admission to certain doctoral programs for those students who hold a recent master's degree requiring a thesis from an accredited university.

- Official report of scores achieved on the Test of English as a Foreign Language (TOEFL) is required for all international applicants whose native language is not English. The Graduate School requires a minimum score of 80 on the iBT TOEFL or equivalent. To be awarded a Teaching Assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent. Applicants with iBT TOEFL scores below 80 or equivalent will be required to take English language training. IELTS, Pearson PTE Academic English and DuoLingo proficiency scores are accepted on a case-by-case basis. (IELTS: Minimum 6.5 for admission and minimum 7.0 to receive a teaching assistantship; Pearson: Minimum 55 for admission and minimum 65 to receive a teaching assistantship; DuoLingo: Minimum 105 for admission and minimum 110 to receive a teaching assistantship).

All application materials become part of the permanent records of the University and will not be returned.

Fall applicants who wish to be considered for assistantships or fellowships should submit an application and all supporting materials no later than January 15th of that year. All programs set their own individual application deadlines, and some are earlier than January 15, so please check with your program's website or the graduate coordinator. A list of graduate programs, with website links and contact information for graduate coordinators is available here. Some programs admit students in the Fall only, or may have other deadlines; such deadlines are noted in the program description section of the catalog.

When the application and all required supporting materials have been received, the application is reviewed by faculty members of the appropriate program. This review is normally conducted by an admissions committee, composed of graduate faculty members, which makes recommendations to the Graduate School concerning the admission of applicants to the program. Upon receiving the committee's recommendation, the Graduate School reviews the applicant's file. After making the final decision, the Graduate School will inform the applicant of the action taken. Admissions decisions when made may also be viewed on the Graduate School's application portal.

The timing of admissions decisions varies by program. Consult the graduate coordinator in your program to check admission status. A list of graduate coordinators is available here.

Immunization Law

Maine Law requires all degree-seeking students and full-time, non-degree students born after December 31, 1956 to provide proof of immunization against measles, mumps, rubella, tetanus and diphtheria with the Office of Student Records. Failure to provide your immunization documents may effect your eligibility to enroll in classes, your financial aid, your housing and other academic areas. For complete information regarding the required immunization documentation and submission process, visit studentrecords.umaine.edu/home/records/immunizations-information/

Types of Admission

Regular admission is granted to students whose academic records and supporting documents indicate they are qualified to undertake graduate study in their chosen fields.

Tentative admission is granted to a student admitted during the final year of undergraduate work. Admission on this basis is contingent upon the satisfactory completion of the undergraduate program and submission of a complete, final transcript showing receipt of the degree.
Provisional admission is granted to a student who has not yet met all the prerequisites for admission to graduate study in the academic field. Prerequisite and elective courses must be included as part of the student's program of study.

Conditional admission may be granted to a student whose academic record may not meet all established academic requirements but suggests promise for success in graduate study. Conditional admission is equivalent in every way to regular admission with the single exception that students may not receive graduate assistantships or fellowships. In order to be removed from conditional status a student must maintain the same level of academic excellence expected of all graduate students. Specifically, to be removed from condition, a student must earn grades of "A" or "B" in his or her first nine hours of graduate credit in order to continue graduate study.

Certificate admission. All students applying to graduate certificate programs must submit a certificate application to the Graduate School prior to completion of 50% of the required coursework. Certificate students must also send a transcript indicating completion of a bachelor's degree. Additional credentials may be required for certain programs. Please refer to the website, https://umaine.edu/graduate/programs/degree-programs/

Non-degree admission. All students enrolling in 500-and 600-level courses, regardless of whether or not they intend to receive graduate degree credit for course work, must apply for non-degree graduate admission, and will be billed at graduate rates for all classes taken at any level. Proof of an earned baccalaureate degree is required if the degree was not earned within the University of Maine System. Non-degree status is good for one calendar year. International students must also provide a minimum iBT TOEFL score of 80 or equivalent for non degree status.

Visiting student admission. An international student in good standing in another recognized graduate school who wishes to enroll for a limited number of course credits, and who plans to resume work at the school of original admission, may be admitted as a visiting graduate student. Admission is granted through submission of a "Visiting Graduate Student Application" signed by an official of the Graduate School in which the student is enrolled. International students who apply this way must document finances and have a minimum iBT TOEFL score of 80 or equivalent.

Readmission to the Graduate School

A student previously admitted to the Graduate School who has failed to maintain continuous enrollment and who wishes to resume graduate work must file an "Application for Readmission to the Graduate School" and pay the appropriate readmission fee.

The student's readmission must be recommended by the program involved and approved by the Graduate School. An applicant for readmission will not necessarily have preference over new applicants, and will be treated in the same manner as an applicant for initial admission. Any student readmitted to Graduate School will be governed by policies listed in the Graduate Catalog and departmental handbook for the year of readmission.

International Applicants

The University welcomes applications from graduates of institutions of higher education in other nations. Prospective students are urged to begin the application process as early as possible. In addition to the material required of all applicants, applicants from non-English speaking countries must furnish proof of their proficiency in English by submitting scores achieved on the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service.

International transcripts, if not in English, must have an official translation, either from the institution or a public company such as World Education Services. WES.org

Arrangements for taking this examination should be made directly with the Educational Testing Service, Box 899, Princeton, NJ 08541 or ets.org. The Graduate School requires a minimum score of 80 on the iBT TOEFL or equivalent. To be awarded a Teaching Assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent. TOEFL
scores may be waived if the applicant has attended and received a degree from an English speaking institution. IELTS, PTE Academic and DuoLingo scores are also accepted on a case by case basis. (IELTS: Minimum 6.5 for admission and minimum 7.0 to receive a teaching assistantship; Pearson: Minimum 55 for admission and minimum 65 to receive a teaching assistantship; DuoLingo: Minimum 105 for admission and minimum 110 to receive a teaching assistantship). The University of Maine offers ESL instruction for international students seeking conditional admission in order to study English in the U.S. prior to beginning their graduate studies (see: umaine.edu/iei/).

Health insurance is required of all international students and dependents residing in the U.S. Health insurance may be purchased through the University. Students with comparable insurance coverage must provide proof of acceptable coverage. Please visit the Office of International Programs website for more information on international health insurance.

Financial aid from The University of Maine and is awarded competitively. Students not receiving university support must provide proof of sufficient funds to meet all expenses while studying in the United States. Further information about funding for international students is found in the catalog section on Financial Awards and Assistance.

The Clery Act

The Clery Act requires universities to disclose three-year statistics regarding campus crime, including public property within, or immediately adjacent to and accessible from the campus. This report includes our policies for campus security, such as those concerning alcohol and drug use, crime prevention, the reporting of crimes, sexual assault, and other matters. You can obtain a copy of this report by accessing the following website, umaine.edu/security or obtain a paper copy upon request by contacting the Police Department, University of Maine, 81 Rangeley Road, Orono, ME 04469-5794 or by calling 207-581-4040.

Registration/Enrollment/Insurance

Students are strongly encouraged to register (enroll) for classes as early as possible. Otherwise, the student may experience delays in making housing arrangements, obtaining library access, and other matters requiring identification. Registration for classes is also required before students may be appointed as graduate assistants and may enroll in the student or GA health insurance policies.

Graduate students may register for classes themselves using student self-service in Maine Street, or register through the administrative specialists in their respective departments. The Graduate School can register students, the two pre-registration periods for matriculated graduate students are in the Fall and Spring semesters.

For first time registrations, new students must contact their advisor for initial advising. If the student has not been assigned an advisor, the graduate coordinator of the department may advise him/her on course selection. If a new student does not complete class registration before classes begin, the advisor or graduate coordinator should complete a registration form and send it to the Graduate School to guarantee that the student has been formally matriculated.

Add/drop deadlines are set by the Office of Student Records and must be strictly followed. The University enforces these deadlines and students are financially responsible for courses dropped after the add/drop period.

Graduate assistants must maintain full-time registration status (usually six or more credit hours per semester) while they hold an assistantship. Recipients of some fellowships and scholarships are required to register for at least nine degree hours each semester. Students holding assistantships in the summer must register for at least one graduate credit hour. All graduate assistants, fellows, and trainees earning a half-time equivalent stipend ($1,833.33 month) must purchase the University's health insurance or provide proof of insurance coverage.
The assistantship will not cover tuition for courses audited, courses taken as pass/fail when the course also has a graded option, and courses numbered below 400-level. You are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

Add-and-Drop. Beginning on the first day of classes each semester, there is a five-day period during which a student may add or drop a course, change divisions of a course, or change credit status. Courses may be dropped without penalty only during the official add-and-drop period. Consult the Graduate School and/or department for registration and add-and-drop procedures. Failure to properly drop a course may result in tuition charges to the students account. Graduate Assistants are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

Continuous Enrollment. Continuous enrollment means every graduate student admitted for full-time study is required to register each fall and spring semester for at least 6 credit hours except as noted in the "General Policies and Regulations" of the Graduate School website. Full-time students must register each semester from the time of the first enrollment in the Graduate School until the completion of all requirements for the graduate degree, including filing the thesis or dissertation and passing the final oral examination.

A graduate student who has been admitted on a part-time basis is required to enroll and register at least once every 12 months from the time of first registration in the Graduate School until the completion of all requirements for the graduate degree. All students must also be registered in the semester in which they receive their degrees.

Course work included in a student's program of study taken at a campus other than The University of Maine may satisfy the continuous enrollment requirement, provided the student's University of Maine advisor and the Graduate School have approved the registration in advance and in writing (see Away Registration below).

A student who fails to maintain continuous enrollment is considered inactive and must apply for readmission to the Graduate School in order to resume work on a graduate degree.

On-Leave. Degree students who will not be taking classes must apply for on-leave status. Failure to file for on-leave status results in broken enrollment, and the student must apply for readmission to finish their degree. The time spent officially on-leave does not count in the time limits for earning degrees. Students may not register as graduate students while on leave.

Away Registration. A student may arrange to study at another institution after being admitted as a graduate student at the University of Maine. This study may be undertaken at another campus in the University of Maine System or another accredited institution within or outside of the state of Maine. Such arrangements must, however, be approved by the student's advisor and by the Graduate School prior to registration in the course. The Domestic Study Away Registration form, which is available from the Graduate School website, should be used. The conditions for transfer shall comply with basic transfer policy and may not exceed 50 percent of the student's entire course work for the degree. Away registration for credit will also satisfy the continuous enrollment requirement. It is particularly important that students receiving financial aid fill out the Domestic Study Away Registration form. Failure to do so may stop receipt of financial aid funds.

Summer Session. The University offers the opportunity to pursue graduate studies during the summer. Although many graduate-level courses are offered during the summer session, the University does not guarantee that any particular course will be offered. Details regarding courses offered may be found at Summer University.

The availability of individual faculty members to supervise research or to participate in final oral examinations during the summer session varies. Graduate students should determine, in advance, whether the members of their advisory
committee will be available during a particular summer session.

**600-Level Courses.** Enrollment in 600-level courses is limited to graduate students admitted to a degree program; or to those who have received a non-degree admission; or to a student from another recognized school who has been admitted as a visiting graduate student. The instructor is normally the final authority in judging a student's qualifications to take a particular course. In the case of 600-level business administration courses, prior approval from the Maine Business School is required, and involves submission of GMAT scores and official transcripts to the MBA program director. Students whose application to the Graduate School is pending may take one graduate level business course without submission of GMAT scores.

**Disclaimers**

**Non-Discrimination Notice**

The University of Maine is an EEO/AA employer and does not discriminate on the grounds of race, color, religion, sex, sexual orientation, transgender status, gender expression, national origin, citizenship status, age, disability, genetic information or veteran's status in employment, education, and all other programs and activities. The following person has been designated to handle inquiries regarding nondiscrimination policies: Director of Equal Opportunity, 101 North Stevens Hall, University of Maine, Orono, ME  04469-5754, 207.581.1226, TTY 711 (Maine Relay System).


The University of Maine System ("the University") is committed to providing a safe environment which promotes the dignity and worth of each member of the community. In complying with the letter and spirit of applicable laws and in pursuing its own goals of diversity, the University does not discriminate on the basis of sex in employment, education, and all other programs and activities. For this reason, the University will not tolerate sex discrimination, sexual harassment, sexual assault, dating violence, domestic violence, stalking, or retaliation in any form. All conduct of this nature is considered a violation of the Sex Discrimination, Sexual Harassment, Sexual Assault, Relationship Violence, Stalking and Retaliation Policy.

The University will respond promptly and effectively to complaints and reports of violations of this policy. The University has an obligation to address incidents of sexual harassment that it knows or should know about, even when a complaint or report is not filed. The University will take steps to end and prevent recurrence of violations and to correct their discriminatory effects on the complainant and others. In responding to all complaints and reports, the University will act to ensure the safety of students, guests, and employees while complying with state and federal laws and provisions of applicable collective bargaining agreements and employee handbooks.

**Abbreviated Definitions under the Sex Discrimination, Sexual Harassment, Sexual Assault, Relationship Violence, Stalking and Retaliation Policy and Procedures** for complete definitions, please see the full policy online:

A. **Sexual Harassment:** Sexual harassment includes unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature, including sexual assault and sexual violence.

B. **Sexual Assault:** Sexual assault means an offense that meets the definition of rape, fondling, incest, or statutory rape.

C. **Dating Violence:** Dating violence is violence committed against a person by an individual who is or has been in a social relationship of a romantic or intimate nature with that person.

D. **Domestic Violence:** A felony or misdemeanor crime of violence committed by a current or former spouse or
intimate partner of the victim; by a person with whom the victim shares a child in common; or by a person who is or was cohabitating with the victim as a spouse or intimate partner; or by any other person against an adult or youth victim who is protected from that person's acts under the domestic or family violence laws of the jurisdiction in which the crime of violence occurred.

E. Stalking: Stalking is engaging in a course of conduct directed at a specific person that would cause a reasonable person to fear for the person's safety or the safety of others or suffer substantial emotional distress.

F. Retaliation: Retaliation is action taken by the University or any individual or group against any person for opposing any practices forbidden under this policy or for filing a complaint, testifying, assisting, or participating in an investigation or proceeding under this policy. This includes action taken against a bystander who intervened to stop or attempt to stop a violation of this policy. Retaliation includes intimidating, threatening, coercing, or in any way discriminating against an individual because of the individual's complaint or participation. Action is generally deemed retaliatory if it would deter a reasonable person in the same circumstances from opposing practices prohibited by this policy.

G. Sexual Misconduct: Sexual misconduct includes, but is not limited to, prostituting another person, nonconsensual image capturing of sexual activity, presentation or unauthorized viewing of a nonconsensual videotaping of sexual activity, letting others watch you have sex without the knowledge or consent of your sexual partner, possession of child pornography, peeping tommy, and/or knowingly transmitting an STD or HIV to another person.

H. Consent: Consent is agreement to engage in sexual contact. Consent must be informed, freely and actively given, and consist of a mutually agreeable and understandable exchange of words or actions. Consent is clear, knowing and voluntary. Consent is active, not passive. Consent may be withdrawn at any time. Silence, in and of itself, cannot be interpreted as consent. Consent can be given by words or actions, as long as those words or actions create mutually understandable clear permission regarding willingness to engage in (and conditions of) sexual activity. Past consent does not imply future consent. Consent to engage in one form of sexual activity does not imply consent to engage in any other sexual activity. Consent to engage in sexual activity with one person does not imply consent to engage in sexual activity with any other person.

It is not consent when the exchange involves unwanted physical force, coercion, intimidation, and/or threats. If an individual is mentally or physically incapacitated or impaired such that one cannot understand the fact, nature or extent of the sexual situation, and the incapacitation or impairment is known or should be known to a reasonable person, there is no consent. This includes conditions resulting from alcohol or drug consumption, or being asleep or unconscious. Consent is not valid if the person is too young to consent to sexual activity under Maine law.

Consenting Relationships:
Consenting relationships may constitute sexual harassment. When a professional power differential exists between members of the University of Maine System and a romantic or sexual relationship develops, there is a potential for abuse of that power, even in relationships of apparent mutual consent. Faculty and staff members are strongly advised not to engage in such relationships and must report any such relationship to Human Resources, without exception. The Consenting Relationship Guidelines are found here. Further, the University System prohibits the abuse of power in romantic or sexual relationships.

To assure that power is not abused and to maintain an environment free of sexual harassment, a faculty or staff member must eliminate any current or potential conflict of interest by removing himself or herself from decisions affecting the other person in the relationship. Decisions affecting the other person include grading, evaluating, supervising, or otherwise influencing that person's education, employment, housing, or participation in athletics or any other University System activity.

Contact Information:

Questions, concerns and complaints about discrimination or discriminatory harassment in any area of the University or about the application of laws and regulations related to equal opportunity and affirmative action should be directed to: Equal Opportunity Administrator/Title IX Coordinator/ADA Coordinator at the Office of Equal Opportunity, 101 North Stevens Hall, Orono, ME 04469-5754; 207.581.1226 (voice) or 207.581.9484 (TDD).
For more information about resources available for students who have been victims of sexual discrimination or violence, please visit the Office of Sexual Assault and Violence Prevention Office website at umaine.edu/OSAVP or contact Deputy Title IX Coordinator, equal.opportunity@maine.edu

Financial Information

Graduate Tuition and Fees (2021-2022)

Semester Charges (based on 9 credit hours)

<table>
<thead>
<tr>
<th></th>
<th>Resident</th>
<th>Non-Resident</th>
<th>New England Regional Program</th>
<th>Canadian Resident Tuition Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition</td>
<td>$4,869.00</td>
<td>$14,607.00</td>
<td>$8280.00</td>
<td>$4869.00</td>
</tr>
<tr>
<td>Technology Fee</td>
<td>63.00</td>
<td>63.00</td>
<td>63.00</td>
<td>63.00</td>
</tr>
<tr>
<td>Student Activity Fee</td>
<td>75.00</td>
<td>75.00</td>
<td>75.00</td>
<td>75.00</td>
</tr>
<tr>
<td>Room and Board</td>
<td>5706.00</td>
<td>5706.00</td>
<td>5706.00</td>
<td>5706.00</td>
</tr>
</tbody>
</table>

The financial requirements of the University, changing costs, state and legislative action, and other matters may require an adjustment of these charges and expenses. The University reserves the right to make such adjustments to the estimated charges and expenses as it may be necessary in the opinion of the Board of Trustees up to the date of final registration for a given academic term. The applicant acknowledges this reservation and agrees to the financial terms and conditions of the University by the submission of an application or by registration.

Tuition:

Maine Resident: $541.00 per credit hour
Non-Resident: $1,623.00 per credit hour
New England Regional: 70% above the Maine resident rate ($920.00)
Canadian Resident Tuition Rate: Maine resident rate. ($541.00)

All courses at the 500 level and above will be billed at graduate tuition rates. Also, all course work taken by matriculated and non-degree graduate students will be billed at the graduate rate. This includes prerequisites and electives, regardless of the level of the course.

Technology Fee:

$7.00 per credit hour

Program Tuition Differential:

<table>
<thead>
<tr>
<th>Program</th>
<th>Less than 6 Cr hours</th>
<th>6+ Cr Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>$150</td>
<td>$300</td>
</tr>
<tr>
<td>Program</td>
<td>Business</td>
<td>All Other Programs or Certificates</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Business</td>
<td>$150</td>
<td>$300</td>
</tr>
<tr>
<td>Nursing</td>
<td>$193</td>
<td>$385</td>
</tr>
</tbody>
</table>

**UMaine Online Tuition**:  
Business $650 per credit hour  
Engineering $700 per credit hour  
Education $550 per credit hour  
All other programs or certificates $590 per credit hour

*UMaine Online rates apply only to students enrolled in online programs through UMaine Online. Technology Fee, Activity Fee and Tuition Differential described above do not apply.

**Room and Board**: Rate shown above is based on a double room plus the most commonly selected meal plan. Information on the various Room and Board options and rates available for graduate students can be found at [http://umaine.edu/housing/graduate-housing/](http://umaine.edu/housing/graduate-housing/)

**Health Insurance**: Health insurance is voluntary and available for all graduate students enrolled in 6 credit hours or more. For more information on student health insurance requirements go to: [https://umaine.edu/bursar/insurance/](https://umaine.edu/bursar/insurance/)

**Residency Guidelines**

*Residency Classification*. There are many factors considered in determining residency for in-state tuition purposes. No one factor can be used to establish domicile. Rather, all factors and circumstances must be considered on a case-by-case basis. A domicile or residency classification assigned by a public or private authority neither qualifies nor disqualifies a student for University of Maine System (UMS) in-state status.

Eligibility for in-state tuition will be determined at the time of registration; when a student applies to a degree program at any University of Maine System campus. The decision, made by the Graduate School, shall be made based on information and documentation furnished by the student as well as other sources available to the University. No student is eligible for in-state tuition classification until he/she has become domiciled in Maine, in accordance with University guidelines, before such registration. If the student is enrolled full-time in an academic program, as defined by the University, it will be presumed that the student is in Maine for educational purposes, and that the student is not in Maine to establish a domicile. A residence established for the purpose of attending a UMS institution would not, by itself, constitute domicile. The burden will be on the student to prove that he/she has established a Maine domicile for other than educational purposes. An individual who has lived in the State of Maine, for other than educational purposes, one year prior to registration or application to a campus is considered an in-state student.
A current member of the United States Armed Forces or a Veteran of the United States Armed Forces who has been honorably discharged will be billed at the in-state tuition rate. Veterans must supply a DD214, Certificate of eligibility for the GI bill®, or Military ID card. Active duty members must supply a copy of their Military ID card.

In general, dependents of members of the Armed Forces will be granted in-state tuition during such periods of time as they are on active duty in the State of Maine or if their Military State of residency is Maine as evidenced by appropriate official documentation. Individuals who have been granted in-state tuition under these conditions, but then cease active duty would continue to be granted in-state tuition. All dependents using the GI Bill® are billed at the in-state tuition rate.

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at www.benefits.va.gov/gibill.

A student, spouse, or domestic partner of a student, who currently has continuous, permanent full-time employment in Maine before the student decides to apply for degree status at the University will be considered in-state for tuition purposes.

A student who is dependent on his/her parent(s) and/or legally appointed guardian (or to whom custody has been granted by court order) is considered to have a domicile with the parent(s) for tuition purposes.

In-state tuition is not available to anyone who holds a non-immigrant U.S. visa. If an individual is not a domiciliary of the United States, they cannot be a domiciliary of the State of Maine.

A student who attended an out-of-state educational institution at in-state tuition rates in the immediately preceding semester, shall be presumed to be in Maine for educational purposes and not to establish a domicile. Again, the burden will be on the individual to prove that he/she has established a Maine domicile for other than educational purposes.

**Change of Residency Classification**

To change tuition status, the following procedures are to be followed:

1. "Request for Change in Tuition Status" cover sheet and application must be filed with the Associate Bursar at The University of Maine, Bursar's Office, 5703 Alumni Hall, Rm 100, Orono, Maine 04469-5703 before the first day of classes for the summer session, fall or spring semester for which residency is requested. All applications are prospective.

2. If the Associate Bursar's written decision, to be issued within 30 days of the first day of classes is considered incorrect by the student, the student may appeal that decision in writing within 30 days, in the following order.
   - The Bursar & Senior Finance Officer. After receiving a written decision from this level within 30 days, the student has 30 days to submit a written appeal to the Chief Business Officer.
   - The Chief Business Officer. After receiving a written decision from this level within 30 days, the student has 30 days to submit a written appeal to the President (or designee).
   - The President (or designee) will issue a final decision within 30 days.

In the event that the Associate Bursar, or other designated official, possesses facts or information indicating a student's change of status from in-state to out-of-state, the student shall be informed in writing of the change
in status and will be given an opportunity to present facts in opposition to the change. The student may appeal the decision of the Associate Bursar or other designated official as set forth in the preceding paragraph.

New England Regional Student Program

Expanded graduate study opportunities are made available each year to New England residents through the New England Regional Student Program (RSP), administered by the New England Board of Higher Education (NEBHE). NEBHE's Tuition Break RSP program enables thousands of New England residents to enroll at out-of-state New England public colleges and universities at a discount. Students are eligible for the RSP Tuition Break when they enroll in an approved major or program. Depending on the institution in which they enroll, students qualifying for study under the Program are charged either the institution's resident tuition or some percentage above the resident tuition. The University of Maine charges 65 percent above the resident tuition. Typically, degree programs offered under the Regional Student Program are high-cost, specialized, professional programs such as forestry, oceanography, hydrology, occupational therapy, and pharmacology, although general areas of study also are offered.

Requests for detailed information should be directed to the graduate school of participating state universities. It is essential that students read the individual catalog, since degree nomenclature differs by institution. Application for enrollment is made directly to the institution, which has sole authority over admissions. Applicants must clearly indicate, both in their initial inquiries and on their application forms, that they are seeking admission under the terms of the New England Regional Student Program. Further information is available from the New England Board of Higher Education, New England Regional Student Program, 45 Temple Place, Boston, MA 02111, 617-357-9620. Information about qualifying programs can also be found online at www.nebhe.org

Canadian Resident Tuition Rate

Residents of Canada are assessed reduced tuition equivalent to the resident tuition rate for any course work taken as a graduate student at The University of Maine.

Invoices and Due Dates

Charges are calculated using pre-registrations, room sign-up information, and data supplied by the Admissions Office. Billing statements will be available online only. Email notifications concerning student accounts will be sent periodically to the student's @maine.edu email address. Students may view their account statements on Student Self-Service on MaineStreet.

The University expects the student to be financially responsible. All accounts are carried in the name of the student, regardless of the source of payment. Bills and statements are mailed to the student, not the parent. All charges are payable in full by the due date on the invoice. After that, a $100.00 late fee is assessed. The initial due dates are September 15 for the Fall semester and January 15 for the Spring semester.

Delinquent students will be subject to the following administrative sanctions:

1. They are prevented from receiving an official certified copy of their transcript and diploma.
2. They are prevented from registration or pre-registration at any university in the University of Maine System.
3. The University of Maine System or its universities may disclose (directly or through its collection agencies) to a credit bureau organization that the student has failed to pay an assessed charge.
4. The University of Maine System or its universities may use in-house collection efforts, commercial collection firms, legal services, and the State of Maine Bureau of Taxation for collection on the accounts.

Authorized User Access
Students may authorize parents or other third parties to view and pay on their accounts online. Instructions for adding an authorized user can be found at umaine.edu/bursar/user/.

3rd Party/Sponsor Billing

Once the student receives an invoice, he/she can use the Anticipated Resources area of Student Self-Service on MaineStreet to notify the Bursar's Office of any third party sponsorship.

It is the student's responsibility to provide authorization (purchase order/authorization form) from the third party/sponsor. The student sends the purchase order/authorization form, which indicates how much the third party/sponsor will be paying and any payment due for charges not covered by the third party/sponsor to the Bursar's Office by the due date.

If these items are received by the payment due date shown on the statement, no late fee will be assessed.

Please view the following link for detailed 3rd party billing information:

https://umaine.edu/bursar/3rd-party-billing/

Late Payment Fee

A $50 late payment fee will be assessed each month to students who fail to pay their bills or fail to notify the Bursar's Office of any third party sponsorship or anticipated resources by the due date. To avoid being charged the late fee, students who have not received a bill should contact the Bursar's Office.

With the first bill for the fall, spring and summer semesters, students will use the Anticipated Resources page of Student-Self-Service on MaineStreet (Path: Student Self-Service / Self Service / Campus Finances / Anticipated Resources) to notify the University of any credits from other resources that are not shown on the billing statement (i.e. third party/sponsor payments, waivers/scholarships, loans). Instructions for entering anticipated resources can be found at https://umaine.edu/bursar/resources/

Financial Aid Refunds

A credit balance created by the disbursement of financial aid is normally disbursed to the student by the start of each semester, unless the student has requested that funds be held on his/her account. Excess financial aid will be held on accounts if the financial aid award is based on full-time enrollment and current enrollment is not full-time. Full-time enrollment for graduate students is 6 or more credits or 1 thesis credit. For more information please visit http://umaine.edu/bursar/refunds/. Credit balance refunds are available by check through the mail or direct deposit to a US bank account. Instructions for enrolling in direct deposit are online at https://umaine.edu/bursar/directdeposit/

Refund for Tuition and Fees

Student charges will be adjusted for voluntary withdrawals from the university and for drops or withdrawals from individual classes in accordance with the schedule and provisions set forth below.

For refunding purposes the following definitions apply:

- "Standard" full semester classes are classes which are scheduled to start during the first week of a semester and meet through the end of that semester.
- "Non-standard" classes are classes whose starting and ending dates do not coincide with the starting and ending dates of the Fall or Spring semester, including all Summer University classes. These classes fall into two groups:
  - Classes with duration of less than 12 weeks in length.
  - Classes with duration of 12 weeks or longer.
• The "Drop" period is the time frame a student may drop classes from their schedule without academic or financial penalties. For Standard full semester classes, the drop period ends:
  o September 13, 2021 for Fall 2021
  o January 31, 2022 for Spring 2022

• Dropping classes is a reduction in a student's class load during the Drop period while remaining enrolled in other classes at any of the University of Maine campuses.

• Withdrawing from classes is a reduction in a student's class load after the Drop period while remaining enrolled in other classes at any of the University of Maine campuses.

• A "Withdrawal from the University," either temporary or permanent, involves the student withdrawing from all classes at all University of Maine System campuses for which he/she is registered as well as notifying appropriate administrative officials of his/her decision to leave.

• Students who stop attending any or all of their classes, without providing official notification are not entitled to a refund. If a student ceases attendance for emergency reasons, the University will accept a written appeal.

**For Dropped Classes:**

"Standard" Full Semester Classes:

<table>
<thead>
<tr>
<th>Drop/Withdrawal</th>
<th>Percent of Refund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to the end of the Drop Period</td>
<td>100%</td>
</tr>
<tr>
<td>After the Drop Period</td>
<td>0%</td>
</tr>
</tbody>
</table>

"Non-standard" classes:

<table>
<thead>
<tr>
<th>Drop/Withdrawal</th>
<th>Percent of Refund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawal on or before the number of days equal to the number of weeks a class is scheduled. For example, for a six week course, a refund will be granted through the sixth day.</td>
<td>100%</td>
</tr>
<tr>
<td>After the number of days equal to the number of weeks a class is scheduled.</td>
<td>0%</td>
</tr>
</tbody>
</table>

**For Withdrawals from the University:**
"Standard" Full Semester classes and "Non-standard" classes of 12 weeks or more:

<table>
<thead>
<tr>
<th>Withdrawal</th>
<th>Percent of Refund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to the end of the second week</td>
<td>100%</td>
</tr>
<tr>
<td>Prior to the end of the fourth week</td>
<td>75%</td>
</tr>
<tr>
<td>Prior to the end of the sixth week</td>
<td>50%</td>
</tr>
<tr>
<td>Prior to the end of the eighth week</td>
<td>25%</td>
</tr>
<tr>
<td>After the eighth week</td>
<td>0%</td>
</tr>
</tbody>
</table>

"Non-Standard" short classes - classes of less than 12 weeks in length:

<table>
<thead>
<tr>
<th>Withdrawal</th>
<th>Percent of Refund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Withdrawal on or before the number of days equal to the number of weeks a class is scheduled. For example, for a six week course, a refund will be granted through the sixth day.</td>
<td>100%</td>
</tr>
<tr>
<td>After the number of days equal to the number of weeks a class is scheduled</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Determination of Attendance**

For "standard" full semester classes, the attendance period begins on the opening day of scheduled university classes, includes weekends and holidays, and ends on the date the student notifies the Graduate School Office in writing, that he/she is withdrawing.

For "Non-standard" classes, the attendance period begins on the start date of the class as specified on the class schedule of classes, includes weekends and holidays, and ends on the date the student notifies the Graduate School Office in writing, that he/she is withdrawing.

These policies are available on-line at https://umaine.edu/bursar/refund-policies/

**Room and Board Cancellations**

For information on room and board cancellation policies, please refer to the University of Maine Housing Services website - http://umaine.edu/housing/cancellation-fee/

**Involuntary Withdrawals**

Consideration for retroactive refunds of tuition and fees for involuntary withdrawals, e.g. extended illness or military service, will be considered by the University on a case-by-case basis. Administrative dismissals are not covered by these procedures and thus are not entitled to refunds of institutional charges.
Statute of Limitations

Appeals for the exception to the established refund practice may be made to the designated university official. Normally, appeals will be considered up to 90 days after the close of the semester/session for which the student is claiming a refund. For a typical semester/session the dates are no later than March 31 (Fall), August 31 (Spring) and November 30 (Summer). University academic appeals committees hear appeals on academic matters and have no authority to authorize refunds.

Department of Veteran Affairs' "Covered Individual Policy":

In compliance with United States Code section 3679 of title 38, any individual who is entitled to educational assistance under chapter 31, Vocational Rehabilitation and Employment, or chapter 33, Post-9/11 GI Bill® benefits will be permitted to attend or participate in the course of education during the period beginning on the date on which the individual provides to the educational institution a certificate of eligibility for entitlement to educational assistance. A certificate of eligibility can also include a "Statement of Benefits" obtained from the Department of Veterans Affairs' eBenefits website, or a VA form 28-1905 form for chapter 31 authorization purposes.

The University of Maine will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other institutional facilities, or the requirement that a covered individual borrow additional funds, on any covered individual because of the individual's inability to meet his or her financial obligations to the institution due to the delayed disbursement funding from the VA under chapter 31 or 33.

This agreement will terminate on the date on which payment from the VA is made to the institution or 90 days after the date the institution certified tuition and fees following the receipt of the certificate of eligibility, whichever date is most beneficial to the covered individual.

GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at www.benefits.va.gov/gibill.

Satisfactory Academic Progress (SAP) for Financial Aid Recipients

Federal financial aid regulations require financial aid recipients to make progress toward earning their degree, stay above specific GPA minimums and to complete the degree within a maximum time-frame. You can lose eligibility for aid if you are not doing well in your classes and/or frequently withdraw from classes and/or if it is taking you a very long time to earn your degree. If you are not meeting the minimum standards, even if you are allowed by your academic dean to continue your enrollment, you will have to do so without the benefit of financial aid. Additionally, at this point VA benefits will no longer be certified, until such a time that the reason for unsatisfactory progress is resolved.

Progress is reviewed once each academic year normally at the end of the spring semester. This review includes all attempted coursework, even if the student did not receive financial aid for some or all of that coursework. Students who are not meeting the minimum standards for Satisfactory Academic Progress are notified in writing on the MaineStreet Message Center of the loss of eligibility for further financial aid, effective the following enrollment period.

A grade of D or below is unsatisfactory SAP.

If a student is dismissed for failure to make SAP, there is no probationary period and no readmission. The probationary period if implemented will be up to the point where the student has exceeded the maximum number of C grades.

A copy of the Satisfactory Academic Progress Policy is available in the Office of Student Financial Aid, as well as on the Office of Student Financial Aid website at umaine.edu/stuaid/sap.
Financial Awards and Assistance

School financing is generally offered to students through their graduate programs. However, if financial support is unavailable, it is the graduate student's responsibility to identify sources for financial assistance. The University of Maine offers assistantships, fellowships and traineeships. A typical assistantship appointment will require students to work 20 hours a week. The benefits of these positions include a monthly stipend, a tuition waiver, and coverage of half of the cost of the group health insurance plan provided to graduate assistants, fellows and trainees by the University. All full-time graduate students must provide proof of health insurance. Graduate assistants, fellows and trainees on the equivalent of half-time appointments and who require health insurance must enroll in the GA health insurance plan, or the International plan (for international students).

All applicants who wish to be fully considered for nomination for assistantships, fellowships or traineeships, should have a completed application on file at the Graduate School no later than January 15th for the following summer or fall terms. Students should contact their academic unit directly to inquire about the possibility of securing an assistantship, or to be nominated for any of the authorized positions offered by the Graduate School. Most awards are highly competitive and based on academic performance rather than financial need. A student may normally hold only one assistantship or financial award per year.

The following is a description of financial support opportunities for graduate students.

Graduate Assistantships. Awarded by individual departments or offices, graduate assistantships are generally available in most academic fields which offer a degree program, as well as in such areas as admissions, student aid, and residence life. Some assistantships and fellowships are also awarded competitively through the Graduate School each spring for the following academic year. For most assistantships, up to nine hours of tuition per semester is paid, exclusive of audited and pass/fail courses, and courses numbered below 400-level. The assistantship will not cover tuition for courses audited, courses taken as pass/fail when the course also has a graded option, and courses numbered below 400-level. You are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

The assistantship also pays for 50% of the premium for the group health insurance plan for graduate assistants and fellows or the International plan (for international students) offered by the University. In some cases, a limited amount of tuition for the summer following the academic year in which the assistantship appointment is effective may also be paid by the sponsoring unit.

Graduate assistants normally devote half-time (20 hours per week) to work-activities. International students' visas prohibit them from working elsewhere in addition to the assistantship. Most graduate assistants are required to register for a full-time load of at least six hours of degree credit in the fall and spring semesters. Exceptions are doctoral students who have been admitted to candidacy, doctoral students in Psychology who are taking clinical internships, master's students in dietetic internships, and graduate students in their final semester of study. In these instances, one credit may be considered full-time. If an assistantship continues through the summer, the graduate assistant must register for at least one graduate credit hour.

Admission to the Graduate School and enrollment in courses is required before an appointment to a graduate assistantship is processed. Because these assistantships are awarded by the departments, the student should correspond directly with the appropriate program coordinator regarding the availability of assistantships.

Selected Financial Awards and Descriptions, see The Graduate School website for full listing.

Chase Distinguished Research Assistantships (CDRA). Up to ten research assistantships are awarded annually by the Graduate School. The awards include a monthly stipend, a tuition waiver for up to nine hours per semester exclusive of courses taken as audit or pass/fail or below 400 level and coverage of 50% of the University's health insurance plan. Some receive a tuition waiver during the summer following the academic year of the award. These
awards are made on a competitive basis and involve nomination by the department of study and submission of a research proposal delineating the research to be undertaken. Nominations are sought in December-January.

**Resident Life Positions.** Assistant Community Coordinator positions in the University residence halls are available each year. The position involves working with students, advising complex governments, programming, interpreting and enforcing policies and procedures, advising residents and making referrals, and assisting the Community Coordinator with managing the complex. ACC's receive a stipend, an apartment for the academic year, and a meal plan for themselves while the University is in session, plus tuition up to 18 hours per year. The selection process begins in February so applicants are encouraged to apply early. A limited number of resident assistant positions and internship positions are also available through Residence Life. For information on application procedures, contact Residence Life Room 315, 5748 Memorial Union Orono, Maine 04469-5748 telephone, 207/581-4801.

**Atlantic Provinces Graduate Scholarships.** Three scholarships, which pay up to 18 hours of tuition per academic year, are available on a competitive basis to graduates of higher education institutions in the Atlantic Provinces and Quebec. Applicants interested in being nominated for this award should consult their department. Nominations are sought in January-February. The award may be continued beyond the first year if the student remains in good standing and is re-nominated by his/her program coordinator.

**Graduate Trustee Tuition Scholarships.** Fifteen to twenty scholarships, which pay up to 18 hours of tuition per academic year, are available annually on a competitive basis to students enrolled in graduate programs. Scholarship recipients must be full-time students and may register for up to nine hours of credit each semester. The Graduate School requests nominations from the departments in January-February. Interested students should seek nomination through their departments of study.

**Thurgood Marshall Scholarships.** At least two scholarships which pay up to 18 hours of tuition are available to graduate students whose socioeconomic background, prior academic or work experience, and/or graduate educational interests would bring a unique perspective to the University of Maine community. Preference for these scholarships is given to individuals from groups that have been traditionally underrepresented in specific programs at The University of Maine. Scholarship recipients must be full-time students and may register for up to nine hours of credit each semester. The Graduate School requests nominations from departments in January-February. Interested students should seek nomination through their departments of study.

**Federally Funded Traineeships and Fellowships.** Subject to the availability of federal funds, federal traineeships and fellowships are available to graduate students in some programs such as special education, social work, nursing, biological sciences, communication sciences and disorders, and clinical psychology. Students should inquire in their field of interest.

**Janet Waldron Doctoral Research Fellowships (formerly UMDRF).** The Janet Waldron Doctoral Research Fellowships are open to all doctoral students, regardless of discipline and designed to stimulate research and scholarship at UMaine as measured by research productivity and doctoral-degree graduation rate. Therefore, successful applicants must explicitly address how fellowship support would result in an overall increase in research productivity. The fellowship is intended to provide doctoral students with up to two years (24 months) of support with a stipend of $25,000 per year and coverage of 1 credit or more of tuition per semester and 50% of the University's group health insurance plan to provide financial support through the completion of their degrees. Nominations are sought in December.

**Susan J. Hunter Teaching Assistantships.** Up to four Hunter teaching assistantships are awarded annually for the spring semester to doctoral students who have passed their comprehensive exams and who intend to enter the
professoriate. The Hunter award provides one half of the annual minimum graduate stipend, one credit of graduate tuition, and 50% of the one-semester health insurance premium for graduate assistants, if the student is not already enrolled in the insurance program. Hunter assistants teach one undergraduate course as the sole instructor, under the mentorship of the normal course instructor, and must attend at least 3 graduate student professional development workshops. The student's mentor or another graduate faculty member of the student's unit must teach a 1-3 credit graduate course that otherwise would not be offered. These awards are made on a competitive basis and involve nomination by the department of study and submission of a plan delineating both the course to be taught by the student and the graduate course to be taught by a unit member. Nominations are sought in the spring semester for the following spring.

Summer Dissertation Fellowships. Dissertation writing fellowships are open to doctoral students who have passed their comps and are actively writing their dissertations. Depending on number of applicants, the Graduate School will consider master's students who have completed four semesters of study and are actively engaged in writing a thesis, but preference will be given to doctoral students. Each fellow will receive an office in Stodder Hall and a $1,833 monthly stipend at the end of June, July, and August. Offices will be equipped with desk, chair, and a large table. Fellows are expected to spend at least 5 hours a day, five days a week using the offices to work on their dissertations; however, they may not live in these rooms.

Other Fellowships may be available through individual departments or units. For example, the Canadian-American Center offers several fellowships for graduate students pursuing study of a regional nature involving New England, the Atlantic Provinces of Canada, and Quebec. Students should inquire in their field of interest.

Student Financial Aid

The Office of Student Financial Aid administers several financial aid programs to help University of Maine graduate students finance their education. Office staff award, process, and disburse financial aid for University of Maine students, and advise students and their families, the campus community, and the general public on issues related to financial aid. Our contact hours are from 8:30 a.m. to 4:30 p.m. Monday, Wednesday, Thursday, and Friday and from 9:30 a.m. to 4:30 p.m. on Tuesday. Advisors are available on a walk-in basis between 8:30 a.m. and 3:30 p.m. Monday, Wednesday, Thursday, and Friday and from 9:30 a.m. to 3:30 p.m. on Tuesday. All correspondence concerning financial aid should be addressed to the Office of Student Financial Aid, 5781 Wingate Hall, Orono, ME 04469-5781. For assistance with the application process, status updates, or answers to other questions about financial aid, contact the office at (207) 581-1324, or via e-mail umfinaid@maine.edu.

Applying for Financial Aid

To determine the amount and types of assistance each student can receive, students are required to apply for financial aid. The University of Maine requires only one financial aid application: the Free Application for Federal Student Aid (FAFSA). Students must apply for financial aid each year, using FAFSA at fafsa.gov.

The FAFSA allows students to enter application information and electronically submit their application directly to the federal processing center. Some information can be "pre-filled" from the prior year's application when the Federal Student Aid ID (FSA ID) is used. An FSA ID can be created at: fsaid.ed.gov. The student's signature must be provided before the FAFSA can be processed. There are two ways in which the application can be signed: the student can use their FSA ID to electronically sign the FAFSA or a paper signature page can be printed, signed, and mailed to the address provided. Students should note the confirmation number that is given when the application is submitted.

After applying, the student will receive an email from the federal processing center that directs them how to access their Student Aid Report (SAR) online. The student is expected to review the SAR and make any necessary corrections immediately, or contact the Office of Student Financial Aid for assistance. As long as the University of Maine is listed on the SAR in the school section, the Office of Student Financial Aid will receive the application data, generally within two to three business days. The application will be reviewed and the student will be notified on his/her MaineStreet To Do List if any additional documentation (IRS Data Retrieval, verification forms, or other information) is required. The IRS Data Retrieval tool allows applicants to request and retrieve their tax data directly from the IRS. Once this data is retrieved from the IRS, it can be transferred to the FAFSA application.
Once the student's file is considered complete, a financial aid award will be made available to the student. The student should accept (or decline) each type of aid offered and follow all instructions to ensure continued processing and disbursement of funds to the student's account at the University of Maine Bursars Office.

Eligibility for Financial Aid

To be eligible for most types of Federal, State and University financial aid, each student must:

- be a U.S. citizen or eligible non-citizen
- have earned a high school diploma or G.E.D.
- be offered admission to a University of Maine degree program
- not be in default on a previous Federal educational loan program
- continue to be in good academic standing
- continue to make satisfactory progress toward a degree (see Satisfactory Academic Progress for Financial Aid Recipients).

Most types of financial aid require at least half-time enrollment in order to be eligible. Full-time registration for a graduate student is normally defined as six or more degree hours per semester; part-time status is three to five credit hours per semester. Doctoral students who have been admitted to candidacy, psychology and human nutrition students on approved internships, and students in their final semester of study may maintain full-time enrollment status by registering for a minimum of one thesis or internship credit. Students enrolled in summer session are eligible for aid. However, for students taking one credit, overall financial aid eligibility is less than the eligibility for a graduate student enrolled for 6 or more credit hours due to the reduced cost of tuition and fees.

Financial aid is initially awarded based upon the assumption of full time enrollment regardless of official University status. Each student's enrollment level is verified at the end of the Add/Drop period each semester; financial aid eligibility is recalculated and awards are adjusted if necessary. The student is notified by email if the financial aid award changes. Students participating in cooperative employment programs, practicums, internships and field experience may not be eligible for financial aid unless they are enrolled at least half time.

Federal, State and University financial aid programs are not available for non-degree enrollment. Some lending institutions offer loan programs to students who are currently taking classes in non-degree programs. Further information is available upon request.

NOTE: early registration for classes, including enrollment for Thesis Credits, helps ensure timely processing and disbursement of financial aid funds.

Financial Aid Programs

Graduate students may be offered assistance from the following financial aid programs:

**Federal Direct Unsubsidized Loans** are funded through the federal government and are awarded to students enrolled in a degree program at least half-time who have applied for federal financial aid. Graduate students are allowed to borrow up to $20,500 in unsubsidized Direct Loan per year. As of July 1, 2012, graduate students are no longer eligible for subsidized Direct Loans. Actual eligibility may be less than the annual maximum depending upon enrollment level and the amount of all other financial educationally-related assistance, if any. Students must accept the Federal Direct Loan via MaineStreet. More information is available on the Financial Aid website, located at www.umaine.edu/stuaid.

NOTE: Repayment of principal is deferred on unsubsidized loans while a student is enrolled at least half time. Interest rates are fixed at each academic year and are available on our website at umaine.edu/stuaid/loans/stafford/. Interest begins to accrue or can be paid by the student immediately after disbursement on any unsubsidized loan. Any break in continuous enrollment, such as a leave of absence, will result in the student entering into the 6-month grace period, and repayment could begin before the student re-enrolls in a degree program at least half-time.

NOTE: first-time borrowers of a Federal Direct Loan must complete Entrance Counseling before loan proceeds will be released. To complete the requirement on the web, visit studentloans.gov. Students who have borrowed previously and
completed an Entrance Interview/Loan Counseling session at another college or university should contact the Office of Student Financial Aid. First time Federal Direct Loan borrowers must also complete a new Master Promissory Note (MPN) at studentloans.gov.

**Other Sources of Funding:**

**Scholarships** may be available from the student's academic department or from outside scholarship agencies, to which the student applies directly, and do not have to be repaid.

**Graduate Assistant Tuition Scholarships** are awarded by offices and departments on campus and reported to the Student Financial Aid Office. These assistance programs are usually offered to full-time graduate students in return for the students' efforts in research and/or teaching while working on a graduate degree (contact the Graduate School, Academic Department, or the Office of Student Employment for more information).

**Payment Plans** give students the option of making periodic payments of part or all of the amount due to the University of Maine. For more information visit umaine.edu/bursar/payment-options and click on Installment Payment Plan, or contact the University of Maine Bursar's Office at 581-1521.

**Credit-Based Loan Programs** are available through the Federal Direct Plus loan program and various lending institutions throughout the United States. Please visit the Office of Student Financial Aid's website at umaine.edu/stuaid/types-of-aid/loans for more information on Direct Plus and alternative loans.

**Changes to Financial Aid Awards**

Changes to awards can occur even after a financial aid award has been offered, and aid can be retracted even after it has been posted to a student's account with the Bursar's Office. Students are notified by email any time their financial aid award is adjusted. Changes to awards may be necessary at any time during the academic year due to any or all of the following circumstances:

- changes in enrollment level each semester
- auditing a course
- withdrawal from all classes
- discontinued attendance in classes
- corrections and updates to original application data
- receipt of additional information affecting continued eligibility
- changes in housing plans
- changes in residency status
- changes in student and/or family circumstances
- receipt of additional assistance and/or scholarships
- changes in Satisfactory Academic Progress status

Students are encouraged to contact the office to discuss the impact on their financial aid eligibility before their status changes, if at all possible.

**Financial Aid for Summer Session**

Summer Session is considered to be the end of the University's academic year. To be eligible for Summer Session financial aid, students must have applied for federal financial aid for the previous year and enroll in a minimum of one credit. Generally, financial aid is limited to any remaining Federal Direct Loan eligibility. Federal Work-Study may also be available and requires a separate application, which is available early in the Spring Semester and must be turned in prior to the deadline listed on the application. Students are encouraged to contact the Office of Student Financial Aid to request further information; the best time to discuss specific eligibility is midway through the spring semester and after the student is pre-registered.

**Limits on Financial Aid Eligibility**
Most University of Maine students will have enough financial aid eligibility to complete a graduate degree, but limits do exist and eligibility is impacted by academic performance. To maintain eligibility for financial aid, each student must make progress toward a degree according to the University's Satisfactory Academic Progress for Financial Aid Recipients Policy, measured in three areas; Grade Point Average (GPA), successful completion of credit hours attempted, and length of time it takes to reach completion.

The Federal Direct Loan program places limits, called aggregate limits, on the total amount that may be borrowed by any student. These limits are specified by Federal Student Aid on their website (studentaid.ed.gov/sa/types/loans/subsidized-unsubsidized).

**Withdrawal from All Classes**

If a student withdraws from the University after the semester begins, federal regulations stipulate that financial aid eligibility must be re-evaluated and pro-rated based on the portion of the semester the student completed. Eligibility for continued deferment of any prior loans is also affected. Any potential refund of tuition and fees from the University may be retained to repay financial aid programs before any reimbursement may be made to the student. In some cases, the student may be required to repay some or all financial aid funds previously disbursed to them by the University's Bursars Office. Students considering withdrawing from all classes must contact the Graduate School who will collaborate with the Office of Student Financial Aid to determine the impact of the withdrawal on financial aid. A copy of the withdrawal policy is available in the Office of Student Financial Aid and on their website.

**Institutional (Unofficial) Withdrawal**

Federal regulations require that the Office of Student Financial Aid determine the last date of attendance for an academic related activity for all students who discontinue class attendance. For those students who do not officially withdraw, the mid-point of the semester may be used as the official withdrawal date. Once a withdrawal date has been determined, charges and financial aid will be recalculated based on this date. Please be aware that as a result of this action, financial aid funds may be adjusted and money may be owed the University. You will be notified of any change. A copy of this policy is available in the Office of Student Financial Aid.

**Special Circumstances**

Special circumstances, such as leaving full-time employment to pursue a graduate degree, changes in spousal employment, loss of a benefit or other type of income, changes in marital status, or unexpected/unusual costs, should be brought to the attention of the staff of the Office of Student Financial Aid. Students may meet with an advisor or contact the office at (207) 581-1324 to explain their circumstances.

**Satisfactory Academic Progress for Graduate Financial Aid Recipients**

Federal financial aid regulations limit how long any student can continue to receive financial aid. In order to maintain eligibility for financial aid, each student must be making progress toward a degree. Students can lose eligibility for financial aid if they are not meeting academic standards for continued enrollment, if they are not completing a sufficient number of the credits they have enrolled for, and/or if it is taking too long to earn their degree. Each student's progress is reviewed annually. Students who are not meeting the minimum standards for Satisfactory Academic Progress are notified in writing of the loss of eligibility for further financial aid. Students who are not making Satisfactory Academic Progress, but who are allowed to continue enrollment, may have to do so without the benefit of financial assistance. A copy of the Satisfactory Academic Progress Policy for Financial Aid Recipients is available in the Office of Student Financial Aid.

**Satisfactory Academic Progress Appeal Procedure**

Every student has the right to appeal upon notification of loss of financial aid eligibility due to lack of academic progress. Appeals are considered by a committee. Appeals can only be made in writing. The Graduate Appeal Form and policy can be found at umaine.edu/stuaid/sap. All appeals should be submitted along with appropriate supporting
General Policies

General Policies and Regulations of the Graduate School

It is the student's responsibility to become familiar with the various requirements of graduate study applicable to them and to satisfy these requirements properly. The following policies and regulations apply to graduate study at The University of Maine. Some graduate programs have additional policies and regulations. Please contact the graduate program coordinator for specific program requirements.

1. **Course Levels.** In general, any graduate student working toward a master's degree will be required to present a minimum of 12 hours (exclusive of thesis) of 500- and 600-level course work to partially satisfy requirements for that degree. However, certain degrees have established additional requirements. The same requirement applies to the Certificate of Advanced Study and Education Specialist. Only courses at the 400-level and above may be used for graduate credit.

2. **Grades and Credits.** Graduate degree credit will be granted routinely only to students admitted to graduate programs. Only those courses listed in this publication may be counted for graduate credit, and then, only if given by an instructor approved to teach courses for graduate credit. Once admitted to the Graduate School, all courses taken normally count in the graduate GPA, regardless of academic program or degree completion. Courses taken as a non-degree student also count in the GPA if the courses are part of the degree requirements.

   Normally, only a grade of A or B is acceptable for course work on a student's program of study. A grade of C may carry graduate degree credit if a student's advisory committee so recommends and if the Graduate School approves such an exception. However, no student will be allowed to accumulate more than six hours of C grades on a program of study for a master's degree, nor more than 12 hours of C grades on a program of study for a Ph.D. or Ed.D. Grades below C are not considered acceptable for any graduate student. Since prerequisite and elective courses, as well as required courses, are part of the program of study, the 6- and 12-hour limits apply to all course work for which a student registers while in a particular degree program. Students receiving hours of C in excess of these numbers (or lower grades) will not be considered as having made satisfactory progress toward completing degree requirements.

   Project/thesis/dissertation credits (xxx 699) shall be graded with a P (Pass), I (Incomplete), or F (Fail).

   Audited and Pass-Fail Courses are normally not accepted for graduate degree credit.

   Incomplete and L Grades. Incomplete grades, unless made up during the period before the degree is awarded, will remain as I's on the student's transcript. Each department offering a course may establish additional requirements for alteration or completion of an incomplete grade. An L grade (stopped attending class) computes as a failing grade. A student may not carry a combination of more than three I or L grades in all enrolled degree programs without permission of the graduate program coordinator(s) and the Graduate School. Any course in which a student earns a
grade of I, L, W, or a grade below a C will negatively impact the student's academic progress, and may impact eligibility for financial aid.

3. Registration. Full-time registration for a graduate student is normally defined as six or more degree hours per semester or summer session; part-time status is five hours or less per year. Doctoral students who have been admitted to candidacy, psychology and human nutrition students on approved internships, and students in their final semester of study may maintain full-time enrollment status by registering for a minimum of one thesis or internship credit. Students who have completed at least 6 thesis credits may substitute UGR 501 for the thesis registration requirement and still be considered full time. Registration for a minimum of one thesis credit during the summer session also satisfies the requirement for registration as a graduate student.

The University of Maine and the University of Maine at Machias acknowledge and adhere to the federal definition of a credit hour with respect to courses offered face to face, in hybrid format, and online, as developed in 2010 and published in the Code of Federal Regulations (CFR), Title 34, Part 600.02:

[A] credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than

(1) One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit [. . .] or the equivalent amount of work over a different amount of time; or

(2) At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution[,] including laboratory work, internships, practica, studio work, and other academic work leading to the awarding of credit hours.

https://www.ecfr.gov/cgi-bin/text-idx?SID=ae813138f65e93bd81a17b66d59d067d&mc=true&node=pt34.3.600&rgn=div5#se34.3.600_12

4. Transfer Credit. When courses taken at other institutions, outside the University of Maine System, have been accepted toward partial fulfillment of requirements for an advanced degree, only the credit hours (not grades) will be transferred. Evaluation of performance levels and satisfaction of quality standards shall be based entirely on grades earned at the University of Maine.

A maximum of 6 hours of credit in the case of a master's candidate, and 30 hours beyond the bachelor's degree in the case of a PhD candidate (30-45 hours in the case of an Ed.D. candidate), may be accepted in transfer (subject to the approval of the candidate's advisory committee) for appropriate courses completed in residence at other institutions prior to matriculation in the Graduate School at the University of Maine. Courses to be accepted must have been taken at a fully accredited college or university which offers a graduate program, and must be acceptable at that institution in partial fulfillment of its requirements for an advanced degree.

In no case may the number of credit hours transferred into a graduate degree program exceed 50 percent of the student's entire course work for the degree. (see Residence Requirement below).

Credit cannot be transferred for courses which would not, if taken at UMaine, have received graduate credit, courses in which a grade lower than "B" was received, correspondence courses, courses which are inappropriate for inclusion in the student's degree program, and courses completed at such a date as to exceed time limits prescribed for a particular degree program.

Up to twelve credit hours may be transferred from appropriate course work taken at UMaine before matriculation in a graduate degree program if no other work is being transferred.
5. Time Limit. All work for a master's degree Certificate of Advanced Study, and for the Education Specialist must be completed within six years of matriculation.

All work for a doctoral degree must be completed within eight years of matriculation. Students must be admitted to candidacy within four years of registration as a doctoral student; the dissertation must be completed within four years of admission to candidacy.

If requirements for an advanced degree or certificate are not completed within the time specified, they must file a petition for Exemption for Regulation requesting an extension which must first be approved by their department and then by the Graduate School. If the student has broken enrollment and exceeded the time limit of their program, they must apply for readmission before being allowed to continue working toward the degree. Courses exceeding the time limit for the degree may be counted only if revalidated by the instructor. If the application for readmission is approved, the student's program of study will be revised in view of the work completed and/or revalidated.

6. Residence Requirement. In the master's degree, Education Specialist and Certificate of Advanced Study programs, at least 50 percent of course work applied toward the degree must be taken through The University of Maine. An institutional unit graduate committee may increase this minimum residence requirement.

Residence requirements for doctoral students may be found in the descriptions of the degree of Doctor of Philosophy and Doctor of Education elsewhere in this catalog.

7. Advisory Committee. The graduate student, in conjunction with their advisor, is responsible for initiating activities to establish the student's advisory committee, which is appointed by the Dean of the Graduate School or designee, as early as possible in the student's course of study. The student's major advisor or thesis advisor normally acts as chairperson of this advisory committee. The committee for a master's candidate is composed of a minimum of three members of the Graduate Faculty; a five member committee is required for a doctoral student. It is highly recommended that one committee member be selected from the Graduate Faculty of a department other than that of the student's intended major. The advisory committee guides the student on course work and the thesis, and often serves as the examining committee for the master's final examination and as the core of the examining committee for the doctoral final examination. Advisory committees may not be required for students in professional, nonthesis degree programs. Graduate students should consult with their advisors to clarify this requirement in relation to the degree being pursued.

8. Program of Study. The program of study is an outline of all academic work to be undertaken by a graduate student, and must include prerequisite and elective courses taken while enrolled in a graduate program. It is planned by the student and his or her advisory committee as early as possible in the course of study, and in order to continue to register for graduate courses, this program must be submitted to the Graduate School before the end of the first year of study for doctorate students holding a master's degree. Those holding only a bachelor's degree must file this form by completion of 12 credit hours or by the third registration, whichever comes first.

The entire program of study must be presented on a form available from the Graduate School. When it is approved by the student's advisory committee and filed in the Graduate School it becomes the student's required curriculum. Changes in the program of study may be made by submitting a "Request for Change in Program" form approved by the student's advisory committee. It is the student's responsibility to obtain approval of major changes in the course of study at the time such changes are made. Minor changes may be made and the "Request for Change in Program" form filed at the Graduate School during the semester in which graduation occurs.

Certain non-thesis programs such as the M.Ed., C.A.S., Ed.S, and M.B.A., have prepared curricula in photocopied form which satisfy the requirements for a program of study. These are available from the appropriate departmental offices.

9. Foreign Language Requirement. Each institutional unit designates the foreign language requirement, if any, in its catalog description. There is no overall Graduate School language requirement.
10. Final Examination. A final examination is required of all students in thesis programs and in many non-thesis programs. Other members of the faculty may be invited to attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

11. Application for Graduation. Candidates for degrees must apply for graduation within MaineStreet according to the following schedule: by October 1, for degrees to be awarded at the end of fall semester; by July 15, for degrees to be awarded at the end of summer session; and February 1, for degrees to be awarded at the end of spring semester.

For more information about the application process go to studentrecords.umaine.edu/graduation/.

Graduation Timeline: Each unit performs final certification of degree completion by the specified date established by the Office of Student Records each semester.

Students who apply for graduation but do not meet the minimum requirements will be notified by the unit and/or the Graduate School.

12. Undergraduate Registration in Graduate Courses.

University of Maine undergraduate students with appropriate qualifications and permission of the instructor may also take graduate-level (500-599) courses for undergraduate degree credit. These credits may not be used to fulfill requirements for a graduate degree unless they exceed the bachelors degree requirements or are taken within an approved accelerated graduate program (see below).

Accelerated graduate programs: Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit. Students in approved accelerated undergraduate/graduate programs may begin taking graduate classes with departmental approval in their junior or senior year. Total combined enrollment for the semester may not exceed 15 hours. Up to nine hours of 500 or 600-level degree credit may be applied to both the undergraduate and graduate degrees. The credits will be posted on the graduate transcript when the student completes the undergraduate degree with at least a 3.0 GPA and is formally admitted to Graduate School. The following accelerated programs are currently available at the University of Maine:

4+1 (nonthesis):

Undergraduate program/Graduate program

- biology/biology (this would also include related options in plant science, zoology and ecology)
- any computer science-related undergraduate program/spatial informatics
- any computer science-related undergraduate program/information systems
- any computer science-related undergraduate program/spatial information science and engineering
- economics/economics
- electrical or computer engineering/electrical or computer engineering
- food science/food science
- forestry/forestry
- history/history
- math/math
- political science/global policy
- special education
- business administration
- mechanical engineering
- human development
- intermedia

Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit.
4+2 (thesis): **Undergraduate program/Graduate program**

biology/biology (this would also include related options in plant science, zoology and ecology)

food science/food science

math/math

*Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit.*

13. Faculty as Candidates for Advanced Degrees. Members of the University faculty at the instructor level or above, may become candidates for advanced degrees from any college or school of The University of Maine other than The University of Maine college or school in which they hold faculty appointments.

14. Requests for Exceptions to Regulations. Students may request exceptions to the Graduate School Policies and Regulations, but must submit convincing evidence the exception is needed and is warranted. Forms for this purpose may be obtained from the Graduate School or from the web site https://umaine.edu/graduate/facultystaff-resources/.

15. Withdrawal Procedure. To ensure proper posting of their academic and financial records, students who withdraw from graduate study must notify the Graduate School in writing.

Graduate students are encouraged to secure a copy of the Student Handbook from the Office of Student Affairs or at umaine.edu/handbook. Although primarily for undergraduates, this publication contains many of the University's policies and regulations with which students should be familiar.

16. Grievance Procedure. Recognizing the highly individualized nature of graduate programs, a student filing an academic appeal is encouraged to request that their thesis advisor or other faculty member of their choice act as a counselor and/or representative at any level of the appeal process which is as follows:

- The student should discuss the concern with the appropriate faculty member(s);
- If the concern persists, the student should follow the department's written appeal procedures if they exist, or if not, consult with the graduate program coordinator or chairperson/school director, (or the college dean, if there is no department);
- If the complaint remains unresolved, the student should write to the Dean of the Graduate School, outlining the situation, and requesting a review. The Dean of the Graduate School or their designee will discuss the situation with the college dean and/or appropriate members of the department or graduate program. The Dean of the Graduate School or their designee will then meet with the student and attempt to resolve the problem;
- If this resolution is not satisfactory, the Dean of the Graduate School will refer the appeal to the Executive Committee of the Graduate Board for one final review. After hearing from the student and the faculty member(s) involved, the Executive Committee will render its decision, which shall be considered binding. The decision will be communicated to the student by the Dean of the Graduate School.

**Graduate Certificate**

General Requirements. Graduate certificate programs may be earned by students who have completed at least a bachelor's degree from an accredited university or college. Graduate certificate programs consist of nine to eighteen credit hours of course work at the 400-level or higher. At least 50% of the course work applied towards the requirements for the certificate must be 500-level or above.
Students who are currently enrolled in the Graduate School and who wish to pursue an approved graduate certificate program simultaneously must apply for admission to the certificate program before one-half of the required credits are completed.

A maximum of 40% of the credit hours towards any certificate program may be accepted as transfer credit. One course in which a grade of "C" was earned may be applied towards the requirements for a graduate certificate. Acceptance of a course towards a certificate or acceptance into a graduate certificate program does not necessarily guarantee acceptance of the same course towards a graduate degree.

The student will be required to complete the certificate program within the time limit specified for the program; if no time limit is specified, it shall be the same as that for completion of the master's degree (six years).

Students in graduate certificate programs are not eligible for federal financial aid unless also enrolled in a degree program. However, nonresident students in on-line graduate certificate programs are eligible for an e-tuition rate of 125% of the Maine resident tuition.

Master's Degree

General Requirements. The following requirements apply to the degrees of Master of Arts and Master of Science: A minimum of 30 semester hours, including credit given for the thesis, is required. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. If more than 10 semester hours are allowed, the candidate must spend at least two academic years in resident graduate study.

A thesis is required of all candidates for the degrees of Master of Science and Master of Arts with the exception of specific non-thesis options. A final copy of the thesis must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library. Students in thesis programs must have an advisory committee of three members of the Graduate Faculty. All MS and MA students in thesis programs must complete an appropriately approved Responsible Conduct of Research course (umaine.edu/graduate/students/progress/rcr/) before the commencement of the fourth _699 credit.

A graduate student working toward a master's degree will be required to present a minimum of 12 hours (exclusive of thesis) of 500- and/or 600-level course work to partially satisfy requirements for that degree.

Departmental or program requirements for master's students may be found in the program descriptions elsewhere in this catalog.

Awarding of Posthumous Degrees for Undergraduate and Master's Programs

The following policy is to govern the awarding of degrees posthumously at The University of Maine.

Requirements:

A posthumous degree may be awarded if:

- At the time of death the student had completed all requirements of their degree program and would have qualified for graduation; or
- At the time of death the student was enrolled in their final semester, was taking the necessary courses to complete their degree requirements, and their instructors and/or advisor can show that the student was likely to complete the coursework satisfactorily.

Procedure:
• A request for a posthumous degree is made to the chair of the students department by family, friends, or faculty members who have worked with the student. A death certificate and proof of their relationship to the student must be made available;
• If the above requirements have been met, the request will go to the Associate Dean of the college/Graduate School for approval;
• Provost reviews and makes recommendation to the President
• President has final approval;
• The approved request is forwarded to the Office of Student Records.

Awarding of Posthumous Degree:

• The students diploma and transcript will note that the degree was awarded posthumously;
• The students name will appear in the Commencement program, with a note that the degree was awarded posthumously;
• The President, Provost or their designee(s) will hold a private reception with the family and friends of the deceased and present the degree at the reception.

Doctor of Philosophy

The Ph.D., the highest of academic degrees, is awarded to candidates demonstrating outstanding achievement in a specialized field of scholarship and primarily for demonstrated ability for independent research in a subdivision of this field.

The following requirements apply to the Ph.D. degree:

Residence Requirement. The minimum residence requirement for Ph.D. programs is met by registering for courses or thesis research through the University of Maine for four semesters beyond the baccalaureate degree. Students entering doctoral programs with a master's degree must register for at least two semesters of course work or research. Individual institutional units may increase this requirement. At least 50% of the credits applied to the degree must be earned from the University of Maine.

Tuition Requirement. Doctoral students will be charged tuition based on the number of credit hours for which they register. A full-time student must register for a minimum of 6 credit hours per semester in order to satisfy the requirements for the doctoral degree, except students who have been admitted to candidacy, students on psychology internships, and students in their final semester, in which case 1 thesis or internship credit may be considered full-time. The total number of credits required is determined by the academic department and the student's advisory committee. In general, no more than 30 semester hours of transfer credit from a master's degree will be accepted.

Language Requirement. There is no overall Graduate School language requirement. Each department or institutional unit offering graduate programs designates the language requirement, if any. This may be found in departmental descriptions elsewhere in this catalog. A student must meet the appropriate language requirement before being admitted to candidacy.

Comprehensive Examinations. Comprehensive examinations, which may be written, oral, or both, will be administered by the student's major department and passed to the satisfaction of the advisory committee. These examinations may not be taken until the student has completed at least one and one-half years, or the equivalent, of study beyond the bachelor's degree. These examinations are given to determine whether the student's progress in studies has been satisfactory and whether pursuit of research for the thesis will be profitable and the training requirements for the degree will likely be met.
Admission to Candidacy. Admission to candidacy signifies the student has successfully fulfilled all degree requirements except for completing the dissertation, and the final oral examination. Graduate students in doctoral programs will be admitted to candidacy when the Graduate School is informed the student has successfully passed the comprehensive examination and has met any other departmental requirements. All students admitted to candidacy may maintain full-time status by registering for a minimum of 1 thesis credit. A student must be admitted to candidacy within four years of registration as a doctoral student. All work for a doctoral degree must be completed within four years of admission to candidacy.

Dissertation. The doctoral dissertation must demonstrate the candidate's mastery of the area of research, and must embody the results of an original investigation in the principal field of study. It must give evidence of an exhaustive study of a specialized field and must be an authoritative statement of knowledge on the subject or produce a new interpretation by rearrangement or reanalysis of existing data. The work must be a definite contribution to knowledge of sufficient importance to warrant its publication. All PhD students must complete an appropriately approved Responsible Conduct of Research course (umaine.edu/graduate/students/progress/rcr/) before the commencement of the fourth semester.

A final copy of the dissertation must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library. While more credits are allowed, doctoral students must register for a minimum of 6 credits of thesis.

The Final Examination. After the doctoral dissertation has been accepted by the candidate's advisory committee, the original copy shall be presented to the Graduate School. The candidate must then appear for final examination by an examining committee of no fewer than five members (usually the student's advisory committee) appointed by the Dean of the Graduate School upon recommendation of the major advisor. Other members of the faculty may attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

The final examination, which is oral, is concerned with the subject of the dissertation and with the candidate's understanding of related matters important to a proficiency in the principal field of study. The examination must demonstrate the candidate's mastery of the techniques of research and skill in organizing and presenting the material.

The committee vote need not be unanimous for a doctoral candidate to pass the final oral examination; however, only one (1) negative vote will be permitted.

Doctor of Education

The Ed.D. is given primarily for outstanding achievement in educational leadership or higher education, for demonstrated ability in independent research, and in recognition of a significant contribution to education as evidenced by the dissertation. The holder of the degree is expected to have demonstrated a comprehensive understanding and knowledge of the foundations of education and proficiency in applying that understanding to the field of specialization.

Admission to Candidacy. A graduate student in the doctoral program will be admitted to candidacy when the Graduate School is informed that the student has successfully completed all examinations and has met any other College of Education and Human Development departmental requirements. All students admitted to candidacy may maintain full-time status by registering for a minimum of 1 thesis credit. A student must be admitted to candidacy within four years of registration as a doctoral student. All work for the doctoral degree must be completed within four years of admission to candidacy.

Residence Requirement. The minimum residence requirement for Ed.D. programs is met by registering for courses or thesis research through The University of Maine for four semesters beyond the baccalaureate degree. Students entering doctoral programs with a master's degree must register for at least two semesters of course work or research. Individual institutional units may increase this requirement.

Tuition Requirement. Doctoral students will be charged tuition based on the number of credit hours for which they register. A full-time student must register for a minimum of 6 credit hours per semester in order to satisfy the
requirements for the doctoral degree. The total number of credits required is determined by the academic department and the student's advisory committee. In general, no more than 50% of post-baccalaureate credits will be accepted in transfer credit towards the degree.

**Comprehensive Examination.** The comprehensive examination will be in the area of specialization and will be administered by the student's advisory committee. The nature of the examination, and determinations regarding the level of performance, as well as all other aspects of the examination shall be made by the Graduate Faculty of the area of specialization. The final decision as to the student's performance in the examination shall rest with the advisory committee.

**Dissertation.** The doctoral dissertation must demonstrate the candidate's mastery of the area of research. It must give evidence of an exhaustive study of a specialized field and must be an authoritative statement of knowledge on the subject or produce a new interpretation by rearrangement or reanalysis of existing data. The work must be a definite contribution to knowledge of sufficient importance to warrant its publication. All EdD students must complete an appropriately approved Responsible Conduct of Research course (umaine.edu/graduate/students/rcr/) before the commencement of the fourth _699_ credit.

A final copy of the dissertation must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library.

While more credits are allowed, doctoral students must register for a minimum of 6 credits of thesis (_699_).

**The Final Examination.** After the doctoral dissertation has been accepted by the candidate's advisory committee, the original copy shall be presented to the Graduate School. The candidate must then appear for final examination by an examining committee of no fewer than five members appointed by the Dean of the Graduate School upon recommendation of the major advisor. Other members of the faculty may attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

The final examination, which is oral, is concerned with the subject of the dissertation and with the candidate's understanding of related matters important to a proficiency in the principal field of study. The examination must demonstrate the candidate's mastery of the techniques of research and skill in organizing and presenting the material.

**Awarding of Posthumous Degrees for Doctoral Programs**

**Preamble:**

The University of Maine ordinarily awards undergraduate and graduate degrees only to those candidates who have completed all course work and other requirements necessary to earn the degree. However, given the somewhat extended nature of a graduate students dissertation preparation, occasions may arise in which a student passes away just prior to completing the final doctoral degree requirements. This policy permits the University of Maine to confer a doctoral degree to a deceased graduate student who has been admitted to candidacy and has completed all work except submission of the final dissertation, and who would likely have finished the remaining degree requirements within a year of the death.

**Procedure:**

Upon receiving signed approval from the student's dissertation committee, the graduate program coordinator and/or department chair forwards a nomination letter to the Dean of the Graduate School expressing support for the conferral of the posthumous doctoral degree. The letter should address how close the student was to completing the dissertation at the time of his/her death. The nomination packet should also include the students Curriculum Vitae and may also contain letters of support from other faculty members. The Dean of the Graduate School will confer with the Executive Committee of the Graduate Board about awarding the degree posthumously. If the review is favorable, the Dean will forward a recommendation to the Provost and the President that the doctoral degree be conferred posthumously. The President will inform the UMS Vice Chancellor for Academic Affairs of the University's decision.
Dual Degrees

The University of Maine Graduate School allows students to pursue two graduate degrees under the circumstances detailed below. In all cases, dual degrees should be interpreted to include separate majors within the same degree (e.g., Master of Science), a combination of two different degrees, or a combination of a graduate degree and certificate of advanced study/education specialist. In all cases, students will receive separate diplomas or certificates.

1. Consecutive Degrees. Enrollment in consecutive dual degrees refers to matriculation in a second graduate degree program at the University of Maine after completion of the requirements for a first graduate degree earned at The University of Maine. A student may apply up to 9 credits earned in a graduate degree program at The University of Maine toward a masters degree or a Certificate of Advanced Study or Education Specialist with approval of the students graduate advisory committee and/or graduate program coordinator in the second graduate program. Thesis or research credits from the first program may not be counted toward the requirements of the second program. Additional policies on transfer credit in graduate certificate programs and doctoral programs are included elsewhere in the Policies and Regulations of the Graduate School.

2. Concurrent Degrees. Enrollment in concurrent dual degrees occurs when a student is matriculated in two graduate degree programs simultaneously. A student may not be enrolled in more than two graduate programs simultaneously. In general, a student may pursue concurrent degrees only with approval of the appropriate graduate program coordinator(s) and the Dean of the Graduate School. The student must apply and be admitted to both programs. With approval of the students graduate advisory committee(s) and/or the graduate program coordinator(s), a student may apply up to 9 University of Maine credits earned in one masters degree toward the requirements for a second masters degree or Certificate of Advanced Study. Transfer policy for doctoral degrees is covered elsewhere in the Policies and Regulations of the Graduate School. Generally, students must complete separate theses if required by both programs. Completion of the degree requirements for the two programs need not be at the same time. If a students tuition is funded by one or more units, it is up to the funding unit to decide if tuition may cover courses taken solely for completion of the second program.

3. Integrated Dual Degrees. Some units have formalized concurrent dual degrees between programs which create an integrated program linking the two disciplines, while continuing to award separate degrees. Generally, these dual degree programs follow the rules outlined above. However, if the formalized dual degree program features further integration, such as a single admissions process, submission of a single thesis, a single advisory committee composed of members from both programs, or more than 9 credits of common courses, the program, including proposed programs of study, must be approved by the Dean of the Graduate School and the Graduate Board of the University of Maine.

Thesis/Dissertation Preparation

Rules for thesis and dissertation preparation are outlined in a separate publication, "Thesis Guidelines," which is available at umaine.edu/graduate/students/progress/thesis. It is the student's responsibility to be familiar with the format(s) acceptable to the Graduate School. The student's advisor should have the thesis or dissertation about one month prior to the final examination, or at an alternate time specified by the institutional unit concerned.

A complete draft of the thesis, in a form acceptable for examination purposes, must be delivered to the Graduate School in PDF format no later than 24 hours prior to the final oral examination. The advisor must send the "Tentative Thesis Acceptance Statement" via email. At this time, the format and major components will be reviewed as acceptable or not. A checklist of required changes and the thesis draft will be sent back to the student via email. The student should allow approximately one week for the Graduate School to review the thesis draft. The final copy of the thesis must be submitted in PDF format to the Graduate School.
A checklist of dates for potential graduates is available each semester on the Graduate School website. It is the student's responsibility to consult this checklist to ascertain appropriate due dates.

**Doctoral Commencement Eligibility.** May doctoral candidates must have successfully completed all degree requirements, including acceptance of dissertation by the Graduate School, prior to the Commencement date. Candidates who are unsure of their academic status should contact the Graduate School (207.581.4217).

NOTE: Doctoral students graduating in **August** may participate in Commencement if the following requirements are **ALL** met:

- Apply to graduate for August graduation in MaineStreet studentrecords.umaine.edu/graduation/. Applying for May graduation is reserved ONLY for students completing all the requirements.
- Submit a Notice of Oral Examination to the Graduate School (2 weeks prior to the defense).
- Submit the tentative dissertation to the Graduate School office at least 24 hours prior to the defense.
- Successfully present and orally defend the dissertation by the last Friday in April, the established deadline for participation in Commencement.
- Submit a copy of the Final Thesis Acceptance Form demonstrating an affirmative vote of the Committee. The original form with all signatures must accompany the final dissertation and other required forms.

**Graduate Courses**

**Animal & Veterinary Sciences**

- AVS 546 - Forage Science and Range Management
- AVS 554 - DNA Sequencing Analysis Lab
- AVS 555 - Animal Nutrition
- AVS 556 - Animal Nutrition Laboratory
- AVS 577 - Zoonoses and Animal Health
- AVS 590 - Special Topics in Animal Science
- AVS 633 - Graduate Seminar in Animal Science
- AVS 690 - Graduate Research in Animal Science
- AVS 699 - Graduate Thesis/Research

** Anthropology**

- ANT 500 - Advanced Social Theory
ANT 510 - Climate, Culture, and the Biosphere
ANT 521 - Geographic Information Systems I
ANT 522 - Geographic Information Systems II
ANT 530 - Human Dimensions of Climate Change
ANT 550 - Anthropological Dimensions of Environmental Policy
ANT 553 - Governance of the Commons and Global Change
ANT 555 - Resource Management in Cross-cultural Perspective
ANT 560 - Research Design and Methods
ANT 564 - Ecological Anthropology
ANT 566 - Economic Anthropology
ANT 576 - Method and Theory in Archaeology
ANT 597 - Advanced Topics in Anthropology
ANT 598 - Independent Study
ANT 699 - Graduate Thesis/Research

Art

ART 570 - Intermedia Studio I
ART 597 - Independent Study in Studio Art
ART 598 - Directed Study in Studio Art

Art Education

AED 574 - Topics in Art Education
AED 597 - Independent Study in Art Education
AED 598 - Directed Study in Art Education
Art History

ARH 597 - Independent Graduate Study
ARH 652 - Critical Methods in History of Art
ARH 692 - Baroque Research Seminar
ARH 693 - Medieval Research Seminar
ARH 694 - Renaissance Research Seminar

Astronomy

AST 598 - Special Topics in Theoretical or Experimental Astrophysics

Biochemical Engineering

BEN 551 - Biological and Medical Image Analysis I
BEN 552 - Biological and Medical Image Analysis II

Biochemistry, Microbiology and Molecular Biology

BMB 502 - Introduction to Bioinformatics
BMB 530 - Cellular Signal Transduction Mechanisms
BMB 580 - Seminar in Microbiology
BMB 582 - Seminar in Biochemistry
BMB 597 - Special Topics in Biochemistry
BMB 598 - Special Topics in Microbiology
BMB 699 - Graduate Thesis/Research

Biological Engineering

BLE 597 - Advanced Topics in Biological Engineering
BLE 599 - Independent Study in Biological Engineering
BLE 699 - Graduate Thesis/Research

**Biological Sciences**

BIO 501 - Evolutionary Theory and Application
BIO 504 - Advanced Developmental Biology
BIO 505 - Professionalism in Biology
BIO 510 - Climate, Culture, and the Biosphere
BIO 511 - Insect Ecology
BIO 512 - Advanced Seminar in Biology
BIO 515 - Thermal Ecology-Animals and Climate Change
BIO 525 - Community Ecology
BIO 530 - Biology of the Fungi
BIO 531 - Fungal Biology Laboratory
BIO 532 - Biology of the Fungi
BIO 550 - Biogeochemistry of Terrestrial Ecosystems
BIO 555 - Biological Invasions
BIO 572 - Paleoecology
BIO 574 - Neurophysiology
BIO 580 - Cell Biology
BIO 583 - Cell Biology (Lab)
BIO 593 - Advanced Biometry
BIO 597 - Special Topics in Biology
BIO 687 - Problems in Biological Sciences I
BIO 688 - Problems in Biological Sciences II
BIO 699 - Graduate Thesis/Research

Biomedical Sciences

BEN 502 - Advanced Materials in Bio-inspired Engineering
BEN 503 - Advanced Instrumentation Design
BEN 512 - Modeling of Biomedical Systems
BEN 580 - Computational Methods in Biomedical Engineering
BMB 520 - Introduction to Image Analysis
BMS 525 - Molecular Genetics
BMS 605 - Professionalism and Responsible Conduct of Research in Biomedical Science and Engineering
BMS 625 - Foundations of Biomedical Science & Engineering
BMS 630 - Journal Club in Biomedical Science and Engineering
BMS 635 - Current Approaches in Biomedical Science & Engineering
BMS 640 - Experimental Methods in Cell & Molecular Biology
BMS 645 - Biology Tissue Development and Function
BMS 650 - Grant Writing in Biomedical Science & Engineering
BMS 660 - Cell, Molecular and Developmental Neurobiology
BMS 690 - Special Topics in Biomedical Science & Engineering
BMS 699 - Graduate Thesis/Research

Business Administration

ACC 507 - Advanced Accounting
ACC 515 - Advanced Federal Tax Topics
ACC 608 - Topics in Accounting
ACC 697 - Field Experience in Accounting

BUA 561 - Knowledge Management and Decision Support Systems

BUA 601 - Strategic Data Analysis

BUA 680 - Foundations of Business Intelligence and Analytics

BUA 681 - Data Management and Analytics

BUA 682 - Data Pre-Processing for Business Analytics

BUA 683 - Information Visualization

BUA 684 - Business Data Mining and Knowledge Discovery

BUA 685 - Problem Solving and Decision Analysis

BUA 686 - Predictive and Business Forecasting

MBA 545 - Selected Topics in Business Administration

MBA 596 - International Field Study

MBA 605 - Creating & Capturing Value in the Digital Economy

MBA 609 - Financial Statement Analysis

MBA 620 - Law, Business and Society

MBA 626 - Management of Contemporary Organizations

MBA 637 - Global Supply Chain Networks

MBA 639 - Contemporary Issues in International Business

MBA 645 - Selected Advanced Topics in Business Administration

MBA 649 - Strategic Decision Making

MBA 651 - Financial Management

MBA 652 - Management of Financial Institutions

MBA 653 - Investment Management
MBA 668 - Electronic Commerce
MBA 670 - Managerial Marketing
MBA 695 - MBA Internship
MBA 698 - Independent Study

Canadian Studies
CAN 501 - Understanding Canada
CAN 599 - Internship

Center for Undergraduate Research
UGR 501 - Principles and Practices of Mentoring Undergraduate Research

Chemical Engineering
CHE 510 - Introduction to Transport Phenomena
CHE 540 - Advanced Chemical Engineering Thermodynamics
CHE 561 - Advanced Chemical Engineering Kinetics
CHE 580 - Chemical Engineering Analysis
CHE 598 - Special Topics in Chemical Engineering
CHE 695 - Graduate Seminar I
CHE 696 - Graduate Seminar II
CHE 699 - Graduate Thesis/Research

Chemistry
CHY 502 - Chemistry Instructional Laboratory Leadership
CHY 523 - Advanced Polymer Chemistry
CHY 531 - Structure and Mechanism in Biological Chemistry
CHY 541 - Topics in Advanced Analytical Chemistry
CHY 551 - Topics in Advanced Organic Chemistry
CHY 553 - Organic Qualitative Analysis
CHY 555 - Intermediate Organic Chemistry
CHY 556 - Theoretical Organic Chemistry
CHY 559 - Problem Solving In Organic Chemistry
CHY 560 - Physical Methods of Inorganic Chemistry
CHY 562 - Advanced Organometallic Chemistry
CHY 563 - Inorganic Chemical Kinetics and Mechanisms
CHY 571 - Topics in Advanced Physical Chemistry
CHY 573 - Computer Simulation Methods
CHY 575 - Principles of Quantum Chemistry
CHY 578 - Nanoscience
CHY 583 - Advanced Wood Chemistry
CHY 661 - Topics in Advanced Inorganic Chemistry
CHY 673 - Statistical Thermodynamics
CHY 693 - Graduate Seminar
CHY 698 - Graduate Research
CHY 699 - Graduate Thesis/Research

Civil and Environmental Engineering

CIE 521 - Civil Engineering Systems and Optimization
CIE 533 - Environmental Aquatic Chemistry
CIE 534 - Environmental Microbiology
CIE 537 - Water Pollution

CIE 540 - Experimental Analysis of Structures

CIE 543 - Introduction to Composite Materials in Civil Engineering

CIE 544 - Design of Wood and Masonry Structures

CIE 545 - Structural Dynamics

CIE 547 - Prestressed Concrete Structures

CIE 548 - Bridge Engineering

CIE 549 - Numerical Methods in Engineering

CIE 551 - Water Wave Mechanics

CIE 552 - Physical Hydrology

CIE 553 - Water Resources Sustainability

CIE 554 - Natural System Hydrodynamics

CIE 555 - Computational Methods for Water Resources Engineering

CIE 557 - Measurement Techniques in Water Resources

CIE 558 - Coastal Engineering

CIE 559 - Marine Turbulence

CIE 563 - Thermal Soil Mechanics

CIE 564 - Deep Foundations

CIE 598 - Selected Studies in Civil Engineering

CIE 640 - Advanced Structural Analysis

CIE 644 - Advanced Composite Materials in Civil Engineering

CIE 647 - Advanced Topics in Steel Design

CIE 648 - Fracture Mechanics
CIE 660 - Advanced Soil Mechanics

CIE 699 - Graduate Thesis/Research

Communication

CMJ 503 - Critical Historiography of Rhetoric

CMJ 506 - Rhetorical Theory: Civic Tradition

CMJ 510 - Critical Studies in Mass Communication

CMJ 515 - Mass Communication Theory

CMJ 520 - Media History

CMJ 524 - Seminar in Interpersonal Communication

CMJ 525 - Propaganda and Political Communication

CMJ 540 - Social Media and Digital Cultures

CMJ 545 - Media Ecology

CMJ 579 - The Theory of Composition

CMJ 580 - Environmental Communication

CMJ 593 - Topics in Communication

CMJ 595 - Teaching Observation and Training

CMJ 600 - Introduction to Graduate Study in Communication

CMJ 601 - Seminar in Research Methods

CMJ 602 - Teaching Communication in College

CMJ 603 - Seminar in Rhetorical Criticism

CMJ 604 - Qualitative Communication Research Methods

CMJ 606 - Rhetorical Theory: Critical Tradition

CMJ 608 - Communication Theory
CMJ 610 - Seminar in Risk Communication
CMJ 690 - Directed Research
CMJ 693 - Reading for Graduate Comprehensive Exams
CMJ 695 - Graduate Internship
CMJ 698 - Contemporary Issues in Human Communication
CMJ 699 - Graduate Thesis/Research
CSD 680 - Augmentative and Alternative Communication

**Communication Sciences and Disorders**

CSD 581 - Articulation and Phonology Disorders
CSD 582 - Voice Disorders
CSD 583 - Fluency Disorders
CSD 584 - Language Disorders in Children: Preschool
CSD 585 - Language Disorders in Children: School-Age
CSD 586 - Current Issues in Clinical Practice
CSD 588 - Aural Rehabilitation
CSD 601 - Seminar in Research Methods
CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia
CSD 683 - Seminar in Clinical Procedures
CSD 684 - Seminar in Clinical Procedures II
CSD 685 - Diagnostic Process in Speech-Language Pathology
CSD 686 - Clinical Practicum
CSD 687 - Swallowing Disorders
CSD 688 - Neurocognitive Disorders in Adults
CSD 689 - Motor Speech Disorders
CSD 690 - Directed Research I
CSD 691 - Directed Research II
CSD 699 - Graduate Thesis/Research

Computer Science

COS 515 - Topics in Scientific Computation: Simulation and Modeling
COS 520 - Software Engineering I
COS 530 - Introduction to Cybersecurity
COS 535 - Information Privacy Engineering
COS 542 - Cloud Computing
COS 550 - Theoretical Computer Science I
COS 554 - Algorithms
COS 565 - Data Visualization
COS 570 - Topics in Artificial Intelligence
COS 580 - Topics in Database Management Systems
COS 598 - Advanced Topics in Computer Science
COS 699 - Graduate Thesis/Research
DSE 510 - Data Science and Engineering Practicum

Disability Studies

DIS 500 - Contemporary Disability Theory
DIS 520 - Disability: Advanced Interaction of Human Diversity and Global Environments
DIS 530 - Disability Policy
DIS 670 - Doctoral Interdisciplinary Project in Disability Studies

DIS 680 - Independent Study in Disability Studies

Earth Sciences

ERS 501 - Paleoceanography

ERS 503 - Graduate Research Seminar in Earth and Climate Sciences

ERS 525 - How to Build a Habitable Planet

ERS 527 - Isotope Geology

ERS 534 - Coastal Sedimentology

ERS 541 - Glaciers and our Landscape

ERS 542 - Atmosphere, Ocean, Ice, and Climate Change

ERS 544 - Introduction to Glaciology

ERS 552 - Geomorphology

ERS 553 - The Quaternary Stratigraphic Record

ERS 555 - Microstructural Processes

ERS 560 - Marine Geology

ERS 579 - Topics in Structure and Petrology

ERS 580 - Introduction to Hydrogeology

ERS 581 - Proposal Writing

ERS 588 - Topics in Applied Hydrogeology

ERS 602 - Selected Study in Geology II

ERS 699 - Graduate Thesis/Research

Ecology and Environmental Sciences
AVS 511 - Advanced Aquaculture

EES 590 - Special Topics in Ecology and Environmental Science

EES 595 - Professional Experience in Ecology & Environmental Science

EES 598 - Special Seminar in Ecology and Environmental Sciences

EES 699 - Graduate Thesis/Research

Economics

ECO 502 - Contemporary Issues in World Economy

ECO 504 - Behavioral Economics

ECO 505 - SL:Sustainable Energy and Policy

ECO 511 - Macroeconomic Theory

ECO 514 - Microeconomic Theory

ECO 515 - Advanced Microeconomics

ECO 516 - Evolutionary Economics

ECO 530 - Econometrics

ECO 531 - Advanced Econometrics and Applications

ECO 532 - Applied Time Series Econometrics

ECO 550 - International Environmental Economics and Policy

ECO 553 - Financial Economics

ECO 565 - Graduate Economics Practicum

ECO 581 - Agent-Based Modeling

ECO 590 - Advanced Topics in Economics

ECO 595 - Graduate Internship in Economics

ECO 699 - Graduate Thesis/Research
SPI 550 - International Environmental Economics and Policy

Education-Administration

EAD 510 - Educational Supervision
EAD 531 - School Law for Administrators
EAD 551 - Dynamic of Change in Schools
EAD 560 - Functions and Theories of Educational Leadership
EAD 562 - Group Leadership and Decision-Making in Schools
EAD 563 - Individual Leadership: Problems, Paradoxes and Possibilities
EAD 565 - Inquiry and Evaluation in Schools I
EAD 566 - Inquiry and Evaluation in Schools II
EAD 615 - The Principalship
EAD 616 - Resource Based Decision Making for School Leaders
EAD 630 - School Finance and Business Management
EAD 634 - School Personnel Management
EAD 640 - Contract Negotiation and Management for Educational Administration
EAD 650 - Leadership Studies
EAD 651 - Organizational Behavior in Education
EAD 654 - Educational Policy Formulation and Analysis
EAD 656 - Social and Ethical Foundations of Educational Leadership
EAD 658 - Advanced Leadership Studies in Education
EAD 660 - The Adult Learner in PK-12 Education
EAD 661 - Advanced Educational Supervision
EAD 667 - Dissertation III
EAD 668 - Dissertation IV

EAD 690 - Principal Internship

EAD 691 - Internship in Educational Leadership

EAD 692 - Superintendent Internship I

EAD 698 - Special Topics in Educational Leadership

**Education-Adult Education**

EAD 567 - Stakeholder Engagement

**Education-Curriculum**

EHD 533 - Dynamics of the Curriculum

EHD 544 - Mentoring, Supervision, and Teacher Development

EHD 595 - Leadership in Curriculum Design for Administrators/Supervisors

**Education-Early Literacy**

EEL 543 - Literacy Teaching and Learning Part I

EEL 544 - Literacy Teaching and Learning Part II

EEL 552 - An Exploration of the Writer's Workshop in PreK-12 Classrooms

EEL 554 - An Exploration of the Reader's Workshop in PreK-12 Classrooms

EEL 556 - An Exploration of the Language Workshop in PreK-12 Classrooms

EEL 562 - Literacy Processing: Exploring How Students Learn to Read and Write Part II

EEL 581 - Theoretical Perspectives within MPCL Coaching Part II

EEL 582 - Clinical Practices in MPCL Coaching Part I

EEL 583 - Clinical Practices in MPCL Coaching Part II

EEL 596 - Literacy Lessons Teacher Training I
EEL 597 - Literacy Lessons Teacher Training II
EEL 652 - Intervention Designs for Struggling Learners Part I
EEL 653 - Intervention Designs for Struggling Learners Part II
ERL 570 - Designing Online Learning Experiences
ERL 576 - Literacy in the Home, School, and Community

Education-General (EDG)

EAD 653 - Statistics for Scholarly Practitioners
EAD 655 - Qualitative Analysis for Scholarly Practitioners
EHD 575 - Educational Research
EHD 657 - Educational Practicum (Activity)
EHD 691 - Graduate Apprenticeship
EHD 693 - Educational Internship

Education-General (EDU)

EHD 504 - Teaching and Assessing for Student Learning in the Secondary School
EHD 580 - Educational Institute (Activity)
EHD 586 - Seminar: Action Research in PreK-12 Schools
EHD 587 - Practicum: Action Research in PreK-12 Schools
EHD 590 - Topics in Education
EHD 690 - Topics in Education
EHD 698 - Independent Study in Education

Education-Higher Education

EAD 600 - Educational Research for School Leaders
EAD 647 - Organizational Learning and Development
EAD 665 - Dissertation II
EHD 545 - Educational Theory
EHD 546 - Teacher Leadership in Schools and Communities
EHD 576 - Interviewing Methods in Qualitative Research
EHD 577 - Discourse Analysis
ESC 556 - Climate Change Education
HED 523 - The American Community College
HED 561 - Developmental Theory in Higher Education
HED 562 - Assessing Impact of College on Students
HED 580 - History of Higher Education in the United States
HED 598 - Special Topics in Higher Education
HED 610 - Capstone Seminar in Student Affairs
HED 620 - Seminar in Higher Education in the United States
HED 630 - Higher Education and the Law
HED 640 - Issues in College Teaching
HED 650 - Social Context of Higher Education
HED 654 - Higher Education Policy and Politics
HED 676 - Doctoral Seminar in Higher Education
HED 677 - Doctoral Seminar in Higher Education Research
HED 690 - Higher Education Internship
HED 697 - Independent Study in Higher Education
SED 625 - Sp Education Internship for Maine's Alternative Certification and Mentoring

Education-History and Philosophy (EDH)

EHD 500 - Social Context of Education
EHD 501 - Social Context of Education
EHD 519 - Formative Assessments: Research, Practice and Policy
EHD 541 - Prevention and Intervention in School Settings: Social Emotional Learning
EHD 660 - Historical Roots of U.S. Educational Practice, Policy and Thought

Education-Literacy

EEL 563 - Literacy Processing in Middle and High School Settings I
EEL 564 - Literacy Processing in Middle and High School Settings II
EEL 578 - Scaffolding Student Learning Through Differentiation and Contingent Teaching I
EEL 579 - Scaffolding Student Learning Through Differentiation and Contingent Teaching II
EEL 585 - Reflective Practice within MPCL Coaching
EEL 646 - Dyslexia Studies within a Literacy Processing Framework I
EEL 647 - Dyslexia Studies within a Literacy Processing Framework II
ELL 577 - Curriculum & Assessment in ESL/EFL Contexts
ERL 516 - Visual Literacy-Exploring Meaning in the Art of Picturebooks
ERL 517 - Literature for Children
ERL 518 - Literature for Young Adults
ERL 534 - Literacy and Language Development
ERL 537 - Literacy Across the Curriculum

ERL 538 - Current Practices in Vocabulary Teaching and Learning, PreK-12

ERL 540 - Writing in Schools & Colleges

ERL 542 - Writing and the Young Child: Birth to 8

ERL 544 - Digital Writing in the Classroom

ERL 545 - Introduction to the National Writing Project

ERL 547 - National Writing Project Seminar in Mentoring

ERL 548 - National Writing Project Advanced Institute in Teacher Leadership

ERL 552 - Seminar in Teacher Research

ERL 553 - Literacy Assessment

ERL 569 - Clinical Practices-Teaching Children

ERL 590 - Special Topics in English Language Arts and Related Fields

ERL 601 - Seminar in Reading

ERL 603 - Proseminar in Literacy I

ERL 697 - Independent Study in Literacy

ERL 698 - Special Topics in Literacy

Education-Mathematics

EMA 551 - Newer Practices in Mathematics Education

EMA 598 - Special Topics in Mathematics Education

Education-Measurement and Testing

EHD 521 - Classroom Practice to Improve Learning

Education-Psychology
EHD 621 - Educational Psychology (Doctoral)

Education-Reading Recovery

EEL 598 - Reading Recovery Teacher Training I
EEL 599 - Reading Recovery Teacher Training II
EEL 655 - Seminar: Issues Related to Reading Recovery Theory and Practice I
EEL 656 - Seminar: Issues Related to Reading Recovery Theory and Practice II
EEL 657 - Reading Recovery Internship I
EEL 658 - Reading Recovery Internship II
EEL 659 - Reading Recovery Practicum I
EEL 660 - Reading Recovery Practicum II

Education-Research

EAD 648 - Responsible Conduct of Research in Education
EAD 663 - Dissertation Proposal
EAD 664 - Dissertation I
EHD 510 - Introduction to Educational Research
EHD 569 - Seminar in Educational Leadership
EHD 571 - Qualitative Research: Theory, Design and Practice
EHD 572 - Advanced Qualitative Research
EHD 573 - Statistical Methods in Education I
EHD 574 - Statistical Methods in Education II
EHD 602 - Directed Readings (area)
EHD 642 - Seminar in School Leadership
EHD 643 - Seminar in School District Leadership
EHD 676 - Doctoral Seminar in Educational Leadership
EHD 699 - Graduate Thesis/Research

Education-Science

ESC 555 - Engineering Design Process for K-12 Educators

Education-Special Education

SED 500 - Adapting Instruction for Students with Disabilities
SED 520 - Law and Policy Affecting Individuals with Disabilities
SED 523 - Home-based Practicum and Seminar in Early Intervention
SED 524 - Literacy and Language Development
SED 528 - Educational Methods for Students with Autism
SED 532 - Behavior Management and Intervention
SED 536 - Educational Strategies For Students with Severe Disabilities
SED 543 - Program Planning and Curriculum Access
SED 544 - Mathematical Methods in Special Education
SED 545 - Intervention for Reading Difficulties
SED 553 - Assessment in Special Education I
SED 556 - Assessment of Students with Autism Spectrum Disorders and Severe Disabilities
SED 563 - Positive Behavior Support for Students with Autism Spectrum Disorders
SED 564 - Assistive Technology and Universal Design for Learning in PreK-12 Classrooms
SED 581 - Response to Intervention for Behavior: School-Wide Prevention
SED 582 - Response to Intervention for Behavior: Targeted Interventions

SED 583 - Response to Intervention for Behavior: Individualized Interventions

SED 585 - Autism and Social Communication

SED 598 - Special Topics in Special Education

SED 605 - Seminar in Special Education

SED 610 - Internship in Special Education Teaching

SED 620 - Critical and Creative Thinking and Panel Review

SED 630 - Internship in Special Education Administration

SED 697 - Independent Study in Special Education

SEI 524 - Supporting Play and Social-Emotional Development of Infants and Young Children

Education-Technology

EDT 515 - Dynamic PK-12 Library Management

EDT 516 - Reference and Research for Digital Age Teaching, Learning and Libraries

EDT 520 - Digital Age Teaching and Learning Methods

EDT 528 - Designing Technology Systems to Optimize Learning

EDT 531 - Studio in Computing for Learning

EDT 532 - Creative and Connected Learning Environments

EDT 537 - Introduction to Flipped, Blended, and Online Learning

EDT 540 - Instructional Design and Project Management

EDT 541 - Advanced Instructional Design

EDT 542 - Supporting Technology Integration through Professional Development and Coaching
EDT 543 - Practicum in Instructional Design
EDT 545 - Legal, Ethical and Security Issues in Educational Technology
EDT 559 - Essentials for Educational Technology Leaders
EDT 560 - Assessment in the 21st Century Classroom
EDT 561 - Technology Supported Inquiry-Based Teaching and Learning
EDT 562 - Technology for Young Learners
EDT 563 - Future Ready: Embedding Design Thinking in The Learning Process
EDT 570 - Leveraging Crowd-Based Knowledge in K-12 Classrooms
EDT 571 - Methods of Teaching Inclusive Computational Thinking
EDT 572 - Teaching Programming in Multiple Paradigms
EDT 580 - Instructional Technology Institute
EDT 598 - Special Topics in Instructional Technology
EDT 616 - New Directions for Educational Technology
EDT 657 - Practicum
EDT 693 - Educational Internship
EDT 697 - Independent Study in Instructional Technology

**Electrical and Computer Engineering**

ECE 515 - Random Variables and Stochastic Processes
ECE 523 - Mathematical Methods in Electrical Engineering
ECE 533 - Advanced Robotics
ECE 543 - Microelectronic Devices I
ECE 548 - VLSI Test/Characterization
ECE 550 - Electromagnetic Theory
ECE 552 - Wave Propagation
ECE 565 - Solid State Device Theory I
ECE 571 - Advanced Microprocessor-Based Design
ECE 573 - Microprogramming
ECE 574 - Cluster Computing
ECE 577 - Fuzzy Logic
ECE 581 - Estimation and Detection Theory
ECE 583 - Coding Theory
ECE 584 - Estimation Theory
ECE 585 - Fundamentals of Wireless Communication
ECE 590 - Neural Networks
ECE 591 - Deep Learning
ECE 598 - Selected Advanced Topics in Electrical and Computer Engineering
ECE 599 - Selected Study in Electrical and Computer Engineering
ECE 663 - Design and Fabrication of Surface Wave Devices
ECE 699 - Graduate Thesis/Research
EET 514 - zzprinted Circuit Board Design
EET 515 - Automation and Integration
EET 560 - Renewable Energy and Electricity Production
EET 584 - Engineering Economics
SFR 548 - Quantitative Social Science for Natural Resource Management
SFR 589 - Tools for Consulting Foresters
SPA 519 - Rebels and Realists in 19C Literature
Engineering (PSM)

ENM 586 - Advanced Project Management

GEE 694 - Professional Science Masters in Engineering and Business Internship

English

ENG 507 - Graduate Fiction Workshop

ENG 508 - Writing Workshop in Poetry and Poetics

ENG 515 - Approaches to Collaborative Writing

ENG 516 - Perspectives on Information Design

ENG 518 - Topics in Professional and Technical Writing

ENG 529 - Studies in Language, Literature, and Writing

ENG 536 - Studies in Canadian Literature

ENG 541 - Colonial and Early National American Literature

ENG 542 - Studies in North American Literatures

ENG 545 - American Literature at the fin-de-siecle

ENG 546 - Modernisms

ENG 549 - Studies in Gender and Literature

ENG 551 - Medieval Literature

ENG 553 - Early Modern Drama

ENG 554 - Early Modern Prose and Poetry

ENG 555 - Restoration and Eighteenth-Century British Literature

ENG 556 - British Romanticism

ENG 558 - British Modernist Literature
ENG 570 - Critical Theory

ENG 579 - Theorizing and Researching Composing

ENG 580 - Topics in Poetry and Poetics

ENG 581 - Twentieth-Century Poetry

ENG 596 - Graduate Internship

ENG 600 - Introduction to Graduate Studies in English

ENG 606 - Rhetorical Theory: Critical Tradition

ENG 693 - Principled Practices in the Teaching of Writing

ENG 697 - Independent Reading/Writing

ENG 699 - Graduate Thesis/Research

**English as a Second Language**

ELL 570 - Methods of Teaching English as a Second Language

ELL 585 - Applied Linguistics and Second Language Acquisition Principles for ESL/EFL

ELL 591 - Multiculturalism and Diversity for English as a Second Language (ESL) Contexts

**Food Science and Nutrition**

FSN 501 - Advanced Human Nutrition

FSN 502 - Food Preservation

FSN 506 - Nutritional Assessment

FSN 508 - Nutrition and Aging

FSN 510 - Trace Mineral Nutrition, Metabolism and Clinical Applications

FSN 512 - Current Food Safety Systems
FSN 517 - Food Safety and Quality Control
FSN 520 - Food Product Development
FSN 524 - Responsible Design, Conduct and Analysis of Research
FSN 528 - Food Microbiology
FSN 529 - Food Microbiology Laboratory
FSN 530 - Integrative and Functional Nutrition
FSN 538 - Fermented Foods and Probiotics
FSN 540 - Advanced Clinical Topics
FSN 542 - Sustainability, Nutrition and Health
FSN 543 - Communication in Nutrition and Food Technology
FSN 545 - Utilization of Aquatic Food Resources
FSN 555 - Organic and Natural Foods
FSN 560 - Research Methods in Community Nutrition
FSN 571 - Technical Presentations
FSN 575 - Sensory Evaluation Laboratory
FSN 580 - Food Chemistry
FSN 580 - Food Chemistry
FSN 581 - Problems in Food Science and Human Nutrition
FSN 584 - Lipids, Diet and Cardiovascular Disease
FSN 585 - Principles of Sensory Evaluation
FSN 586 - Sensory Evaluation II
FSN 587 - Food Analysis
FSN 603 - Nutrient Changes in the Food System
FSN 650 - Dietetic Internship Orientation and Application I
FSN 651 - Dietetic Internship Orientation and Application II
FSN 652 - Dietetic Internship Evaluation
FSN 671 - Advanced Graduate Seminar
FSN 681 - Dietetic Supervised Practice
FSN 695 - Food Science and Human Nutrition Practicum
FSN 699 - Graduate Thesis/Research
SFA 551 - Infectious Diseases and Food Safety- From Plants to Humans
SFA 672 - Dynamic Technical Presentations

Forest Resources
SFR 502 - Timber Harvesting
SFR 503 - Advanced Forest Measurements and Models
SFR 504 - Rural Communities: Theory and Practice
SFR 507 - Forest Ecology
SFR 509 - Silviculture
SFR 520 - Tree Physiology
SFR 521 - Research Methods in Forest Resources
SFR 528 - Qualitative Data Analysis in Natural Resources
SFR 530 - Wood Physics and Applications in Building Systems
SFR 531 - Mechanics of Wood and Wood Composites
SFR 539 - Biology of Woody Plants
SFR 544 - Forest Resources Economics
SFR 545 - Adhesion and Adhesives Technology
SFR 546 - Forest Resource Policy
SFR 550 - Wood-Polymer Hybrid Composites
SFR 555 - Advanced Remote Sensing
SFR 557 - Tree Pests and Disease
SFR 570 - Cellulose Nanomaterials and their Composites
SFR 575 - Advanced Forest Biometrics and Modeling
SFR 577 - Forest Landscape Management and Planning
SFR 593 - Sustainable Tourism Planning
SFR 601 - Forest Mensuration Problems
SFR 603 - Forest Management Problems
SFR 605 - Forest Biology Problems
SFR 607 - Silviculture Problems
SFR 609 - Remote Sensing Problems
SFR 611 - Research Problems in Forest Economics
SFR 613 - Forest Recreation Problems
SFR 615 - Problems in Wood Technology
SFR 617 - Forest Policy Problems
SFR 690 - Master of Forestry Project
SFR 695 - Graduate Seminar in Wood Science

French

FRE 500 - History of the French Language
FRE 507 - Seminar in Literature of the Nineteenth Century
FRE 508 - Seminar in the Novel
FRE 509 - Seminar in Poetry
FRE 510 - Seminar in the Theatre
FRE 530 - French Film Survey
FRE 542 - Seminar in North American French Language
FRE 598 - Projects in French II
FRE 699 - Graduate Thesis/Research

Gerontology

GRN 500 - Opportunities and Challenges of Aging
GRN 502 - Interprofessional Care of Older Adults in Diverse Settings

Global Policy

SPI 501 - Research Methods and Design
SPI 502 - Contemporary Issues in World Economy
SPI 503 - Contemporary International Relations
SPI 504 - Global Justice
SPI 510 - Public Service Seminar
SPI 573 - Global Politics
SPI 574 - Conduct of Foreign Policy
SPI 575 - Politics of Development
SPI 576 - The U.S. Intelligence Community and National Security
SPI 577 - Conflict and Violent Extremism Vulnerabilities
SPI 578 - Development in Practice
SPI 590 - Advanced Topics in Policy and International Affairs
SPI 593 - Graduate Seminar
SPI 595 - SPIA Internship
SPI 697 - Independent Study
SPI 699 - Graduate Thesis

History

HTY 501 - History of U.S. Foreign Relations
HTY 502 - Revolutionary America
HTY 505 - American Political History
HTY 517 - Seminar in Premodern European History
HTY 519 - Modern Britain and Empire
HTY 521 - Canada and the United States, 1783 to the Present
HTY 550 - Readings in Bibliography and Criticism in:
HTY 577 - Environmental History
HTY 597 - Field Work in Historical Institutions
HTY 599 - Special Topics in History
HTY 601 - Seminar in American Colonial History
HTY 604 - Seminar in United States History 1916 to Present
HTY 607 - Seminar in American Foreign Relations
HTY 609 - Seminar in New England-Quebec Atlantic Provinces History
HTY 611 - Seminar in British and European History
HTY 647 - Seminar in Methodology and Historiography
HTY 665 - Digital and Spatial History
HTY 699 - Graduate Thesis/Research
Human Development

HUD 511 - Seminar in Family Relationships
HUD 521 - Science as Inquiry: Teaching Young Children
HUD 529 - Numeracy for the Young Child
HUD 551 - Fundamentals of Human Development
HUD 552 - Professional Practices in Human Development
HUD 553 - Program Planning and Evaluation in Human Development
HUD 554 - Legislation and Policy in Human Development
HUD 555 - Grant Development in Human Development
HUD 556 - Introduction to Research Methods in Child Development and Family Relations
HUD 601 - Supervised Fieldwork in Child Development and Family Relations
HUD 609 - Family Counseling
HUD 618 - Sexuality and Human Interaction
HUD 649 - Investigation of Special Topics
HUD 699 - Graduate Thesis/Research

Independent Study

IND 698 - Independent Study
IND 699 - Graduate Thesis/Research

Innovation

INV 510 - Fundamentals and Systems of Innovation
INV 511 - Innovation Engineering: Advanced Innovation Methods
INV 590 - Using Innovation: Proposal and Project
Interdisciplinary

GRD 598 - Special Topics in College Teaching
GRN 501 - Life Transitions and Health in Aging
INT 500 - (ANT, BSC, GES, PSE, QUS) Seminar in Quaternary Studies
INT 510 - (BSC, SMS) Marine Invertebrate Zoology
INT 527 - Integration of GIS and Remote Sensing Data Analysis in Natural Resource Applications
INT 598 - Special Topics in Interdisciplinary Studies
INT 601 - Responsible Conduct of Research

Intermedia

IMD 500 - Creative Concept Development
IMD 501 - Histories and Theories of Intermedia
IMD 520 - Topics in Media Production
IMD 530 - Topics in Technical Development
IMD 540 - Topics in Intermedia Theory / History
IMD 560 - Research Studio I: Critical Research Methods for Creative Production
IMD 561 - Research Studio II: Projects in Collaborative Production
IMD 562 - Research Studio III: Professional Development and Large-scale Practices
IMD 570 - Intermedia Studio Critique I
IMD 571 - Intermedia Studio Critique II
IMD 572 - Intermedia Studio Critique III
IMD 597 - Independent Study in Intermedia
IMD 598 - Directed Study in Intermedia
IMD 600 - Readings for Thesis Conceptual Development
IMD 650 - Field Study and Research
IMD 670 - Without Borders Exhibition
IMD 699 - Graduate Thesis/Research

**Kinesiology and Physical Education**

KPE 560 - Assessment and Evaluation of Human Performance
KPE 573 - Motor Performance and Learning
KPE 575 - Current Studies in Kinesiology and Physical Education
KPE 580 - Human Biomechanics
KPE 588 - Advanced Exercise Physiology

**Liberal Studies**

IDS 500 - Graduate Seminar in Interdisciplinary Studies
IDS 697 - Independent Study
IDS 698 - Independent Study
IDS 699 - Master Project in Interdisciplinary Studies

**Maine Studies**

MES 501 - Maine Studies: An Interdisciplinary Approach
MES 520 - Advanced Topics in Maine Studies
MES 530 - Maine Politics and Public Policy
MES 540 - Maine and the Northeast Borderlands
MES 598 - Directed Study in Maine Studies
Marine Sciences

SMS 500 - Marine Biology
SMS 501 - Biological Oceanography
SMS 520 - Chemical Oceanography
SMS 525 - Marine Biogeochemistry
SMS 531 - Coral Reefs
SMS 540 - Satellite Oceanography
SMS 541 - (SMS, CIE) Physical Oceanography
SMS 544 - Oceanography and Natural History of the Gulf of Maine
SMS 552 - Coupled Natural and Human Systems
SMS 553 - Institutions and the Management of Common Pool Resources
SMS 555 - Resource Management in Cross-cultural Perspective
SMS 562 - Fisheries Population Dynamics
SMS 563 - Fisheries Policy & Management
SMS 564 - Marine Resource Management
SMS 585 - Marine System Modeling
SMS 595 - Data Analysis Methods in Marine Sciences
SMS 597 - Independent Study
SMS 598 - Special Topics in Marine Science
SMS 683 - Internship in Marine Policy
SMS 691 - Marine Science Seminar
SMS 697 - Readings in Marine Science
SMS 699 - Graduate Thesis/Research
Master’s Comprehensives
GRR 699 - Reading for Master's Comprehensives

Mathematics and Statistics
MAT 500 - Topics in Graduate Mathematics
MAT 523 - Real Analysis I
MAT 524 - Real Analysis II
MAT 527 - Functions of a Complex Variable I
MAT 528 - Functions of a Complex Variable II
MAT 562 - Advanced Linear Algebra
MAT 563 - Abstract Algebra
MAT 564 - Abstract Algebra II
MAT 577 - Topology I
MAT 578 - Topology II
MAT 590 - Graduate Research Seminar
MAT 699 - Graduate Thesis/Research
STS 531 - Mathematical Statistics I
STS 532 - Mathematical Statistics II
STS 533 - Stochastic Systems

Mechanical Engineering
MEE 500 - Research Methods
MEE 501 - Macroscopic Thermodynamics
MEE 536 - Advanced Heat Transfer I
MEE 541 - Manufacturing and Testing of Composites
MEE 546 - Finite Elements in Solid Mechanics
MEE 547 - Flight Dynamics and Control of Aircraft
MEE 549 - Numerical Methods in Engineering
MEE 550 - Mechanics of Laminated Composite Structures
MEE 551 - Robot Dynamics and Control
MEE 552 - Aircraft and Automobile Structures
MEE 554 - Theory of Elasticity
MEE 555 - Smart Materials
MEE 557 - Introduction to Continuum Mechanics
MEE 558 - Mechanical Behavior of Materials
MEE 559 - Engineering Optimization
MEE 560 - Computational Methods in Fluid Dynamics
MEE 562 - Advanced Fluid Mechanics
MEE 564 - Fluid Structure Interaction
MEE 565 - Offshore Floating System Design
MEE 573 - Advanced Vibrations I
MEE 590 - Modern Control Theory and Applications
MEE 638 - Advanced Heat Transfer II
MEE 639 - Advanced Radiative Heat Transfer
MEE 644 - Mechanical Engineering Analysis I
MEE 646 - Advanced Finite Elements in Solid Mechanics
MEE 658 - Theory of Plates and Shells
MEE 696 - Mechanical Engineering Graduate Seminar
MEE 697 - Mechanical Engineering Projects
MEE 699 - Graduate Thesis/Research

Modern Languages and Classics
MLC 566 - The Teaching of Modern Languages
SPA 520 - Seminar in Film

Music-Education
MUE 630 - Contemporary Music Education
MUE 650 - Topics in Music Education

Music-General
MUS 510 - Special Topics in Music
MUS 600 - Research in Music
MUS 650 - Topics in Choral Music
MUS 651 - Topics in Instrumental Music
MUS 698 - Special Studies in Music

Music-History
MUH 550 - Music Period Course
MUH 650 - Topics in Music History

Music-Organizations and Ensembles
MUO 502 - University Singers
MUO 503 - Oratorio Society
MUO 504 - Collegiate Chorale
MUO 505 - Marching Band
MUO 506 - Concert Band
MUO 507 - Pep Band
MUO 508 - Symphonic Band
MUO 509 - University Orchestra
MUO 511 - Opera Workshop
MUO 514 - UM Jazz Ensemble
MUO 518 - Percussion Ensemble
MUO 520 - Chamber Jazz Ensemble

Music-Performance
MUP 511 - Advanced Chamber Music I
MUP 512 - Advanced Chamber Music II
MUP 610 - Vocal Performance
MUP 611 - Keyboard Performance
MUP 612 - String Instrument Performance
MUP 613 - Wind Instrument and Percussion Performance
MUP 695 - Graduate Recital

Music-Theory
MUY 650 - Topics in Music Theory

New Media
DIG 500 - Introduction to Digital Curation
DIG 510 - Metadata Systems
DIG 540 - Digital Collections & Exhibitions

DIG 550 - Digital Preservation

Nursing

NUR 502 - Families in Health and Illness

NUR 503 - Advanced Health Appraisal and Physical Assessment: Nurse Practitioner

NUR 504 - Theory Development in Nursing

NUR 505 - Nursing Research

NUR 506 - Professional Issues in Advanced Practice Nursing

NUR 507 - Advanced Pathophysiology

NUR 508 - Advanced Pharmacology and Therapeutics: Nurse Practitioner

NUR 512 - Curriculum and Course Development and Evaluation in Nursing Education

NUR 515 - Assessment, Measurement and Evaluation in Nursing Education

NUR 516 - Field Experience in Nursing Education or Administration

NUR 520 - Family Nurse Practitioner Management of Neonate to Adolescent

NUR 521 - Nurse Practitioner Gynecologic and Reproductive Care of Women

NUR 522 - Family Nurse Practitioner Care of Adults I

NUR 523 - Family Nurse Practitioner Care of Adults II

NUR 524 - Family Nurse Practitioner Management of Neonate to Adolescent-Clinical

NUR 526 - Family Nurse Practitioner- Care of Adults 1 (Clinical)

NUR 531 - Advanced Health Appraisal and Physical Assessment (Lab)

NUR 644 - Healthcare Leadership and Management
NUR 675 - Philosophical Foundations and Ethical Decision Making Frameworks for Advanced Practice Nursing

NUR 693 - Ethical Inquiry in Health Care

NUR 694 - Health Policy, Politics and Practice

NUR 695 - Topics in Nursing

NUR 697 - Scholarly Project

NUR 698 - Independent Study in Nursing

NUR 699 - Graduate Thesis/Research

Peace Studies

PAX 510 - Theories in Peace and Reconciliation Studies

PAX 591 - Forgiveness: Creating a Culture of Peace & Reconciliation

PAX 598 - Independent Graduate Study

Philosophy

PHI 566 - Graduate Readings in Philosophy

Physics

PHY 501 - Mechanics

PHY 502 - Electrodynamics I

PHY 503 - Quantum Mechanics I

PHY 510 - Graduate Laboratory

PHY 512 - Statistical Mechanics

PHY 574 - Methods of Theoretical Physics I

PHY 575 - Methods of Theoretical Physics II

PHY 588 - Graduate Seminar
PHY 598 - Special Topics in Theoretical or Experimental Physics

PHY 603 - Quantum Mechanics II

PHY 624 - Solid State Physics I

PHY 625 - Solid State Physics II

PHY 699 - Graduate Thesis/Research

Plant, Soil and Environmental Science

PSE 509 - Experimental Design

PSE 513 - Weed Ecology and Management

PSE 557 - Advanced Plant Pathology

PSE 580 - Scientific Communications I

PSE 581 - Scientific Communications II

PSE 597 - Special Topics in Plant, Soil and Environmental Sciences

PSE 699 - Graduate Thesis/Research

Political Science

POS 531 - Topics in Comparative Politics

POS 549 - Seminar in American Politics

POS 596 - Directed Research in Political Science

Psychology

PSY 507 - Multicultural Issues in Clinical Psychology

PSY 522 - Social Development

PSY 528 - Life Span Development

PSY 540 - Advanced Psychological Statistics and Methods I
PSY 541 - Advanced Psychological Statistics and Methods II
PSY 551 - Advanced Physiological Psychology
PSY 561 - Advanced Social Psychology
PSY 567 - Advanced Cognitive Psychology
PSY 581 - Supervision, Consultation, and Interprofessional Issues
PSY 592 - Directed Readings:(area)
PSY 601 - Proseminar in Psychological Sciences
PSY 602 - Clinical Research Forum
PSY 603 - Ethics and Professional Problems
PSY 621 - Affective Science of Emotion Regulation and Psychopathology
PSY 625 - Basic Methods in Assessment
PSY 626 - Advanced Clinical Assessment
PSY 630 - Current Topics in Social Psychology
PSY 634 - Advanced Psychopathology
PSY 647 - Foundations of Clinical Neuropsychology
PSY 651 - Developmental Psychopathology
PSY 655 - Seminar in Psychotherapy
PSY 661 - History and Philosophy of Psychology
PSY 682 - Clinical Supervision and Consultation II
PSY 683 - Clinical Supervision and Consultation III
PSY 691 - Practicum (activity)
PSY 692 - Directed Research
PSY 695 - Internship in Clinical Psychology I
PSY 696 - Internship in Clinical Psychology II

PSY 699 - Graduate Thesis/Research

Quaternary and Climate Studies

QUS 699 - Graduate Thesis/Research

Resource Economics and Policy

ECO 527 - Regional Economics: Modeling

ECO 571 - Advanced Environmental and Resource Economics I

ECO 572 - Advanced Environmental and Resource Economics II

ECO 593 - Graduate Seminar

ECO 597 - Independent Studies

Science Mathematics Teaching

SMT 500 - Educational Psychology with Applications to Science and Mathematics Teaching and Learning

SMT 501 - Integrated Approaches to Physics Education I

SMT 502 - Integrated Approaches to Physics Education II

SMT 503 - Integrated Approaches in Earth Sciences Education I

SMT 504 - Integrated Approaches in Earth Sciences Education II

SMT 505 - Integrated Approaches in Mathematics Education I

SMT 506 - Integrated Approaches in Mathematics Education II

SMT 507 - Integrated Approaches in Biology Education

SMT 588 - Seminar in Science and Mathematics Education Research

SMT 589 - Graduate Seminar

SMT 590 - Seminar for Teaching Interns
SMT 591 - Secondary Student Teaching

SMT 598 - Special Topics in Science and Mathematics Education

SMT 699 - Graduate Thesis/Research

Social Work

INT 610 - Advanced Seminar in Integrated Behavioral Healthcare

SWK 530 - MSW Advanced Standing Bridging Course-Social Welfare Policy

SWK 531 - MSW Advanced Standing Bridging Course-Social Work Practice

SWK 532 - MSW Advanced Standing Bridging Course-Social Work Research

SWK 533 - MSW Advanced Standing Bridging Course-Human Behavior and the Social Environment

SWK 540 - Social Welfare Policy and Issues for Generalist Practitioners

SWK 550 - Human Behavior and The Social Environment I

SWK 560 - Practice in Generalist Social Work I

SWK 563 - Practice in Generalist Social Work II

SWK 571 - Trauma Theory and Treatment in Social Work Practice

SWK 577 - Group Strategies in Health/Mental Health Settings

SWK 580 - Adult and Child Psychopathology

SWK 585 - History, Assessment and Interventions in Substance Use and Abuse

SWK 586 - Advanced Clinical Social Work Practice in Integrated Healthcare

SWK 595 - Field Practicum in Social Work

SWK 597 - Advanced Topics in Social Work

SWK 600 - Advanced Integrative Professional Seminar

SWK 640 - Issues in Social Welfare Policy for Advanced Generalist Practitioners
SWK 650 - Human Behavior and the Social Environment II
SWK 661 - Advanced Generalist Social Work Practice with Individuals
SWK 664 - Generalist Social Work Practice with Families and Small Groups
SWK 665 - Advanced Generalist Social Work Practice with Organizations and Communities
SWK 691 - Advanced Social Work Research I
SWK 692 - Advanced Social Work Research II
SWK 695 - Advanced Field Practicum in Social Work

Spanish
SPA 515 - Seminar in Advanced Grammar
SPA 544 - Seminar in Translation
SPA 597 - Projects in Spanish I
SPA 598 - Projects in Spanish II

Spatial Information Engineering
COS 540 - Computer Networks
SIE 501 - Introduction to Graduate Research
SIE 502 - Research Methods
SIE 504 - The Beauty and Joy of Computing
SIE 505 - Formal Foundations for Information Science
SIE 507 - Information Systems Programming
SIE 508 - Object Oriented Programming
SIE 509 - Principles of Geographic Information Systems
SIE 510 - Geographic Information Systems Applications
SIE 512 - Spatial Analysis
SIE 515 - Human Computer Interaction
SIE 516 - Interactive Technologies for Solving Real-World Problems
SIE 517 - Spatial Interaction Design
SIE 525 - Information Systems Law
SIE 550 - Design of Information Systems
SIE 554 - Spatial Reasoning
SIE 555 - Spatial Database Systems
SIE 557 - Database System Applications
SIE 558 - Real-time Sensor Data Streams
SIE 559 - Geosensor Networks
SIE 580 - Ontology Engineering Theory and Practice
SIE 589 - Graduate Project
SIE 590 - Information Systems Internship
SIE 598 - Selected Studies in Spatial Information Engineering
SIE 693 - Graduate Seminar
SIE 694 - Doctoral Seminar
SIE 699 - Graduate Thesis/Research

Special Education-Early Intervention

SED 505 - Diversity of Development in Childhood
SED 506 - Assessment and Program Planning in Early Intervention
SED 511 - Planning Inclusive Early Childhood Programs and Environments
SED 513 - Early Childhood Intervention/Special Education Individualized Practicum

SED 514 - Administration and Public Policy for Early Childhood Programs

SED 516 - Seminar and Practicum in Collaborative Consultation

SED 517 - Serving Infants and Toddlers in Natural Environments

SED 521 - Center-based Practicum and Seminar in Early Intervention

SED 529 - Language Development and Literacy for Diverse Young Learners

SED 546 - Intervention for Writing Difficulties

SED 566 - Executive Function in Learning

SED 587 - Collaborations and Transitions for Special Educators

SED 655 - Graduate Project in Early Intervention

SEI 525 - Center-Based Practicum and Seminar in Early Intervention

Students at Risk

SAR 540 - Introduction to Students at Risk

Surveying Engineering Technology

SVT 501 - Advanced Adjustment Computations

SVT 511 - Geodetic U.S. Public Land Survey Computations

SVT 512 - Advanced Survey Law

SVT 531 - Advanced Digital Photogrammetry

SVT 532 - Survey Strategies in Use of Lidar

SVT 541 - Geodesy

SVT 542 - Applied Hydrographic Surveying

Theatre
THE 596 - Field Services in Theatre Production

THE 667 - Special Studies in Theatre I

THE 669 - Theatre Laboratory

THE 697 - Directed Research I

THE 699 - Graduate Thesis/Research

**Wildlife Ecology**

WLE 591 - Movements and Migrations

WLE 650 - Graduate Seminar in Wildlife Science

WLE 697 - Special Problems in Wildlife Ecology

WLE 699 - Graduate Thesis/Research

**Women's, Gender, and Sexuality Studies**

WGS 501 - Graduate Topics in Women's, Gender and Sexuality Studies

WGS 510 - Advanced Studies in Feminist and Queer Theory

WGS 580 - Feminist Pedagogy and Women's, Gender and Sexuality Studies Practicum

WGS 698 - Individualized Projects in Women's, Gender, and Sexuality Studies

**Digital Curation**

DIG 580 - Digital Curation Internship

**Graduate Education**

**The University**

Founded in 1865, the University of Maine is the land-grant, sea-grant, and space-grant university of the State of Maine. Located on a 660-acre campus adjoining the town of Orono, it is nine miles from Bangor, Maine's third-largest city.

The flagship campus in the University of Maine System, the Orono campus is dynamic and cultural. Enjoying a classic New England setting, the campus offers easy access to both Maine's urban and rural areas. **Last year over 500**
students from 70 foreign countries and most American states studied at UMaine; more than 35% of the total enrollment regularly is admitted from other states and nations. Culturally, The University of Maine should appeal to every taste. Guest speakers provide insight into current political, social, and scientific thought. Special programs in the arts abound, including theatre productions, musical offerings, and art exhibits. Intercollegiate athletic events occur throughout the academic year.

The full-time faculty numbers over 600. There are nearly 12,000 students enrolled at The University of Maine. The graduate student population exceeds 2,000.

Graduate study at the University of Maine is focused in academic departments within the following colleges: Business; Education and Human Development; Engineering; Liberal Arts and Sciences; and Natural Sciences, Forestry, and Agriculture.

Mission

The mission of the Graduate School of the University of Maine is to produce engaged scholars and professionals by promoting excellence in all aspects of the graduate student experience. The School provides advanced education and professional training through innovative teaching, mentorship, research, and creative activity in established and emerging areas. This rigorous education prepares students to contribute meaningfully to the advancement of the state of Maine, the nation and the global community.

Graduate Study and Graduate Life

Graduate work has been available at the University of Maine for many years. The first master's degree was conferred in 1881; the first doctoral degree in 1960. Since 1923, graduate work has been a separate division of the University. Today the master's degree is offered in over 85 areas of study and the doctorate in 35 areas.

In addition to coordinating graduate admissions in conjunction with individual graduate programs, the Graduate School has primary responsibility for administering the policies and procedures relating to graduate study. Graduate School policy is made by the Graduate Faculty, acting through its representative body, the Graduate Board.

University of Maine graduate courses are offered on other campuses/centers and via distance education on a program-by-program basis, including the Master of Social Work (MSW) degree; the Master of Business Administration (MBA); the PhD programs in biomedical science and in biomedical engineering. The College of Education and Human Development offers a Master of Education and an Educational Specialist degree both online and in cohort-based programs.

Online Education: The Division of Lifelong Learning, in partnership with the Graduate School and the academic colleges, has developed a number of online and blended graduate degrees, certificate programs and courses. Online programs are delivered by the same expert faculty teaching on campus and dedicated online student support services are available. For a full list of UMaineOnline offerings see https://online.umaine.edu/. Non-Maine resident graduate students enrolled in University of Maine online programs are eligible for a discounted e-tuition rate.

Graduate School Office:

The Graduate School's staff located on the ground level of Stodder Hall is available to assist graduate students in both academic and personal matters. The staff offers advice concerning admission, registration, degree requirements, thesis format, procedures for changing programs, and the availability of fellowships and scholarships as well as housing information. Students are encouraged to contact this office concerning any matters for which additional information is needed. www.umaine.edu/graduate
Stodder Hall also houses the office of the Graduate Student Government and a residence hall for single graduate students and graduate student couples (https://umaine.edu/graduate/housing/).

**Auxiliary Services**

Auxiliary Services provides on-campus housing for graduate students in Stodder Hall, and graduate students with families at University Park. Auxiliary Services also operates UMaine Dining, providing dining services for the entire campus community.

**Housing:** Stodder Hall is a coed facility that offers continuous housing throughout the academic year. The majority of the rooms are single occupancy with a limited number of double rooms. The room and board license covers the academic year. Graduate students may also apply for summer housing. Stodder Hall is smoke-free.

**Eligibility for Housing:**

- Graduate students must be matriculated and enrolled in University of Maine course work. Verification of graduate status will be made by the Graduate School.
- If in compliance with all other requirements, graduate students may remain in the residence hall for up to five continuous years.

Graduate students with families (spouse or partner, and/or children) may apply to live at University Park Family Housing. For more information and an application please call (207) 581-4854 or e-mail: jkosnow@maine.edu or visit our web site at: http://umaine.edu/housing/family-housing/.

**UMaine Dining Meal Plan Information:** UMaine Dining is pleased to offer our student customers various options to purchase meals that are designed to provide value, flexibility, and convenient spending; along with a variety of professional restaurant facilities, right here on campus! Our friendly staff is dedicated in providing a wide selection of healthy and fresh dining options whether it is a familiar home favorite to gourmet and international cuisine.

A meal plan is required for all on-campus residents (with the exception of the apartment-style housing at DTAV and Patch). Graduate residents and commuter students have a variety of meal plan options. Find out more about on-campus dining at www.umaine.edu/dining.

**Contact Information:**

Housing Services, 5734 Hilltop, Suite 103, Orono, ME 04469-5734. E-mail: um.housing@maine.edu
UMaine Dining, 5734 Hilltop, Suite 101, Orono, ME 04469-5734. Email: um.dining@maine.edu

**Services for Commuter and Non-Traditional Students.** Commuter and Non-Traditional Student Programs (CNTSP) advocates for and responds to the needs of the University's commuter students (any student who does not live in University housing) and non-traditional students. (generally 24 or older, assuming responsibilities in addition to studies, such as parent, spouse or partner, family caretaker, or employee, back in school after several years of employment, homemaking, or other activity and/or are veterans of the armed services.)

CNTSP provides students with information about programs and services, as well as personal and academic support and referrals. Knowledgeable staff are available in the Commuter Lounge in the Wade Center on the ground floor of Memorial Union, 8AM to 9PM Mon-Fri. Services provided include off-campus housing information, microwave, refrigerator, free coffee and lockers rentals. Programming includes a monthly event on the first Friday of every month, numerous workshops revolving around technology, academics, and finances, a monthly meeting for students who are also parents, family friendly events, and a family friendly/lactation space. For additional information, contact CNTSP by phone at (207) 581-1420 or UM.CNTSP@maine.edu Visit the CNTSP web page at http://www.umaine.edu/cntsp/
Veterans Education and Transition Services (V.E.T.S.) provides advocacy, support, resources and programs that serve the needs of the UMaine veteran population. These services include VA certification for both student veterans and veterans' dependents who are accessing VA educational benefits. The VETS office offers, Veterans Week, Student-Veteran Orientation, M-Project Guides (peer mentors for new student-veterans), Student-Veterans Awareness Panels and a Veterans Lounge. V.E.T.S. is located at 161 Memorial Union. http://www.umaine.edu/veterans

Safety Management (SM) empowers UMaine's mission of advancing learning and discovery through excellence, innovation, research and public service by providing occupational safety training, audit, guidance, and consultation services to the campus.

SM policies are drafted to foster a safe and healthful campus and research environment, to encourage fulfillment of Board of Trustees policies, as well as, Federal and State regulatory requirements, by being flexible, building trust and empowering the shared campus communities. SM also supports all University of Maine System campuses as part of its role in the University of Maine System's Department of Facilities Management and General Services. This role was developed as part of the Mission Excellence initiative to help focus scarce public higher education resources and ensure our systems, structures, processes, and employees are efficient and effective.

Annual Basic Safety Training and Annual Department Safety Training is required for all regular, part time, temporary and student employees. Classes are offered monthly, and training is available online through UMS Academy and through individual departments.

Log into the UMaine Portal (Intranet) https://my.umaine.edu/ to access UMS Academy by clicking the icon containing blue apple set on a book inscribed with an outline of the State of Maine. Basic Safety should be listed on your course list. Other training courses of use may also be found in UMS Academy. More information may be found at https://mycampus.maine.edu/group/mycampus/sm-training .

Refresher training must be completed on an annual basis. Additional annual area specific departmental training is conducted and required within each department, laboratory, or operational unit. Specific information may be obtained from the laboratory manager or your supervisor. Other Safety Training may also be required based on the functions of the work assigned. If you have any occupational safety concerns, training needs, or additional support needs, please contact SM for assistance at 581-4055.

Cutler Health Center (https://umaine.edu/auxservices/cutler/)

To meet the needs of the students at the University of Maine, Cutler Health Center offers comprehensive healthcare to the University campus community. Clinical services at Cutler Health Center are provided by Northern Light Eastern Maine Medical Center. Services offered include but are not limited to: general medical care including the treatment of acute medical problems or injuries, chronic illness, immunizations, women's health issues, contraception, sexual health, smoking cessation and skin cancer screenings. Northern Light/Cutler Health Center also provides students with an on-site laboratory, physical therapy, and x-ray.

The clinical staff includes physicians, nurse practitioners, physician assistants, nurses, an athletic trainer, and a physical therapist.

All graduate students including teaching and research assistants are welcome to use the health center for medical care. We also provide services to University of Maine employees and their dependents. Northern Light/Cutler Health Center is a primary care provider with physicians available to take care of your primary care needs. Review Northern Light Cutler Health Center's website for a biography of providers to assist with your primary care provider selection. Please be sure to make contact with your insurance company if you choose to change your primary care provider (PCP) to one of the Northern Light Cutler Health Center's providers.
Appointments: We offer appointment-based care Monday - Friday, from 8:00 am to 5:00 pm. Students should arrive at the health center at least 10 to 15 minutes prior to their scheduled appointment to allow adequate time for the check-in process to be completed. A limited number of same-day appointments are held and assigned based on the order you arrive at the facility with an acute injury or illness. An appointment can be requested by calling 207-581-4000.

myNothernLightHealth: myNothernLightHealth is a secure, convenient, no cost way for you to manage health and wellness information for you and your family. With myNothernLightHealth you have a secure, easy to navigate place to request appointments or prescription refills, review test results, communicate with your healthcare team, and more. myNothernLightHealth provides you with a stronger voice in your own health. Your healthcare provider will invite you to join myNothernLightHealth. After you register you will receive an email asking you to confirm the registration and create a secure, individualized, personal login. After that is completed, you can exchange health-related messages in this secure setting with your healthcare team.

Appointment Cancellation Policy: (Notify Us in Advance). Students who make an appointment and cannot keep the allotted appointment time have the responsibility to call the Cutler Health Center appointment line at 207-581-4000 or send a secure message via myNothernLightHealth to cancel or reschedule their appointment in advance, 24 hours prior to the scheduled appointment time.

Radiology and Laboratory Services: All radiology and laboratory services require an order from a physician. Orders must provide the diagnosis and specify the phone number and office address of the physician ordering the tests. Laboratory services are available for all Northern Light Cutler Health Center's primary care patients as well as students.

Women's Health Services: Women's Health Services include annual exams, emergency contraception counseling, screening and treatment for sexually transmitted diseases and infections, pregnancy testing, pregnancy options counseling and referral, breast exams and self-breast exam education, birth control provisions, as well as assessment and treatment of urinary tract infections. For consultation, follow-up, and referral for a variety of women's concerns including PMS, menopause, colposcopy, biopsy for abnormal pap evaluation call 207-581-4000.

Emergency Services: In an EMERGENCY please dial 911 from any phone. The University of Maine operates a state licensed volunteer ambulance service U.V.A.C. (University Volunteer Ambulance Corps). This ambulance service responds to all campus locations and operates mutually with surrounding community emergency services.

Non-Emergency Transportation Support: If it is determined you need to go to a hospital or local clinic but it is not an emergency, Cutler Health Center provides "No Charge " taxi transport to and from the local hospital, urgent care center, medical specialist referrals and pharmacies; 7 days a week/24 hours a day (see After Hours Services). Contact 581-4000 for more information in regards to coordinating the taxi service.

After Hours Service: A health care provider is available 24 hours a day 7 days a week. Coverage varies for each break so please check the website for details. The medical answering service is available to coordinate taxi transportation to and from the local hospital, urgent care center, specialist referrals and pharmacies 7 days a week/24 hours a day. Calling 207-581-4000 when the Health Center is closed activates the service. There is no charge for the taxi service. The costs of all hospital, emergency room, medication, radiology, laboratory, non-health-center physician, and/or other services are the responsibility of the student.

Counseling Center. The Counseling Center has licensed Psychologists, Licensed Clinical Social Workers and Doctoral level Psychology Interns that provide short term, confidential and free group and individual counseling for graduate students enrolled in 1 or more credits. Due to the impact and/or aftermath of the Pandemic the method for delivering service may be subject to change. Please visit our website for up to date information about services, hours and procedures for making an appointment: www.umaine.edu/counseling. You may also call 207 581-1392, to obtain information or leave a message.
If you experience an emergency and are unable to reach the Counseling Center at 207 581-1392, you may contact UMaine Police at 207 581-4040, Maine Crisis Services at 1 888 568-1112 or go to the nearest Emergency Department.

The Counseling Center website has many user friendly resources and links to other services, to access these, please visit our website at: www.umaine.edu/counseling.

**Career Center.** The Career Center assists graduate students in planning for professional careers. Services available include individual career counseling, career information for exploring options, assistance in identifying potential employers, resume/vitae development and critiques, job search strategy sessions, mock interviews and interview coaching, job listings, employer information, and information on preparing for an academic job search. Students may access job listings via CareerLink on the Career Center website which gives students immediate access to job listings nationwide. Career counselors who specialize in the health and legal professions are available to meet with students considering professional school in the health professions or law school. There is no charge to students for these services. The Career Center is located on the third floor of the Memorial Union and is open Monday-Friday, 8:00 a.m.-4:30 p.m. For further information, call 581-1359 or access our website: www.umaine.edu/career

**Peace Corps Recruiting.** The University hosts a Peace Corps recruiter on a regular basis who conducts interviews, provides informational sessions, and is available for class presentations. Contact information for the New England Peace Corps recruiter may be obtained by calling the Career Center in the Memorial Union at 581-1359. The Peace Corps offers graduating students the opportunity to make a difference in another part of the world while gaining valuable personal and professional experience. Volunteers are needed for a wide variety of fields, including ESL, education, forestry, environmental education, parks & wildlife, and small business development.

**Office of International Programs.** The Office of International Programs (OIP) has primary responsibility for coordinating and promoting UMaine international initiatives, exchanges, and programs. The OIP fosters and supports international education on campus and strives to advance international understanding and global awareness.

The Office of International Programs is responsible for admission of undergraduate international students; establishing and coordinating successful university linkages, exchanges, and study abroad programs for students and faculty; immigration processing and advising; the University's exchange visitor program; and, international student orientation and support services. With academic departments, the OIP promotes internationalization of the curriculum and sponsors activities, seminars, and programs to promote international awareness both on campus and in the community. Services to foreign nationals include immigration, cultural and academic advising, and various social activities including a weekly coffee hour. There is an active International Student Association. Every fall OIP offers Culturefest, a celebration of cultures through exhibits, arts and food, and an International Dance Festival in the spring. The office also provides support to faculty and researchers.

The University of Maine's Study Abroad Program is located in the Office of International Programs and there are opportunities for graduate students to participate in an international experience. For more information call 581-1509 or visit OIP in 300 Stodder Hall.

For additional information call 581-3437, e-mail international@maine.edu, or visit www.umaine.edu/international.

**Intensive English Institute (IEI)** prepares international students and non-native speakers of English for university study or for professional activities where English is the medium of communication. Intensive English core language classes are offered in the Fall, Spring and Summer semesters. Custom short programs are also available. In addition to a full-time course of study, the IEI offers academic advising, cross-cultural counseling, tutorials and self-study.
opportunities in a variety of content and skill areas. The Institute administers the TOEFL every semester. Students may also participate in the Conversation Partners Program.

Full-time study consists of eighteen hours per week of class time. Students are charged a tuition fee for each IEI course. Conditionally admitted students may take a combination of language study courses and degree courses. For more information please contact the IEI by telephone: (207) 581-3821, e-mail: um.iei@maine.edu, or the website: www.umaine.edu/iei/.

The mission of Student Accessibility Services (SAS) is to work with students and campus partners to create an inclusive university experience for students with disabilities. We equip students with accommodations, remove barriers to educational access, and connect students with campus resources. Students with documented physical, mental health, learning and other disabilities may request accommodations by contacting SAS and providing documentation of their disability. SAS provides testing accommodations, alternative format textbooks, note takers, classroom relocation, other auxiliary aids, as well as housing accommodations. For further information please contact Student Accessibility Services via phone at 207.581.2319 or visit our website at www.umaine.edu/studentaccessibility.

Graduate Student Government. The Graduate Student Government (GSG) continues to nurture a long tradition of graduate students who join together in research, mutual academic concerns, and educational and social activities. The GSG is the delegated governing unit for the graduate student body as pronounced by the University of Maine and the Board of Trustees (BOT). It is administered by an Executive Committee of Officers elected each year. The GSG maintains a healthy, professional and working relationship with the University Administration in order to best serve the graduate student community and the University as a whole. The Graduate Student Government is composed of Senators from various graduate departments and programs within the colleges of the University of Maine. Dependent upon the particular department, program, and the number of graduate students enrolled, each graduate department or program is encouraged to send at least one (1) graduate student to be a voting member of the GSG. It is the mission of the GSG to support both the academic and non-academic activities of the graduate student body. Keeping with its mission, GSG will continue to perform the following duties: act as a liaison between the University of Maine's Administration, faculty, staff and graduate students; encourage graduate students' involvement in GSG activities and University functions; facilitate and encourage educational, professional and research activities of graduate students; disseminate information regarding graduate activities to graduate students, Administration, faculty, staff and the campus community as a whole; represent graduate student interests to the University community, the state of Maine, and national organizations. The GSG meets every other week to discuss and vote on matters of policy, procedure and budget. These meetings are open to all graduate students. They are invited to not only attend these meetings, but also become more involved on campus and in the community! There are several committees within the GSG that bring together Senators to focus on a specific topic, including, but not limited to health insurance, services, and finance. The GSG has the ability to make a difference in all aspects and levels of the University of Maine, such as influencing University policy decisions, serving on University committees and sponsoring special services to graduate students.

- **Funding for Graduate Students:** The primary responsibility of the Graduate Student Government is directed toward the academic concerns of graduate students. This includes grants reviews and awards processes each semester. This year, approximately $76,000 was awarded to graduate students for research, travel, conferences and other degree-related expenses. Since its inception, the GSG has awarded over $1,000,000 in grants. The GSG is able to provide funding for numerous graduate students and plan various social and educational events in most part due to the Graduate Student Activity Fee.

- **Graduate Student Recognition (Hooding) Ceremony:** The Graduate Student Government was instrumental in initiating the Graduate Student Recognition (Hooding) Ceremony, which has become an annual event and an integral part of graduate education at the University of Maine.

- **Student Symposium: Research & Creative Activity:** Each spring, the Graduate Student Government co-sponsors the Student Symposium to showcase the best of graduate and undergraduate students' research efforts and innovation.
- **Clubs and Organizations**: The Graduate Student Government also sponsors over 25 clubs and organizations that benefit the graduate student body. If there's a club or an organization not listed, but that you would like sponsored by the GSG, then think about starting up your own! It's fun and easy!

- **Health Insurance**: We advocate for better health insurance options and coverage for all graduate students, including graduate assistants (GAs), research assistants (RAs), teaching assistants (TAs), and graduate students who are not on assistantships.

- **How to Contact Us**: For more information, please email us at gsg@maine.edu and visit the GSG website at https://umaine.edu/gsg/. Become a fan of the GSG on Facebook, follow the GSG on Twitter and Instagram (@umainegsg), or stop by Stodder Hall to say hello! We would love to hear from you! We hope to see you soon!

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**Campus Recreation** is a central student service in the Division of Student Life, and offers a wide variety of recreational programming. Maine Bound, which is part of Campus Recreation, offers a wealth of indoor and outdoor recreation and education opportunities. Available to students through their recreation fee, Campus Recreation and Maine Bound offer a wonderful variety of recreation and fitness choices. Open Recreation is available in the state-of-the-art New Balance Student Recreation Center (NBSRC), as well as the Bridge Tennis Courts, Wallace Pool, and Mahaney Dome. Amenities at these facilities include over 140 pieces of weight/cardio equipment, 3 basketball/volleyball courts, 2 racquetball/squash courts, 1 multi-activity court, 2 multi-purpose group exercise studios, competitive lap pool, leisure pool with spa, sauna, and vortex, indoor turf field, indoor track, and eight outdoor lighted tennis courts. The NBSRC offers a wide range of group fitness classes, and many other fitness programs including personal training. Numerous intramural sports are available for men, women and coed. Campus Recreation maintains more than 15 miles of trails in the University's DeMeritt Forest for hiking, biking, horseback riding, snowshoeing, and skiing. Outdoor gear such as tents, canoes, kayaks, cross country skis and snowshoes are available for rent at Maine Bound. Sports equipment such as racquets, weight belts, and balls for various sports are available for checkout in the Rec Center. Lockers are available for rental or for complimentary day use. The Maine Bound Adventure Center, located near the Collins Center for the Arts, houses an indoor rock climbing tower and bouldering wall. Trips, clinics and courses (credit and noncredit) are available in kayaking, canoeing, climbing, backpacking, hiking, camping, snowshoeing, skiing and more. For more information, visit the Campus Recreation website http://www.umaine.edu/campusrecreation.

**Memorial Union.** The Memorial Union is one of the two major student hubs on campus (the New Balance Student Recreation Center being the other one). Many student support services are located in the Memorial Union. These include the following: University Bookstore; the Multicultural Center; Title IX Student Services; the Career Center; the Commuter Lounge; the Student Wellness Resource Center; the Hackerspace; the Veterans Center; the First Year and Transfer Student Center; the Package and Postal Center; the Student Service Center (parking pass, MaineCard, etc.); the University Credit Union and ATM; the Rainbow Resource Center (LGBTQ+ support/services); the Bodwell Center for Service and Volunteerism; Residence Life; Fraternity and Sorority Affairs; Center for Student Involvement; Mind Spa; and the Vice President for Student Life/Dean of Students Office. In addition to all of these services, the Bear's Den (food court) is on the main (2nd floor) floor of the Union and includes the campus pub. The Union is a great place to meet and hang out with friends and colleagues. It is also the site of a wonderful variety of events and activities such as the International Student Coffee hour, comedians and musicians, films, lectures and a great many other things. The Maine Campus (student newspaper), WMEB (student radio station), Student Government, Inc. (undergraduate student government) offices, and the Spirit Room (Bananas the Bear Display) are also found in the Memorial Union. The Union is host to many conferences and meetings, and rooms can be reserved by calling (207) 581-1405.

**The Package and Postal Center**: The Package and Postal Center is located on the ground level of the Union and is home to the post office. You can buy stamps, send/receive packages, etc. In fact, all packages deliverable to residence halls come to the Center for easy, secure, and convenient student pick up. The Center is also the quick copy center on campus. They do color and black/white copying, binding, and transparencies.
**Student Service Center:** The Student Service Center is located next to the University Credit Union on the first floor of the Union. Students can get their Maine Cards, replacement Maine Cards, and their parking passes at the Student Service Center. Many other services are also available including a notary public, meal plan purchases/changes, and Black Bear Bucks. Contact them at 207-581-2273.

**The University Bookstore** is centrally located in the heart of campus on the lower level of the Memorial Union. The Bookstore offers many competitively priced options for course material such as rentals, digital delivery as well as used and new textbooks. As the official bookstore of the University of Maine the Bookstore can guarantee you will get the correct material to meet your academic needs while still being competitive with such online sellers as Amazon. The Bookstore not only features course materials but carries one of the largest selections of official UMaine clothing and gifts, official class rings and electronics. As an Authorized Apple Campus Store, the Bookstore offers educational discount pricing for students on Apple computer products as well as an assortment of Apple and Dell computers and accessories with a professional computer service & repair center available on site. Contact the Bookstore at 207-581-1700 or go to umaine.edu/bookstore.

**The Division of Student Life.** The Division of Student Life provides a network of student-oriented programs and services, which address a variety of student needs. Our services are unique; they are dynamic collaborations of multiple efforts, from leadership programs and ethnic cultural celebrations to volunteer activities, health education opportunities, and outdoor adventure programs. In addition, we provide an appointed liaison from our office committed to serving graduate students' specific needs. We are here for personal advice, for small and large problems, and for educational life concerns. For more information or to schedule an appointment with a graduate student advocate, please call 581-1406 or visit us on the website at http://umaine.edu/studentlife/

**The Collins Center for the Arts** is a cultural and artistic centerpiece for eastern and northern Maine. The 1,435 seat Hutchins Concert Hall provides the perfect venue to see a wide variety of performances including Broadway tours, legendary musicians and singers, nationally-known comedians, classic and modern dance, live theatre, family shows, and much more. The John I. and Elizabeth E. Patches Chamber Music Series brings some of the finest instrumental and vocal chamber musicians in the world to Orono, Maine. Home to one of the largest projector screens in Maine, audiences can see broadcasts from The Metropolitan Opera's award-winning "The Met: Live in HD" and "National Theatre Live," broadcasting the best of British theatre recorded live from the London stage. The CCA is proud to be the home of the Bangor Symphony Orchestra, one of the oldest, continually-operating community orchestras in the nation. Each year, the Symphony performs the Nutcracker, and other orchestral masterworks for thousands of fans. The Collins Center is also the perfect place to see arts education in action with performances presented by UMaine's School of Performing Arts ensembles. Additionally, the Collins Center plays hosts to a number of campus and community events, including performances, lectures, rallies and public forums. For more information about the CCA's performances and events, visit www.collinscenterforthearts.com.

**The Hudson Museum.** The Hudson Museum's collection features an extraordinary collection of Pre-Columbian artifacts ranging from Olmec to Aztec - The William P. Palmer III Collection, Native American holdings from Maine, the Southwest, Northwest Coast, Arctic, and Plains, as well as collections from Africa, Oceania and Asia. The Museum hosts temporary and permanent exhibits, offers guided tours and gallery programs for learners of all ages, lectures, workshops and an annual Wabanaki Winter Market. It also offers staff assistance for directed research projects and internships and programs for UMaine classes. For further information, please call 581-1904 or visit us on the web at www.umaine.edu/hudsonmuseum.
**Versant Power Astronomy Center.** Versant Power (formerly Emera) Astronomy Center on Rangeley Road opened in 2014 as Maine's largest and most advanced astronomy facilities of its kind, financed by the generous contributions of anonymous donors. The facility houses the Maynard F. Jordan Planetarium featuring a 10 meter dome, digital 4K projection system, and digital 5.1 audio. The Jordan Observatory with a 20 inch PlaneWave research telescope, and the Clark Observatory which has been relocated to this facility host the 8 inch Alvin Clark refractor for visual astronomy viewing. Intended for the use of students, researchers, and the public, the facility offers a variety of astronomy and other science programs throughout the year and serves as a resource for the UMaine Campus. Audiences in the planetarium can enjoy a view of the stars and journeys of adventure through space and to the limits of the imagination. Public showings are offered on Friday evenings and Sunday afternoons, along with other selected times. Private programs can be arranged for school classes, private groups, birthday parties, families and more.

For more information visit the Versant Power Astronomy Center web site: Astro.UMaine.edu.

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**Graduate Programs, Certificates, Specializations, Emphases**

**Animal Sciences**

The M.S. degree in Animal Sciences may be earned for a program of study in reproductive physiology, animal health, nutrition or management. The Ph.D. degree may be earned by completing a program of study in Food and Nutrition Sciences or Biological Sciences. Thesis research constitutes a major portion of the M.S. and Ph.D. programs. Students are required to take Graduate Seminar (AVS 633). Ph.D. students must present four seminars and M.S. students must present two seminars. For the M.S. degree, a minimum of 30 semester hours, including credit given for the thesis, is required. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. In addition, a minimum of 12 hours (exclusive of thesis) of 500- and/or 600-level course work is required. Additional requirements for M.S. and Ph.D. degrees can be found in the General Policies and Regulations of the Graduate School elsewhere in this catalog.

Students interested in pursuing graduate studies in animal nutrition should have undergraduate courses in mathematics, physics, organic chemistry, biochemistry, and quantitative analysis. Training in physiology and biochemistry is desirable for students interested in animal physiology, and some work in statistics is desirable for all graduate students.

Graduate students will take many of their formal graduate courses in supporting departments, depending upon their specific interests and fields of study.

Graduate students appointed to assistantships in Animal and Veterinary Sciences devote a minimum of half time to research or teaching activities. Complete research facilities are available, including laboratories and animal units, with opportunities for field tests.

The program also offers a non-thesis Master of Professional Studies (M.P.S.) degree in Animal Sciences. Requirements for the M.P.S. are 30 credit hours, of which at least 15 hours must be 500- and/or 600-level. In addition, each student will be required to complete a minimum of three hours in an "independent study" type course in the area of Animal and Veterinary Science. The M.P.S. student is required to demonstrate competence in chosen fields of specialization during an oral comprehensive examination at the completion of his or her program. Courses selected must include a minimum of 12 credits in Animal and Veterinary Sciences. In addition, a minimum of 12 hours must be selected in a specialized field of study. The three credit "independent study" type course is to be a short-term research project. Upon completion of the project, a written report will be presented to the major professor and a seminar on the project will be presented to the Animal Science faculty and students.
Graduate Faculty

Timothy Bowden, Ph.D. (University of Aberdeen, 1998), Associate Professor. Aquatic animal health.


Suzanne L. Ishaq, PhD (University of Vermont, 2015), Assistant Professor. Host-associated microbial communities and animal health.

Pauline Kamath, Ph.D., (University of California, Berkeley, 2011), Assistant Professor. Ecology and evolution of infectious diseases in wildlife and livestock, population and phylogenetics/genomics.

Colt Knight, Ph.D., (University of Arizona, 2016), Assistant Professor of Extension - State Livestock Specialist

Anne Lichtenwalner, PhD., D.V.M., (University of Idaho, 1995, Oregon State University, 1989), Associate Professor. Diseases of Livestock, poultry and fish.

David Marcinkowski, Ph.D., (The Ohio State University, 1982), Associate Extension Professor. Dairy Management.

Juan J. Romero, Ph.D. (University of Florida, 2013), Assistant Professor. Ruminant nutrition, forage quality, and hay and silage production.


Associate Graduate Faculty


Robert C. Bayer, Ph.D. (Michigan State, 1972), Professor. Fisheries and aquaculture nutrition, management and physiology.

Anthropology and Environmental Policy

Today a variety of environmental specters threaten Earth's populations. Greenhouse-gas emissions are changing earth systems, global ecology, disease patterns, and land-use. Ocean fisheries and forests in many parts of the world, including Maine, are in precipitous decline. Loss of agricultural land in combination with population increases may well result in widespread famines in the near future. There are also growing problems associated with nutrient pollution, loss of wildlife and biodiversity, soil erosion, the depletion of non-renewable resources, and environmental degradation. These problems affect people, but people also cause them. Moreover, many are global in origin but local in their effects. Demands on forests and fisheries are international, for example, but the environmental consequences are felt locally in over-cut woodlands and wiped-out fisheries. Climate is affected by human activity at a global level,
but climate changes will have very different effects in different regions of the globe. Since Maine is a natural resource state, the global origins of these threats are particularly relevant to the people of Maine, their culture, and their society.

The PhD and MA programs in Anthropology and Environmental Policy center on understanding human society and culture in cross-cultural perspective and their pivotal role in implementing successful environmental policy. The program engages students in a multi-disciplinary framework bridging environmental sciences and policy while focusing on the sociocultural impacts of, and responses to, local and global environmental change.

Students engage with faculty in cutting-edge research on the way social relations, human organization, cultural perceptions, and ecological behavior affect the causes and consequences of local, national, and global environmental change. Students analyze social and cultural dimensions of policy that mitigate negative environmental consequences of this change while safeguarding or promoting human well-being. Areas of environmental policy and research include global climate change, energy resources, marine resources, eco-tourism, forestry resources, land-use, water management, and pollution control.

The program core is a firm grounding in anthropological social and cultural theory, qualitative and quantitative methodology, and policy development and analysis. Students engage in methodological and specialized courses tailored to their specific environmental interests at the local, national, or international scale.

Students may enter the program with a Bachelor's or Master's degree in Anthropology, Biology, Climate Change, Economics, Marine Sciences, Forestry, or any other related field. All students take the Core Curriculum courses in Cross-Cultural Human Dimensions, with the remaining curriculum individually tailored depending on each student's background, environmental focus area, and national or international environmental policy interest. Courses in policy and basic methodology will be dependent on courses students have taken previously.

**Financial Aid**

Graduate Teaching Assistantships and Work Study positions are available on a competitive basis for qualified students.

**Graduate Faculty**

**Christine Beitl**, Ph.D. (University of Georgia, 2012), Graduate Coordinator, Associate Professor of Anthropology; Sustainability science, coastal/ marine anthropology, economic anthropology, environmental anthropology, political ecology


**John Daigle**, Ph.D. (University of Massachusetts, 1997), Associate Professor of Forest Recreation Management. Recreation planning and management, social research methods for natural resource professionals, human dimensions of natural resources management.

**Samuel P. Hanes**, Ph.D. (Rutgers University, 2008) Associate Professor of Anthropology. Historical geography, human ecology, agriculture, aquaculture, natural resource management.

**Stephen Hornsby**, Ph.D. (University of British Columbia, 1986), Professor of Geography and Canadian Studies, Director for the Canadian American Center. Historical geography, expansion of Europe overseas, eastern Canada and northeastern United States.

**Cindy Isenhour**, Ph.D. (University of Kentucky, 2010), Associate Professor of Anthropology, Cooperating Faculty Climate Change Institute. Environmental anthropology, economic anthropology, climate policy
Teresa Johnson, Ph.D. (Rutgers University, 2007), Associate Professor of Marine Policy, Cooperating Professor of Anthropology. Fisheries management, marine policy.

Alice Kelley, Ph.D. (University of Maine, 2006), Associate Research Professor of Climate Change Institute, Cooperating Professor of Anthropology. Geoarchaeology, surficial geology, and geomorphology.

Jessica Leahy, Ph.D. (University of Minnesota, 2005), Professor of Human Dimensions of Natural Resources. Social psychological aspects of natural resources management, environmental attitudes and behavior, information effects.

Paul Mayewski, Ph.D. (Ohio State University, 1973), Director, Climate Change Institute and Professor of Earth and Climate Sciences. Climate change and atmospheric chemistry.

Lisa Neuman, Ph.D. (Duke University, 2002), Associate Professor of Anthropology and Native American Studies. Politics of Indian identities. Tribal sovereignty and economic enterprise, gender studies, cultural production, cultural history, North America, Oklahoma, Maine.

Bonnie Newsom, Ph.D. (University of Massachusetts, 2017), Assistant Professor of Anthropology and Faculty Associate, Climate Change Institute. Archaeology of Maine and the Maritimes, Indigenous archaeologies, aboriginal pottery, historic preservation, shell midden research.

Darren Ranco, Ph.D. (Harvard University, 2000), Associate Professor of Anthropology and the Senator George Mitchell Center for Environmental and Watershed Research, Chair of Native American Programs. Indigenous intellectual property rights, research ethics, environmental justice, tribal governance.

Paul (Jim) Roscoe, Ph.D. (University of Rochester, 1983), Professor Emeritus of Anthropology, Cooperating Professor of the Climate Change Institute, Cooperating Professor in the School of Policy and International Affairs. Anthropology of climate change, warfare, social and political evolution.


Daniel Sandweiss, Ph.D. (Cornell University, 1989), Professor of Anthropology and Climate Change. Prehistoric and historic archaeology, coastal adaptations, climate change.

Rachel Schattman, Ph.D. (University of Vermont, 2016), Assistant Professor of Sustainable Agriculture; Agroecology, climate change, sustainability, water resources, participatory action research

Linda Silka, Ph.D. (Oklahoma State University, 1974), Professor of Resource Economics. Research partnerships, research ethics, grant writing, program evaluation, community-university partnerships.

Marcella Sorg, Ph.D. (Ohio State University, 1979), Research Professor, Margaret Chase Smith Policy Center, State of Maine Forensic Anthropologist, Faculty Associate in Anthropology. Forensic anthropology, taphonomy of human remains.

Mario Teisl, Ph.D. (University of Maryland, 1997), Director, School of Economics, Professor of Resource Economics. Information economics, food safety, environmental and social marketing, environmental economics.

Tim Waring, Ph.D. (University of California-Davis, 2010), Associate Professor of Resource Economics. Sustainability, human cooperation, human cultural evolution, evolutionary ecology.

Gregory Zaro, Ph.D. (University of New Mexico, 2005), Associate Professor of Anthropology and Climate Change. Archaeology, historical ecology, agricultural intensification, urbanism, Mesoamerica, Andes, Eastern Adriatic.
Aquaculture and Aquatic Resources

Program of Study

The program leading to the M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources is an interdisciplinary program with core faculty drawn from the School of Food and Agriculture, the School of Marine Sciences, School of Biology and Ecology, the School of Economics, and the College of Engineering.

The graduate program in Aquaculture and Aquatic Resources is designed to train professionals for a career in aquaculture and related industries or for further academic training.

The M.S. and Ph.D. degrees are intended to have a strong basis in the biological and/or physical sciences with additional training and research opportunities in areas such as aquatic health, physiology and nutrition, aquaculture production, engineering, food science and technology, social sciences, policy, and economics.

The Program Faculty come from multiple disciplinary areas including:

- engineering, pathology, physiology, nutrition, seafood processing, and population and habitat modeling.

Faculty work with a variety of aquatic species including, but not limited to:

- cod, halibut, salmon, trout, oysters, clams, mussels, sea urchins, sea horses, abalone, seaweed, and lobsters.

Research Facilities

Extensive analytical facilities and associated research support are available on the Orono campus, and at off-campus locations both east and west of Orono.

The Aquaculture Research Center (ARC) is located on the Orono campus and houses numerous temperature-controlled recirculating saltwater systems from 150 gallons to 4000 gallons.

- Facilities are available for egg incubation of cod, haddock, and halibut.
- A larval rearing laboratory allows the production of juvenile cod and haddocks as well as other fish species. A live food production laboratory is available for the production of rotifers and brine shrimp.
- The Center houses numerous aquaria for holding lobsters, shellfish, sea urchins, and tropical reef fish.
- The Center also houses a 120X8X4 ft wave tank which is used to conduct scale model tests.

The Matthew Highlands Pilot Plant, also located on campus, has state-of-the-art food processing equipment including: Blast freezer, smoke house, pasteurizer, ozone system, and other equipment necessary for value-added product development of wild-caught and farm raised aquatic species.
The Center for Cooperative Aquaculture Research (CCAR) is located on a 24-acre site in Franklin and has 610 feet of tidal marine frontage on Taunton Bay.

- It comprises both seawater and freshwater aquaculture systems.
- The objectives of CCAR are to develop integrated aquaculture techniques, to serve as a business incubator, to produce finfish juveniles for commercial grow-out, to develop sustainable aquaculture techniques, and to train staff and students in aquaculture techniques.
- The Center houses a salmonid egg incubation facility, pilot scale recirculation systems for marine finfish, a marine finfish nursery, a marine broodstock facility, and several large grow-out systems. The systems currently hold halibut, cod, sea worms, sea urchins, and the red alga Porphyra.

The University of Maine at Machias Marine Science Field Station (MSFS) at the Downeast Institute (DEI) is located on a 14-acre peninsula on Great Wass Island in the town of Beals. It has 2,500 feet of tidal frontage (rocky shore with some soft-bottom intertidal) overlooking Western Bay.

- The facilities include a large ecology wet lab, three small climate-controlled labs for work with quarantine organisms, ocean acidification studies, and other climate-related efforts. A dry lab, specimen lab, and sample processing lab round out the marine research laboratory.
- Business incubator.
- Office space for PIs and graduate students.
- Adjacent production-scale shellfish hatchery to produce commercially important bivalves for research, development, and outreach activities. Currently, species in culture include soft-shell clams, razor clams, Atlantic surf clams, Arctic surf clams, blue mussels, European oysters, American oysters, and sea scallops.
- Classroom and Conference room.
- Two fully-functional tidal impoundments (2- and 3-acres) for mesocosm studies.
- 100-ft x 30-ft pier constructed of fiber composites with two 12-ft x 20-ft floats.
- A new residence hall is within a 5-minute walk of the marine research lab. It can accommodate 18-20 scientists and students.

Cost and Financial Aid

More information on cost and financial aid can be obtained through:

The Bursar's Office: https://umaine.edu/bursar/

Student Financial Aid Office: https://umaine.edu/stuaid/

Correspondence

https://umaine.edu/graduate/

Graduate Faculty
Robert C. Bayer, Ph.D. (Michigan State), Professor. The Lobster Institute, School of Food and Agriculture. Lobster fisheries and aquaculture nutrition, management and physiology.

Brian F. Beal, Ph.D. (University of Maine), Professor. University of Maine at Machias. Shellfish aquaculture, estuarine biology, marine benthic ecology, and experimental design.

Kathleen P. Bell, Ph.D. (University of Maryland), Professor, School of Economics. Environmental and natural resources economics, spatial modeling and analysis, human-environment interactions, and marine policy.

Timothy J. Bowden, Ph.D. (University of Aberdeen, UK), Associate Professor, School of Food and Agriculture. Aquatic animal health, environmental impacts on animals, seasonality and circadian impacts.

Deborah A. Bouchard, Ph.D. (University of Maine), Assistant Extension Professor, University of Maine Cooperative Extension. Aquatic animal health specialist.

Damian C. Brady, Ph.D. (University of Delaware), Assistant Professor, School of Marine Sciences. Spatial and temporal dynamics of water quality and organism behavior.

Ian R. Bricknell, Ph.D. (University of Lancaster, UK), Professor. School of Marine Sciences. Aquatic animal health, especially parasites such as sea lice.

Laurie Connell, Ph.D. (University of North Carolina), Research Professor, School of Marine Sciences, Marine algae, shellfish toxins and shellfish health.

Keith S. Evans, Ph.D. (Iowa State University). Assistant Professor. School of Economics and School of Marine Sciences. Marine resource economics, marine development, non-market valuation, and marine policy.

Heather Hamlin, Ph.D. (University of Maine). Associate Professor. School of Marine Sciences Reproductive biology and endocrinology of aquacultured animals.

Anne Lichtenwalner, Ph. D. (University of Idaho), DVM (Oregon State University), Associate Professor. School of Food and Agriculture. Extension Veterinarian and Director, University of Maine Veterinary Diagnostic Laboratory. Animal health and animal disease surveillance.
Caroline Noblet, Ph.D. (University of Maine), Assistant Professor. School of Economics. Consumer choice, sustainable behavior, labeling.

Lewis (Brian) Perkins, Ph.D. (University of Maine), Laboratory Director and Assistant Research Professor. School of Food and Agriculture. Analytical method development for bioactive compounds, naturally occurring toxins and pesticide residues in food and environmental matrices.

Paul D. Rawson, Ph.D. (University of South Carolina), Associate Professor of Marine Science and Graduate Co-Coordinator. School of Marine Science. Ecological genetics of marine invertebrates and marine bivalve aquaculture.

Denise I. Skonberg, Ph.D. (University of Washington), Associate Professor and Graduate Co-Coordinator. School of Food and Agriculture. Seafood by-product utilization, seafood processing, quality evaluation of aquaculture products.

Gayle Zydlewski, Ph.D. (University of Maine), Associate Professor, School of Marine Sciences. Environmental impact on behavior, population dynamics and physiology.

External Graduate Faculty

Carrie J. Byron, Ph.D. (University of Rhode Island), Assistant Professor. Department of Marine Science. University of New England. Food web ecology, trophic dynamics and carrying capacity of ocean foods production.

Barry A. Costa-Pierce, Ph.D. (University of Hawaii), Henry L. & Grace Doherty Professor, Chair of Marine Sciences, and Director of Marine Science Center - University of New England. Ecological aquaculture, detritus and food web trophic dynamics, social ecology of aquaculture and fisheries systems.


Autism Spectrum Disorders (Certificate)

In 2000, the Center for Disease Control estimated that 1 in 1000 children were diagnosed with an autism spectrum disorder (ASD). By 2018, those estimates had increased to 1 in 59. All preK-12 schools in Maine are required to provide educational services to students with an ASD in the Least Restrictive Environment (LRE). The primary purpose of this 4-course certificate sequence is to prepare experienced educators, administrators and related service providers to assume a leadership role in the development and implementation of educational programs for students with autism in school settings.
Certificate program objectives:

1. Candidates will develop theoretical knowledge and applied skills for understanding the needs of students with ASD and providing evidence-based practices according to individual needs.
2. Candidates will have the necessary theoretical and applied background to provide leadership to their schools and districts in developing a sound model of educational and social/behavioral support and intervention.
3. Candidates will be familiar with and able to access available resources to support their districts' efforts in providing services for their students with ASD.
4. Candidates will have the knowledge and skills to serve as team leaders and coaches in supporting program implementation in their schools and districts.

There are two tracks for the Graduate Certificate in Autism Spectrum Disorders:

1. Special educators enroll in the following courses:
   - SED 528 Educational methods for students with autism
   - SED 585 Social Communication for students with ASD
   - SED 556 Assessment in special education: Students with ASD and severe disabilities
   - SED 563 Positive behavioral supports for students with ASD

2. General educators or others supporting individuals with autism enroll in the following courses:
   - SED 528 Educational methods for students with autism
   - SED 585 Social Communication for students with ASD
   - SED 564 Universal design for learning in classrooms
   - SED 532 Behavior management

Biochemistry

Graduate studies in the Department of Molecular and Biomedical Sciences can lead to an M.P.S., M.S. or Ph.D. degree in Biochemistry. Students may choose from biomedical research areas such as cell regulatory systems, protein biochemistry, molecular immunology, cellular and molecular toxicology, microbiology, bioinformatics, and genomics. Financial aid is available on a competitive basis, primarily in the form of graduate teaching assistantships. Research assistantships and University fellowships are also available.

Faculty members are actively involved in research that is supported at the federal level. Students admitted to the graduate program in Biochemistry may also carry out their research with faculty listed under Microbiology in this catalog, in a number of laboratories in other departments at the University, the Jackson Laboratory in Bar Harbor, the Maine Medical Center Research Institute in Portland, or through cooperative institutional arrangements and Associate faculty or staff. (In addition to the University of Maine-based faculty listed below, several faculty at Jackson Laboratory, MMCRI, etc, mentor research students in this degree program.)

The Ph.D. degree in Biochemistry and Molecular Biology is awarded for significant and original contributions to basic knowledge through research. The curriculum plan is variable and will take into account each student's goals for graduate study and the content and quality of his or her undergraduate preparation.

The Master's program prepares students for further studies toward the Ph.D., or medical degrees, as well as for careers in academic or industrial research, or teaching. The M.P.S., Master of Professional Studies, is a non-thesis Master's degree.

The Department of Molecular and Biomedical Sciences is housed in Hitchner Hall, which is well equipped to do modern research in biochemistry, bacteriology, virology, molecular biology, genomics, bioinformatics, and
immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, phase, confocal, and fluorescent microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals.

Prerequisite for admission to these programs is the completion of undergraduate work in chemistry, mathematics, physics and molecular biology/biochemistry substantially equivalent to that required of undergraduate students at this institution whose major is Biochemistry.

**Graduate Faculty**

**Julie A. Gosse**, Ph.D. (Cornell, 2005) Associate Professor and Graduate Coordinator. Biochemical, molecular, and cellular toxicology to aid in human environmental health risk assessment.

**Robert E. Gundersen**, Ph.D. (University of Texas-Austin, 1983) Chair and Associate Professor. The role of signal transduction during growth and development in eukaryotes.


**Benjamin L. King**, Ph.D. (University of Maine, 2016) Assistant Professor. Bioinformatics and Systems Biology of Stress Responses.

**Melissa S. Maginnis**, Ph.D. (Vanderbilt, 2007) Assistant Professor. Virus-host cell interactions that regulate JC Polyomavirus infection and pathogenesis.

**Sally Molloy**, Ph.D. (University of Maine, 2007) Assistant Professor. Genomics and Microbiology.

**Melody N. Neely**, Ph.D. (University of Michigan School of Medicine, 1998) Associate Professor. Host-pathogen interactions, with focus on Streptococcus.


**Biochemistry and Molecular Biology**

Graduate studies in the Department of Molecular and Biomedical Sciences can lead to an M.P.S., M.S. or Ph.D. degree. Students may choose from biomedical research areas such as cell regulatory systems, protein biochemistry, molecular immunology, cellular and molecular toxicology, microbiology, bioinformatics, and genomics. Financial aid is available on a competitive basis, primarily in the form of graduate teaching assistantships. Research assistantships and University fellowships are also available.

Faculty members are actively involved in research that is supported at the federal level. Students admitted to the graduate program in Biochemistry may also carry out their research with faculty listed under Microbiology in this catalog, in a number of laboratories in other departments at the University, the Jackson Laboratory in Bar Harbor, the Maine Medical Center Research Institute (MMCRI) in Portland, or through cooperative institutional arrangements and Associate faculty or staff. (In addition to the University of Maine-based faculty listed below, several faculty at Jackson Laboratory, MMCRI, etc, mentor research students in this degree program.)
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The Department of Molecular and Biomedical Sciences is housed in Hitchner Hall which is well equipped to do modern research in biochemistry, bacteriology, virology, molecular biology, genomics, bioinformatics, and immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, confocal and other microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals.

Prerequisite for admission to these programs is the completion of undergraduate work in chemistry, mathematics, physics, and biochemistry/molecular biology substantially equivalent to that required of undergraduate students at this institution whose major is Biochemistry.

**Graduate Faculty**

**Robert E. Gundersen**, Ph.D. (University of Texas-Austin, 1983), Chair and Associate Professor. The role of signal transduction during growth and development in eukaryotes.

**Julie A. Gosse**, Ph.D. (Cornell, 2005), Associate Professor and Graduate Coordinator. Biochemical, molecular, and cellular toxicology to aid in human environmental health risk assessment.

**Joshua B. Kelley**, Ph.D. (University of Virginia, 2008), Assistant Professor. Spatio-temporal regulation of G-proteins in receptor mediated gradient tracking using microfluidics and computational cell biology approaches.

**Benjamin L. King**, Ph.D. (University of Maine, 2016) Assistant Professor. Bioinformatics and Systems Biology of Stress Responses.

**Melissa S. Maginnis**, Ph.D. (Vanderbilt, 2007) Assistant Professor. Virus-host cell interactions that regulate JC Polyomavirus infection and pathogenesis.

**Sally Molloy**, Ph.D. (University of Maine, 2007), Assistant Professor. Genomics and Microbiology.

**Melody N. Neely**, Ph.D. (University of Michigan School of Medicine, 1998) Associate Professor. Host-pathogen interactions, with focus on Streptococcus.

**Robert T. Wheeler**, PhD (Stanford, 2000), Associate Professor. Genetics, genomics, biochemistry and cell biology of fungal pathogens with mammalian hosts.

**Biological Sciences**
The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

**Doctor of Philosophy**

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

**Master of Science**

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

**Research Specializations**

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.
**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

**Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

**Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleocology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

**Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: umbiosci@maine.edu, https://sbe.umaine.edu/.
Graduate Faculty

Andrei Alyokhin, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

Seanna L. Annis, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

Christopher S. Cronan, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

Francis A. Drummond, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

Allison Gardner, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

Jacquelyn Gill, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

Hamish Greig, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates.

Eleanor Groden, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

David Hart, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

Clarissa Henry, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of segmentation and muscle development in Zebrafish.

Rebecca Holberton, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

Michael T. Kinnison, Ph.D. (University of Washington, 1999) Professor of Evolutionary Applications. Microevolution, eco-evolutionary dynamics, aquatic ecology, population and conservation genetics, fish ecology.

Danielle Levesque, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

Joyce E. Longcore, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

Brian McGill, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

Brian Olsen, Ph.D. (Virginia Tech., 2007), AssociateProfessor. Avian ecology, behavior, demography, mating systems, and life history evolution.

Michelle Smith, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

Ek Han Tan, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

Kristy Townsend, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

Mary S. Tyler, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in Drosophila; educational multimedia materials.

Seth Tyler, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

Yong Jiang Zhang, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

Cooperating Faculty

Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

William O. Bray, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

Jim Dill, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

David Hiebeler, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

Sara Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

William H. Livingston, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

James D. McCleave, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

Paul Rawson, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

Alan M. Rosenwasser, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.
Walter C. Shortle, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

Robert S. Steneck, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

Rebecca J. Van Beneden, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

Robert G. Wagner, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

Biomedical Engineering

The Masters of Science in Biomedical Engineering prepares students to conduct research involving the application of engineering to biological systems. Examples of research projects are sensors to detect specific biological molecules or pathogens in food or water, understanding cell membranes in terms of signaling and transport of molecules, imaging of cells or proteins, conformation of biological molecules at membrane surfaces, controlling the interaction of bacteria and cells with surfaces as well as environmental risk assessment modeling. Alliances with several governmental agencies and other organizations, such as the Institute of Molecular Biophysics, the Jackson Laboratory and Maine Medical Center Research Institute, increase research opportunities related to genetics and biomedical issues in engineering. Cooperation with the Frontier Institute for Research in Sensor Technologies gives access to tools related to surface analysis.

Research Facilities

Standard equipment for cell growth and characterization, near IR, confocal microscope, mechanical testing of biological materials and other tools are available. Specialized equipment is also available related to individual projects.

Financial Aid

Graduate Research Assistantships are available on a competitive basis for externally funded research projects.

Applying

Applications for entry into the program for either the fall or spring semesters must be received at least three months prior to the start of the semester. For fall semester, it is recommended that applications be received by March of that year. Applications are available online at the Graduate School.

Correspondence:

The Graduate School
5775 Stodder Hall, Room 42
University of Maine
Orono, ME 04469-5755
207-581-3291
graduate@maine.edu

Dept. of Chemical and Biological Engineering
Requirements

The M.S. degree requires 30 semester hours of graduate work which must include two seminars and 18 credits of courses in addition to the thesis. Required core courses are BEN 502 (Advanced Materials in Bioinspired Engineering), BEN 503 (Advanced Instrumentation in Biomedical Engineering) and BEN 580 (Computational Methods in Biomedical Engineering). Three technical electives courses are required of which one needs to be 500 level or above.

Graduate Faculty


Albert Co, Ph.D. (Wisconsin, 1979), Associate Professor. Transport phenomena, fluid mechanics, polymeric fluid dynamics, rheology, applied numerical methods.

William J. DeSisto, Ph.D., (Brown, 1989), Professor. Advanced material, sensors.

Caitlin Howell, Ph.D. (University of Heidelberg, Germany, 2011) Assistant Professor. Biological interfaces, bacterial biofilm growth and control, surface-mediated tissue engineering, dynamic materials design.

John J. Hwalek, Ph.D. (Illinois, 1982), Associate Professor. Process information systems, heat transfer.

Michael D. Mason, Ph.D. (California at Santa Barbara, 2000), Professor. Photophysics of nanoparticles and molecular nanoprobes, single molecule imaging, time-resolved single photon spectroscopic imaging techniques.

Paul J. Millard, Ph.D., (University of Maryland, 1984), Associate Professor. Microbial biosensors, physiological genomics systems, fluorescence technology.


Hemant P. Pendse, Ph.D. (Syracuse, 1980), Professor and Chair. Colloidal phenomena, paper manufacture, fluid particle systems, and instrument/sensor development.

Thomas J Schwartz, Ph.D. (Wisconsin, 2015), Assistant Professor. Heterogeneous catalysis, reaction kinetics, in situ spectroscopy, biomass conversion to fuels and chemicals.

Adriaan Van Heiningen, Ph.D. (McGill, 1982), J. Larcom Ober Professor. Forest products biorefinery, chemical reaction engineering in wood pulping and pulp bleaching, black liquor gasification and direct causticization with titanate.

G. Peter van Walsum, Ph.D. (Dartmouth College, 1998), Associate Professor. Renewable energy, fuels and chemicals, bioprocessing, process engineering.
Sarah Walton, Ph.D. (U. Maine, 2009), Lecturer

M. Clayton Wheeler, Ph.D.(Austin, 1997), Professor. Chemical Sensors, fundamental catalysis, surface science, and selective sensor materials.

Biomedical Science and Engineering

The Ph.D. in Biomedical Science and Ph.D. in Biomedical Engineering are offered through the Graduate School of Biomedical Science and Engineering (GSBSE), which is a multidisciplinary research consortium connecting four external research organizations with the University of Maine as the degree-granting institution. The over 150 affiliated faculty conduct research in a variety of topics, including biomedical engineering, computational biology, bioinformatics, biophysics, bioengineering and nanotechnology, molecular and cell biology, neuroscience, and the molecular mechanisms of disease. The GSBSE contributes to learning and discovery on the emerging frontier of the biological, physical, clinical, and behavioral sciences, preparing new faculty, training scientists and engineers, and furthering Maine's biotechnology and biomedical infrastructure.

The GSBSE is a multi-institutional graduate program connecting two academic institutions of the University of Maine and the University of New England as well as three world-class research institutions of The Jackson Laboratory, the Maine Medical Center Research Institute, and the Mount Desert Island Biological Laboratory. GSBSE Ph.D. students

Students admitted to the GSBSE Ph.D. programs first explore the consortium through a year of laboratory rotations before joining a laboratory and partner site for the duration of their program. In addition, Ph.D. students and faculty instructors utilize distance learning platforms and video conferencing extensively to deliver the core Foundations and supporting coursework.

In addition to the two Ph.D. degrees, the GSBSE also offers a PSM in Bioinformatics.

More information on our program can be found on our website at: gsbse.umaine.edu.
Botany and Plant Pathology

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

Master of Science

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

Animal Behavior and Behavioral Ecology, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

Applied Biology, including biological control and insect pest management, fisheries, and plant pathology.

Botany, Plant Biology, Mycology, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

Developmental and Cell Biology, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

Ecology, Environmental Biology, and Paleoecology, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

Entomology, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

Fisheries Biology, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

Freshwater Biology, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.
**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

**Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

**Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

**Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.
Applications can be submitted online at the Graduate School website.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: umbiosci@maine.edu, http://biology.umaine.edu.

Graduate Faculty

**Andrej Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates.

**Eleanor Groden**, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.


**Rebecca Holberton**, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.


**Danielle Levesque**, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.
Joyce E. Longcore, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

Brian McGill, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

Brian Olsen, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.


Michelle Smith, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

Ek Han Tan, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

Kristy Townsend, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

Mary S. Tyler, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in Drosophila; educational multimedia materials.

Seth Tyler, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

Yong Jiang Zhang, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

Cooperating Faculty

Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

William O. Bray, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

Jim Dill, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

David Hiebeler, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

Sara Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

William H. Livingston, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.
James D. McCleave, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

Paul Rawson, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

Alan M. Rosenwasser, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

Walter C. Shortle, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

Robert S. Steneck, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

Rebecca J. Van Beneden, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

Robert G. Wagner, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

Business Administration

Known as the MaineMBA, the Master of Business Administration (MBA) program is designed to equip the student with the highest level of analytical, strategic, and leadership skills needed in a globally competitive workforce. The MaineMBA is a 30-33 credit program offering concentrations in:

- Accounting
- Business Analytics
- Finance
- Food Technology Industry Management
- Global Policy
- Healthcare Systems
- Human Nutrition Management
- Sustainability

The MaineMBA also offers joint degrees in:

- MaineMBA/ J.D. (With the University of Maine School of Law)
- MaineMBA/ M.S. Information Systems (With the Department of Information Science)
- MaineMBA/ M.A. Global Policy (With the School of Policy and International Affairs)

Additionally, Undergraduate students at University of Maine System schools may be eligible for Accelerated Pathway entry, allowing them to be admitted to graduate study while still pursuing their undergraduate degree. Students in the Accelerated Pathway are permitted to begin MaineMBA coursework in their senior year of their undergraduate experience.

The MaineMBA is available on campus at locations in Orono and Portland, as well as 100% online. Students may choose to take courses in either format or switch between the two. Most online courses are offered in 8-week
asynchronous schedules, with on-campus courses offered in 8-week or full-semester sessions. Students may choose to study full time or part time, with most part-time students completing the program in six semesters.

The Maine Business School (MBS) and MaineMBA are accredited by AACSB International-The Association to Advance Collegiate Schools of Business-the most significant accreditor of business schools. The MaineMBA is highly ranked by publications such as US News and World Report, Fortune, CEO, etc. MaineMBA students enjoy a 93% career placement rate at graduation.

MaineMBA students come from a variety of backgrounds, including areas such as engineering, medical professions, business and industry, the arts, and the humanities. An undergraduate degree in business is not required. The average MaineMBA student has nine years of professional experience prior to entry.

https://umaine.edu/business/degrees-and-programs/mba/

The Program

All candidates for the MaineMBA degree must complete the following eight core graduate courses:

- BUA 601 - Strategic Data Analysis Credits: 3
- MBA 609 - Financial Statement Analysis Credits: 3
- MBA 626 - Management of Contemporary Organizations Credits: 3
- MBA 637 - Global Supply Chain Management Credits 3
- MBA 651 - Financial Management Credits: 3
- MBA 670 - Marketing Management Credits: 3
- BUA 680 - Foundations of Business Intelligence Credits: 3
- MBA 649 - Strategic Decision Making Credits: 3

General/ No Concentration (30 Credits): Students in the general concentration take the MaineMBA Core plus two elective courses, which may include an international field study (MBA 596) which goes to a different part of the world every year and an internship (recommended for students without work experience).

Accounting Concentration (33 Credits): Candidates for the MaineMBA Accounting concentration take 8 core courses plus three accounting electives

Business Analytics Concentration (33 Credits): Candidates for the MaineMBA Business Analytics concentration take 8 core courses plus three business analytics electives.

Finance Concentration (33 Credits): Candidates for the MaineMBA Finance concentration take 8 core courses plus three finance electives.

Food Technology Industry Management (33 Credits): Candidates for the MaineMBA Food Technology Industry Management concentration take 8 core courses plus three food technology electives.

Global Policy Concentration (33 Credits): Candidates for the MaineMBA Global Policy concentration take 8 core courses plus three Global Policy courses including:

- Contemporary Issues in World Economies
- Contemporary International Relations
- Global Politics OR Global Policy elective

Human Nutrition Industry Management (33 Credits): Candidates for the MaineMBA Human Nutrition Industry Management concentration take 8 core courses plus three human nutrition electives.
**Healthcare Systems (33 Credits):** Candidates for the MaineMBA Healthcare Systems concentration take 8 core courses plus three healthcare courses including:

- MPH 525 American Healthcare Systems
- Healthcare elective
- Healthcare elective

**Sustainability (33 Credits):** Candidates for the MaineMBA Sustainability concentration take 8 core courses plus three sustainability courses including:

- PPM 612 Sustainable Communities
- Sustainability elective
- Sustainability elective

**Foundational Skill Requirements**

Applicants seeking entry into the MaineMBA program must have a baccalaureate degree from a U.S. accredited college/university or comparable overseas bachelor's degree. Foundational skills in accounting, economics, statistics, and finance are required. Applicants without required prerequisite coursework may fulfil foundational requirements through coursework, tutorials, or other significant demonstrated experience.

Applicants for the MaineMBA Accounting concentration must complete undergraduate coursework in: Financial Accounting, Managerial Accounting, Intermediate Accounting I; Intermediate Accounting II; Auditing; and Taxation. Students without these courses may be admitted provisionally while these courses are completed.

Students must receive a B- minimum in each prerequisite course or pass tutorials with an 80% or better. Candidates are also expected to be proficient in MS Office applications and have excellent writing and presentation skills.

**Application Process and Requirements**

Applications are reviewed on a rolling admission basis, meaning that once the application is complete, the admission evaluation process begins. The application can be completed online at [http://www.umaine.edu/graduate](http://www.umaine.edu/graduate) The application includes submission of the following items:

- Completed application
- Resume or CV
- Essay
- Names and contact information of three recommenders
- Current resume
- Official college transcripts from all schools attended
- Official score reports from the Graduate Management Admission Test (GMAT) taken within the last five years. When ordering GMAT report, use Institution Code 1ZF-RM-18
- For applicants whose native language is not English, original iBT TOEFL score report is required or comparable of English language proficiency report. When ordering TOEFL score, use Institution Code 3916.
The $65 online application fee may be paid by credit card (Visa, MasterCard or Discover), or check / money order made payable to the University of Maine. Paper applications require a fee of $75.

Application materials should be sent to:

The Graduate School
5775 Stodder Hall, Room 42
University of Maine
Orono, ME 04469-5775
graduate@maine.edu

**Applications Deadlines:** The MaineMBA admits students year round on a rolling basis. Suggested target dates for a completed application are August 1 to be considered for fall admission, December 1 for the spring semester, and April 1 for summer admission. Late applications may be considered once all materials are available or may be considered for a future entry term. Completed applications for students requesting assistantships or other funding should be received by **January 15** prior to fall semester. International students requiring a student visa should apply early.

**Admission Criteria:** Admission to the University of Maine MBA program is competitive. In its admission process, the University of Maine Business Graduate Program considers factors that indicate the potential to successfully complete the MBA program and achieve positions of leadership in the private or public sector. That potential is judged by prior academic performance, GMAT score, communication skills, recommendations, and work or military experience. Interviews are not required for admission to the University of Maine MBA program, but may be requested by either the applicant or the MaineMBA admissions committee.

**Academic Performance:** Applicants must have a bachelor's degree from an accredited college/university with a 3.0 cumulative GPA, 3.5 preferred. Candidates are also expected to have strong analytical, math, writing, and presentation skills. Full admission is based on meeting all foundational skills, academic standards, satisfactory GMAT scores, and all requirements. Conditional or provisional admission is possible as specified under Graduate School policies.

**GMAT Score:** Applicants must submit official GMAT scores taken within the last five years. A GMAT score of 550 is preferred; no less than 500. Applicants with GMAT scores less than 500 may be considered for conditional admission providing other strong qualifications are demonstrated in the application. LSAT and GRE scores are also accepted.

The GMAT is waived for applicants with a PhD, JD, MD, or master's degree from a U.S. accredited program. The GMAT is waived for applicants with a CPA or CFP.

The GMAT may be waived for strong candidates with five or more years of post-graduate demonstrated professional or military experience. Experience includes:

- Management of staff in a direct working relationship, and/or
- Leadership of work teams, and/or
- Financial or budgetary responsibility, and or
- Job responsibilities that specifically demonstrate applied quantitative and analytical skills.
Note: The GMAT will be requested from applicants with sufficient work experience but who do not meet the academic minimums in order to strengthen the candidate's portfolio. International applicants must submit a GMAT score. No GMAT waiver is automatic and an approved waiver request does not guarantee admission to the program.

**Recommendations:** Contact information for three recommendations are requested as part of the application process. Recommenders should be from current or former supervisors and current or former professors who can comment on the candidate's academic strengths, work ethic, responsibilities and accomplishments, career advancement, managerial experience, and predictable success in the MBA program.

**Essay:** Students are required to submit a personal essay as part of their application. An essay prompt is included in the application. The essays are evaluated not only for content, but also for writing style, cohesion, purpose of study, and must be free of grammatical errors.

**Resume or C.V.** Work experience is not required but encouraged for admission to the MBA program. Significant work experience with management responsibilities can be a major decision factor.

**TOEFL:** Applicants whose native language is not English must also provide evidence of the Test of English as a Foreign Language (TOEFL) or comparable English language proficiency score report (e.g., IELTS, ELS Language Report). TOEFL: To be considered for admission, the MBA program requires a minimum score of 80 on the iBT TOEFL or 550 on the paper-based TOEFL. To be considered for a graduate assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent (580 paper-based). IELTS: Minimum 6.5 for admission and minimum 7.0 to be considered for a graduate assistantship. A WES or ECE course-by-course report for coursework taken at an overseas college/university may be required.

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**Apply Online at the Graduate School website**

Arrangements for the Graduate Management Admission Test may be made by contacting:

Graduate Management Admissions Test (GMAT) or www.gmac.org

Internet: http://www.umaine.edu/business/mba

If you have any questions, please contact us at 207-581-1973 or via email at: MBA@maine.edu

**Graduate Faculty**

**Pankaj Agrrawal,** Ph.D. (University of Alabama, 1996), Associate Professor of Finance.

**Richard Arend,** Ph.D. (University of British Columbia, 1995) Professor of Strategic Management

**Jean Henri Akono,** Ph.D. (University of Texas at San Antonio), Assistant Professor of Accounting.

**David J. Barrett,** CPA, MSA (Indiana University), Lecturer in Accounting.

**Richard Bilodeau,** M.B.A. (University of Southern Maine, 1998) Lecturer of Entrepreneurship and Marketing

**Muralee Das,** PhD (University of Melbourne, 2016), Associate Professor of Management.
Jeffrey DiBartolomeo, Ph.D., (University of Central Florida, 2018) Assistant Professor of Finance

Faye W. Gilbert, Ph.D. (University of North Texas, 1988), Executive Dean & Professor of Marketing.

C. Matt Graham, M.S.B.E. (Southern New Hampshire University, 2004), Lecturer of Management Information Systems.

Jason Harkins, Ph.D. (University of Oklahoma, 2008), Assistant Professor of Management.

Nory B. Jones, Ph.D. (University of Missouri, 2001), Professor of Management Information Systems.

Stephen Jurich, Ph.D. (University of Mississippi, 2015), Assistant Professor of Finance.

Jie Li, Ph.D., (University of Cincinnati, 2012) Assistant Professor of Organizational Behavior

Sebastian Lobe, Ph.D. (University of Regensburg, Germany, 2004), Assistant Professor of Finance.

Yonggang "Tim" Lu, Ph.D.(Texas Tech University, 2007), Harold Alfond Associate Professor of Business Analytics.

Ivan M. Manev, Ph.D. (Boston College, 1997), Public Policy, and Health, Nicholas Salgo Professor of Business Administration and Professor of Management.

Ikechukwu Ndu, Ph.D. (University of London, 2019) Assistant Professor of Accounting.

Dmitri Markovitch, Ph.D. (New York University, 2004), Assistant Professor of Marketing.

Grant Miles, Ph.D. (Pennsylvania State University) Associate Professor of Management.

Patti Miles, Ph.D. (University of Texas at Arlington, 2008), Assistant Professor of Management.

Susan E. Myrden, Ph.D. (Saint Mary's University) Assistant Professor of Marketing.

Bert Smoluk, Ph.D. (Lehigh University, 1997) Professor of Finance.

James Suleiman, Ph.D. (University of Georgia, 1998) Associate Professor of Management Information Systems.

Hirotoshi Takeda, Ph.D. (Universite Paris Dauphine, 2011& Georgia State University, 2010), Assistant Professor of Business Analytics and Information Systems.

Stefano Tijerina, Ph.D. (University of Maine, 2011), Lecturer in Management.

Cynthia D. Tollerson, Ph.D. (University of Houston, 2012) Harold Alfond Assistant Professor of Accounting.

Stephanie A. Welcomer, Ph.D. (Pennsylvania State University, 1997), Professor of Management.

Rozhin Yousefvand-Mansouri, Ph.D. (McGill University of Montreal, 2018) Assistant Professor of Accounting.

Qiujie "Angie" Zheng, Ph.D. (Washington State University, 2010), Associate Professor of Business Analytics.

Additional information is available from:

Graduate School of Business Office

5723 Donald P. Corbett Business Building, Room 209

The University of Maine
Business Administration (Certificate)

The graduate business certificate program provides students with advanced level business skill sets rooted in the basic business disciplines (economics, accounting, finance, marketing, information systems, and management). Upon completion, students will be prepared to work effectively in a business environment with high-level core business knowledge.

The certificate consists of 5 courses and is ideal for those working full-time, exploring a second career in business, military personnel, out-of-state or international students, or individuals planning on applying for the MBA Program in the future. To learn more about this program, please contact the Maine Business School at 207-581-1973 or mba@maine.edu. To apply, please complete the Graduate School online admission application indicating Business Certificate (check "Graduate Certificate Program" in Business).

https://umaine.edu/business/mba/programs/graduate-business-certificate/

The Certificate Program (15 credits hours) Consists of:

BUA 400: Introduction to Accounting. An accelerated course that provides pre-MBA students with an introduction to managerial and financial accounting. Offered online in the summer.

ECO 410: Accelerated Introductory Economics. An accelerated presentation of the fundamental elements of micro and macroeconomic theory. Offered online in the fall.

Plus three 600 level BUA classes selected from the MBA required core. Those classes and when they are offered online are: Fall semester:

BUA 601: Statistical Analysis and Modeling for Organizational Operations. Familiarizes the student with statistical data analysis and management science techniques as they support decision-making throughout an organization.

Prerequisite is any statistics course.

BUA 605: Creating & Capturing Value in the Digital Economy. Represents an integration of concepts and principles from the Marketing and Management Information Science disciplines. Prerequisite: BUA 270 Marketing or equivalent, or successful completion of the MBA Marketing Tutorial.

BUA 651: Financial Management. An MBA course that provides a foundation in financial management. Prerequisite is financial and managerial accounting, which can be met by taking BUA 400 or two undergraduate courses in financial and managerial accounting; and a principles of finance course or the MBA program's finance tutorial.

Spring semester:

BUA 609: Financial Statement Analysis. This course is designed to help students understand how to use and analyze financial statements. Offered online in the fall.
financial statements for making valuation and business decisions. Prerequisite is financial and managerial accounting, which can be met by taking BUA 400 or two undergraduate courses in financial and managerial accounting.

**BUA 620:** Business Law and Society. Live Section. Introduces managers to current U.S. laws and regulations that impact on the operations of business. This course has no prerequisites.

Alternative 600 level BUA courses may substitute with permission of the MBA Director.

**BUA 626:** Management of Contemporary Organizations. Explores analytical perspectives to understand how individuals organize themselves in accomplishing organizational goals. Applies a managerial approach with a focus on real-life contemporary organizations. Prerequisite is a basic management course or the MBA program's marketing tutorial.

**Summer term:**

**BUA 620:** Business Law and Society. Online Section. Introduces managers to current U.S. laws and regulations that impact on the operations of business. This course has no prerequisites.

Alternative 600 level BUA courses may substitute with permission of the MBA Director.

**Business Certificate Admission Requirements:**

In general, students will be admitted into the certificate program based on the following criteria:

An undergraduate degree from a regionally accredited college or university with a recommended minimum GPA of 3.0.

1. Official transcripts from all institutions attended
2. Two letters of recommendation.
3. International students must meet Graduate School English Language Proficiency requirements.

If a student later desires to apply for the MBA program, GMAT scores may be required.

For more information please visit the https://umaine.edu/business/

**Business Analytics (Certificate)**

The Graduate Certificate in **Business Analytics** is designed for students interested in gaining essential analytical skills to make data-driven business decisions by capitalizing on rich data resources. This certificate provides professional-level education in leveraging big data through advanced analytical tools such as data visualization, predictive modeling and machine learning/artificial intelligence. This certificate is a stand-alone credential or can be combined with the MaineMBA; graduate-level courses taken in the Certificate may transfer to the MaineMBA, upon admission.

For more information, please visit the program https://umaine.edu/business/mba/.
Chemical Engineering

The Department of Chemical and Biological Engineering has well established programs in Chemical Engineering at both undergraduate (B.S.) and graduate (M.S./Ph.D.) levels. The graduate program is designed to prepare students for careers in research or education. A choice of courses and research topics allows the student to become specialized in specific areas.

Research projects cover a wide area of chemical engineering and include both fundamental and applied topics. The major active research areas include pulping and bleaching processes, coating flows, flow in porous media, rheology, advanced materials, surface chemistry, molecular biophysics, advanced imaging and spectroscopic techniques, nanotechnology and heterogeneous catalysis. Significant recent funding has improved laboratories and supported students to do research on methods to produce fuels and chemicals from biomass.

The unique aspect of the department is the close contact with industrial sponsors. This interaction with industry gives the student real life exposure and good contacts. The Paper Surface Science Program is a consortia of companies that meet regularly to review student research. A number of other research projects receive direct support and input from industrial representatives. In addition to industrial support, the department receives significant funding from governmental agencies such as the National Science Foundation, the Department of Energy, the Department of Agriculture, and the Department of Environmental Protection Agency. Some funding recently has been obtained from foundations interested to produce fuels from biomass as well as to use cellulose nanofibers in various packaging applications.

The Department has well equipped laboratories that include some specialized facilities such as a sum frequency spectrometer, two custom built confocal microscopes, and a comprehensive analytical chemistry suite. The department also has a fully equipped pilot plant linked to paper production. In addition, students have access to other equipment on campus such as equipment in the Laboratory for Surface Science and Technology and the Advanced Wood Composites building.

The M.S. degree requires 30 semester hours of graduate work which must include two seminars and six term courses in addition to the thesis. Students holding a B.S. degree in science or other engineering disciplines are also eligible for admission to the M.S. program, although additional make-up courses may be required. The Ph.D. degree requires a minimum of 45 semester hours, beyond the B.S. level, comprising four seminars and at least eight graduate courses (24 credits) in addition to a research thesis. Ph.D. candidates are also required to pass a qualifying examination on chemical engineering fundamentals and to present and successfully defend a thesis proposal. Students who enter the program with a recognized Master's degree may be allowed up to 30 course credits towards the Ph.D., subject to approval by the Graduate Committee of the Department. Required core courses for the M.S. and Ph.D. degrees are CHE 510, CHE 540, CHE 561 and CHE 580.

Financial assistance is available in the form of graduate assistantships which provide tuition and stipends. Application for admission should be submitted as soon as possible and at least five months in advance of the proposed starting date. Students applying for the fall semester should have their application in by the first of March of that year. Further details of the program and current research projects can be obtained from the Chair of the Department of Chemical and Biological Engineering, on request.
**Graduate Faculty**


**Albert Co**, Ph.D. (Wisconsin, 1979), Associate Professor. Transport phenomena, fluid mechanics, polymeric fluid dynamics, rheology, applied numerical methods.

**William J. DeSisto**, Ph.D., (Brown, 1989), Professor. Advanced material, sensors.

**Caitlin Howell**, Ph.D. (University of Heidelberg, Germany, 2011) Assistant Professor. Biological interfaces, bacterial biofilm growth and control, surface-mediated tissue engineering, dynamic materials design.


**Andre Khalil**, Ph.D. (Universite Laval, Canada, 2004). Associate Professor. Computational modeling, image analysis, signal processing, radiomics.

**Michael D. Mason**, Ph.D. (California at Santa Barbara, 2000), Professor. Photophysics of nanoparticles and molecular nanoprobes, single molecule imaging, time-resolved single photon spectroscopic imaging techniques.

**Paul J. Millard**, Ph.D., (University of Maryland, 1984), Associate Professor. Microbial biosensors, physiological genomics systems, fluorescence technology.


**Hemant P. Pendse**, Ph.D. (Syracuse, 1980), Professor and Chair. Colloidal phenomena, paper manufacture, fluid particle systems, and instrument/sensor development.

**Thomas J Schwartz**, Ph.D. (Wisconsin, 2015), Assistant Professor. Heterogeneous catalysis, reaction kinetics, in situ spectroscopy, biomass conversion to fuels and chemicals.

**Karissa Tillbury**, Ph.D. (Wisconsin, 2015), Assistant Professor. 2-phonton microscopy, second harmonic generation microscopy, auto-fluorescence, extracellular matrix collagen.


**G. Peter van Walsum**, Ph.D. (Dartmouth College, 1998), Associate Professor. Renewable energy, fuels and chemicals, bioprocessing, process engineering.

**Sarah Walton**, Ph.D. (University of Maine, 2009), Lecturer.

**M. Clayton Wheeler**, Ph.D.(Texas at Austin, 1997), Professor. Chemical Sensors, fundamental catalysis, surface science, and selective sensor materials.
Chemistry

The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. A wide range of research projects is available in analytical, inorganic, materials, organic, physical, polymer, and sustainable materials chemistry. In addition, many of our faculty are actively engaged in interdisciplinary research projects.

The general requirements for admission to programs leading to advanced degrees are described in the general section of this catalog. Candidates for advanced degrees in the Department of Chemistry typically are expected to have completed the minimum undergraduate program established by the American Chemical Society Committee on Professional Training.

The graduate program in chemistry may include any chemistry courses numbered above 500, along with certain courses numbered between 400 and 500 if approved by the student's advisory committee, or in the first semester of study, by the graduate executive committee of the department. Graduate courses in chemistry include advanced analytical techniques, synthesis, and reaction mechanisms in organic chemistry, molecular modeling and computer simulation methods, physical inorganic and inorganic reaction mechanisms, organometallics, quantum mechanics, molecular spectroscopy and statistical thermodynamics, and sustainable materials chemistry. Special topics courses and seminar courses are also offered. Suitable courses in other departments such as Biochemistry, Chemical and Biological Engineering, Geology, Mathematics, or Physics may also be included in a student's program of study. Thesis-based research is an integral part of the student's training. Research normally comprises about one-half of the 30 semester hours required in a master's degree program and about two-thirds of the work in a doctoral program.

Placement examinations are given to each entering graduate student and are used as a guide in determining the program of study. Comprehensive examinations are part of the doctoral program as described in the general regulations of the Graduate School.

Graduate assistants usually require two years to complete the requirements for a master's degree. The minimum time for completion of requirements for the doctorate is six semesters of full-time study and research beyond the bachelor's degree. Four to five years usually are required.

Graduate assistantships are available to qualified students.

The Five-Year BS-MS degree program allows highly qualified undergraduates of The University of Maine to earn Bachelor of Science and Master of Science degrees in five years instead of the normal six-year period. It is designed for a small number of very able students who wish to prepare for graduate school or medical school, or for direct employment where a master's degree has become a distinct advantage in seeking professional positions in industry. Some electives for the bachelor's degree are replaced by courses in chemistry, which count toward the graduate degree. Further information about research projects and curriculum requirements is available from the Chair of the Chemistry Department and the department web site: http://www.umaine.edu/chemistry/

Graduate Faculty

François G. Amar, Ph.D. (Chicago, 1979), Professor of Chemistry and Member of the Honors faculty (former Dean of Honors College and past Chair of Chemistry). Physical chemistry; computer simulation of reaction dynamics in molecular, ionic, and metallic clusters, theory of photoelectron spectra of clusters; gas-surface dynamics; biofuel catalysis; optical and elastic properties of microspheres. Chemical education research: analogical reasoning in
chemistry; role of gesture in student and teacher interactions; active learning strategies for large classes and laboratories; differentiated instruction in chemistry teaching. Honors: collaborative and community engaged undergraduate research; international collaborations; fostering the liberal arts core.

Matthew Brichacek, Ph.D. (Cornell Univ., 2010), Assistant Professor. Design, synthesis, and evaluation of biologically active compounds. Development of new reaction methodologies to enable the facile synthesis of complex biomolecules.

Alice E. Bruce, Ph.D. (Columbia Univ., 1985), Professor and Chair. Inorganic, organometallic and bioinorganic chemistry; synthesis, structure and reactivity of gold(I) clusters; thiolate-disulfide exchange; detection of environmental mercury(II) using nanostructured supports.

Mitchell R. M. Bruce, Ph.D. (Columbia Univ., 1985), Professor. Inorganic, bioinorganic, and organometallic chemistry involving synthesis and reaction mechanisms; zinc and gold mediated thiol-disulfide exchange; metal-protein chemistry; electrochemical redox processes; calculations; reactivity of mercury and late transition metals; active learning strategies in class and laboratory.

Barbara J. W. Cole, Ph.D. (Washington, 1986), Professor, Chemistry of sustainable materials including wood and paper, carbohydrates, lignin, and biologically active plant extracts; high-value bioproducts.

Scott Collins, Ph.D. (Brigham Young Univ., 1980), Professor, Chemistry; Professor, Graduate School for Biomedical Sciences and Engineering; Professor and Member, Frontier Institute for Research in Sensor Technologies (FIRST); Co-Director, MicroInstruments and Systems Laboratory (MISL). Micro and Nano Fabrication, nanoscience, electrochemistry of semiconductors, BioMEMS, fractal phase transitions, embryology.

Brian G. Frederick, Ph.D. (Cornell, 1991), Associate Professor, and Member, Frontier Institute for Research in Sensor Technologies (FIRST) and FBRI (Forest BioProducts Research Institute). Physical chemistry, surface science and catalysis, biofuels and value-added chemical, materials characterization, spectroscopy, reaction mechanisms, quantum mechanical modeling.

William M. Gramlich, Ph.D. (University of Minnesota, 2012), Associate Professor and Graduate Program Coordinator. Synthesis and characterization of polymers and materials that are used as renewable materials and composites, modular and stimuli responsive hydrogels for drug delivery and tissue engineering, and coatings to prevent and detect biofouling and infections.

Howard Patterson, Ph.D. (Brandeis, 1968), Professor Emeritus. Physical/inorganic and analytical/environmental Chemistry. Light-induced photochemical changes and optical memory in mixed metal systems. Development of inorganic chemical sensors for the detection of harmful compounds. Synthesis and characterization of novel catalysts which convert low molecular weight hydrocarbons into usable high molecular weight products. Photo-destruction and detection of organic pollutants in water using photocatalysts.


Carl P. Tripp, Ph.D. (University of Ottawa, 1988), Professor of Chemistry and Member of FIRST (Frontier Institute for Research in Sensor Technologies). Surface chemistry of materials, infrared and Raman spectroscopy, chemical sensors, thermolectric devices, sol-gel synthesis of metal oxides, polyelectrolyte/surfactant adsorption on surfaces, silane reactions on metal oxides, photocatalysts for water purification, molecular studies of paper coatings, supercritical fluids.
Civil Engineering

The Department of Civil and Environmental Engineering offers the Master of Science (M.S., thesis and non-thesis options), and Doctor of Philosophy (Ph.D.) degrees. Areas of study and concentrations include Environmental Engineering, Geotechnical Engineering, Structural Engineering and Mechanics, and Water Resources Engineering at the masters and doctoral levels. In addition, the Department offers an accelerated Master of Engineering (M.E.) degree program (4 + 1, non-thesis) with a concentration in Water and Environment. Areas of study/concentration within Civil and Environmental engineering are aligned with University of Maine's Signature Research Areas (Marine Sciences, Climate Change, Advanced Materials in Infrastructure and Energy, Sustainability Solutions and Technologies).

Environmental and Water Resources Engineering

The Environmental and Water Resources Engineering areas focus on qualitative and quantitative aspects of marine and inland surface waters, groundwater and wetland environments within the broad context of environmental sustainability. The programs allow for study in environmental engineering including biological and chemical aspects of water quality and remediation; water resources engineering including surface and groundwater hydrology, hydroclimatology, and adaptive environmental management; and coastal engineering including river and estuarine mixing and transport processes, and the hydrodynamic and morphodynamic impact of waves, tides and storm surge on estuaries and coasts. Interdisciplinary approaches incorporating environmental and water resources engineering course work and content, and intersecting with other departments' related programs are encouraged.

The University of Maine is fortunate to be located in a region having an extensive and diverse system of lakes, streams, and rivers, providing one of the finest outdoor laboratories in the world for research on water quality and quantity. The Environmental Chemistry, Environmental Microbiology and Water Resources Laboratories are equipped with essential sample preparation, analytical chemistry, anaerobic cultivation, molecular biology and computing equipment. State of the art low detection level analytical capabilities, microscopy and sequencing facilities are also available on campus.

A program of study can be planned in one of the following areas:

*Environmental engineering:* Physical, chemical and biological processes affecting water quality; freshwater and marine pollution control; wastewater treatment; hazardous wastes; solid waste management; element and nutrient cycling in the environment.

*Water resources engineering:* Surface and groundwater hydrology, hydroclimatology, coastal engineering, river and estuarine mixing and transport processes, wave, tide and sediment dynamics in estuaries, hydrologic response to climate change and adaptive environmental management and policy.

Geotechnical Engineering

The geotechnical engineering graduate program provides opportunities for specialized training and research in soil mechanics, unsaturated/gassy soil mechanics, thermal soil mechanics, slope stability, soil-structure interaction, and design of foundations and earth retention structures. Students in the program may choose either a thesis option, conducting fundamental research or research applied to practical engineering problems, or a professional practice option without a thesis.

Graduate courses are offered in advanced soil mechanics, thermal soil mechanics, rock mechanics, advanced laboratory and in situ testing methods, slope stability, shallow and deep foundations, earth retaining structures, and ground improvement techniques. Additionally, students have the opportunity to incorporate coursework across disciplines,
such as structural and environmental engineering courses offered by the department, Earth Sciences, and other disciplines.

Research opportunities are available to study: behavior of soft and stiff clays; investigation of natural hazards in land, coastal, and near-shore environments related to formation, failure, improvement, prevention, and engineering; soil structure interaction using full scale installations and/or modeling of scaled systems, specifically for offshore foundations and piled systems; onshore and offshore site characterization employing in situ, geophysical, and laboratory methods; thermal behavior of soils related to energy transfer, permafrost vulnerability and cold regions engineering; and application of reliability in geotechnical engineering.

**Structural Engineering and Mechanics**

The program offers graduate courses and opportunities for advanced research in several areas of structural mechanics and design. This includes the development of innovative materials and structural systems to solve problems in traditional civil infrastructure, marine facilities, building structural systems, and non-traditional applications. Particular areas of strength are composite materials, including wood-based, polymer matrix, and cement-based systems, as well as innovative computational modeling approaches.

Research opportunities are available in structural systems for offshore wind power, the development of lightweight modular blast-resistant structural systems, bio-based materials and renewable systems, characterization and processing techniques for composite materials, the use of composite materials in civil infrastructure, structural health monitoring, experimental micromechanics, bridge engineering, and timber engineering. Projects are often inter-disciplinary, and closely integrate experimental and analytical/computational research. Many student projects are conducted in the Advanced Structures and Composites Center (composites.umaine.edu), a state-of-the-art facility for material processing and fabrication, small scale testing and characterization, and large scale structural testing.

Required and elective graduate courses and seminars are offered in the Civil and Mechanical Engineering departments that cover the areas of structural design, structural mechanics, structural dynamics, numerical methods, composite materials, bridge engineering, fracture mechanics, experimental mechanics, and related topics. The program is research oriented and sufficiently flexible to permit students to develop their interests and individual objectives.

**General Information**

Applicants for the M.S. and M.E. degree programs should normally have a B.S. degree in Civil Engineering from an accredited institution. Applicants who do not meet this requirement may find it necessary to take certain courses without graduate credit. A grade point average of at least 3.0 usually is required for admittance. Candidates with a grade point average less than 3.0 can be accepted, based on sufficient evidence of satisfactory performance.

Candidates for the M.S. (thesis option) degree are required to take 24 credit hours of coursework, 12 of which must be 500-level and higher. A thesis is required for which at least six credit hours can be awarded. Candidates for the M.S.
(non-thesis option) degree are required to take 30 credit hours of coursework, 12 of which must be 500-level and higher.

The M.E. degree is offered only with a concentration in Water and Environment. Candidates for the M.E. degree are required to take 30 credit hours of approved coursework, 12 of which must be 500-level and higher. Up to nine credits of approved senior-level undergraduate engineering or science courses counted toward the B.S. degree requirements may also be counted toward the 30-credit M.E. degree requirements for students who have been formally admitted to and successfully complete the M.E. degree. Three hours of M.E. or M.S. (non-thesis) course work can be replaced by a project with a written technical report. An M.S. thesis student is typically not allowed to change to the M.E. program. Students changing programs within the Department must have the approval of all members of the student's advisory committee and the Graduate Coordinator.

The Ph.D. degree is granted in recognition of high scholastic attainment in some area of civil engineering in concert with a demonstrated ability for independent research. The preparation and defense of a thesis embodying the results of an original investigation in a specialized area of civil engineering are essential features of the program. The program for the Ph.D. carries a minimum residency requirement of two academic years and a course credit requirement of 42 credit hours, at least 12 of which must be 500-level and higher, or the equivalent, beyond the B.S. degree. Transfer credit of up to 24 credit hours and one academic year of residency may be accepted. In view of the wide variety of specialized areas embodied in Civil and Environmental Engineering, the student's program of study will be established in consultation with the graduate committee. To attain the academic breadth necessary in the doctoral program, it is also required that all students complete an approved minor program consisting of at least nine credit hours of course work outside the major area of specialty. Before admission to candidacy for the Ph.D., a student must successfully complete a qualifying examination designed to test the student's area of expertise. The qualifying examination will normally be taken as soon as possible after the student has completed the graduate school requirement of one and one-half years of study beyond the bachelor's degree. No foreign language requirement is included in the program.

All students matriculating into M.S (thesis option) or Ph.D. programs must pass one credit of Responsible Conduct of Research (RCR) training prior to completing the degree, preferably prior to commencing the research. At the advisory committee's or Graduate Coordinator's discretion, this credit may be substituted for one of the 6 required thesis/dissertation credits (CIE 699).

The following table summarizes credit requirements:

<table>
<thead>
<tr>
<th>Degree program</th>
<th>Total credits</th>
<th>Course credits (min.)*</th>
<th>Thesis credits (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. (thesis)</td>
<td>30</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>M.S. (non-thesis)</td>
<td>30</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>M.E. (Water and Environment)</td>
<td>30</td>
<td>30, incl. 9 carried over from the B.S. degree</td>
<td>0</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>48</td>
<td>42</td>
<td>6</td>
</tr>
</tbody>
</table>

* At least 12 credits must be 500-level and higher
Financial assistance is available for graduate students from several sources, including teaching and research assistantships. Additional information regarding the graduate program is available at: https://civil.umaine.edu/graduate-students/

## Graduate Faculty

**Onur G. Apul**, Ph.D., P.E (Clemson University, 2014) Assistant Professor. Environmental engineering; water treatment, environmental nanotechnology, adsorption of synthetic organic compounds by carbon adsorbents, environmental organic chemistry, aquatic chemistry.

**Dana N. Humphrey**, Ph.D., P.E. (Purdue University, 1986), Professor and Dean. Geotechnical engineering, reinforced embankments, soil stabilization, behavior of stiff clay, use of waste materials in construction.


**Bill G. Davids**, Ph.D. (University of Washington, 1998), John C. Bridge Professor. Structural engineering and computational mechanics; numerical modeling and finite element analysis; bridge design.

**Aaron Gallant**, Ph.D. (Northwestern University, 2014), Assistant Professor. Geotechnical engineering; ground improvement, soil-structure interaction, fundamental behavior of saturated and unsaturated/gassy soils, full-scale instrumentation & modeling.

**Per Garder**, Ph.D., P.E. (Lund University, 1982), Professor. Transportation planning; forecasting, design & evaluation with emphasis on traffic safety & environmental aspects.

**Kimberly Huguenard**, Ph.D. (University of Florida, 2013), Associate Professor. Coastal engineering, turbulence and vertical mixing in estuaries, river plumes and nearshore zones, storm surge propagation, residual circulation and material transport.

**Shaleen Jain**, Ph.D. (Utah State, 2001), Professor and Chair. Hydrology and water resources engineering, hydroclimatolgy, environmental sustainability, adaptive management.


**Jean MacRae**, Ph.D. (University of British Columbia, 1997), Associate Professor. Biological treatment of solid wastes for resource recovery, bioremediation, environmental microbiology.

**Edwin Nagy**, Ph.D., P.E., S.E. (University of Maine, 2010), Lecturer. Structural engineering, Structural steel design, wood structures.

**Lauren Ross**, Ph.D. (University of Florida, 2014), Assistant Professor. Estuarine, fjord and coastal hydrodynamic processes, marine renewable energy, analytical and numerical modeling of flow and sediments in semi-enclosed basins, physics of internal waves and tides.
Ali Shirazi, Ph.D. (Texas A&M University, 2018) Assistant Professor. Transportation engineering, transportation safety, transportation data and data analytics, fundamental work in traffic safety, transportation systems.

**Classroom Technology Integrationist (Certificate)**

Certification in Classroom Technology Integration

A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine

Educators are increasing their use of technology across curriculum areas; and this certificate is designed to provide the knowledge and skills to integrate technology into teaching and learning. Learner outcomes will be around advancing student learning, creativity, and innovation in both face-to-face and virtual environments; design, development and evaluation of authentic learning experience and assessment using contemporary tools; and finally learner outcomes will include global societal issues and responsibilities in the digital age.

**Required for the Certificate in Classroom Technology Integration**

- EDT 520 Digital Age Teaching and Learning Methods
- 9 credits of approved EDT electives, check here for options.

For more information: https://online.umaine.edu/contact-us/ or umaineonline@maine.edu

**Climate Change Institute (Interdisciplinary Climate Studies) (Certificate)**

The Climate Change Institute graduate certificate in Interdisciplinary Climate Studies is designed to provide interdisciplinary climate expertise to people from various disciplines. The educational objectives of this graduate certificate are for students to gain an understanding of the Earth's physical and chemical climate system; gain an understanding of the relationships among climate, ecosystems, and humans; develop basic proficiency with climate analysis tools; strengthen key professional skills in interdisciplinary science, including communication to various audiences, collaborative skills, and proposal development.

The CCI graduate certificate in Interdisciplinary Climate Studies has 9 credits of required courses:

1. **ERS 542 Atmosphere, Ocean, Ice & Climate Change** (3 credits)
2. **ANT 501/BIO 501 Climate, Culture, and the Biosphere** (3 credits) or **ANT 530 Human Dimensions of Climate Change**
3. **INT 500 Interdisciplinary Applications of Climate Science** (3 credits)
For more information on the certificate program contact the Climate Change Institute. Applications can be made through the Graduate School.

Climate Change Institute (Quaternary and Climate Studies)

The Quaternary Period, the most recent in Earth's history, witnessed numerous climatic fluctuations, glaciations, sea-level changes, and shifts in organism distribution. These changes shaped our contemporary environments and strongly influenced human evolution. A knowledge of Quaternary events facilitates understanding of current environmental changes and may enable anticipation of future changes. Maine was particularly affected by Quaternary events because its landscape was shaped largely by glaciation and its biota was influenced strongly by climatic change.

Quaternary and Climate Studies commonly are interdisciplinary and thus require cooperation between several academic departments. To facilitate such cooperation, the Climate Change Institute, dedicated to teaching and research, was established at The University of Maine in 1972. The Institute is staffed by members of the Departments of Anthropology, Computer Science, History, and the School of Earth and Climate Sciences, School of Biology and Ecology, and School of Marine Sciences. The Institute is not a formal academic department. Rather, it is a research unit and serves to organize and promote interdepartmental teaching and research related to Quaternary and Climate Studies.

The Climate Change Institute offers a Master of Science degree in Quaternary and Climate Studies. The program provides students with training in the anthropology/archaeology, biology, climatology and/or geology of the Quaternary Period and contributes to an appreciation of the interaction of these fields towards a better understanding of Quaternary paleoclimatology, paleoecology, and prehistoric archaeology. Many of the courses pertinent to the Quaternary Period are listed under offerings by cooperating departments. Graduate thesis credits are arranged by the staff.

The Certificate of Interdisciplinary Climate Studies is a three-course sequence that addresses the needs and interests of graduate students both in CCI as well as those in programs outside of CCI. Currently, many graduate students in CCI obtain degrees in our affiliated departments; they have requested a way to distinguish their climate expertise on their diploma. In addition, there are many graduate students outside of CCI who have expressed an interest in developing interdisciplinary climate expertise.

The certificate benefits current graduate students in CCI by providing formal recognition of their interdisciplinary climate training.

Research interests of staff members focus on historically oriented problems of the Quaternary Period. These interests overlap and complement each other to a degree which insures cooperation, and encourages interdisciplinary approaches and joint research projects. Graduate students may pursue interdisciplinary thesis projects and will be supervised jointly by several staff members. Although much Institute research is conducted in New England and adjacent Canada, projects are also current in the western and northeastern United States, Canada, India, Nepal, China, the Arctic, New Zealand, Sweden, Norway, Chile, Antarctica, Peru, and Cuba.

Financial Aid

Research assistantships are available on a competitive basis through both the Climate Change Institute and the Graduate School.

Graduate Faculty

Katherine Allen, Ph.D. (Columbia, 2013), Assistant Professor of Earth and Climate Sciences. Paleoceanography.
Daniel F. Belknap, Ph.D. (Delaware, 1979), Emeritus Professor of Earth Sciences, Center for Marine Studies, Quaternary and Climate Studies, and Oceanography. Marine geology, quaternary stratigraphy, and sedimentology.

Sean Birkel, Ph.D. (Maine, 2010), Research Assistant Professor of Earth and Climate Science. Climatology.

Fei Chai, Ph.D. (Duke, 1995), Professor of Marine Sciences and Quaternary and Climate Studies. Ecosystem modeling, tropical oceanography, El Niño, ocean carbon cycle.

Sudarshan S. Chawathe, Ph.D. (Stanford, 1999), Associate Professor of Computer Science. Semistructured data, streaming data, peer-to-peer systems, autonomous environments, data exploration and mining, differencing, and change management.

George H. Denton, Ph.D. (Yale, 1965), Professor of Earth Sciences and Quaternary and Climate Studies. Paleoecology of lakes and glacial geology.

Ann Dieffenbacher-Krall, Ph.D. (Maine, 1998), Associate Research Professor of Quaternary and Climate Studies. Paleoecology.

James L. Fastook, Ph.D. (Maine, 1976), Professor of Computer Sciences. Numerical modeling of glaciers and ice sheets.

Ivan J. Fernandez, Ph.D. (Maine, 1981), Professor of Soil Science, Biogeochemistry and forest ecosystems.

Jacquelyn Gill, Ph.D. (Wisconsin, 2012), Associate Professor of Paleocoeology and Plant Ecology. Paleocoeology, biogeography, vegetation, extinction, climate change, plant-herbivore interactions.

Brenda Hall, Ph.D. (Maine, 1997), Professor of Earth Sciences and Quaternary and Climate Studies. Glacial geology, geomorphology, geochronology.

Cindy Isenhour, Ph.D. (Kentucky, 2010), Associate Professor of Anthropology. Climate policy, embodied energy, consumption.

George L. Jacobson Jr., Ph.D. (Minnesota, 1975), Professor Emeritus of Plant Biology and Quaternary and Climate Studies. Paleoecology and plant ecology.

Shaleen Jain, Ph.D. (Utah State, 2001), Professor of Civil and Environmental Engineering. Hydroclimatology, water resources engineering, climate variability and change, adaptive environmental management and decision making.

Alice Kelley, Ph.D. (Maine, 2006), Associate Research Professor, Geoarchaeology, surficial geology, and geomorphology.


Peter O. Koons, Ph.D., (Swiss Federal Institute of Technology, 1983), Professor of Earth Sciences. Geodynamics.

Karl Kreutz, Ph.D. (New Hampshire, 1998), Professor of Earth and Climate Sciences. Paleoclimate, glaciology, geochemistry.

Andrei Kurbatov, Ph.D. (SUNY Buffalo, 2001), Associate Research Professor of Quaternary and Climate Studies. Explosive volcanism, tephrachronology, glaciochemistry.

Bradfield Lyon, Ph.D. (MIT, 1991), Associate Research Professor of Earth and Climate Studies. Climate analysis, climate extremes, climate change, impacts of climate variations.

Kirk A. Maasch, Ph.D. (Yale, 1989), Professor of Earth Sciences and Quaternary and Climate Studies. Theory of climate.
Paul Andrew Mayewski, Ph.D. (Ohio State, 1973), honorary Ph.D. (Stockholm University, 2000), Director and Professor, Climate Change Institute and Professor of Earth Sciences. Climate change and atmospheric chemistry.


Brian Olsen, Ph.D. (Virginia Tech, 2007), Associate Professor of Biology and Ecology. Evolutionary ecology and ornithology.

Aaron Putnam, Ph.D. (Maine, 2010), Associate Professor of Earth and Climate Sciences. Glacial geomorphology and geochronology, climate dynamics.

Paul "Jim" Roscoe, Ph.D. (Rochester, 1983), Professor of Anthropology. Anthropology of climate change, warfare, social and political evolution.

Daniel H. Sandweiss, Ph.D. (Cornell, 1989), Professor of Anthropology and Quaternary and Climate Studies. Prehistoric and historic archaeology, coastal adaptations, climate change.


Jasmine Saros, Ph.D. (Lehigh University, 1999), Professor of Biological Sciences and Quaternary and Climate Studies. Paleoecology.

Molly Schauffler, Ph.D. (Maine, 2003), Assistant Research Professor of Quaternary and Climate Studies. Paleoecology, environmental science education.

Marcella H. Sorg, Ph.D. (The Ohio State University, 1979), Research Associate Professor in the Margaret Chase Smith Policy Center, Department of Anthropology, and Climate Change Institute. Adjunct Professor of Anthropology and Consultant to the Office of Chief Medical Examiner in Maine. Forensic Anthropology, taphonomy of human remains.

Gregory Zaro, Ph.D. (New Mexico, 2005), Associate Professor of Anthropology and Quaternary and Climate Studies. Archaeology, historical ecology, agricultural intensification, urbanism, Mesoamerica, Andes, Eastern Adriatic.

Associated Faculty


David Keefer, Ph.D., (Stanford, 1977), Adjunct Research Professor. Earthquake-induced landslides, geomorphology and hillslope processes, Quaternary Geology, Engineering Geology, Geoarchaeology.


J. Curt Stager, Ph.D. (Duke University, 1985), Professor, Natural Sciences, Paul Smith's College, NY. Tropical climate changes of the last millennium.


External Faculty
**Communication**

The Department of Communication and Journalism offers a M.A. and Ph.D. in Communication. Doctoral students also choose an external concentration from areas such as English, History, Psychology, Women's Studies, and more. Both degrees provide students with a) a broad understanding of historical and contemporary theories; b) the research skills necessary to explore and contribute knowledge; and c) the ability to apply their knowledge in varied settings. All students are expected to demonstrate a holistic understanding of theory and research and to be competent analysts of literature appropriate to their program of study. Both degrees encourage the integration of knowledge from among diverse approaches. The Master's program provides students with a broad foundation for doctoral study and for employment as communication professionals. The doctoral program prepares students to a) become a faculty member or join an appropriate profession; b) conduct research utilizing theories and methods blended from different disciplines; and c) make linkages between disciplines and professions.

Our faculty expect students to develop active research independent of class projects, and to rigorously, creatively challenge knowledge presented by instructors and other students in class. Master's students may choose to pursue either a thesis or a research paper option as part of their program of study. Doctoral students complete a dissertation and comprehensive exam as part of their program. UMaine faculty support graduate students in producing research, whether it is challenging or revising accepted theory or creating new knowledge.

**Program Requirements**

The curriculum is designed to provide students with both a central grounding and the flexibility to develop individual interests in Communication. The program of study in each area is designed to be completed over two years of full-time enrollment for Master's students, and at least three years for doctoral students, but may also be completed on a part-time basis over a longer time period. Each course is typically offered once in a two year cycle.

**Financial Information**

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the Department offers graduate assistantships to qualified students. Graduate assistants teach six credit hours a semester (three hours during the first semester of teaching) in interpersonal communication, public speaking, storytelling, or journalistic writing and editing courses. Teaching assistants are carefully supervised and must take a course in communication pedagogy so that they develop instructional skills useful in later careers.

Assistantships are nine-month appointments that include tuition waiver and monthly stipends. Applicants interested in an assistantship should so indicate in their initial application for admission. Additional information about departmental graduate work can be found in the CMJ Graduate Student Handbook, also available by contacting the department's Graduate Coordinator, Dr. Laura Rickard (larura.rickard@maine.edu).
MASTER OF ARTS

Requirements

A student completes required "core" courses, courses relevant to an area of emphasis, and electives. Students must complete 32 credit hours total (or 33 if they are Teaching Assistants).

1. Core (20 or 21 credits, contingent on Teaching Assistant status):
   a. Required Courses (11 credits):
      CMJ 515     Mass Communication Theory (Credits: 3)
      CMJ 600 Introduction to Graduate Study in Communication (Credits: 2)
      CMJ 601 Seminar in Research Methods (Credits: 3)
      CMJ 608 Communication Theory (Credits: 3)
   b. One additional research methods course selected from below (3 credits):
      CMJ 503     Critical Historiography of Rhetoric (Credits: 3)
      CMJ 603 Seminar in Rhetorical Criticism (Credits: 3)
      CMJ 604 Qualitative Communication Research Methods (Credits: 3)
   c. Two CMJ seminars in a Communication or Mass Communication "area of emphasis" (6 credits): See list of courses under "Electives" below. Tracked courses to be approved by Advisory Committee.
   d. Teaching Pro-seminar [required only for CMJ Teaching Assistants] (1 credit)
      CMJ 602*     Teaching Communication in College (Credit: 1)

   *All Graduate Teaching Assistants are required to enroll in CMJ 602 in their first Fall semester.

2. Electives (12 credits):
   a. Departmental Electives
      CMJ 503     Critical Historiography of Rhetoric (Credits: 3) [if not used as methods requirement]
      CMJ 506     Rhetorical Theory: Civic Tradition (Credits: 3)
      CMJ 510     Critical Studies in Mass Communication (Credits: 3)
      CMJ 520     Media History (Credits: 3)
      CMJ 525     Propaganda and Political Communication (Credits: 3)
      CMJ 540     Social Media and Digital Cultures (Credits: 3)
      CMJ 545     Media Ecology (Credits: 3)
      CMJ 580     Environmental Communication (Credits: 3)
      CMJ 593     Topics in Communication (Credits: 3) [may be repeated with new content]
      CMJ 602 Teaching Communication in College (Credit: 1) [if not used as a TA requirement]
      CMJ 603 Seminar in Rhetorical Criticism (Credits: 3) [if not used as methods requirement]
      CMJ 604 Qualitative Communication Research Methods (Credits: 3) [if not used as methods requirement]
      CMJ 605 Communication in Organizations (Credits: 3)
      CMJ 606     Rhetorical Theory: Critical Tradition (Credits: 3)
      CMJ 610     Risk Communication (Credits: 3)
      CMJ 695     Graduate Internship (up to 3 credits; approval required)
      CMJ 698     Contemporary Issues in Human Communication (Credits: 3)
   b. Outside Electives: Up to 6 credits of elective course work outside of CMJ may replace Departmental electives:
      - if the courses are applicable to the student's research interests, and
      - if the student receives unanimous approval from the student's Advisory Committee
3. Thesis Credits (Optional): If the MA thesis option is selected, 6 credits replace Elective course work.  
   CMJ 699  Graduate Thesis (1-6 credits per term, repeatable for 6 credits total)

4. Final Project: Students' thesis or research paper will reflect their area of emphasis.

DOCTORATE

Doctoral students have flexibility in designing their program of study. A student must take a minimum of 90 hours of graduate coursework (including approved transfer credits from his or her Master's degree), with at least 60 hours beyond the Master's. At least 48 of those 90 hours must be in primary Communication graduate courses, and at least 18 hours must be in an external concentration area. Across the major and concentration, students are also required to take a minimum of 12-15 credit hours each in appropriate theory and methods coursework, to complete a comprehensive examination, and to write a dissertation that draws on and synthesizes the program coursework.

There are two ways to break down the credit hours for the doctorate. The first way is by major and concentration. Note that the 66 minimum hours of coursework includes up to 30 hours from the MA degree.

Coursework by Degree & Discipline

<table>
<thead>
<tr>
<th>Credits from MA</th>
<th>30 maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours in Communication</td>
<td>48 minimum (including MA)</td>
</tr>
<tr>
<td>Hours in Concentration Area</td>
<td>18 minimum (including MA)</td>
</tr>
<tr>
<td>Sub-total of Degree &amp; Discipline Hours</td>
<td>66 credit hours minimum</td>
</tr>
<tr>
<td>Dissertation Hours</td>
<td>12-24 credit hours</td>
</tr>
<tr>
<td>Total Hours in the Ph.D. Program</td>
<td>90 credits minimum</td>
</tr>
</tbody>
</table>

The second way to break down the credit hours for the doctorate is by course type. Note that students are required to take an appropriate number of theory and methods courses in their concentration so as to be conversant and competent in the forms of research particular to that concentration. The student's advisory committee will help determine what "appropriate" means in his or her case.

Coursework by Course Type

<table>
<thead>
<tr>
<th>Methods:</th>
<th>Communication</th>
<th>12-15 credit hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory:</td>
<td>Communication</td>
<td>12-15 credit hours</td>
</tr>
<tr>
<td>Content:</td>
<td>Communication</td>
<td>36-42 credit hours</td>
</tr>
</tbody>
</table>
Sub-total of Method, Theory and Content Hours 66 credit hours minimum

Dissertation Hours 12-24 credit hours

Total Hours in the I.Ph.D. Program 90 credit hours minimum

**General Information**

In the first semester, a temporary advisor will be appointed; for all MA students, this advisor is the Graduate Coordinator. Students work with this faculty member in developing their plans for their program of study. The official program must be turned in to the Graduate School after completing 12 hours of course work or prior to the third registration (i.e., during the second semester of a two-year or four-semester program). During the first year (semesters one and two) students select their official advisory committee for either a thesis or non-thesis program. For Master's students, three faculty members are required for the official committee; at least two must be members of the Graduate Faculty in Communication. For doctoral students, five faculty members are required for the official committee; three Graduate Faculty in Communication are required, as well as two Graduate Faculty from the student's external concentration. All members of a student's official committee must approve the program of study. The official committee must also approve changes to the program of study once it has been submitted. Students may change members of the committee as necessary and appropriate.

**Master's Program Research Options**

Research Paper Option.

The student must prepare and present a research project. Although the non-thesis project is not as extensive as the thesis, the research paper must evidence critical thinking. The student defends the research paper in an oral examination.

Thesis Option. Students electing the thesis option enroll in CMJ 699 for a maximum of six (6) hours. The student's official advisory committee must approve a thesis prospectus prior to the student undertaking the research. After the thesis is completed, the student defends the research in an oral examination with the official advisory committee.

**Doctoral Program Research Option**

Dissertation. After completing a comprehensive examination, doctoral candidates enroll in CMJ 699 for a maximum of twenty-four (24) hours. The comprehensive exam is a timed essay exam based on questions developed by the committee in consultation with the student. Post-exam, the student's official advisory committee must approve a dissertation prospectus prior to the student undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

**Graduate Faculty**

Amelia Couture Bue, Ph.D. (University of Michigan, 2020), Assistant Professor. Media psychology, body image, empowerment, eye-tracking and psychophysiological methods.
Paul Grosswiler, Ph.D. (University of Missouri, 1990), Professor. International mass communication, culture and technology, media ecology

Liliana L. Herakova, Ph.D. (University of Massachusetts, 2014), Assistant Professor and Graduate Teaching Coordinator. Health communication, food studies, pedagogy, social justice.

Bridie McGreavy, Ph.D. (University of Maine, 2012), Associate Professor and Undergraduate Coordinator. Environmental communication, argument and critical thinking, communication research, sustainability science.

Laura N. Rickard, Ph.D. (Cornell University, 2012), Associate Professor and Graduate Coordinator. Risk communication, strategic communication, environmental communication, sustainability, policy.

Judith E. Rosenbaum, Ph.D. (Radboud University, The Netherlands, 2007), Associate Professor and Department Chair. Social media, media entertainment, selection and enjoyment, media psychology, health communication.

Michael J. Socolow, Ph.D. (Georgetown University, 2001), Associate Professor. History of mass communication, broadcast journalism, sports broadcasting, propaganda.

Nathan E. Stormer, Ph.D. (University of Minnesota, 1997), Professor. Rhetorical theory and criticism, medical rhetoric, visual communication.

Claire F. Sullivan, Ph.D. (University of Washington, 1991), Associate Professor. Interpersonal communication, health communication, sport communication.

Communication Sciences and Disorders

The MA program (thesis or non-thesis) provides students with the academic and clinical training associated with the delivery of high quality services in speech-language pathology. Our program extends over a two-year period for regular, full-time students (September entry only). Supervision of clinical experiences is accomplished by experienced clinical faculty and a faculty-student ratio that permits considerable individual attention. In addition to weekly observation of the student's practicum, the supervisor and student have one-hour meetings each week to discuss various aspects of the student's clinical work. Clinical experiences are provided in a variety of settings, with individuals across the lifespan who have a wide range of communication disorders. The Communication Language and Hearing Center is the primary facility where students obtain their first clinical experiences. Additional clinical placements are in hospitals, rehabilitation centers, public and private schools, and community speech and hearing centers. The program welcomes applications from students whose undergraduate course of study does not include coursework in communication sciences and disorders. These students are admitted on a Provisional basis, and complete undergraduate courses (along with some graduate courses) during the first year of the graduate program. The Master's program at the University of Maine is accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) of the American Speech-Language-Hearing Association (ASHA), 10801 Rockville Pike, Suite 310, Rockville, Maryland 20850, 800-498-2071 or 301-296-5700. Applicants who wish to be considered for Fall admission must submit their application by January 15. Applicants are typically notified of a decision in early March.

A complete application includes:

- Graduate School Application form (online),
- transcripts of all undergraduate and graduate coursework,
- letters of recommendation from three persons familiar with your academic and/or clinical abilities (preferably from professors with whom you have multiple courses), and
- official GRE scores.

Applicants are responsible for monitoring the completion of their application by the above deadline.

Financial Information
In addition to University fellowships and scholarships listed elsewhere in this catalog, graduate students in Communication Sciences and Disorders are eligible for graduate assistantships, pending the availability of funds. Assistantships include a partial tuition waiver and a monthly stipend. Applicants interested are invited to apply once they are admitted to the graduate program. Additional information about the graduate program can be obtained from the Graduate Program Coordinator at Dunn Hall (Mailing address, 5724 Dunn Hall, Orono, ME 04469-5724, web site: https://umaine.edu/comscidis/graduate-information/)

Graduate Faculty

Amy E. Booth, MA, CCC-A (Kent State University, 1987), Lecturer & Staff Audiologist. Audiological assessment, hearing aid fitting, hearing impairment rehabilitation.

Christopher M. Grindrod, PhD (McGill University, 2004). Assistant Professor & Graduate Coordinator. Aphasia, neurogenic communication disorders, and neurolinguistics.

Nancy E. Hall, PhD, CCC-SLP (Case Western Reserve University, 1992), Professor & Department Chair. Fluency disorders, developmental language disorders.


Jane Puhlman, PhD, CCC-SLP (Florida State University, 2015). Assistant Professor. Child language disorders.


Jennifer M. Seale, PhD, CCC-SLP (State University of New York at Buffalo, 2016). Assistant Professor. Augmentative and alternative communication, school-based therapy.

Judith L. Stickles, MA, CCC-SLP (University of Maine, 1982). Lecturer, Staff Speech-Language Pathologist & Clinic Director. Language and school-based therapy.

Judy P. Walker, PhD, CCC-SLP (University of Massachusetts at Amherst, 1994). Associate Professor. Aphasia, telepractice delivery of speech-language therapy.

External Faculty

Lori Edwards, MS, CCC-SLP (Northeastern University). Swallowing disorders, motor speech disorders.

Michael Towey, MA, CCC-SLP (University of Maine). Voice disorders.

Program Requirements in Communication Sciences and Disorders

Core Course Work (44 credits)

- CSD 581 - Articulation and Phonology Disorders (3 credits)
- CSD 582 - Voice Disorders (3 credits)
- CSD 583 - Fluency Disorders (3 credits)
- CSD 584 - Language Disorders in Children: Preschool (3 credits)
- CSD 585 - Language Disorders in Children: School-Age (3 credits)
- CSD 588 - Aural Rehabilitation (3 credits)
- CSD 601 - Seminar in Research Methods (3 credits)
CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia (3 credits)
CSD 683 - Seminar in Clinical Procedures (1 credit)
CSD 684 - Seminar in Clinical Procedures II (1 credit)
CSD 685 - Diagnostic Process in Speech-Language Pathology (3 credits)
CSD 686 - Clinical Practicum
Audiology (1 credit)
Speech-Language Pathology (5 credits)
CSD 687 - Swallowing Disorders (3 credits)
CSD 688 - Neurocognitive Disorders in Adults (3 credits)
CSD 689 - Motor Speech Disorders (3 credits)

Additional Course Work (6 credits)

In addition to the core course work, non-thesis students must complete six credits in elective graduate courses from the department or related disciplines such as Education, Psychology, Social Work, Sociology, Nursing, Gerontology, and Special Education. These courses must be approved by the student's advisor. Thesis students will take six credits of CSD 699 instead (see below).

Department policies concerning residency requirements and other matters pertaining to part-time students will be those policies in effect when the student enters the program or subsequent policies if elected by the student.

Non-Thesis Option

In addition to the course work outlined above, non-thesis students must pass a comprehensive examination. More detailed information on the preparation and evaluation of the comprehensive examination are available in the department's Graduate Program Handbook.

Thesis Option

Students electing a thesis option must enroll for thesis credits (CSD 699, minimum six credits required). A thesis prospectus must be approved by the Advisory Committee prior to undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

- CSD 699 - Graduate Thesis/Research (6 credits)

Program Requirements in Communication Sciences and Disorders

Core Course Work: (41 core credits)

- CSD 581 - Articulation and Phonology Disorders Credits: 3
- CSD 582 - Voice Disorders Credits: 3
- CSD 583 - Fluency Disorders Credits: 3
- CSD 584 - Language Disorders in Children: Preschool Credits: 3
- CSD 585 - Language Disorders in Children: School-Age Credits: 3
- CSD 586 - Current Issues in Clinical Practice Credits: 3
- CSD 588 - Aural Rehabilitation Credits: 3
- CSD 601 - Seminar in Research Methods Credits: 3
- CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia Credits: 3
- CSD 683 - Seminar in Clinical Procedures Credits: 1
- CSD 684 - Seminar in Clinical Procedures II Credits: 1
- CSD 685 - Diagnostic Process in Speech-Language Pathology Credits: 3
- CSD 686 - Clinical Practicum Credits: 1-2
Audiology Credits: 1
Speech-Language Pathology Credits: 5

- CSD 687 - Swallowing Disorders Credits: 3
- CSD 688 - Neurocognitive Disorders in Adults Credits: 3
- CSD 689 - Motor Speech Disorders Credits: 3

Additional Course Work: (6 credits)

In addition to the core course work, non-thesis students must complete six credit hours in elective graduate courses from the department or related disciplines, such as Anthropology, Education, Psychology, Computer Science, Social Work, Philosophy, Communication or Sociology. These courses must be approved by the student's advisory committee. Thesis students will take six credits of CSD 699 instead (see below).

Department policies concerning residency requirements and other matters pertaining to part-time students will be those policies in effect when the student begins his/her program or subsequent policies if elected by the student.

Non-Thesis Option

In addition to the course work outlined above, non-thesis students must pass a written comprehensive examination. More detailed information on the preparation, procedures and evaluation of the comprehensive examination are available in the department's Graduate Student Handbook.

Thesis Option

Students electing a thesis option must enroll for thesis credit hours (CSD 699, minimum six credit hours required). A thesis prospectus must be approved by the student's Advisory Committee prior to undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

- CSD 699 - Graduate Thesis/Research Credits: Ar

Composite Materials and Structures (Certificate)

The University of Maine understands there is a growing demand for engineers and scientists with strong fundamental knowledge and skills necessary for analysis, design, manufacturing, and testing of composite materials and structures. In a collaboration between the College of Engineering and the School of Forest Resources, the Composite Materials and Structures graduate certificate builds that knowledge and skills giving students a competitive advantage in the job market.

Through this 12-credit certificate, students will:

- Be introduced to modern composites made of different constituent materials
- Develop skills necessary for analysis, design, fabrication, and testing of modern composite materials and structures
- Establish the suitability of composite materials and structures for various applications

Curriculum

The courses completed for the graduate certificate may be counted towards a graduate degree per the guidelines of the respective graduate degree program.
Graduate students must complete 12 credits with a minimum grade of C in no more than one course. At least three courses (9 credits) must be at 500 or 600 level.

Core Courses
The following courses are required (6 credits):

- MEE 441/541: Manufacturing and Testing of Composites (3 credits)
- MEE 450: Mechanics of Composite Materials (3 credits) OR CIE 543: Introduction to Composite Materials in Civil Engineering (3 credits)

Electives
Select two of the following courses (6 credits):

- MEE 550: Mechanics of Laminated Composite Structures (3 credits)
- CIE 644: Advanced Composite Materials in Civil Engineering (3 credits)
- SFR 531: Mechanics of Wood and Wood Composites (3 credits)
- SFR 545: Adhesion and Adhesives Technology (3 credits)
- SFR 550: Wood-Polymer Hybrid Composites (3 credits)
- SFR 570: Cellulose Nanomaterials and Their Composites (3 credits)

For more information please contact the Program Coordinators, Masoud Rais-Rohani (masoud.raisrohani@maine.edu) and Douglas Gardner (douglasg@maine.edu).

Computational Thinking for Educators Certificate

A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine

The Graduate Certificate in Computational Thinking for Educators is a 100% online program that prepares educators to integrate computational thinking education strategies into learning environments and understand its cultural and contextual implications.

The program incorporates the International Society of Technology in Education (ISTE) Computational Thinking Competencies standards to engage learners in authentic and active learning. Students in this program will learn how to:

- Improve and expand their practice by understanding the core concepts of computational thinking
- Explore strategies to integrate computational thinking using multiple and effective instructional strategies
- Design, develop, and implement activities to support creative and innovative problem-solving
- Understand the impact of equity and access to computational thinking and computing resources and practices in a global society

Required for the Certificate in Classroom Technology Integration

EDT 571: Methods of Integrating Inclusive Computational Thinking

EDT 572: Programming in Multiple Paradigms

Six Credits of Approved Electives:

EDT 520: Digital Age Teaching and Learning Methods*

EDT 531: Studio in Computing
EDT 573: Introduction to Web Development and Mobile Application Development for Educators **

EDT 574: Computational Thinking in Early Childhood and Elementary Contexts **

EDT 575: Computational Thinking in Middle Level and Secondary Contexts **

EDT 598: Special Topics *

Students may also request to enroll in up to six graduate-level credits from the Spatial Information Science and Engineering program (SIE courses at the 500-level or above such as SIE 504, SIE 507, SIE 515 or SIE 525). Your advisor can help you choose which electives outside of the program will best help you meet your goals.

*With permission from the Program Advisor or Program Coordinator

**These courses may appear as 598 in Mainstreet.

For more information: https://online.umaine.edu/graduate-certificate-in-computational-thinking-for-educators/

https://online.umaine.edu/contact-us/ or umaineonline@maine.edu

## Computer Science

The School of Computing and Information Science offers the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.) degrees in computer science. The M.S. degree provides an intensive course of study in areas of faculty research interest. It provides the student with an excellent understanding of computer science that provides a solid foundation for many advanced jobs in the field.

The Ph.D. is granted to highly-qualified students who have completed a rigorous course of study and research training resulting in the preparation and defense of a dissertation describing original computer science research. The Ph.D. is the highest academic degree. It confers the right to use the title "doctor" and opens the door to rewarding and fulfilling careers in academia and industry.

The doctoral student will obtain a broad and deep graduate-level background in computer science, with particular depth in a chosen area of specialization. The student will engage in research from almost the beginning of the program and will receive extensive training in computer science research over the course of the program under the direction of a faculty advisor.

### Requirements for the M.S. Degree

An M.S. student has one of three options: preparing and defending a master's thesis, completing and presenting a master's project, or a courses-only set of requirements. The thesis option is the traditional route to an M.S. degree. Although the thesis requires substantially more work by the student than the project, it allows a more in-depth examination of a problem. The thesis option prepares the student for a career in research and development or for further graduate work in a Ph.D. program. The master's project is more targeted and applied than the thesis and has more course work. A courses-only option is primarily for students seeking jobs in industry.
All three options require thirty (30) credit hours of course work, twenty-four (24) credit hours from among the approved Computer Science graduate curriculum, mostly COS courses at the 500 level and above, and six (6) credit hours possibly from outside computer science at the 400 level and above:

1. Required core courses (6 hours; must be passed with a grade of B or better):
   1. Research ethics (1 credit hour) INT 601 - Responsible Conduct of Research.
   2. Professional communications (public speaking, professional writing, online resource development). These will be offered as two one-credit courses. (2 credit hours) SIE 501 - Introduction to Graduate Research, SIE 502 - Research Methods.
   3. One graduate-level Computer Science Theory course. (3 credit hours) either COS 550 - Theoretical Computer Science or COS 554 - Algorithms

2. Breadth requirements - three graduate-level Computer Science courses selected from four breadth categories (at least three categories must be selected) (9 hours). Breadth categories including representative courses include:
   1. Artificial Intelligence
      - COS 580 - Topics in Artificial Intelligence
      - COS 573 - Computer Vision
      - COS 575 - Machine Learning
      - COS 576 - Interpretability and Explainability in Machine Learning
   2. Data and Information
      - DSE 501 - Statistical Foundations of Data Science
      - COS 535 - Information Privacy Engineering
      - COS 565 - Data Visualization
      - COS 580 - Topics in Database Management
      - COS 582 - Introduction to Data Science
   3. Applications
      - COS 515 - Simulation and Modeling
   4. Systems
      - COS 520 - Software Engineering
      - COS 530 - Cybersecurity
      - COS 540 - Computer Networks
      - COS 541 - Cloud Computing

3. Two COS course electives (6 credit hours). This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.

4. One additional elective course (3 credit hours) approved by the M.S. Advisory Committee, not limited to computer science, however the course must be at the 400 level or above and cannot be satisfied with research credits or independent study.

5. Six (6) additional credit hours:
   EITHER
   An M.S. thesis, usually a research effort executed under six (6) thesis research credit hours of COS 699.
   OR
   An applied M.S. project executed under three (3) research credit hours of COS 699 and a COS course elective (3 credit hours) of a formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above (cannot be satisfied with research credits or Independent study).
   OR
   A course-only option: a COS course elective (3 credit hours) of a formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above (cannot be satisfied with
research credits or Independent study) and an elective course (3 credit hours) approved by the M.S. Advisory Committee, not limited to computer science, however the course must be at the 400 level or above (cannot be satisfied with research credits or independent study).

As per Graduate School requirements, students will form an advisory committee consisting of a minimum of three members, at least two of whom are from the computer science graduate faculty. The student's advisor must be a member of the computer science graduate faculty, or UMaine faculty approved by a 2/3rds majority vote of the computer science graduate faculty, or co-advised by a member of the computer science graduate faculty.

Courses from outside the COS catalog may be added to the computer science graduate curriculum by a formal petition by the student and 2/3rds majority vote of the Computer Science Graduate Faculty. Students who complete the M.S. curriculum are urged to consider continuing on to the Ph.D. program; the M.S. requirements are a subset of the Ph.D. program.

For students choosing the thesis option, a thesis must be prepared as required by the Graduate School and defended publicly. For the project option, the student must give a public presentation of the project.

Requirements for the Ph.D. Degree

The Ph.D. program is designed to prepare the student to conduct research in computer science and to hold positions in academia and industry. The student is required to carry out in-depth, independent, publishable research that is an original contribution in the field. He or she will be involved in research soon after entering the program.

There are several steps for earning a Ph.D.:

- Coursework, Computer Science Primary Doctoral Curriculum (see below)
- Preparing a dissertation proposal and passing the Proposal Defense and Doctoral Comprehensive Examination (see below)
- Admission to candidacy
- Completing the dissertation research and any research-directed coursework
- Dissertation preparation and Pre-defense (see below)
- Successful defense of a dissertation

At all stages of their work, the student is guided by their advisor and an advisory committee. The student is urged to choose an advisor as early in the program as possible. The advisor must be a member of the computer science graduate faculty, or UMaine faculty approved by a 2/3rds majority vote of the computer science graduate faculty, or co-advised by a member of the computer science graduate faculty. The advisor will help the student form their advisory committee. The Graduate School requires that the advisory committee consist of five (or more) members at least three of whom should be members of the Computer Science Graduate Faculty, including the student's advisor, and it highly recommends that one committee member be selected from the graduate faculty of another program other than the student's. The computer science graduate faculty allows this external member to be from another university as well.

Coursework

The student is required to complete 43 credit hours in an approved program of study. If the student completed an M.S. thesis, they may count their thesis toward three (3) credit hours of their doctoral coursework. The program of study will be developed in consultation with the student's advisory committee. The Computer Science Primary Doctoral Curriculum will comprise:

1. Required core courses (7 hours; must be passed with a grade of B or better):
   1. Research ethics (1 credit hour) INT 601 - Responsible Conduct of Research.
2. Professional communications (public speaking, professional writing, online resource development). These will be offered as three one-credit courses. (2 credit hours) SIE 501 - Introduction to Graduate Research, SIE 502 - Research Methods, SIE 693 - Graduate Seminar.

3. One graduate-level Computer Science Theory course. (3 credit hours) either COS 550 - Theoretical Computer Science or COS 554 - Algorithms

2. Breadth requirements - three graduate-level Computer Science courses selected from four breadth categories (at least three categories must be selected) (9 hours). Breadth categories including representative courses include:

1. Artificial Intelligence
   - COS 580 - Topics in Artificial Intelligence
   - COS 573 - Computer Vision
   - COS 575 - Machine Learning
   - COS 576 - Interpretability and Explainability in Machine Learning

2. Data and Information
   - DSE 501 - Statistical Foundations of Data Science
   - COS 535 - Information Privacy Engineering
   - COS 565 - Data Visualization
   - COS 580 - Topics in Database Management
   - COS 582 - Introduction to Data Science

3. Applications
   - COS 515 - Simulation and Modeling

4. Systems
   - COS 520 - Software Engineering
   - COS 530 - Cybersecurity
   - COS 540 - Computer Networks
   - COS 541 - Cloud Computing

3. Elective coursework with an optional M.S. thesis:

EITHER

Two COS course electives (6 credit hours) AND a COS M.S. thesis. This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.

OR

Three COS course electives (9 credit hours). This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.

After completion of the Computer Science Primary Doctoral Curriculum the student may prepare and defend their Dissertation Proposal as part of their comprehensive examination and admission to candidacy. Additional coursework, tailored to the dissertation topic and doctoral research will be required:

1. Two course electives (6 credit hours) approved by the student's Ph.D. Advisory Committee, not limited to computer science, however the courses must be at the 400 level or above (cannot be satisfied with research credits or independent study). It is expected that these electives will be directly related to the Ph.D. dissertation research.

2. A minimum of twelve (12) credit hours of Thesis/Research credits (COS 699). Students admitted from the University of Maine who have taken one or more of these courses as an undergraduate must take an approved substitute course in those areas. Students from elsewhere who have had similar courses may ask for a waiver for one or more breadth courses and provide the Graduate Coordinator with sufficient documented evidence of
expertise in the area. This will be evaluated on a case-by-case basis. Except in rare cases the student will be required to take the breadth courses as stated.

The 1-credit hour research ethics course should generally be taken the first semester that the student is in the program, followed by the other required courses on graduate research, research methods, and the graduate seminar. During this sequence, the student will be introduced to what it means to be a Ph.D. student, and they will be introduced to the program, the computer science graduate faculty, and their research.

Proposal defense and Oral Comprehensive Examination

Somewhere between 1.5 and 2.5 years after entering the program, the student will provide to the committee a written dissertation proposal describing the proposed research topic, the research performed to date, a complete review of relevant literature, and plans for carrying out the proposed research. The student's proposal will then be subject to examination by the Ph.D. committee during an oral defense. This oral examination constitutes the student's Ph.D. Comprehensive examination, and the committee can pass the student, ask for modifications, or require a new proposal presentation (see Admission to Candidacy below).

Admission to Candidacy

Once the student has completed the Computer Science Primary Doctoral Curriculum (the research ethics seminar, the research methods sequence, the theory requirement, all required breadth requirements, and the initial elective coursework or M.S. thesis), and has prepared their dissertation proposal and passed the Proposal defense and Oral Comprehensive Examination, then by a vote of the computer science graduate faculty they can be admitted to candidacy for the degree.

As stated above, this oral examination constitutes the student's Ph.D. Comprehensive examination, and will include both a review of the topic, groundwork, and planning of the dissertation as well as an examination of the student's preparation to embark on the proposed research program. The committee can pass the student, ask for modifications, or require a new proposal presentation.

The combined proposal defense and candidacy exam is an oral presentation and interview attended by the Ph.D. advisory committee and is not open to the public.

If the student should not pass their combined proposal defense and candidacy exam, they are permitted a second attempt at this Ph.D. Comprehensive examination no sooner than 3 months but not more than 1 year after the initial exam.

Dissertation Preparation and Pre-Defense

The student will complete their dissertation research and any research-directed coursework. Under the direction of their advisor and with consultation of their committee, they will prepare a draft of their doctoral thesis.

Six (6) to twelve (12) months before the final dissertation defense, the student will give a pre-defense presentation to the committee. It is expected that a draft of the thesis will be largely completed at this time. The pre-defense dissertation presentation is an oral presentation and interview attended by the Ph.D. advisory committee and is not open to the public.

Dissertation

The dissertation is a major written work that describes the student's original, publishable contribution to the field of computer science research. The student's advisory committee guides the student's work on the dissertation. Upon completion, the dissertation is defended at a public presentation. The candidate will present their research and be subjected to cross examination not only by their advisory committee but also by the members of the audience.

The Ph.D. Advisory Committee will confer and vote in private on the results of the Ph.D. dissertation defense. At its discretion, the committee may also invite other non-voting members into the conference including but not limited to
the COS Graduate Program Coordinator, members of the COS Graduate Program Committee, and the SCIS Director. For the candidate to successfully pass their examination, only one dissenting vote of the advisory committee is allowed. The Ph.D. Advisory Committee can pass the student, ask for modifications to the dissertation, or require a new presentation of the dissertation defense.

If the candidate should not pass their Ph.D. dissertation defense, they are permitted a second attempt of their Ph.D. dissertation defense no sooner than 3 months but not more than 1 year after the initial defense.

Petitions

In order to request an exception to the limitation of two attempts at an oral examination or defense, or other rules outlined here, the student (or candidate) should petition the COS Graduate Program Committee by submitting a written explanation of their request to the COS Graduate Program Coordinator with justifications of why such an exception should be granted. The petition should be endorsed by at least three members of their Ph.D. Advisory committee.

Other Policies

The Computer Science Graduate Program is inherently part of the UMaine Graduate School and is governed under its rules and policies. For the resolution of any policies, procedures, or rules not covered here, students and faculty are referred to the UMaine Graduate School Policies and Regulations.

Graduate Faculty

**Sudarshan S. Chawathe**, Ph.D. (Stanford University, Computer Science, 1999). Associate Professor. Areas of interest: autonomous and semistructured databases. (chaw@cs.umaine.edu)

**Chaofan Chen**, Ph.D. (Duke University, Computer Science, 2020). Assistant Professor. Areas of interest: interpretable machine learning and applications of machine learning in high-stakes decision making. (chaofan.chen@maine.edu)

**Phillip M. Dickens**, Ph.D. (University of Virginia, Computer Science, 1993), Associate Professor. Areas of interest: high-performance computing, grid computing, distributed systems, distributed simulation, networking protocols, performance modeling. (dickens@cs.umaine.edu)

**James L. Fastook**, Ph.D. (University of Maine, Physics, 1975), Professor. Areas of interest: glacial modeling, finite elements, non linear differential equations, vector and parallel processing, supercomputers. (fastook@maine.edu)

**Sepideh Ghanavati**, Ph.D. (University of Ottowa, Computer Science, 2013), Assistant Professor. Areas of interest: privacy and security in software engineering, privacy and security for Internet of Things (IoT), regulatory compliance software engineering, usable privacy, machine learning and deep learning for privacy policy analysis, privacy by design and privacy requirements analysis, goal-oriented requirements modeling and requirements engineering. (sepideh.ghanavati@maine.edu)

**Torsten Hahmann**, Ph.D. (University of Toronto, Computer Science, 2013). Associate Professor. Areas of interest: artificial intelligence (knowledge representation, logic, automated reasoning), spatial informatics, spatial AI, knowledge and ontology engineering, theoretical computer science. (torsten.hahmann@maine.edu)

**Penny Rheingans**, Ph.D. (University of North Carolina Chapel Hill, Computer Science, 1993). Director SCIS, Professor. Areas of interest: visualization of spatial and non-spatial data, including the visualization of predictive models, data with associated uncertainty, and data about student success. Visualization based on perception and illustration. Dynamic and interactive representations and interfaces, and the experimental validation of visualization techniques. Computer science pedagogy and gender issues in technology education. (penny.rheingans@maine.edu)

**Roy M. Turner**, Ph.D. (Georgia Institute of Technology, Computer Science, 1989), Associate Professor. Areas of
interest: artificial intelligence (problem solving, planning, context-sensitive reasoning), cooperative distributed problem solving, multiagent systems, control of autonomous underwater vehicles, computational ecology, applications of AI to biology. (rmt@cs.umaine.edu)

**Manuel Woersdoerfer**, Ph.D. (Goethe University, Germany, Business Ethics, 2011). Assistant Professor. Areas of interest: engineering and computer ethics (especially big data ethics and information privacy), business (ethics) and human rights, (political) Corporate Social Responsibility (CSR) and corporate citizenship, multi-stakeholder CSR-initiatives (especially equator principals framework and U.N. guiding principles on business and human rights), sustainable finance and finance ethics, climate ethics/justice (with special focus on financial institutions and climate change mitigation), constitutional economics, neoliberalism and social market economy, behavioral and happiness economics, economic psychology and neuroeconomics, economic policy (with a special focus on European integration and politics). (manuel.woersdoerfer@maine.edu)

**Salimeh Yasaei Sekeh**, Ph.D. (Ferdowsi University of Mashhad, Iran, Inferential Statistics, 2013). Assistant Professor. Areas of interest: machine learning algorithms design and analysis, data science and developing theory and algorithms for data analysis, applications of machine learning approaches in real-time problems, design, improvement, and analysis of deep learning techniques, data mining and pattern recognition, statistical machine learning and signal processing, network structure learning with applications in biology. (salimeh.yasaei@maine.edu)

**Terry S. Yoo**, Ph.D. (University of North Carolina Chapel Hill, Computer Science, 1996). Associate Professor. Areas of interest: open source software project management, large data initiatives, data Science, 3D multiscale medical image analysis and data visualization, computer graphics, image-based search, computational geometry, 3D printing, high-resolution 3D electron microscopy, Computer vision. (terry.yoo@maine.edu)

### Computing for Educators Certificate

**Computing for Educators**

The graduate certificate in Computing for Educators is for those desiring to teach computational thinking, computer coding, and computer science skills problem-solving courses primarily in grades 9-12. The 15-credit certificate is available completely online and on-campus. Most courses are taught with simultaneous on campus and online sections. The online section is typically asynchronous but distance students may attend live online at their choosing.

The certificate, designed to educate teachers with little to no or moderate current computer science and programming skills, prepares students with foundational coding and database knowledge enabling them to teach dedicated computer coding and computer science problem-solving courses.

Graduate students completing the certificate acquire the requisite knowledge and skills preparing them to teach both of the Computer Science Advanced Placement (AP) courses recommended to be taught in high schools.

While this graduate certificate program has been designed specifically for teachers and other educators, the individual courses within it are germane for students across many disciplines. The courses strive to serve the substantive content computing needs of graduate students in many domains.

**Program Requirements**

The Graduate Certificate in Computing for Educators (CfE) consists of 15 credits, all earned in course work. If some required courses are duplicative of courses that may have been taken in the student's undergraduate or another graduate program, those courses need not be repeated. The student and Graduate Coordinator would then select replacement courses for approval.

**Required Courses**
The fifteen credits of coursework must include:

- the following three core courses:
  
  SIE 504 The Beauty and Joy of Computing
  SIE 507 Information Systems Programming
  SIE 508 Object Oriented Programming

- one course from among the following courses:
  
  SIE 509 Principles of Geographic Information Systems
  SIE 516 Interactive Technologies for Solving Real-World Problems
  SIE 557 Database Applications
  SIE 558 Real Time Sensor Databases
  COS 465/565 Data Visualization
  COS 470/570 Topics in Artificial Intelligence

- one course from among the following pre-approved electives:
  
  Any previously listed course above not yet taken
  SIE 550 Design of Information Systems
  SIE 505 Formal Foundations for Information Science
  SIE 510 Geographic Information Systems Applications
  SIE 512 Spatial Analysis
  SIE 515 Human Computer Interaction
  SIE 517 Spatial Interaction Design
  Any other 500 level SIE course
  EDT 520 Digital Age Teaching and Learning Methods
  EDT 571 Methods of Integrating Inclusive Computational Thinking
  Any other 500 level COS course

Only courses in which the student obtains a grade of B or higher count toward the completion of the Computing for Educators Graduate Certificate.

**Computing for Educators Graduate Certificate Admission**

Students to be admitted into the Computing for Educators Graduate Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, an essay, and a current resume that includes contact information for three references. Admissions are rolling.
Students may apply to transfer up to 3 credits of graduate course work (that has not counted toward another degree) into the Computing for Educators Graduate Certificate. While a course may be waived to avoid substantial repetition of course material, the total of 15 credits in course work must still be acquired. The Graduate Coordinator must approve transfer credits after assessing whether they are appropriate and will as well assess proposed waivers and substitution courses on the program of study. No more than one 400 level course, if any, may be approved for inclusion on the Program of Study. Apply at Apply Now.

Continuation of Computing for Educators Graduate Certificate to M.S. in Information Systems or Alternative M.S.

Before or upon completion of the Computing for Educators Graduate Certificate, students may apply for and continue through the complete MS Information Systems (MSIS) degree. Students may have accepted into the MS only those courses in which they received a grade of B or higher. If aspiring to both credentials, it is typically less work to apply for both graduate programs at the same time when initially applying to grad school although the two also may be pursued consecutively. Alternatively, the successful candidate might apply the graduate certificate credits in pursuit of a MS Data Science and Engineering, MS Spatial Informatics, or MS Spatial Information Science and Engineering [Project Option] degree.

Additional Information

Graduate Certificate in Computing for Educators SCIS Website
Curriculum for MS Information Systems, MS Spatial Informatics [Online Only], and MS Spatial Information Science and Engineering [Project Option]
Course Descriptions: See SIE course descriptions
Program of Study Forms: Find at Forms and Documents

Spatial Computing and Information Systems Graduate Faculty

M. Kate Beard-Tisdale, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

Max J. Egenhofer, Ph.D. (Maine, 1989), Professor. Qualitative reasoning, spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

Nicholas A. Giudice, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

Torsten Hahmann, Ph.D. (Toronto, 2013), Associate Professor. Ontologies, especially spatial ontologies with application to earth and geoscience applications, ontology engineering, knowledge representation, automated reasoning, information extraction, artificial intelligence, and logic.

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.
Nimesha Ranasinghe, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Conservation Biology (Emphasis)

Biological sciences and natural resource conservation are cornerstones for The University of Maine with many programs covering various aspects of these disciplines. Because of this breadth, Conservation Biology—the applied science of maintaining the earth's biological diversity—is an interdepartmental activity at The University of Maine. There are about thirty faculty members in five units (Department of Wildlife, Fisheries, and Conservation Biology, School of Forest Resources, School of Marine Sciences, and School of Economics) who constitute a conservation biology interest group. The University funds Conservation Biology activities specifically with an interdepartmental Conservation Biology Seminar Series, with monies for travel to Conservation Biology conferences, and with an endowed chair, the Libra Professorship of Conservation Biology. The forest, wetland, freshwater, and marine ecosystems of Maine offer a diverse biota near campus for conservation biology research.

Degrees

Graduate students studying Conservation Biology at The University of Maine can earn any one of the following degrees depending on their specific interests:

**Doctor of Philosophy**

Biological Sciences, Ecology and Environmental Sciences, Forest Resources, Marine Biology, Oceanography, Plant Sciences, Wildlife Ecology, Zoology

**Master of Science**


**Other Master Degree Options**

Master of Forestry, Master of Wildlife Conservation

Courses in Conservation Biology


Application

To inquire about specific opportunities and the availability of graduate assistantships, contact any of the faculty members listed below whose interests are close to yours. For general information about Conservation Biology at The University of Maine, write to Malcolm Hunter, Department of Wildlife, Fisheries, and Conservation Biology, Nutting Hall, preferably by e-mail (mhunter@maine.edu)
Graduate Faculty

Andrei Alyokhin, Ph.d. (University of Massachusetts, 1999), School of Biology and Ecology. Invasion biology, non-target effects of biological control.

Kathleen P. Bell, Ph.D. (University of Maryland, 1997), School of Economics. Land management, land-use change; environmental economics, geographic information systems, spatial econometrics


Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), School of Marine Sciences. Ecosystem structure and function in estuaries and rocky intertidal zones.

Aram Calhoun, Ph.D. (University of Maine, 1996), Department of Wildlife, Fisheries, and Conservation Biology, wetland ecology and conservation with a special interest in wetland functions in the landscape.


Christopher S. Cronan, Ph.D. (Dartmouth College, 1978), School of Biology and Ecology. Biogeochemistry and plant ecology, resource sustainability in forest ecosystems, effects of air pollution and global change on natural resources.

Shawn Fraver, Ph.D. (University of Maine, 2004), Forest ecology, dendrochronology, forest carbon dynamics.


Daniel J. Harrison, Ph.D. (University of Maine, 1986), Department of Wildlife, Fisheries, and Conservation Biology. Wildlife habitat relationships, interactions among forest management practices and wildlife populations, predator ecology.

David D. Hart (University of California, Davis, 1979) School of Biology and Ecology, Senator George J. Mitchell Center for Environmental and Watershed Research. Stream ecology, watershed science and management, restoration ecology, adaptive management.
Rebecca L. Holberton, Ph.D. (State University of New York at Albany, 1991), School of Biology and Ecology. Endocrinology, ecology, and behavior of birds, ecophysiology of migrating birds; biology of Arctic - and temperate breeding birds; conservation biology.


Pauline Kamath, Ph.D. (University of California - Berkeley, 2011), School of Food and Agriculture. Wildlife disease ecology and evolution, epidemiology, One Health, molecular ecology, conservation genetics.

Michael T. Kinnison, Ph.D. (University of Washington, 1999), School of Biology and Ecology. Fish ecology, contemporary evolution, conservation genetics.

Jessica Leahy (University of Minnesota, 2005), School of Forest Resources. Social psychological aspects of natural resources management, environmental attitudes and behavior, information effects.

Heather M. Leslie, PhD (Oregon State University, 2004), School of Marine Sciences. Marine ecology, coupled social-ecological systems; ecosystem-based management; conservation planning.

Danielle Levesque, Ph.d. (University of KwaZulu-Natal, 2014), School of Biology and Ecology. Evolutionary and ecological physiology, and energetics of mammals (and the occasional bird) in relation to climate.

Anne Lichtenwalner, DVM Ph.D. (Oregon State University DVM 1989; University of Idaho, 1995), School of Food and Agriculture, infectious diseases at the wildlife/livestock interface, with emphasis on environmental and anthropogenic effects on health (One Health and the Environment).


Amber M. Roth, Ph.D. (Michigan Technological University, 2012), Department of Wildlife, Fisheries, and Conservation Biology and School of Forest Resources. Forest wildlife ecology, habitat management, and conservation with a focus on migratory birds.

Frederick A. Servello, Ph.D. (Virginia Polytechnic Inst. and State University, 1985), Department of Wildlife, Fisheries, and Conservation Biology. Vertebrate nutrition and physiology, habitat relationships of birds and mammals.
Carly Sponarski, Ph.D. (Memorial University of Newfoundland, 2010), Department of Wildlife, Fisheries, and Conservation Biology. Human dimensions of wildlife and fisheries conservation, social and conservation psychology, human cognition modeling, quantitative social science methods, risk perception and management decision-making processes.

Robert Steneck, Ph.D. (Johns Hopkins University, 1982), School of Marine Sciences. Marine benthic ecology, fisheries management.

Tim M. Waring, Ph.D. (University of California, Davis, 2010), School of Economics. Experimental approaches to human culture and cooperation as determinants of conservation behavior.

Joseph Zydlewski, Ph.D. (University of Massachusetts, Amherst, 1998), Maine Cooperative Fish and Wildlife Research Unit/Department of Wildlife, Fisheries, and Conservation Biology. Physiology, behavior and ecology of migrating fish, impacts of invasive fish species, ecological responses to habitat fragmentation.

Data Science and Engineering

Graduate Catalog Description for Data Science and Engineering

Return to: Graduate Programs, Certificates, Specializations, Emphases

The Data Science and Engineering programs offered at the University of Maine are intended to meet the growing demand for graduates with core skills in managing and analyzing complex data and analytics challenges. The graduate programs provide a pathway for students from diverse fields to transition to multiple data science and engineering career paths by providing them with core graduate-level courses across the entire spectrum of the data lifecycle.

In support of the interdisciplinary spirit of data science and engineering, the program is designed to accommodate students from a wide range of undergraduate degrees or other graduate degree backgrounds with options for specialization in different domains. A collection of courses with a variety of in-class and online options support students in residence as well as meet the needs of people currently in the workforce or who are otherwise place-bound and need training or retraining in the area of Data Science and Engineering.

Graduate programs offered include the Master of Science in Data Science and Engineering (thesis and coursework-only options) and the Graduate Certificate in Data Science and Engineering. For high-performing qualifying undergraduate students that may be pursuing any degree program, an Accelerated Four-Plus-One option exists allowing completion of an undergraduate degree and the MSDSE in five years.

Program Objectives

Graduates of the master's program achieve the following learning objectives and outcomes:

- an appreciation of data sources, the data acquisition process, data types, data quality, and methods for cleaning.
- an understanding of issues impacting the efficient processing, representing, storing, managing, and retrieval of large amounts of data.
• an understanding of how to leverage modern computational infrastructures and software tools to perform large-scale data analysis and machine learning.
• an understanding of common analytical tools, their methods, their effective use, and the strengths and limitations of each.
• the skills to effectively explore and present data to different audiences through visual and multimodal methods.
• a familiarity with data security, curation, and preservation strategies
• the ability to form questions for analysis from an understanding of the characteristics and goals of different application domains
• an understanding of artificial intelligence and its applications
• an awareness of the ethical issues, risks, and responsibilities related to data science.

Master of Science in Data Science and Engineering

The University of Maine offers both thesis and course-work only options in the Master of Science in Data Science and Engineering. All work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Data Science and Engineering.

The thesis option is the scientific track, typically requiring a strong engineering, computer science, human-computer interaction, or mathematics undergraduate background. Prospective master's students with other disciplinary backgrounds are expected to make up the requisite math and engineering courses that would allow them to succeed in the graduate curriculum. The thesis option includes a substantial piece of individual research as a basis for a master's thesis.

The coursework-only option is aimed at students who desire to focus primarily on coursework rather than research at the master's level. The formal coursework is complemented by an internship requirement or a one-semester project in which the student must demonstrate that he or she can apply acquired knowledge for implementing a particular solution.

Degree Requirements

Applicants to the data science and engineering program should have at least one college level statistics course in their backgrounds. Admitted students have the opportunity to become familiar with various data science, data mining, data engineering, business analytics, machine learning, and artificial intelligence topics. Computer programming, statistics germane to data science, and systems knowledge may be picked up as part of the program if applicants don't already have these foundations. Applicants with undergraduate degrees in computer science, engineering, math, and similar fields (i.e., those with two semesters of calculus and calculus-based statistics) have the opportunity to pursue higher level machine learning and artificial intelligence fundamentals and theory courses along with applications of advanced AI methods addressing real-world problems. The multiple paths to graduation and multi-disciplinary course opportunities make the program highly flexible in meeting individual student needs.

Master (Coursework-Only Option)

A candidate must complete 30 graduate course credits on-campus or online on a program of study approved by advisors that includes:

• A specified foundation course in each of statistics, programming, and systems unless waived based on previous coursework
• DSE 510 Practicum in Data Science and Engineering (3cr)
• 12 course credits drawn from at least four of the five Theme Areas
• At least one course must include a substantial practical experience. Options include SIE 589 Graduate Project, SIE 590 Information Systems Internship, or a course from an approved list.
• Further course credits from within the Foundation Courses, Theme Areas, or Domain Specializations to bring the total to 30 credits
• No more than 6 course credits, if any, at the 400 level

**Foundation Courses**

- Statistics Foundations
- Programming Foundations
- Systems Foundations

**Theme Area Courses**

Theme 1: Data Collection Technologies  
Theme 2: Data Representation and Management  
Theme 3: Data Analytics  
Theme 4: Data Visualization and Human Centered Computing  
Theme 5: Data Security, Preservation, and Reuse

**Domain Specialization Courses**

Domain A: Spatial Informatics  
Domain B: Bioinformatics / Biomedicine  
Domain C: Business Information  
Domain D: Social and Behavioral Data Science  
Domain E: Engineering Analytics

**Master (Thesis Option)**

A candidate must complete 30 graduate course credits on a program of study approved by advisors that includes:

- Specified foundation courses in each of statistics, programming, and systems unless waived based on previous coursework
- DSE 510 Practicum in Data Science and Engineering (3cr)
- SIE 501 Introduction to Graduate Research (1cr)
• SIE 502 Research Methods (1cr)
• INT 601 Responsible Conduct of Research (1cr)
• 12 course credits drawn from at least four of the five theme areas
• 6 credits of thesis
• Further course credits from within the foundation courses, theme areas, or domain specializations to bring the total to 30 credits
• No more than 6 course credits, if any, may be at the 400 level

For either master's degree option, a maximum of six credit hours of graduate course work taken prior to enrollment in the master's program, whether at this university or another, may be counted toward the master's degree assuming that the course(s) did not count toward a completed undergraduate or graduate degree and if the student's graduate advisory committee formally approves acceptance of the courses on the student's Program of Study.

**Admission Requirements**

Admission to the MS Data Science and Engineering is competitive. In the admission process, the graduate faculty considers the potential of applicants to complete a program successfully and achieve a position of leadership in the private, public or research sectors.

Students with undergraduate degrees in any field may apply. The bachelor's degree should be from an accredited four-year U.S. accredited college or university with a 3.0 cumulative or higher GPA, or equivalent international university degree with comparable academic performance (exceptions considered on case-by-case basis)

Applications are accepted on a rolling basis and no strict deadlines apply. Thesis-based MS students applying for campus-wide research assistantships or scholarships should take and submit the GRE and complete their application packets by January 1 for fall admission. We generally seek students that score at the mean or above on the verbal, quantitative and analytical segments of the GRE exam and in the 50th percentile or above on the exam overall. Exceptions are considered on a case-by-case basis.

Required information in the MSDSE online application should include transcripts from previous institutions, test scores (if required), current resume that includes contact information for three references, an essay, and the application fee. For detailed instructions, see Further Admission Information.

**Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students**

Undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the MS Spatial Information Science and Engineering (Coursework-Only Option) graduate degree program. Applications for conditional "early admission" should be received preferably by the middle of the first semester of the junior year and are not accepted after the senior year has commenced. The final year in completing the Master's degrees may be taken either on-campus or online.

By taking a course overload of three credits in the second semester of the Junior year and course overloads in each of the semesters of the Senior year, a motivated student typically may acquire 9 credits (but no more than 12) for graduate school (at undergraduate tuition rates) prior to acquiring their undergraduate degree assuming that they receive a B or better in the courses. These courses, if chosen appropriately, may double count toward both the undergraduate and graduate degree. By taking a 3-credit Information Systems Internship graduate course with a corporation, agency or
non-profit organization during the summer, a student may readily complete the coursework master's degree in a single year after their undergraduate degree. This master's degree will be highly complementary to an undergraduate degree in almost any field and attractive to employers.

To apply for early admission before or during the junior year, an applicant should expect to have an overall minimum undergraduate grade point average of 3.25, must have completed the University of Maine General Education Requirement in Math and must have three letters of recommendation from current or previous university instructors. Apply using the Application for Admission to the DSE Four Plus One Program. Continuation in the graduate program is based primarily on performance in the graduate courses and overall grade point average upon graduation from the undergraduate program. Accepted Four Plus One students must complete the full graduate application in their senior year. The GRE exam is typically waived for these accepted high performing students. Below a 3.0 accumulated undergraduate grade point average should be assumed cause for discontinuation in the graduate program.

Students with two or fewer semesters remaining to complete their undergraduate degree program do not qualify for the accelerated "four-plus-one program" but their applications will be considered as applications within the regular graduate admissions process. In this case, one may transfer up to two graduate courses prior to formal admission assuming those courses did not count toward another degree.

Financial Assistance

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the advising professor or other DSE graduate faculty may offer graduate research assistantships to qualified students on externally funded research projects. A very limited number of teaching assistantships may be available. Consult as well Funding at the Graduate School web site.

Data Science and Engineering Graduate Faculty

Ali Abedi
Professor, Electrical and Computer Engineering

Kate Beard-Tisdale
Professor, Spatial Computing

Kathleen P. Bell
Professor, Economics

Sudarshan Chawathe
Associate Professor, Computer Science

Phillip Dickens
Associate Professor, Computer Science

Matthew Dube
Assistant Professor, Computer Information Systems
Richard Eason
Associate Professor, Electrical and Computer Engineering
Max Egenhofer
Professor, Spatial Computing
Keith Evans
Associate Professor, Economics
Sepidah Ghanavati
Assistant Professor, Computer Science
Nicholas Giudice
Professor, Spatial Computing
Ramesh C. Gupta
Professor, Mathematics and Statistics
Pushpa Gupta
Professor, Mathematics and Statistics
Torsten Hahmann
Associate Professor, Spatial Computing
Daniel Hayes
Associate Professor, Forest Resources
David Hiebeler
Professor, Mathematics and Statistics
Raymond Hintz
Professor, Surveying Engineering Technology
Don Hummels
Professor, Electrical and Computer Engineering
Jon Ippolito
Professor, New Media
Shaleen Jain
Professor, Civil and Environmental Engineering
Tora Johnson
Environmental and Biological Sciences, University of Maine at Machias

Nory Jones
Professor, Maine Business School

Andre Khalil
Professor, Chemical and Biological Engineering

Benjamin King
Assistant Professor, Bioinformatics

Anne Kelly Knowles
Professor, History

Cyndy Loftin
Associate Professor, Wildlife, Fisheries, and Conservation Biology

Yonggong (Tim) Lu
Associate Professor, Maine Business School

Jonathan Malacarne
Assistant Professor, Economics

Craig Mason
Professor, Education and Applied Quantitative Methods

Brian McGill
Professor, Biological Science

Silvia Nittel
Associate Professor, Spatial Computing

Harlan Onsrud
Professor, Spatial Computing

Nigel Pitt
Professor, Mathematics and Statistics

Parinaz Rahimzadeh-Bajgiran
Assistant Professor, Forest Resources

Nimesha Ranasinghe
Assistant Professor, Spatial Computing

Andrew Reeve
Professor, Earth and Climate Sciences
Penny Rheingans
Professor, Computer Science
Judith Rosenbaum
Associate Professor, Communication and Journalism
Mike Scott
Lecturer, New Media
Bruce Segee
Professor, Electrical and Computer Engineering
Salimeh Yasaee Sekeh
Assistant Professor, Computer Science
Ali Shirazi
Assistant Professor, Civil and Environmental Engineering
Andrew Thomas
Professor, School of Marine Sciences
Roy Turner
Associate Professor, Computer Science
Vince Weaver
Associate Professor, Electrical and Computer Engineering
J. Michael Weber
Professor, Maine Business School
Zheng (David) Wei
Assistant Professor, Mathematics and Statistics
Aaron Weiskittel
Professor, School of Forest Resources
Thomas Wiesen
Assistant Professor, Economics
Manuel Woersdoerfer
Assistant Professor, Maine Business School
Terry S. Yoo
The Data Science and Engineering programs offered at the University of Maine are intended to meet the growing demand for graduates with core skills in managing and analyzing complex data and addressing data analytics challenges. Students from diverse backgrounds may advance their career potential by building knowledge in the domain. The graduate certificate begins this process as either a stand-alone graduate credential or leading to a full graduate degree. Practitioners across business, industry and government acquire base skills in order to keep up with changing information technology and data challenges in their work environments. The Graduate Certificate in Data Science and Engineering (GCDSE) consists of 15 credits and is designed to provide a foundation in key aspects of the field.

A candidate must complete 15 graduate course credits on-campus or online on a program of study approved by advisors that includes:

- A specified foundation course in each of statistics, programming, and systems unless waived based on previous coursework
- DSE 510 Practicum in Data Science and Engineering (3cr)
- 9 course credits drawn from at least three of the five Theme Areas
- further elective course credits from within the Foundation Courses, Theme Areas, or Domain Specializations as needed to arrive at the total of 15 credits

If none of the foundation courses are waived, the graduate certificate may require up to 21 credits to complete. If all are waived based on previous coursework, at least one elective course will be necessary to complete the 15 credit requirement.

Students in consultation with their adviser should not select courses that are duplicative of courses that may have been taken in the student's undergraduate degree program. For instance, if a previously taken course is duplicative of a course in one of the five core theme areas, simply select another course in that area or another theme area so that the total is still 9 course credits in three of the five core Theme Areas.

Typically, distance students view class sessions over the internet that have been recorded with the on-campus students although some sessions may be pre-recorded. Students in both class sections accomplish the same assignments and exams. Online students may, at their option, participate in most classes live over the internet. Work sessions and/or office hours are typically offered at times convenient for online students.

Course Descriptions
Titles and prerequisites for courses in the program as well as alternative more advanced courses if some courses are waived may be found at Data Science and Engineering Graduate Course Groupings. For more detailed course descriptions and sample syllabi see the DSE Program Course Descriptions.

**Student Eligibility and Admission Criteria**

Students desiring to acquire the Graduate Certificate in Data Science and Engineering should apply by completing the Graduate Certificate Application. The entire application packet including transcripts, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. The time limit for completion of the Graduate Certificate is the same as that set by the Graduate School for completion of a master's degree.

**Continuation of DSE Certificate to M.S. in Data Science and Engineering**

When nearing or upon completion of the DSE Graduate Certificate, students may apply for the MS Data Science and Engineering or another closely related MS degree such as the MSIS or MSSI. They must meet all the master's requirements for admission. Students may transfer most or all of the courses in which they received a grade of B or higher from the DSE Certificate to the MS degree.

**Additional Information**

For additional information on application and program requirements, see Advising Notes.

**Data Science and Engineering Graduate Faculty**

Ali Abedi  
Professor, Electrical and Computer Engineering

Kate Beard-Tisdale  
Professor, Spatial Computing

Kathleen P. Bell  
Professor, Economics

Sudarshan Chawathe  
Associate Professor, Computer Science

Phillip Dickens  
Associate Professor, Computer Science

Matthew Dube  
Assistant Professor, Computer Information Systems

Richard Eason
Associate Professor, Electrical and Computer Engineering
Max Egenhofer

Professor, Spatial Computing
Keith Evans

Associate Professor, Economics
Sepidah Ghanavati

Assistant Professor, Computer Science
Nicholas Giudice

Professor, Spatial Computing
Ramesh C. Gupta

Professor, Mathematics and Statistics
Pushpa Gupta

Professor, Mathematics and Statistics
Torsten Hahmann

Associate Professor, Spatial Computing
Daniel Hayes

Associate Professor, Forest Resources
David Hiebeler

Professor, Mathematics and Statistics
Raymond Hintz

Professor, Surveying Engineering Technology
Don Hummels

Professor, Electrical and Computer Engineering
Jon Ippolito

Professor, New Media
Shaleen Jain

Professor, Civil and Environmental Engineering
Tora Johnson

Environmental and Biological Sciences, University of Maine at Machias
Nory Jones
Professor, Maine Business School
Andre Khalil
Professor, Chemical and Biological Engineering
Benjamin King
Assistant Professor, Bioinformatics
Anne Kelly Knowles
Professor, History
Cyndy Loftin
Associate Professor, Wildlife, Fisheries, and Conservation Biology
Yonggong (Tim) Lu
Associate Professor, Maine Business School
Jonathan Malacarne
Assistant Professor, Economics
Craig Mason
Professor, Education and Applied Quantitative Methods
Brian McGill
Professor, Biological Science
Silvia Nittel
Associate Professor, Spatial Computing
Harlan Onsrud
Professor, Spatial Computing
Nigel Pitt
Professor, Mathematics and Statistics
Parinaz Rahimzadeh-Bajgiran
Assistant Professor, Forest Resources
Nimesha Ranasinghe
Assistant Professor, Spatial Computing
Andrew Reeve
Professor, Earth and Climate Sciences
Penny Rheingans
Professor, Computer Science
Judith Rosenbaum
Associate Professor, Communication and Journalism
Mike Scott
Lecturer, New Media
Bruce Segee
Professor, Electrical and Computer Engineering
Salimeh Yasaei Sekeh
Assistant Professor, Computer Science
Ali Shirazi
Assistant Professor, Civil and Environmental Engineering
Andrew Thomas
Professor, School of Marine Sciences
Roy Turner
Associate Professor, Computer Science
Vince Weaver
Associate Professor, Electrical and Computer Engineering
J. Michael Weber
Professor, Maine Business School
Zheng (David) Wei
Assistant Professor, Mathematics and Statistics
Aaron Weiskittel
Professor, School of Forest Resources
Thomas Wiesen
Assistant Professor, Economics
Manuel Woersdoerfer
Assistant Professor, Maine Business School
Terry S. Yoo
Associate Professor, Computer Science
Yifeng Zhu
Digital Curation (Certificate)

The Digital Curation program is a one to two-year graduate certificate, taught online, intended for professionals looking to work in museums, archives, libraries, studios, offices, and anywhere else that people need to manage digital files. The program walks students through the phases of managing digitized or born-digital artifacts, including acquisition, representation, access, and preservation.

Educational Objectives:

Students develop expertise in the following areas:

- Identifying digital objects that merit short-term or long-term preservation, from individual audiovisual files such as videotapes to complex multimedia objects such as Web sites.
- Managing and preserving selected materials, including using metadata and databases to catalog objects.
- Improving access to public material and managing access to restricted digital material.
- Theorizing and implementing ways to develop, present, and promote digital exhibitions and interpretations of this digital material, on the Web and in real or mobile space.

Required Courses:

1. Acquisition (digitization, recording, selection, law)
   DIG 500: Introduction to Digital Curation
2. Representation (documentation, metadata)
   DIG 510: Metadata
3. Access (database, collection, presentation, network)
   DIG 540 Digital Collections and Exhibitions
4. Preservation (obsolescence, conservation, media formats)
   DIG 550: Digital Preservation

Optional courses:

5. Internship
   DIG 580: Digital Curation Internship
6. Elective

See list of Certificate website.
Students who choose the "fast-track" option may complete the four required courses within two semesters. Students who wish to take the two additional courses or study part-time are welcome to extend their studies over a longer period.

To make things easier for students currently working in collecting institutions, we have designed DIG 580 as an internship that may take place in the student's own workplace.

For up-to-date information, please visit http://DigitalCuration.UMaine.edu.

**Disability Studies (Specialization)**

The Graduate Interdisciplinary Specialization in Disability Studies provides the opportunity for advanced study of theory, research, policy, and practice relevant to the lives of individuals and groups with disabilities. Located within the larger discourse of human diversity, disability is analyzed as an economic, social, cultural, political, and individual phenomenon.

Disability Studies curricula are offered at the University of Maine through the Center for Community Inclusion and Disability Studies (CCIDS), Maine's University Center for Excellence in Developmental Disabilities Education, Research, and Service (See Research Resources page). Graduate students may obtain a specialization in Disability Studies in conjunction with several master's degree programs across campus, or in conjunction with the Interdisciplinary Ph.D. Through coursework, independent studies, or research, and in collaboration with the students' disciplinary departments, students examine a range of issues confronting local, state, national and global communities in which people with disabilities live. The faculty involved in curriculum development represent diverse departments and academic disciplines at the University of Maine.

**Master's Specialization in Disability Studies**

Master's level students would enroll and successfully complete the following courses:

- **DIS 500** Contemporary Disability Theory
- **DIS 520** Disability: Advanced Interaction of Human Diversity and Global Environments
- **DIS 530** Disability Policy
- **DIS 550** Research Seminar in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator)
- **DIS 570** Master's Interdisciplinary Project in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator)

**Doctoral Specialization in Disability Studies**
Doctoral level students would enroll in specialization courses: DIS 500, DIS 520, DIS 530, and DIS 500, which may also be taken in their departments if cross-listed. Doctoral students would complete the following:

- **DIS 670** Interdisciplinary Project in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator).

### Graduate Faculty

**Alan B. Cobo-Lewis**, Ph.D. (University of Wisconsin, 1992), Director, Center for Community Inclusion and Disability Studies; and Associate Professor of Psychology

**Elizabeth DePoy**, Ph.D. (University of Pennsylvania, 1988), Professor of Interdisciplinary Disability Studies, Center for Community Inclusion and Disability Studies; and Professor, School of Social Work.

**Stephen Gilson**, Ph.D. (University of Nebraska Medical Center, 1991), Coordinator and Professor of Interdisciplinary Disability Studies, Center for Community Inclusion and Disability Studies; and Professor, School of Social Work.

### Disability Studies Interdisciplinary Certificate

The University of Maine Center for Community Inclusion and Disability Studies (CCIDS) is now offering a 3-course online Graduate Certificate in Interdisciplinary Disability Studies [http://ccids.umaine.edu/interedu/graduate-certificate/](http://ccids.umaine.edu/interedu/graduate-certificate/). The certificate program is a progressive 9-credit graduate-level curriculum in which students from a variety of disciplines and professional backgrounds can study with students and professionals from other fields to acquire specialized knowledge in disability theory, policy and research.

Three online asynchronous courses examine disability theory, policy, and practices that address disability needs, rights and interventions. The program is open to students who have obtained a baccalaureate degree, including those who seek only the certificate; students who want to study in one or more of the courses without seeking the certificate; and students currently matriculated in masters and doctoral programs.

More detailed information on the Graduate Certificate in Interdisciplinary Disability Studies can be found here.

### Early Childhood Teacher (Certificate)

**Early Childhood Teacher (Certificate)**

Maine has established a new requirement that teachers working in public school Pre-K classrooms must hold, or be working toward, Endorsement 081: Early Childhood Teacher. K-8 certified teachers can apply the four required courses in this certificate in partial fulfillment of the State's requirements for the 081 endorsement.
Objectives:

1. Teachers will be prepared to work with young children and their families across a range of early childhood settings. Teachers may apply courses from this Certificate to State's Early Childhood Endorsement (081). The certificate supports teachers' eligibility to teach in a variety of early childhood settings, including inclusive pre-kindergarten classrooms located in public schools.

2. Teachers will learn about early child development - both in the classroom and through hands-on learning experiences - and use this knowledge to design, develop, and evaluate authentic learning experiences for young children.

3. Teachers will recognize that learning in early childhood environments lays a critical foundation for the young child's later success in school, work, citizenship, and personal fulfillment.

4. Teachers will understand that through play in a content-rich environment, children begin to make sense of the world around them, building the foundations they will need to become capable, enthusiastic learners and responsible, healthy adults.

(All work is based on the state MDOE and NAEYC standards.)

Courses:

CHF 450: Early Childhood Special Education
HUD 521: Teaching Science for Young Children
HUD 529: Teaching Numeracy for Young Children
SED 505: Diversity of Development in Childhood

Contact: Dr. Julie DellaMattera, julie.dellamattera@maine.edu

Earth and Climate Sciences

Introduction

The School of Earth and Climate Science awards both Master's (M.S.) and Doctoral (Ph.D.) degrees. Student applicants to our graduate program commonly have a Bachelor's degree in Earth Sciences or closely related discipline, but the multidisciplinary nature of our program allows for entry from other backgrounds as well. Students entering the graduate program in Earth and Climate Sciences typically have completed at least one year of chemistry, physics, and calculus, as well as several courses in the Earth/environmental sciences beyond the introductory level. Students who have not completed these basic requirements may be admitted, but may be required to complete specific courses to fulfill deficiencies.

We admit students to our program only if we have identified an advisor and if a financial plan is in place to fund the student and the research. Therefore, it is critical that prospective students contact potential advisors before submitting an application. We occasionally are able to admit students who have not contacted potential advisors, but this is uncommon. Students who wish to be considered for teaching assistantships should have a complete application submitted by January 15. Most students are supported through Research Assistantships, which are administered by the faculty members that have received external grant funding. The January 15 deadline is not firm for prospective Research Assistants, but we ask that applications be submitted by then in case partial funding will derive from a Teaching Assistantship.

Research Groups

Geodynamics, Crustal Studies and Earth Rheology
Rocks and landforms at Earth's surface, potentially hazardous volcanic and seismic activity, the response of Earth's surface to icecaps that come and go with changing climate, and the slow but inexorable movement of continents all result from the interaction of physical and chemical processes taking place throughout Earth's crust and mantle. With international interest and funding directed towards addressing both basic research questions and applied problems, the broad fields of geodynamics, structural geology, mineralogy, geochemistry, and petrology are mainstays of geoscience research. Our ongoing and new capacity for microanalysis, including optical microscopy, energy- and wavelength-dispersive spectrometry, cathodoluminescence, electron backscatter diffraction, and laser ablation inductively coupled plasma mass spectrometry, along with experimental petrology and grain- through orogen-scale numerical modeling and supercomputer applications, allow us to develop groundbreaking ideas related to coupled physical and chemical processes that shape Earth's surface and drive the evolution of its lithosphere. Our research program spans spatial scales from micrometers in individual mineral grains (deformation mechanisms, mineral chemistry, microstructures) to hundreds of kilometers in mountain belts (tectonic history, magmatism, structural development, and coupling of surface and deep processes). We study events that occurred from 4.5 billion years ago at the dawn of Earth's history to those active today. We make observations of the natural world, using field, analytical, geochemical, and geophysical datasets, and explain these observations using basic physical and chemical principles. We employ numerical and analogue modeling to test our explanations and conceptual predictions. Our most active research threads center on relating strain to surface evolution, mountain-scale dynamics, mid- to lower-crustal rheology, elastic anisotropy, earthquake geology, physical and chemical processes in subduction zones, microstructural evolution, magma dynamics, pressure-temperature and chemical evolution of metamorphic rocks, stable isotope fractionation, and mineral paragenesis.

Climate Change, Glacial Geology, Glaciology, Paleooceanography, and Quaternary Studies

As concern about the timing, magnitude, and rate of future climate change increases, developing a comprehensive understanding of the relevant mechanisms governing climate variability is crucial. The identification of several abrupt climate shifts in the paleoclimatic record greater in magnitude than those experienced by modern society has served to highlight the potential risks associated with continued increases in atmospheric greenhouse gas emissions. A variety of techniques, including modern observations, process studies, acquisition of paleoclimate proxy data, and model-based data synthesis and prediction, are used to study modern climate, document past climate change, and identify mechanisms of climate change that trigger abrupt climate change. These studies, in turn, serve to improve our ability to estimate future changes. Models that explain observed climate variability on all timescales are still inadequate, in part due to a lack of information on fundamental relationships between climate and environmental responses. Hypotheses that relate changes in climate forcings and associated responses are critical, particularly for the Southern Hemisphere, where long high-resolution paleoclimate records and detailed glaciological observations are limited. Additionally, an understanding of human response to past climate change provides an opportunity to understand the societal impact of major environmental events, such as changing weather patterns and rising sea levels. The interdisciplinary field of geoarchaeology provides the opportunity to examine such events in a human context, leading to a better understanding how future events may shape our cultural response. The School of Earth and Climate Sciences and Climate Change Institute have long been recognized as leaders in these areas, and have been involved in defining and refining several paradigms associated with global and abrupt climate change. Over the next decade, School and Institute faculty will have integral and often leadership roles in several climate research initiatives ranging from deep ice core recovery and geologic sampling to satellite remote sensing and examining human culture/climate linkages.

Environmental Geosciences and Watershed Systems

Near-surface Earth processes control water movement, surface erosion, sediment and nutrient transport into and through major rivers, and the chemical alteration of earth materials. Ecosystem management, water resource protection, and the supply of clean drinking water are all intertwined with near surface physical and chemical processes. These processes impact the lives of people whenever they drink from Maine's abundant water resources or cast a fishing line into one of the many lakes and rivers in the state, and they have direct bearing on the structure and viability of ecosystems in both rural and urban settings. Environmental geoscience faculty are involved in studies of watershed geomorphology, peatland hydrology and geochemistry, groundwater movement in fractured bedrock, chemical
weathering of bedrock, and geochemistry related to carbon sequestration and greenhouse gas emissions. Examples of questions that inspire research undertaken within the group include:

What is the timing and magnitude of sediment movement through watersheds?

How does groundwater flow within peatland ecosystems interact with carbon cycling?

What chemical reactions control the weathering of important rock types?

How do biota affect rock weathering?

How do watersheds respond to changes in climate, vegetation and urbanization?

Our studies involve field measurements, laboratory experiments, and computer simulations. Collaborators in environmental geoscience activities at the University of Maine share our goal of improving our understanding of the environment to develop adaptive natural resource management strategies essential to environmental sustainability. These groups, as well as state and federal agencies, provide many exciting opportunities for multidisciplinary interaction.

Marine/Coastal Geology and Sedimentary Processes

The response of shorelines and their inhabitants to rising sea level and associated coastal processes has been a major research focus of near shore Marine Geology for many years. With the recent explosion of human populations in coastal areas, such as barrier islands, deltas and landslide-prone bluffs, there is a growing need to develop quantitative measurements and models to understand how coastal environments have changed, are changing and will likely change as the level of the sea rises and storms frequently alter the shore. Sea-level change is driven by both glacial expansion and contraction, as well as by land level changes associated with loading/unloading of ice on the land; processes that link marine geology to climate change and geodynamics. As the shoreline rises and falls, processes dominated by waves, wind and tides have swept over what is now the seafloor, as well as terrestrial regions and lakes. Our focus on sea-level change has involved the development of indices to record sea-level change over the past 20,000 years from locations above and below the present shoreline, including mapping the seafloor and lake bottoms. We interact with State agencies, such as Maine Geological Survey and Department of Marine Resources and federal agencies, including the U.S. Geological Survey and National Park Service. Our expertise and research results affect state and national policies on mitigation and prevention of coastal hazards and sound shoreline construction planning. Marine records of past environmental change are also essential to understanding long-term ocean and climate dynamics. We analyze the geochemical, faunal, and physical properties of both coastal and offshore sediments to gain insight into the drivers and feedbacks involved in Earth's climate system.

Facilities

School research facilities are extensive and modern. Facilities available for solid-Earth research include a Cameca SX-100 electron microprobe, Tescan Vega XMU scanning electron microscope (with integrated energy-dispersive spectrometry, electron backscatter diffraction and full-color cathodoluminescence systems), ESI NWR193 excimer laser ablation systems coupled to an Agilent 8900 inductively coupled plasma mass spectrometer (LA-ICP-MS/MS), experimental petrology equipment, powder x-ray diffraction, stable isotope laboratory, computational geodynamics facility, mineral separation, rock preparation, polishing and thin section laboratories, and high resolution photomicroscopy.

Marine Geology equipment and facilities include a suite of digital electronic geophysical equipment for sidescan sonar, seismic reflection and single and multibeam bathymetry, current meters and tide gauges and ground penetrating radar. We have a marine electric vibracorer, a portable coastal vibracorer and hand-operated corers as well as an underwater videocamera. The sedimentology laboratory is fully equipped for core analysis, photography, microscopy, micropaleontology, weighing, centrifuging, drying, muffle furnace, sieving, and automated textural analysis with a
settling tube for sand and an X-Ray sedigraph for mud. GIS capability is supported with computer workstations mounting ArcView and ArcInfo software. A clean room for trace metal analysis equipped with a fume hood and boron-free laminar flow bench is under construction.

The glacial and surficial geology group maintains laboratories in the Sawyer Environmental Building. Facilities include preparation areas (including a clean room) for radiocarbon, uranium-thorium, and cosmogenic isotope dating. We also have facilities and equipment for satellite and air photo interpretation and sediment-core analysis.

The environmental geology group maintains a wet chemistry laboratory and a hydrogeology laboratory. The wet chemistry laboratory includes a shaking water bath, pH meters, stirring hot plates, water filtration system and DI water dishwasher, visible light spectrophotometer, as well as other supplies for sample preparation equipment. The hydrogeology laboratory houses a computer workstation, acoustic Doppler and electromagnetic flow meters, Darcy tube, function generator with voltage potential data loggers (for laboratory experiments), and surveying equipment (GPS Units, total station, autolevel). These labs also store extensive field sampling equipment including soil augers (hand and power auger), several submersible pumps, peristaltic pump, field portable pH and conductance meters, field spectrophotometer, field filters, Hach digital titrator, several water-level indicators, data-logging pressure transducers, and dedicated field laptop. Computer modeling and data analysis is supported with computer workstations utilizing Geochemist’s Workbench, MIKE SHE, and various open source software (Modflow, FiPy, Python).

Graduate Faculty

Katherine Allen, Ph.D. (Columbia, 2013)  Assistant Professor. Paleoceanography, marine geology and geochemistry.

Sean Birkel, Ph.D. (Maine, 2010), Research Assistant Professor. Climate and ice sheet modeling.

Seth Campbell, Ph.D. (Maine, 2014), Assistant Professor. Radar, ice geophysics and dynamics.

Alicia Cruz-Uribé, Ph.D. (Penn State, 2014), Associate Professor. Metamorphic petrology and geochemistry.

George H. Denton, Ph.D. (Yale, 1965), Professor. Quaternary and Glacial Geology.

Christopher C. Gerbi, Ph.D. (Maine, 2005), Professor. Rheology, geodynamics, ice dynamics and geophysics.


Brenda L. Hall, Ph.D. (Maine, 1997), Professor. Quaternary and Glacial Geology, millennial-scale climate change and ice sheet stability.

Scott E. Johnson, Ph.D. (James Cook, 1989), Professor. Structural geology, microstructural processes, Earth rheology, tectonics, coupling of deformation and metamorphism.


Andrei Kurbatov, Ph.D. (SUNY Buffalo, 2001), Associate Professor. Explosive volcanism, tephrachronology, glaciochemistry.

Kirk A. Maasch, Ph.D. (Yale, 1989), Professor. Climate Modeling.
Paul A. Mayewski, Ph.D. (Ohio State, 1973), Professor. Glaciology, paleoclimatology, ice core geochemistry.


Amanda A. Olsen, Ph.D. (Virginia Tech, 2007), Associate Professor. Environmental geochemistry.

Aaron Putnam, Ph.D. (Maine, 2011), Associate Professor. Quaternary and glacial geology.

Andrew S. Reeve, Ph.D. (Syracuse, 1996), Professor. Hydrogeology.

Kristin Schild, Ph.D. (Dartmouth, 2017), Assistant Professor. Geomatics, remote sensing, ice-ocean interactions, physical glaciology.

Sean M.C. Smith, Ph.D. (Johns Hopkins University, 2011), Associate Professor. Geomorphology and Watershed Processes.


Ecology and Environmental Sciences

The University of Maine offers a comprehensive graduate training program in ecology and environmental science (EES). The interdisciplinary graduate program in Ecology and Environmental Science includes faculty members in 14 departments and schools who collectively represent a broad spectrum of expertise in the analysis of the physical, chemical, biological, ecological, societal, environmental policy, and paleoecological aspects of terrestrial, freshwater, and marine ecosystems. Specific areas of program emphasis at The University of Maine include: conservation biology, community and landscape ecology, population ecology and environmental physiology, agricultural ecology, ecosystems analysis of watersheds, wetland ecology, forest ecology, marine and estuarine ecology, paleoecology, soil chemistry, biogeochemistry, environmental chemistry, environmental engineering, environmental measurements and remote sensing, geographic information systems, global change, environmental pollution, environmental economics, environmental policy, population genetics, and freshwater ecology.

Degrees

Graduate students focusing in ecology and environmental science can earn either a Doctor of Philosophy or a Master of Science Degree (thesis or non-thesis).

Application

To inquire about specific opportunities and the availability of graduate assistantships, write to any of the faculty members listed at our website whose interests are close to yours. For more information about the Graduate Program in Ecology and Environmental Science, visit our web site at www.umaine.edu/ecologyandenvironmentalsciences or write to Graduate Program in Ecology and Environmental Sciences, 101 Nutting Hall, University of Maine, Orono, ME 04469, or e-mail: ees@maine.edu
Graduate Faculty

Climate Change Institute
Daniel Dixon, global climatology, environmental sustainability

Department of Anthropology
Christine Beitl, coastal and marine resources, environmental governance, human ecology
Samuel Hanes, cultural and historical geography, environmental anthropology, agriculture, fisheries
Cindy Isenhour, environment policy, climate, commodity chains, waste
Darren Ranço, cultural anthropology, indigenous communities, and environmental justice, climate change adaptation
Paul Roscoe cultural anthropology, ecological anthropology)

Department of Chemistry
Barbara J.W. Cole, plant and wood chemistry

Department of Civil and Environmental Engineering
Shaleen Jain, hydroclimatology, water resources sustainability
Jean D. MacRae, nutrient and metal cycling in natural and engineered systems, including aquaculture waste, wastewater, and solid waste, energy extraction from waste

Department of Communication and Journalism
Bridie McGreavy, environmental communication, communication studies, climate change communication and, resilience, sustainability science
Laura Rickard, risk communication, strategic communication, environmental communication, sustainability, policy

Department of Mathematics and Statistics
David Hiebeler, spatial population ecological and epidemiological dynamics

Department of Spatial Information Science Engineering
Kate Beard-Tisdale, GIS

Department of Wildlife, Fisheries, and Conservation Biology
Erik J. Blomberg, wildlife population ecology
Aram Calhoun, wetland ecology
Stephen M. Coghlan, Jr., conservation and management of native fishes and their supporting ecosystems
Daniel J. Harrison, mammal ecology
Malcolm L. Hunter, Jr., conservation biology, landscape ecology
Cynthia S. Loftin, systems and wetlands ecology, hydrology, GIS
Carly Sponarski, human dimensions of wildlife
Joseph D. Zydlewski, fish ecology, behavior, and physiology

**School of Biology and Ecology**
Andrei Alyokhin, applied insect ecology, behavior and management
Seanna Annis, applied and basic research of fungi, particularly plant-pathogenic fungi
Christopher Cronan, ecosystem ecology, biogeochemistry
Allison Gardner, medical entomology, vector-borne disease ecology, epidemiology
Jacquelyn Gill, paleoecology, community ecology, biogeography, extinction, biotic interactions
Hamish Greig, stream ecology
David Hart, stakeholder-engaged, solutions-driven, sustainability science; boundary spanning
Rebecca Holberton, endocrine physiology and behavioral ecology of migratory birds
Michael T. Kinnison, Contemporary evolution and eco-evolutionary dynamics, aquatic ecology and of fish biology, environmental DNA
Amanda Klemmer, cross-ecosystem food-webs, landscape ecology, aquatic ecosystems
Danielle Levesque, mammalogy, ecophysiology, mammalian health
Joyce E. Longcore, diversity, systematics and phylogeny of the Chytridiomycota
Brian McGill, large scale ecology and global change
Brian Olsen, conservation biology and avian evolutionary ecology
Katharine Ruskin, conservation, breeding biology, avian ecology and biogeography
Jasmine Saros, paleoecology and aquatic ecology
Ek Han Tan, plant genetics and genomics, genome elimination, potato breeding, chromothripsis

**School of Earth and Climate Sciences**
Alice Kelley, Climate Change Institute
Joseph Kelley, coastal geology
Amanda Olsen
Andy Reeve, groundwater geochemistry, hydrology, wetlands, modeling
Sean Smith, Watershed and Fluvial Geomorphology, Land-Sea Connections, Watershed Sustainability Solutions

**School of Economics**
Kathleen Bell, environmental and resource economics, environmental policy, land-use change, climate change, community resilience, social-ecological systems

Travis Blackmer

Keith Evans


Caroline Noblet

Jonathan Rubin, energy and environmental policy, light-duty transportation, greenhouse gas emissions and alternative fuels

Mario Teisl, environmental labeling, resource economics

Timothy Waring, sustainability, cooperation, culture, evolution

School of Food and Agriculture

M. Susan Erich, soil and environmental chemistry

Eric Gallandt, sustainable agriculture, weed ecology and management

Jianjun (Jay) Hao, Plant disease epidemiology, microbiomes associated with soil health and disease management, screen potato germplasm for tolerance and resistance to seed borne and soilborne diseases, signaling molecules in Phytophthora erythroseptic, Mediating pathogen biology, biological control, fungicide resistance

Pauline Kamath, One Health, disease ecology and evolution, wildlife conservation, molecular ecology, genomics

Anne Lichtenwalner, Diseases at the domestic and wildlife interface

Bryan Peterson, ornamental horticulture

Tsutomu Ohno, soil chemistry, organic matter-mineral associations

School of Forest Resources

John Daigle, forest recreation management

Adam Daigneault, Climate change impacts and implications; catchment-level sedimentation mitigation; sustainable energy pathways

Sandra De Urioste-Stone, nature-based tourism

Ivan Fernandez, Climate Change Institute

Shawn Fraver, forest ecosystems

Laura Kenefic, forest ecology and management

Jessica Leahy, human dimensions of natural resources

William Livingston, forest pathology

School of Marine Sciences
Economics

The Master of Arts in Economics and the Master of Science in Economics degrees emphasize practical economic applications. Students enrolled in these programs combine core training in microeconomic and macroeconomic theory and quantitative methods with economics courses covering a wide range of topics. Graduate students acquire the skills and knowledge to apply economic theory and tools to address interesting problems. The School of Economics creates numerous opportunities for students to expand their horizons by involving them in ongoing research projects, partnering them with public and private sector institutions, and connecting them with innovative internship experiences.

Graduates from both programs acquire strong analytical, quantitative, and communication skills, which prepare them for Ph.D. programs in Economics and related fields and employment with government agencies, consulting firms, businesses, and non-profit organizations. The main difference between the two programs is the M.S. provides advanced technical and quantitative training, while the M.A. provides the opportunity for exploring more electives. Both degrees offer thesis and non-thesis options and prepare students for positions requiring advanced analytical skills, knowledge of economic systems and methods, and practical experience conducting analyses of policy issues.

Admission Requirements:

Admission to the School of Economics is competitive. An undergraduate degree in economics or a related field is desirable but not essential for admission. The School of Economics is much more concerned with the applicant’s capacity for graduate study, quantitative reasoning and the quality of previous work. Below is a list of required and recommended courses. Applicants seeking admission generally achieve a B or better in these courses. Applicants seeking funding (see below for more information) generally achieve an A- or better in most of the required courses listed below AND have a 3.5 GPA or higher. Applicants with lower grades/GPA may be admitted/funded, especially if they have unique experiences that demonstrate strong knowledge, skills, determination, and ability to be successful in a rigorous graduate program and make a unique contribution to the School of Economics.

Required Courses (UMaine equivalent*):

- Intermediate Microeconomic Theory (ECO 350)
- Intermediate Macroeconomic Theory (ECO 321)
- Statistics (STS 215 or 232)
- Calculus I (MAT 126)

Strongly Recommended but Not Required (UMaine equivalent*):
In addition to the required and recommended courses listed above, we expect: 1) a strong, well-written personal essay that clearly communicates why the applicant is a good fit for our program and why our program is a good fit for the applicant in the context of a set of clear academic and professional goals; the essay should also demonstrate the potential for the applicant to succeed when faced with challenges; 2) strong letters of recommendation from faculty that taught courses included in our admission requirements and/or other mentors of related work (e.g., thesis/research advisor, job supervisor, etc.), which demonstrate the applicant's ability to be successful in a rigorous graduate program; 3) a well-written and clear resume/CV that demonstrates a strong work ethic and interest in gaining applicable skills/knowledge outside of the classroom.

In the past, we have required the GRE. Due to the COVID-19 pandemic, we are currently waiving the GRE requirement for 2021 and 2022 admission but still strongly recommend it. GRE scores of admitted students in the past have been around 160 for each of the Verbal and Quantitative sections and 4 for the Analytical section.

Official English proficiency examination scores are required unless you received a degree from an English-speaking institution. For more information, visit the Graduate School website or the Admission section of this catalog. For admission, the School of Economics requires TOEFL scores to be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher. To obtain funding, scores should be higher: TOEFL above 98, 247 or 597 respectively, and the IELTS equal to 7.6 or higher.

Other general admission criteria are described in the Admission section of this catalog.

Degree Requirements

Successful completion of 30 credit hours of course work is required for both the M.A. and M.S. degrees in Economics. Students on a thesis track also must pass an oral examination and have their written thesis approved by their Advisory Committee. The thesis offers students an opportunity to complete an independent research project under the guidance of an economics faculty member. The non-thesis option is designed for students who wish to obtain greater breadth in their coursework and job experience through internships, independent studies, and/or additional electives.

The following table outlines the degree requirements for the M.A. and M.S. degree programs with Thesis and Non-Thesis options. The core required ECO courses provide students with tools and problem-solving skills applicable to the economic analysis of a wide variety of public policy issues. Elective courses allow students flexibility in designing programs to meet their needs.
Elective coursework, independent studies, and thesis work are developed in consultation with the student's advisor(s). The areas of interest, background, and future needs of the student will be considered in planning the program of study.

**Funding Support**

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for assistance with research, teaching, or administration. Efforts are made to match the student's interests and background with the needs of the School. Scholarship funding is also available. The faculty nominates top-ranking applicants for these award. Funding support includes a stipend, tuition costs, and subsidized health insurance coverage. Additional funds are provided to students on a competitive basis to cover research expenses. Graduate assistantships require 20 hours of work per week. For details on funding opportunities, visit the School of Economics Graduate Program website: https://umaine.edu/soe/graduate/

**Dual Degree in Global Policy and Economics**

The School of Policy and International Affairs and the School of Economics offer an interdisciplinary dual degree program in Global Policy and Economics (via the Economics M.A., M.S., or Resource Economics and Policy M.S.).

The dual-degree program is intended for students interested in the application of economics and policy in an international setting. The course of study is normally three years. It leads to two master's degrees: one in Global Policy (with a concentration in either International Trade and Commerce or International Environmental Policy) and one in one of our Economics or Resource Economics and Policy degrees.

Students are required to complete the requirements for a master's degree in one of the economic sciences (Economics; Resource Economics and Policy) and the requirements for either the Trade and Commerce or International Environmental Policy concentrations within the Global Policy degree.

Six hours of each degree can be counted as electives for the other (i.e., a total of 12 credits can be double counted); as a result, a total of only 51 hours is required to complete both degrees (rather than the 63 usually required for two completely independent master's degrees).

**Thesis / Internship options for the dual degree:**
1. For thesis students in the Economics program: a thesis is written for the economics degree; an internship is completed for the Global Policy degree.

2. For non-thesis students in the Economics program: six credit hours in coursework replace the thesis requirement for the economics degree; an internship is completed for the Global Policy degree.

3. A separate thesis may be written for the economics degree and for the Global Policy degree.

Students in the dual-degree program will have two graduate coordinators, one from SPIA and one from SOE. Graduate advising committees, whether thesis or non-thesis, must comply with the rules outlined for each graduate degree. Two separate programs of study, one for each degree, must be developed and approved by the respective unit's committee (SPIA and SOE) and the respective graduate program coordinators by the end of the second semester of the student's tenure in the program. The student may choose to have 2 separate committees with separate SPIA and SOE chairs or one integrated SPIA/SOE committee with two co-chairs (one from SPIA and one from SOE).

The programs of study will be designed to meet the requirements of BOTH degrees in which they are enrolled. However, the dual degree program gives the student and his or her committee additional flexibility to devise a program that supports their specific needs.

## Graduate Faculty

The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy and human ecology expertise.

**Mario Teisl**, Ph.D. (University of Maryland), Professor and Director. Information economics, food safety, environmental and social marketing, and environmental economics.

**Christine Beitl**, Ph.D. (University of Georgia) Cooperating Assistant Professor of Anthropology, Ecological and Environmental Anthropology. Intersections of socio-political, ecological, and economic systems.

**Kathleen Bell**, Ph.D. (University of Maryland), Professor. Environmental economics, public economics, and spatial economics.

**James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

**Andrew Crawley**, Ph.D. (University of Glamorgan) Assistant Professor in Regional Economic Development. Economic impact, economic modeling.

**Adam Daigneault**, Ph.D. (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. Freshwater management, climate change mitigation and adaptation, invasive species control, valuing ecosystem services.

**Angela Daley**, Ph.D. (Dalhousie University) Assistant Professor of Health Economics and Policy. Health and labor economics, poverty and inequality, social policy, children and families, rural and remote communities including aboriginal people.

**Keith S. Evans**, Ph.D. (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery
management; nonmarket valuation; applied econometrics

Todd Gabe, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance.

Sharon Klein, Ph.D. (Carnegie Mellon University), Associate Professor. Technical, economic, environmental, and social/policy impacts of renewable energy and energy efficiency, community-based sustainable energy adoption.

Jessica Leahy, Ph.D. (University of Minnesota) Cooperating Professor of Human Dimensions of Natural Resources. Environmental attitudes and behaviors towards forests, forestry, and other natural resource management topics.

Jonathan Malacarne, Ph.D. (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

James McConnon, Ph.D. (Iowa State University), Professor. Regional and community economic development, innovation, and small business management.

Caroline Noblet, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

Jonathan Rubin, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

Philip Trostel, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

Tim Waring, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

Tommy Wiesen, Ph.D. (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics.

EDUCATION (All Degrees)

About the College
The College of Education and Human Development is the largest provider of undergraduate and graduate professional education programs and educational policy research in Maine. The College's graduate programs prepare teachers and other specialists to apply research-based knowledge, field-tested experience and the latest technology to help address the changing needs of schools, colleges, children and families. As the home of statewide, regional and national research and professional development programs, the College's work is informed and innovative. Graduate programs are designed to enrich and extend theory, practice and leadership. The hallmark of graduate work at the College is mentoring-working closely with a faculty advisor whose goal is to ensure that student programs meet unique needs. Small classes, led by widely recognized faculty, encourage debate, inquiry, and discussion based on real experiences and current issues. Flexibility is built into individual programs to allow the greatest impact in specific areas of need. This same commitment to individual growth and inquiry is ingrained in outreach and distance education. Faculty members travel around the state each year to teach graduate courses and consult with cohorts of students who live too far from campus for a reasonable commute, and offer many courses using distance formats.
Accreditation
The College's educator preparation programs are fully accredited by the National Council for Accreditation of Teacher Education and approved by the Maine Department of Education.

Financial Aid
A number of College of Education and Human Development graduate assistantships are available for qualified students from the master through the doctoral levels. A decision on financial aid is made only after a completed application for admission has been received and approved. The College administers the Linda N. Lancaster Fund, which is designated to help cover some professional development expenses of graduate students, such as travel to conferences. Graduate Assistantships in various student affairs offices, based on application to the specific office, serve a number of students especially in our programs in Higher Education and Student Development. This catalog describes other financial aid opportunities elsewhere.

Overview of Degrees
The College offers a variety of graduate programs leading to the Master of Education, Master of Arts, Master of Arts in Teaching, Master of Science, the Education Specialist, Doctor of Education, and Doctor of Philosophy. The Doctor of Education and Doctor of Philosophy degrees require a dissertation. The Master of Arts and Master of Science degrees require a thesis; the Education Specialist, Master of Education, and Master of Arts in Teaching are non-thesis programs. A number of specialty areas or concentrations are available for each degree program. Graduate students, in consultation with their advisors, plan their programs based on Graduate School and College requirements, certification guidelines, professional association recommendations, and individual goals. More information about specific graduate programs is available on the College of Education and Human Development website https://umaine.edu/edhd/graduate/

Master of Education
The Master of Education (M.Ed.) is intended to enhance the preparation of educational professionals in specialty areas. The degree is granted on completion of a planned program of study that includes a minimum of 33-36 semester hours, depending on the discipline. Those semester hours may include up to 6 hours of approved transfer coursework from a fully accredited college or university which would be acceptable at that institution in partial fulfillment of its requirements for a graduate degree, or up to 12 hours of approved transfer coursework from the University of Maine. In lieu of a thesis, M.Ed. programs require completion of a comprehensive paper, project, portfolio, or oral examination, generally during the final semester or year of study. The purpose of this requirement is to enable demonstration of learning that has taken place across the program as a whole. All work for the M.Ed. program must be completed within six years of matriculation.

Eligibility for admission to M.Ed. programs is based on completion of prerequisites for the specific program. Some PreK-12 programs require prior teacher certification. However, an applicant from another undergraduate program may establish eligibility by meeting essential prerequisites. Applicants may be required to take the the Miller Analogies Test or the Graduate Records Exam, if required by their specific program. Applicants should allow up to six weeks for scores to be sent to the Graduate School.

Education Specialist
The Education Specialist (Ed. S.) provides a cohesive program of professional development beyond the master's level for educational specialists. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S.. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be completed within
six years.

Master of Arts
The Master of Arts degree requires a thesis and a minimum of 30 credit hours including credit given for the thesis. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. A graduate student working toward a Master of Arts degree must successfully complete a minimum of 12 hours (exclusive of thesis) of 500- and/or 600- level coursework.

Master of Science
The Master of Science degree requires a thesis and a minimum of 30 credit hours including credit given for the thesis. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. A graduate student working toward a Master of Science degree must successfully complete a minimum of 12 hours (exclusive of thesis) of 500- and/or 600- level coursework.

Master of Arts in Teaching
The Master of Arts in Teaching (MAT) degree is an accelerated teacher licensure program in secondary education that leads to initial teacher certification in a designated content area and a master’s degree. It is designed for those already holding an undergraduate degree in a relevant content area and interested in becoming a secondary school teacher. Content areas include: Math, Life Science, Physical Science, English, Social Studies, and World Languages.

Doctor of Education and Doctor of Philosophy
Doctor of Education (Ed.D.) in and/or concentrations within the Doctor of Philosophy in Education (Ph.D.) are offered in the specialty areas of, Educational Leadership (Ph.D.), Higher Education (Ph.D.), Literacy (Ph.D.), Prevention and Intervention Studies (Ph.D.), and STEM Education (Ph.D.). Standardized test scores, such as the graduate records exam, are determined by the faculty of each program and meet other admissions requirements of the Graduate School and the specific program. Potential candidates should contact the Program Coordinator for each concentration or the Department Chair prior to submitting an application because some programs are offered only to cohorts and are not open to new students every year. In addition, program requirements, application deadlines, and admissions criteria vary by area (see program descriptions below). Candidates wishing to be considered for Graduate School awards should apply no later than January 15.

Graduate Faculty
Elizabeth J. Allan, Ph.D. (The Ohio State University, 1999). Professor, Higher Education. Equity policy, gender and education, policy discourse analysis.
Courtney Angelosante, M.S., BCBA, (University of Southern Maine, 2011). Lecturer, Special Education. Positive Behavior Interventions and Supports, School-wide climate.
A. James Artesani, Ed.D. (West Virginia University, 1992). Associate Dean of Graduate Education, Research, and Outreach and Associate Professor, Special Education. Positive Behavior Interventions and Supports, Emotional and Behavioral Disorders, and Autism Spectrum Disorders.
Victoria Bennett-Armistead, Ph.D. (Michigan State University, 2006). Associate Professor, Early Literacy. Language and literacy acquisition in young children; Literacy instruction in Pre-K and kindergarten; Informational text.
Catherine Biddle, Ph.D. (Pennsylvania State University, 2015). Associate Professor, Educational Leadership. Rural school and community response to social and economic change.
Rebecca Buchanan, Ph.D. (University of California Santa Cruz, 2017). Assistant Professor, Curriculum, Assessment, and Instruction. Intersection of personal identity, professional development, school reform, literacy, and language.
Ian Cameron, M.S. Lecturer, Human Development and Family Studies. Adolescence and
emerging adulthood. Adult development and aging.
Sandra Caron, Ph.D. (Syracuse, 1986). Professor, Family Relations. Human sexuality, AIDS
and families, sexuality education and curriculum development.
Statistics, research methodology.
Julie DellaMattera, Ed.D. (University of Maine, 2006). Associate Professor, Early Childhood
Education. Leadership in early education and policies affecting early education teachers.
Justin Dimmel, Ph.D. (University of Michigan, 2015). Assistant Professor, Mathematics
Education and Instructional Technology. Communication practices in mathematics education;
virtual reality in mathematics education.
Janet Fairman, Ph.D. (Rutgers, 1999), Associate Professor, Public policy, school reform, and
assessment.
Sara Flanagan, Ph.D. (Purdue University, 2012). Assistant Professor, Special Education.
Literacy and secondary students with and without high incidence disabilities, with a specific
focus on written expression.
Maria Frankland, Ph.D. (University of Maine, 2020). Lecturer, Educational Leadership.

Kathleen Gillon, Ph.D. (Iowa State University, 2015). Assistant Professor, Higher Education.
Access and equity in higher education. Role of geography in the facilitation of college-going for
marginalized student populations.
Leah Hakkola, Ph.D. (University of Minnesota, 2015). Assistant Professor, Higher Education.
Diversity discourses in higher education; recruitment and admissions
Sarah Howorth, Ph.D., BCBA (State University of New York at Buffalo, 2015). Assistant
Professor, Special Education.
Elizabth Hufnagel, Ph.D. (The Pennsylvania State University, 2014). Assistant Professor,
Science Education. Emotional expressions and teaching and learning about science topics in
classrooms and other science settings. Climate change and other environmental topics.
Diane Jackson, Ed.D. (University of Maine, 2000). Lecturer, Special Education. Adapting
instruction for students with special needs, math methods in special education.
Lauren Jacobs, M.S. (University of Maine, 2017). Lecturer, Kinesiology and Physical
Education. Outdoor sport opportunities.
Jesse Kaye-Schiess, M.Ed. (University of Maine, 2016). Lecturer, Kinesiology and Physical
Education and Academic Advisor.
Richard Kent, Ph.D. (Claremont, 2002). Professor, Literacy. Portfolio pedagogy, adolescent
male underachievement in literacy, innovative middle school and high school classrooms.
Vanessa Klein, Ph.D. (Kent State University, 2015). Assistant Extension Professor, 4-H STEM
Specialist, and Assistant Professor, Education. Educational programming, leadership for applied
research focused 4-H STEM programming, environmental education, and teacher education.
Robert A. Lehnhard, Ph.D. (Ohio State, 1984). Professor, Kinesiology and Physical Education.
Exercise physiology. Cardiovascular physiology; metabolic support of exercise and growth.
Mary Ellin Logue, Ed.D. (University of Massachusetts, 1984). Associate Professor Emerita,
Early Childhood Education. Parent involvement in children’s learning and schooling, prevention
of learning and social difficulties, teacher education, and application of child development
research to practice.
Mary Mahoney-O’Neil, Ph.D. (University of Maine, 2010). Associate Dean for Academic
Services. Educational psychology; elementary school methods.
Craig Mason, Ph.D. (University of Washington, 1993). Professor, Education and Applied
Quantitative Methods. Research methodology, developmental epidemiology, behavioral
informatics.

Jennifer McNulty, M.Ed. (University of Maine, 2010). Lecturer, Kinesiology and Physical
Education. Health methodology and curriculum development.
Ian Mette, Ph.D. (University of Missouri, 2012). Associate Professor, Educational Leadership.
School reform; instructional leadership; educational supervision.
Tammy Mills, Ph.D. (Montclair State University, 2016). Assistant Professor of Curriculum, Assessment, and Instruction. Explore the complexities of teaching and learning and using non-linear theoretical perspectives of teaching and learning to better understand practice.

Sidney Mitchell, Ph.D. (McGill, 2001). Associate Professor, Educational Psychology. Child development, childhood socialization, family violence, and trauma and resilience.

Mia Morrison, M.Ed. (University of Maine, 2014). Lecturer, Instructional Technology.

William Dee Nichols, Ph.D. (Texas A&amp;M University, 1995). Professor, Literacy Education. Literacy; comprehension; vocabulary; fluency

Christopher Nightingale, Ed.D. (Boston University, 2009). Assistant Professor, Kinesiology and Physical Education. Athletic training; mentoring; physical education pedagogy.

Eric A. Pandiscio, Ph.D. (University of Texas at Austin, 1994). Associate Professor, Math Education. Secondary math education, geometric construction software.

Daniel Puhlman, Ph.D. (Florida State University, 2013). Assistant Professor, Family Studies.

Timothy Reagan, Ph.D. (University of Illinois, Champaign-Urbana, 1982). Professor, Literacy Education. Educational and applied linguistics, educational policy studies, educational reform, comparative education, and philosophy of education.

Deborah L. Rooks-Ellis, Ph.D. (University of Arizona, 2009). Assistant Professor, Early intervention, visual impairment, autism spectrum disorders, severe disabilities, inquiry-based approaches to teaching.

Asli Sezen-Barrie, Ph.D. (Pennsylvania State University, 2011). Associate Professor, Curriculum, Assessment, and Instruction. Goal of improving science teacher education.

Bryan Silverman, Ph.D. (Kent State University, 2014). Lecturer, Curriculum, Assessment, and Instruction. Education and identity, specifically how culture, in a broad understanding, operates on identity. Ideas of rooted cosmopolitanism.


Jane Wellman-Little, CAS (University of Maine, 1997). Lecturer, Teacher Education. Developmental reading, Reading Recovery.

Educational Leadership

(M.Ed., Ed.S., Ed.D.)

Study in Educational Leadership provides both a theoretical and practical understanding of educational organizations, leadership, educational program planning and evaluation, and management functions. M.Ed. and Ed.S. programs prepare leaders primarily for PK-12 public and private schools, but also encompass other education agencies as well. The Ed.D. program serves as a vehicle for scholarly-practitioners to study a problem of practice that informs the analysis of organizational, leadership, and educational practices within PK-12 school settings.

M.Ed.: The Master of Education program in Educational Leadership requires a minimum of 37 credit hours. Students enroll in a sequence of 9 required courses which total 28 credits. Students may choose 3 additional elective courses. Students may choose to take electives before, during, or after the three year program that can be used for certification purposes. The M.Ed. is designed primarily to prepare school-level leaders such as principals, assistant principals, and teacher leaders.

For further information about the program, see https://umaine.edu/edhd/graduate/educational-leadership-masters-cas/ or contact Dr. Maria Frankland at maria.frankland@maine.edu.

Try on Leadership Certificate Program
Students may elect a 15-month Try on Leadership program that leads to Assistant Building Administrator (045) certification applied through the Maine Department of Education. Students typically meet once a week online using a synchronous platform that allow aspiring administrators to apply coursework in action. Students who successfully complete the Try on Leadership Certificate Program can apply for and be accepted to the M.Ed. program and can use this coursework as the required three electives necessary to graduate with the M.Ed. in Educational Leadership. For further information about the program, see https://umaine.edu/edhd/graduate/educational-leadership-masters-cas/ or contact Dr. Betsy Webb at betsy.webb@maine.edu.

Ed.S.: The Education Specialist in Educational Leadership offers opportunities for study beyond the master's degree toward leadership roles, such as school superintendent, curriculum coordinator or to develop research capacities. A minimum of 33 credit hours is required for those with a master's degree in Educational Leadership; 39-45 hours for those with a master's degree in a related field. Coursework in the M.Ed. and the Ed.S. programs is offered in the late afternoon using a synchronous platform in the Fall, Spring, and Summer semesters. Study may be full or part time.

Ed.D.: The UMaine Ed.D. program is designed to support scholarly practitioners who intend to address a problem of practice. The program supports educators in PK-12 leadership positions through a four year sequence of course, wherein students take two 8-week classes in the fall, two 8-week classes in the spring, and one 8-week class in the summer. The Ed.D. Program in PK-12 Educational Leadership seeks to admit post-master's students who: 1) have leadership experience in PK-12 education and who wish to grow professionally and academically; 2) intend to make substantial contributions to the leadership of PK-12 education and are committed to making a positive difference in their leadership practice and workplace; 3) demonstrate the self-direction necessary for advanced graduate study and independent research; and 4) possess the ability and motivation to succeed in the rigorous interpersonal and academic demands of doctoral study. Students accepted into the program may elect to enroll in a superintendent internship. For further information about the program, see https://umaine.edu/edhd/graduate/educational-leadership-edd/ or contact Dr. Ian Mette at ian.mette@maine.edu.

Graduate Faculty

Richard Ackerman, Ed.D., Professor of Educational Leadership

Catharine Biddle, Ph.D., Associate Professor of Educational Leadership

Maria Frankland, Ph.D., Lecturer in Educational Leadership

Ian Mette, Ph.D., Associate Professor of Educational Leadership

Betsy Webb, Ed.D., Libra Professor of Educational Leadership

Electrical and Computer Engineering

The Electrical and Computer Engineering Department offers the following graduate degrees:

- the Master of Science degree in Electrical Engineering,
- the Master of Science degree in Computer Engineering and
- the Ph.D. degree in Electrical and Computer Engineering.

General Information on the M.S. Degrees
Thesis and non-thesis options are available for the M.S. degrees. For a non-thesis degree, a minimum of 30 semester hours of course work is required. Thesis options require 30 credit hours of which six credits of ECE 699 shall be devoted to individual study with a member of the graduate faculty. This work must culminate in the preparation of a written thesis on a significant problem of common interest and an oral defense of the thesis. To obtain a M.S. degree in Electrical Engineering or Computer Engineering, a student must have at least a GPA of 3.0 for all courses taken as a graduate student.

Requirements for the M.S. Degree in Electrical Engineering (MSEE)

A completed Bachelor of Science degree in Electrical Engineering is normally required to become a candidate for the Master of Science degree in Electrical Engineering. Qualified students from other disciplines may become candidates for a Master of Science degree in Electrical Engineering by demonstrating high scholastic competency in all the required undergraduate Electrical Engineering courses. This may be done by actually enrolling in the undergraduate Electrical Engineering courses or by passing an equivalency examination, which covers the material appropriate to the undergraduate Electrical Engineering course.

Students must complete at least three of the five core courses, including Mathematical Methods (ECE523), Electromagnetic Theory (ECE550), Random Variable and Stochastic Processes (ECE515), Advanced Microprocessor-Based Design (ECE 571), and Solid State Electronics (ECE565). In addition to the core curriculum, students may enroll in state-of-the-art courses offered by the Electrical Engineering graduate program. Normally no more than 6 credits of ECE 400 level course work will be acceptable for graduate credit. In addition, no more than one ECE 599 and two ECE 598 courses may be taken toward fulfilling the requirements for a Master of Science degree in Electrical Engineering. Degree candidates may also choose to take courses in Mathematics, Physics, Chemistry, Computer Science and other disciplines, which are consistent with his/her program goals.

Requirements for the M.S. Degree in Computer Engineering (MSCE)

A completed Bachelor of Science degree in Computer Engineering is normally required to become a candidate for the Master of Science degree in Computer Engineering. Qualified students from other disciplines may become candidates for a Master of Science degree in Computer Engineering by demonstrating high scholastic competency in all the required undergraduate Computer Engineering courses. This may be done by actually enrolling in the undergraduate Computer Engineering courses or by passing an equivalency examination, which covers the material appropriate to the undergraduate Computer Engineering course.

Students must complete at least three of the five core courses, including Advanced Microprocessor Based Design (ECE 571), Microprogramming (ECE 573), Mathematical Methods (ECE523), Random Variable and Stochastic Processes (ECE515), and Database (COS 580 or SIE 550). All students must complete at least one graduate-level (500 or above) course in Computer Science. In addition to the core curriculum, students may enroll in state-of-the-art courses offered by the Electrical Engineering, Computer Engineering and Computer Science graduate programs. Normally no more than 6 credits of ECE or COS 400 level course work will be acceptable for graduate credit. In addition, no more than one ECE 599 and two ECE 598 courses may be taken toward fulfilling the requirements for a Master of Science degree in Computer Engineering. Degree candidates may also choose to take courses in Mathematics, Physics, Chemistry and other disciplines, which are consistent with his/her program goals.
Requirements for the Ph.D. Degree in Electrical and Computer Engineering

A doctoral student must complete at least 42 credits of coursework beyond the BS degree requirements. (Thesis and dissertation credits do not count toward this requirement.) Nine credits out of the 42 are to be completed in an area outside of Electrical & Computer Engineering, to constitute a minor. At least 24 credits out of the 42 must be ECE courses. Normally, no more than 6 credits of ECE 400 level course work will be accepted for graduate credit. Additionally, PhD candidates must complete four of the five core course requirements for either the MSEE or MSCE degree. Candidates are required to maintain a GPA of 3.3 for all graduate coursework, pass a qualifying exam on Electrical and Computer Engineering fundamentals and pass a comprehensive exam in the student's area of research. The Ph.D. candidate must complete a program of study, which has obtained the approval of the student's advisory committee and the Graduate Coordinator of the department. The preparation and defense of a thesis embodying the results of an original investigation in a specialized area of Electrical and Computer Engineering are essential features of the program.

4+1 Bachelor's/Master's Degree Programs

The department offers the opportunity for ECE undergraduates to begin taking graduate courses during their senior year, double-counting up to 9 credits toward the BS and the MSEE or MSCE.

Students must submit the application to the graduate coordinator by February 15 of their junior year. Details can be found at the department website: http://ece.umaine.edu/graduate/phd-electrical-computer-engineering/

Application

Applications are accepted at any time for admission in the Fall (September), or the Spring (January) semester. Application materials can be obtained from the Graduate School, 5775 Stodder Hall, Rm 42, Orono, ME 04469-5775, e-mail at graduate@maine.edu, or downloaded from the web site http://www.umaine.edu/graduate/admissions/admissions

Additional Information

Individual faculty may be contacted via the ECE department web site at http://ece.umaine.edu/graduate/phd-electrical-computer-engineering/

Alternatively, the Graduate Coordinator can be reached by regular mail at Department of Electrical and Computer Engineering, University of Maine, Orono, ME 04469, by telephone at (207) 581-2223, or by FAX at (207) 581-4531.

Graduate Faculty

Donald M. Hummels, Ph.D. (Purdue University, 1987), Professor and Chair. Communications, signal processing and pattern recognition.

Herbert M. Aumann, Ph.D. (University of Wisconsin, Madison, 1973) Adjunct Professor. Antennas, phased arrays, antenna measurements, radar systems, data acquisition and signal processing.

Richard O. Eason, Ph.D. (University of Tennessee, 1988), Associate Professor. Robotics and computer vision.

Nuri Emanetoglu, Ph.D. (Rutgers State Univ. of New Jersey. 2003), Associate Professor, Novel semiconductor materials and devices optoelectronics and photonics, piezoelectric materials, thin films, surface acoustic wave devices, sensors.

David E. Kotecki, Ph.D. (University of California at Davis, 1988), Associate Professor. Microelectronics, circuits, electronic materials, computer modeling and simulation.

Mohamad T. Musavi, Ph.D. (University of Michigan, 1983), Professor. Artificial Neural Networks, computer vision, power systems and smart grid.

Mauricio Pereira da Cunha, Ph.D. (McGill University, 1994), Professor. Microwave acoustics, signal processing, sensors and applications.

Bruce E. Segee, Ph.D. (University of New Hampshire, 1992), Professor. Instrumentation, neural networks and computer interfacing.

Rosemary Smith, Ph.D. (University of Utah, 1982), Professor. Microsensors, microtechnology, biomedical microdevices.

John F. Vetelino, Ph.D. (University of Rhode Island, 1969), Professor. Surface acoustic wave devices and applications, microsensors, sonar signal processing, solid state

Vincent Weaver, Ph.D. (Cornell University, 2010), Associate Professor. High performance computing, computer architecture, operating systems, embedded programming

Yifeng Zhu, Ph.D. (University of Nebraska-Lincoln, 2005), Professor. Computer architecture and systems including parallel/distributed computing, and computer storage systems.

**Electrical Engineering Technology Graduate (Certificate)**

The purpose of the graduate certificate in Electrical Engineering Technology (EET) is to increase and enhance the technical and management knowledge and skills of an individual working in industry with a bachelor's degree in a technical field. General skills developed include advanced circuit applications, advanced software applications, and advanced power applications. These technical content areas include real-world, practical applications. Elective courses allow students to develop specialized skills in additional content areas related to the power industry and engineering project management. This certificate is also a path-way towards a Professional Science Master's degree with a concentration in EET if students wish to continue their studies. Certificate program beginning Spring 2022.

An earned baccalaureate engineering, engineering technology, math, physics, or equivalent degree from an accredited program is required for admission.
Elementary Education

Curriculum, Assessment and Instruction (M.S., M.Ed., E.d.S.) Elementary Education

Master of Science (M.S.): The M.S. is a research-oriented degree which culminates in conducting a master's thesis, guided by a committee of three faculty from the program or related fields. This is a 30-credit-hour program, including six credits of thesis research. Four courses (12 credits) are the same as for the M.Ed, as follows:

- EHD 521 - Classroom Practice to Improve Learning
- EHD 533 - Dynamics of the Curriculum
- EHD 519 - Formative Assessments: Research, Practice and Policy
- EHD 541 - Prevention and Intervention in School Settings
- EHD 510 - Introduction to Educational Research

Master's of Education (M.Ed.): The Master of Education program in Elementary Education with a concentration in Curriculum, Assessment and Instruction is designed for teachers who, while continuing a career in classroom teaching, seek to assume responsibility and leadership roles in enhancing standards in the areas of curriculum, assessment and instruction. The degree requires a minimum of 33 credit hours and is offered either completely online or through a combination of online and on-campus courses. The following six online courses (18 credits) are required of all students:

- EHD 521 - Classroom Practice to Improve Learning
- EHD 533 - Dynamics of the Curriculum
- EHD 519 - Formative Assessments: Research, Practice and Policy
- EHD 541 - Prevention and Intervention in School Settings
- EHD 586 - Seminar: Action Research in PreK-12 Schools - offered Fall only.
- EHD 587 - Practicum: Action Research in PreK-12 Schools - offered Spring only.

Education Specialist (E.d.S.)

The Education Specialist (Ed.S) provides a cohesive program of professional development beyond the master's level for educational specialists. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be completed within six years.

Engineering and Business Professional Science Masters

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a B.S. in engineering or engineering technology who want to advance into management positions. The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the
new skills learned by the student with their needs and the needs of their employer. There are tracks in astronautics, computer engineering, wireless engineering, electrical engineering, and surveying engineering. Additional tracks will be added. The latest list of tracks may be found at: https://online.umaine.edu/grad/professional-science-masters-in-engineering-and-business/

**Educational Objectives:**

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
- Increased potential for career advancement.

**Required courses:**

- GEE 486 Advanced Project Management (3 credits)
- GEE 694 Professional Science Masters in Engineering and Business Internship (6 credits)

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For Additional Information about the Professional Science Masters Degree in Engineering and Business, contact:

Dana N. Humphrey, Ph.D., P.E.
Dean of Engineering
College of Engineering
Telephone: 207-581-2217
Email: danah@maine.edu

**Engineering in the Natural Sciences/Interdisciplinary**

**Engineering in the Natural Sciences/Interdisciplinary**

A casual look at the map of the United States makes one aspect of Maine clear, of all the 48 lower states, Maine is the notable for the dominant role of the coast in the life, geography and history of the state. As a program which links the College of Engineering to the School of Marine Science, the I.Ph.D. recognizes the role in the history, life and future of the state. Students pursuing this program link the biological sciences to engineering while recognizing that students need to have both an understanding of the biology of the ocean and comfort with engineering principles in order to work in the complex ocean envelopment with an acceptable level of anthropogenic impact.

For information on the program please contact the program coordinator, Andrew J. Goupee, Assistant Professor of Mechanical Engineering, agoupe91@maine.edu
Engineering Management (Certificate)

The graduate certificate provides training for engineers interested in developing skills in project management, data-based decision making, and the management of engineering organizations. Students who wish to continue to a full masters program have a variety of options in either business or engineering. The market demand for advanced engineering management skills is greater than ever. The courses are delivered through both online and traditional modalities and there are options for the graduate certificate to be completed fully online. The certificate requires 15 credits of coursework.

An earned baccalaureate engineering, engineering technology, or equivalent degree from an accredited college or university is required for admission. A minimum grade point average of 2.5 applies to all candidates and minimum TOEFL score of 80 (IbT), 6.5 (IELTS) or 60 (PTE Academic) are required for international students.

Educational Objectives

- Manage projects in the context of an engineering organization including planning, controlling, scheduling and risk analysis
- Use data to make decisions as well as optimize processes and resources to minimize waste, maximize benefits, and maximize performance
- Manage engineering organizations

Engineering Physics

Degree Programs

Programs of study leading to the degrees of Master of Science, Master of Engineering (Engineering Physics), and Doctor of Philosophy are offered through the Department of Physics and Astronomy.

Doctor of Philosophy

Doctor of Philosophy: Typically a total of 5-6 years are needed to complete the Ph.D. degree for a student who enters the program with a bachelor's degree. This time is approximately equally divided between course work and dissertation research. A dissertation presenting the results of an original investigation in a specialized area of physics is an essential feature of the program and must be completed and defended successfully. Requirements also include passing the comprehensive examination, which must be passed by the end of the third year of study for students who enter the Ph.D. program with a bachelor's in physics or by the end of the second year for students entering with a master's in physics.

The program of study for each student in the Ph.D. program includes a minimum of 30 course hours. The following courses, or their equivalents, are required of all students: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 574 Methods of Theoretical Physics, PHY 503 Quantum Mechanics I, PHY 603 Quantum Mechanics II, PHY 512 Statistical Mechanics, PHY 510 Graduate Laboratory, and PHY 624 Solid State I. In addition, students must take at least one advanced course, chosen from among PHY 598 Continuum Mechanics, PHY 602 Electrodynamics II, PHY 575 Methods of Theoretical Physics II, PHY 598 Statistical Mechanics II, and PHY 625 Solid State II.

Students must also take at least one research specialty elective course, which must be approved by the student's dissertation advisory committee. These electives do not have to be PHY courses, and they can not be from among the 400-level PHY undergraduate core courses in Electricity and Magnetism, Quantum and Atomic Physics, Thermodynamics, Statistical Mechanics, Mathematical Methods, or Optics.
In general, additional courses beyond the above minimal requirements are expected to be included in a student's program of study, at the discretion of the student's dissertation committee (or the Department Graduate Coordinator prior to formation of the dissertation committee). Each of the 400-level undergraduate core courses may be taken for graduate credit under this additional course expectation.

**Master of Science**

The program of graduate study for the master's degree, which normally requires two academic years on a half-time basis, is developed around an original investigation, the results of which are presented as a thesis.

Of the minimum of 30 semester hours required for the Master of Science degree, 24 are devoted to courses in physics and such allied fields as other sciences, mathematics, and engineering. However, the following courses or their equivalents, which are offered every year, must be included: PHY 501 Mechanics; PHY 502 Electrodynamics I, and PHY 503 Quantum Mechanics I.

**Master of Engineering (Engineering Physics)**

http://www.physics.umaine.edu/programs/degrees/grad.html#masterengphy

A minimum of 30 semester hours is required for the Master of Engineering (Engineering Physics) degree. Of the total of 24 required course hours, nine hours must be selected from a meaningful engineering course sequence. In addition, nine hours must be selected from three of the following courses: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, and PHY 510 Graduate Laboratory. A thesis is optional but is strongly encouraged and requires a minimum of 6 credits of thesis (PHY 699). The thesis may be completed in either the Physics Department or the engineering department in which the engineering course sequence is taken. Satisfactory completion of the non-thesis option requires 36 approved course credits.

**Research**

Experimental research is being conducted in the following areas: the physics and chemistry of surfaces, including microsensors, catalysis, adhesion, thin film growth, surface crystallography, phase transitions, tribology, and development of new instrumentation; liquid crystals and colloidal crystallization; environmental nuclear radiation; health physics; biophysics, including Fluorescence Microscopy and Spectroscopy, Function and Lateral Organization of Biomembranes, Single Molecule Fluorescence Photophysics, and the biophysics of membranes and macromolecules; low temperature physics, including superconductivity; optical, x-ray, and radio observations of galaxies and clusters of galaxies; general relativity; physics education, investigating student learning. Theoretical work includes studies of galactic formation and stability, atomic and solid state theory, semi-conductors, non-linear systems, pattern formation, chemically-driven microscopic motors and pumps, radionuclide transport theories, statistical mechanics, equilibrium and nonequilibrium phase transitions, and surface physics.

**Cooperative Research**

Cooperative research projects involving students in Physics degree programs have been conducted with the Department of Electrical and Computer Engineering in studies of semiconductor devices and sensor technology; the Department of Chemistry in optical and resonance studies on anticancer compounds and polymers on metallic surfaces; the Institute for Quaternary Studies in studies of glaciology; the Department of Biochemistry, Microbiology and Molecular Biology in studies of nucleic acids; the Departments of Geological Sciences and Civil and Environmental Engineering in natural
A major interdisciplinary research organization at the University is the Frontier Institute in Sensor Technologies (FIRST) in which research opportunities exist in high technology areas related to surfaces, interfaces, and thin film materials. Specific information is available at http://www.umaine.edu/first/.

**Research Facilities**

The **Frontier Institute in Sensor Technologies** (FIRST) unites researchers from the Departments of Chemistry, Physics, Electrical and Computer Engineering, and Chemical and Biological Engineering in many projects spanning aspects of surface and interface science, thin films, sensors, microsystems, and nanotechnology. Current facilities include thin film synthesis, electron and optical spectroscopies, scanning probe microscopies, X-ray and electron diffraction, focused ion beam-scanning electron microscopy, fluorescence microscopy, device fabrication (Class1000 clean room with photolithography, metallization, wet and dry etch, PECVD, sputtering, mask generation, and packaging), and sensor testing (gas delivery systems, electrical and microwave test equipment, and data acquisition/integrated electronic test suites).

**Biophysics and Optics:** Three laboratories include a superresolution localization microscopy facility and four F-PALM microscopes, image processing computer cluster, tunable femtosecond pulsed Ti:Sapphire laser and optical parametric oscillator (OPO), cell culture facilities, polymerase chain reaction (PCR) thermal cycler, and other equipment for molecular biology, confocal and two-photon laser-scanning microscopes, fluorescence correlation and cross-correlation microscope, fluorimeter, spectrophotometer, Krypton-Argon and Argon ion lasers, numerous diode lasers spanning visible wavelengths from 400-700 nm, and optical tweezer.

The **Physics Education Research Laboratory** has facilities and equipment for conducting research on the learning and teaching of physics, including a classroom intended for curricular activities based on physics education research (PER) and dedicated clinical interview space to ensure the anonymity and privacy of students participating in our research work (as required by our institutional review board for testing with human subjects).

**Astronomy/Astrophysics:** The Emera Astronomy Center consists of two observatories, a planetarium, and a multipurpose classroom space. The Jordan Observatory houses a PlaneWave CDK20 (20 inch) telescope on a German Equatorial Mount with an Apogee Aspen CG16M CCD camera with 7 slot filter wheel for imaging and photometry. The telescope and dome both can be remotely controlled. Additionally, the facility has an historic Alvin Clark refractor (8 inch) housed in a roll-off roof observatory for visual observations. The Jordan Planetarium is a 10 meter 4K digital planetarium with 50 seats which can show a variety of astronomy and science visualizations, real time astronomical data, and full-dome films. The planetarium conducts regular public programs, school programs, and numerous special events. The facility has a multipurpose classroom housing a number of interactive displays and is used for astronomy labs and other university courses.

**Admission**

In addition to satisfying the general admission requirements of the Graduate School, candidates for advanced degrees in physics should have completed at least 16 semester hours in physics beyond the introductory course and have studied mathematics at least through differential equations. Candidates who have majored in other physical sciences or
mathematics are encouraged to apply. A candidate's preparation for graduate study in physics or astronomy can be strengthened by taking selected undergraduate courses for graduate credit.

Financial Assistance

Teaching assistantships are available for the academic year and include remission of tuition for up to nine credit hours per semester and three credit hours in the summer session. These appointments provide for approximately half-time teaching and half-time study. Teaching assignments usually involve six contact hours per week. Summer support is usually available for students in the program.

The University of Maine supports a number of University fellowships and tuition scholarships. Research assistantships are also available in some of the areas of investigation listed above.

Application

Applications are accepted at any time for admission in the Fall (September), or the Spring (January) semester. Application materials can be obtained from the Graduate School, 5755 Stodder Hall, Room 42, Orono, ME 04469-5755, e-mail at graduate@maine.edu, or downloaded from the web site http://www.umaine.edu/graduate/admissions/admissions.

Additional Information

Individual faculty may be contacted via their email addresses above. The department's home page is http://www.physics.umaine.edu/.

Alternatively, the Graduate Coordinator can be reached by regular mail at Department of Physics and Astronomy, University of Maine, Orono, ME 04469, by telephone at (207) 581-1039, or by FAX at (207) 581-3410.

Graduate Faculty

Susan R. McKay, Ph.D. (M.I.T., 1987), Professor and Chair. Condensed matter theory, phase transitions and critical phenomena, systems with quenched disorder, spin glasses, random-field ferromagnets, systems far from equilibrium, pattern formation, non-linear systems, and chaos. (e-mail: susan_mckay@umit.maine.edu)

R. Dean Astumian, Ph.D. (Texas-Arlington, 1983), Professor. Design of microscopic mechanical and electrical pumps and motors powered by non-equilibrium isothermal chemical reactions. (e-mail: astumian@maine.edu)

David J. Batuski, Ph.D. (New Mexico, 1986), Associate Professor. Observational cosmology, large-scale structure in the universe, dynamics of galaxy clusters, interacting galaxies and radio sources. (e-mail: batuski@maine.edu)

Neil F. Comins, Ph.D. (University College, Cardiff, 1978), Professor. Galactic formation, structure, stability, evolution stellar stability, observational astronomy (optical, radio), computational astrophysics general relativity, and astronomy education. (e-mail: neil.comins@umit.maine.edu)

Charles T. Hess, Ph.D. (Ohio, 1967), Professor. Alpha and gamma spectroscopy, x-ray fluorescence, environmental radioactivity, radon in water and air, and health physics. (e-mail: hess@maine.edu)

Samuel T. Hess, Ph.D. (Cornell University, 2002), Assistant Professor. Biophysics, lateral membrane organization, protein structure and dynamics, single molecule fluorescence spectroscopy, nonlinear fluorescence microscopy,
development of new markers for intracellular imaging, numerical modeling, quantum dots. (e-mail: sam.hess@umit.maine.edu)

Peter H. Kleban, Ph.D. (Brandeis, 1970), Professor. Member of the Laboratory for Surface Science and Technology (LASST). Theory of phase transitions, surface science, and electron spectrometers. (e-mail: kleban@maine.edu)

Robert J. Lad, Ph.D. (Cornell, 1986), Professor. Director of the Laboratory for Surface Science and Technology (LASST). Surface physics and chemistry, ceramic materials, interfaces, thin films and gas-surface interactions. (e-mail: rjlad@maine.edu)

James McClymer, Ph.D. (Delaware, 1986), Associate Professor. Digital imaging and light scattering from equilibrium and nonequilibrium phase transitions in liquid crystals. (e-mail: mcclymer@maine.edu)

Richard A. Morrow, Ph.D. (Princeton, 1963), Professor. Semiconductor theory and defects in GaAs. (e-mail: morrow@maine.edu)

Donald B. Mountcastle, Ph.D. (Virginia, 1971), Associate Professor. Molecular biophysics, structure and function of biological and model membranes, cooperative interactions, microcalorimetry, and thermodynamics. (e-mail: donald.mountcastle@umit.maine.edu)

Charles W. Smith, Ph.D. (Ohio, 1968), Professor. Low temperature experimental physics, superconductivity, point contact spectroscopy, and condensed matter physics. (e-mail: charless@maine.edu)

John Thompson, Ph.D. (Brown, 1998), Assistant Professor. Member of Center for Science and Mathematics Education Research. Co-director, Physics Education Research Laboratory. Physics Education: student conceptual understanding of physics topics including thermal physics, sound and longitudinal waves, and two-dimensional kinematics; research on understanding of science teaching and learning; curriculum development and assessment. (e-mail: John_Thompson@umit.maine.edu)

William N. Unertl, Ph.D. (Wisconsin, 1973), Professor. Member of the Laboratory for Surface Science and Technology (LASST). Surface physics and chemistry, atomic force microscopy electron spectroscopy, surface structure, friction and adhesion. (e-mail: unertl@maine.edu)

Michael C. Wittman, Ph.D. (Maryland, 1998), Assistant Professor. Director of the Laboratory for Research in Physics Education (LRPE). Investigating student learning (wave physics, quantum mechanics, electricity and magnetism), research-based curriculum development and dissemination, modeling student reasoning in physics. (e-mail: wittmann@maine.edu)

Research and Associate Graduate Faculty

David Frankel, Ph.D. (Stanford, 1978), Senior Research Scientist, Laboratory for Surface Science and Technology. Surface science and vacuum technology.

Cooperating Graduate Faculty

Jayendra C. Rasaiah, Ph.D. (Pittsburgh, 1965), Professor. Statistical mechanics of electrolytes and polar fluids, computer simulation studies of solutions, fluctuation-dominated kinetics in heterogeneous media, theory of electron transfer reactions, and molecular biophysical chemistry.

English
Students admitted to graduate study in the Department of English pursue a 30-credit program (ten courses or the equivalent) leading to the Master of Arts degree. The program offers degree candidates a challenging and supportive learning environment in which to enhance their knowledge, explore new ideas, and gain experience in research, writing, and teaching. Students explore the aesthetic and pragmatic dimensions of the written word in seminars and workshops that balance tradition with innovation in local and global contexts.

The program allows students to explore new facets of English study -- everything from the intricacies of skills such as creating an assignment-sequence for a class, preparing technical documentation, grant-writing, or editing a short story, to the challenges of poetics, literary and rhetorical theory, and empirical field-research on writing -- while also deepening and widening their knowledge of literature. The degree culminates with a professional portfolio that graduates use to advance their goals toward PhD or MFA programs, teaching careers, employment in the private or public-sector, or personal growth.

Graduate students are central actors in the program's intellectual community: they serve on committees, organize events, participate in research expos, and have their own symposium. Teaching Assistantships in the award-winning first-year composition program include full-tuition waivers, close mentoring, a one-one teaching load, generous stipend support, and a strong benefits package. Students can apply for a third year of funding through the competitive Ulrich Wicks Distinguished Teaching Assistantship. Poets in the program are eligible for support through the Millay Prize for Poetry.

The department offers optional concentrations in Creative Writing, Gender and Literature, Poetry and Poetics, and Writing Studies. English M.A. students may also pursue the interdisciplinary concentration in Women's, Gender, and Sexuality Studies, offered by the Women's, Gender, and Sexuality Studies program.

The degree provides valuable training for teachers of English in high school and community colleges. Those interested in competing for top doctoral programs in literature or writing studies or pursuing a competitive MFA will receive solid preparation for future studies. Alumni of our program have also gone on to careers in journalism, law, publishing, library science, theater, politics, consulting, editing, web and social-media content, photography, and all sectors of public and private education.

In the scheduling of its courses and in the design of the required MA Degree Portfolio that candidates use to demonstrate their accomplishments, the Department presents a substantial and coordinated curriculum of graduate study. The English Department is home to "College Composition," its award-winning first-year writing program, of which our 21 teaching assistants are vital members. It is also home to the Center for Poetry and Poetics (formerly the National Poetry Foundation), which regularly hosts international conferences on modernist and postmodernist poetry, and publishes the scholarly journal *Paideuma: Modernist and Contemporary Poetry and Poetics* as well as many books of and on poetry. To these enterprises graduate students have sometimes contributed editorial assistance as well as articles, and the NPF offers a graduate work-study assistantship providing experience in the practical side of scholarly publishing.

**Admission Requirements**

Applicants normally are expected to have at least a 3.0 grade-point average in English from an accredited institution, and to provide us with three letters of recommendation, official transcripts, a personal statement, and a 10-20 page sample of formal literary analysis (applicants to the creative writing concentration must also submit a 10-20 page sample of creative work.)

Applicants who wish to complete one of the concentrations should indicate this on their application forms. Those wishing to be considered for teaching assistantships will respond to a teaching exercise provided by the department on completion of their application to the graduate program.
The department offers 21 teaching assistantships, of which about half are awarded to incoming students in a typical year. Applicants wishing to be considered for an assistantship beginning in September should have their complete application materials (transcripts, writing samples, personal statement, three letters of recommendation, and teaching exercise) on file with the department by the previous January 15th. The English program accepts applications for graduate studies on a rolling basis; however, applicants for teaching assistantships and other financial aid must submit their materials by January 15th.

Degree Requirements

Of the usual 30 hours of coursework, at least 24 hours must be in English courses numbered 500 or above, including up to six hours of thesis credit (ENG 699). Students with teaching assistantships normally take two years to complete the program; other full-time students sometimes finish more quickly. Typically, four or five graduate courses are offered each semester and two each summer.

All candidates demonstrate their readiness to graduate via a comprehensive and selective Degree Portfolio that illustrates a range of coursework while also highlighting the candidate's special research interests. Degree Portfolios accepted for review are comprised of roughly 50 pages of the candidate's best work, introduced by a 10-12 page (double-spaced) critical-reflective letter. Thesis candidates, including creative writers, also do one-hour defenses of their theses. Thesis candidates take 3-6 credits of thesis work. All students in the creative writing concentration produce a thesis consisting of a substantial body of original work (e.g. a novel, a collection of stories, a collection of poems). The thesis is optional for students in other concentrations.

Coursework:

Four of the ten courses normally required for the degree must be graduate literature courses distributed across three different time-periods. Graduate teaching assistants are required to take ENG 693 Teaching College Composition during their first semester of teaching.

Specific requirements for the optional concentrations are as follows:

Concentration in Writing Studies: 9-12 credits in courses exploring current theories about writing, the teaching of writing, and the contexts of writing—including linguistics, critical theory, and discourse analysis. ENG 579 Theories of Composing, ENG 693 Teaching College Composition, and an additional six credits which may include courses in literacy or rhetoric outside of the department, as approved by the student's advisor.

Concentration in Creative Writing: 9-12 credit hours in creative writing, typically including six credits of workshop and three to six thesis credits.

Concentration in Gender and Literature: 9-12 credits in courses exploring the interrelationships of gender, language and literature, normally to include two offerings of ENG 549 Studies in Gender and Literature. One course may be taken outside the department, as approved by the student's advisor.

Concentration in Poetry and Poetics: 9-12 credits emphasizing theoretical and creative approaches to poetry and poetics. This concentration allows students to combine interests in literary analysis and poetry writing. Includes three to six credit hours of ENG 580: Topics in Poetry and Poetics, three credit hours of ENG 508: Writing Workshop in Poetry & Poetics, and three credit hours of literature courses focused on poetry and/or theory.

To learn more about graduate study in English, go to https://english.umaine.edu/graduate-program/
Graduate Faculty

**Hollie Adams, Ph.D.** (University of Calgary, 2014), Assistant Professor. Creative Writing, Postmodern Fiction, Canadian Literature.

**Caroline Bicks, Ph.D.** (Stanford, 1997), Professor and Stephen E. King Chair in Literature. Shakespeare, early modern drama and culture, history of science, women's and gender studies, feminist theory, girlhood studies.

**Carla Billitteri,** Ph.D. (SUNY at Buffalo, 2001), Associate Professor. Literary theory; feminist theory and gender studies; poetry and poetics; nineteenth- and twentieth-century European and American Literature; drama.

**Laura Cowan,** Ph.D. (Princeton, 1988), Associate Professor. Modernist literature, poetry, nature literature.

**Ryan Dippre, Ph.D.** (University of California-Santa Barbara, 2014). Associate Professor and Director of College Composition. Writing development: K-16 and lifespan; writing technology and beliefs; research methods.

**Dylan B. Dryer,** Ph.D. (University of Wisconsin-Milwaukee, 2007), Associate Professor and Coordinator of Graduate Studies. Research methods, rhetorical genre studies, writing development and assessment, corpus linguistics, language ideologies.

**Steven R. Evans,** Ph.D. (Brown, 1999), Associate Professor and Department Chair. Poetry and poetics; critical theory; sonic archives.

**Benjamin Friedlander,** Ph.D. (SUNY-Buffalo, 1999), Professor. Poetry and poetics; nineteenth- and twentieth-century American literature.

**Sarah Harlan-Haughey,** Ph.D. (Cornell University, 2011). Associate Professor. Medieval literature, folklore, oral traditional studies, and literature and the environment.

**Gregory Howard,** Ph.D. (University of Denver). Associate Professor. Fiction writing, American fiction, postmodern literature.


**Elizabeth Neiman,** Ph.D. (University of Wisconsin-Milwaukee, 2011). Associate Professor. Romanticism, 19th Century British fiction, and gender studies

**Deborah D. Rogers,** Ph.D. (Columbia, 1982), Professor. Restoration and eighteenth-century English literature.

**Kathryn Swacha,** Ph.D. (Purdue University, 2018), Assistant Professor. Rhetoric and communication, rhetoric of health and medicine, rhetorical theory, institutional rhetorics, professional and technical writing

Entomology

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).
Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

Master of Science

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

Animal Behavior and Behavioral Ecology, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

Applied Biology, including biological control and insect pest management, fisheries, and plant pathology.

Botany, Plant Biology, Mycology, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

Developmental and Cell Biology, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

Ecology, Environmental Biology, and Paleoecology, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

Entomology, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

Fisheries Biology, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

Freshwater Biology, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

Genetics and Molecular Biology, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

Plant Pathology, including control of fungal pathogens, and pest management.
Physiology and Physiological Ecology, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

Science Education, including course and program assessment and developing innovative instructional techniques.

Systematics and Evolution, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

Special Options

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

Facilities

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

Application

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: umbiosci@maine.edu, http://biology.umaine.edu.
Graduate Faculty

Andrei Alyokhin, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

Seanna L. Annis, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

Christopher S. Cronan, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

Francis A. Drummond, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

Adria Elskus, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

Allison Gardner, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

Jacquelyn Gill, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

Hamish Greig, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

Eleanor Groden, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

David Hart, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

Clarissa Henry, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of segmentation and muscle development in Zebrafish.

Rebecca Holberton, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

Michael T. Kinnison, Ph.D. (University of Washington, 1999) Professor of Evolutionary Applications. Microevolution, eco-evolutionary dynamics, aquatic ecology, population and conservation genetics, fish ecology.

Danielle Levesque, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

Joyce E. Longcore, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

Brian McGill, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.
Brian Olsen, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.


Michelle Smith, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

Ek Han Tan, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

Kristy Townsend, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

Mary S. Tyler, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in Drosophila; educational multimedia materials.

Seth Tyler, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

Yong Jiang Zhang, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

Cooperating Faculty

Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

William O. Bray, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

Jim Dill, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

David Hiebeler, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

Sara Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

William H. Livingston, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

James D. McCleave, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

Paul Rawson, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating
Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

Alan M. Rosenwasser, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

Walter C. Shortle, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

Robert S. Steneck, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

Rebecca J. Van Beneden, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

Robert G. Wagner, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

**Financial Economics**

The Master of Arts in Financial Economics degree prepares graduates for employment in the financial services sector in positions requiring advanced analytical skills and in-depth familiarity with the structure and functioning of financial markets and institutions. The program provides a solid foundation in microeconomic and macroeconomic theory and financial management to ensure that graduates have the conceptual tools needed to develop sound research designs and understand the role of financial markets and institutions within the economy. The program includes courses from the School of Economics and the Maine Business School.

**Admission Requirements**

Acceptance into the School of Economics graduate programs is competitive. An undergraduate degree in economics or a related field is desirable, but is not essential for admission to this program. The School of Economics is much more concerned with the applicant's capacity for graduate study, quantitative reasoning and the quality of previous work. The successful applicant has a strong academic record, high scores on the GRE, and outstanding recommendations. Graduate degrees in the School of Economics require some training in economics and quantitative methods; students are required to complete the following prerequisites before entering the graduate program.

<table>
<thead>
<tr>
<th>Course</th>
<th>UMaine Equivalent</th>
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<tbody>
<tr>
<td><strong>Required:</strong></td>
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<tr>
<td>Intermediate Macroeconomic Theory</td>
<td>ECO 321</td>
</tr>
<tr>
<td>Intermediate Microeconomic Theory</td>
<td>ECO 350</td>
</tr>
<tr>
<td>Statistics</td>
<td>STS 215 or 232</td>
</tr>
<tr>
<td>Calculus I</td>
<td>MAT 126</td>
</tr>
</tbody>
</table>
Accounting
ACC 400
Business Finance
FIN 350

*Strongly Recommended (not required)*:

Calculus II
MAT 127
Calculus III
MAT 228
Linear Algebra
MAT 262
Mathematical Economics
ECO 480
Econometrics
ECO 485

Computer Programming experience (e.g., R, Matlab, Python)

Other general admissions criteria are described in the general section of this catalog.

**Requirements**

Successful completion of 30 credit hours of course work is required for the M.A. in Financial Economics degree. Students also must pass an oral examination before the completion of their program. Graduate students in this program are required to complete the following sequence of courses:

- ECO 511 - Macroeconomic Theory Credits: 3
- ECO 514 - Microeconomic Theory Credits: 3
- ECO 530 - Econometrics Credits: 3
- ECO 531 - Advanced Econometrics and Applications Credits: 3
- MBA 651 - Financial Management Credits: 3

In addition, students are required to take:

- Two additional graduate courses in economics (Credits: 6)
- Two of three graduate business courses from the following list:
  - BUA 652 - Management of Financial Institutions Credits: 3;
  - BUA 653 - Investment Management Credits: 3;
  - BUA 654 - Futures and Options Markets Credits: 3.

**Student Support**

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for assistance with either research or teaching. Efforts are made to match the student's interests and background with the needs of the School. Scholarship funding is also available. The faculty nominates top-ranking applicants for these awards; funding support includes a stipend, tuition costs, and subsidized health insurance coverage. Additional funds are provided to students on a competitive basis to cover research expenses. Graduate assistantships require 20 hours of work per week. For details on funding opportunities contact the Graduate Coordinator of the School of Economics via the website at [http://www.umaine.edu/soe/](http://www.umaine.edu/soe/)

**Graduate Faculty**
The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy and human ecology expertise.

**Mario Teisl**, Ph.D. (University of Maryland), Professor. Information economics, food safety, environmental and social marketing, and environmental economics.

**Kathleen Bell**, Ph.D. (University of Maryland), Professor and Interim Director of the School of Economics. Environmental economics, public economics, and spatial economics.

**Christine Beitl**, (University of Georgia) Cooperating Assistant Professor of Anthropology, Ph.D. Ecological and Environmental Anthropology. Intersections of socio-political, ecological, and economic systems.

**James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

**Andrew Crawley**, (University of Glamorgan) Assistant Professor in Regional Economic Development. Economic impact, economic modeling.

**Adam Daigneault**, (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. freshwater management, climate change mitigation and adaptation, invasive species control, valuing ecosystem services.

**Angela Daley**, (Dalhousie University) Assistant Professor of Health Economics and Policy. Health and labor economics, poverty and inequality, social policy, children and families, rural and remote communities including aboriginal people.

**Keith S. Evans**, (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery management; nonmarket valuation; applied econometrics.

**Todd Gabe**, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance.

**Sharon Klein**, Ph.D. (Carnegie Mellon University), Associate Professor. Renewable energy, energy economics and policy, environmental impacts of electricity generation, energy generation, and energy storage.

**Jonathan Malacarne**, (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

**James McConnon**, Ph.D. (Iowa State University), Professor. Regional and community economic development, innovation, and small business management.

**Caroline Noblet**, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

**Jonathan Rubin**, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

**Philip Trostel**, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

**Tim Waring**, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

**Tommy Wiesen**, (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics.
Food and Nutrition Sciences

The program leading to the Ph.D. in Food and Nutrition Sciences is a cooperative offering of faculty in the School of Food and Agriculture. Ph.D. candidates choose a focus (animal science, food science, or human nutrition) as a major area of study and research and a Graduate Committee is formed to include members from one or more of these academic areas. A typical doctoral committee consists of a chair who must hold a doctoral degree, at least two other University of Maine faculty members in the same discipline and another 2-3 faculty members with complementary areas of expertise.

There is no minimum credit requirement. An individualized program of study is developed by the student and Graduate Committee according to guidelines prepared by the Food and Nutrition Sciences Program Committee. Course requirements are flexible but include 4 credits of seminar (FSN 571, FSN 671, SFA 672) with formal courses in food and nutrition sciences and related areas chosen to prepare the student for comprehensive examinations and research expertise. Desirable courses for the candidates for the Ph.D. in Food and Nutrition Sciences are given by each of the cooperating programs and are listed in the Course Descriptions section of this catalog. Additional courses offered by other departments may be taken upon approval of the student's graduate committee.

Students working on a federally-funded research project must also complete a Responsible Conduct of Research (RCR) course before or during the first semester of graduate research. The training is required for all doctoral students. The following courses may be taken to satisfy the RCR requirement:

- FSN 524 - Responsible Design, Conduct and Analysis of Research (3 credits) (may also be used to fulfill the statistics requirement)
- INT 601 - Responsible Conduct of Research (1 credit)
- BIO 505 - Professionalism in Biology (2 credits)
- CMJ 600 - Introduction to Graduate Study in Communication (2 credits)
- PSY 603 - Ethics and Professional Problems (3 credits)
- SFR 521 - Research Methods (3 credits)
- SMS 691 - Marine Science Seminar (1 credit)

Comprehensive examinations are required at the end of formal course work but may be taken no earlier than one year in the program. Both written and oral examinations must be passed. The written must be passed before the oral and a maximum of three attempts is allowed for the written/oral examinations combined.

Doctoral students must document a professional competency ("special skill") unrelated to their dissertation research; this competency may be demonstrated via course work or other practical activities. Competencies may include languages, research techniques such as electron microscopy, innovation engineering, marketing, or distance education.

An original research investigation is carried out under the direction of a major advisor. A dissertation is prepared to describe the results of the research, and results are presented in a formal seminar. Although Ph.D. students are encouraged to publish manuscripts with their advisors, there is no minimum number of publications required for graduation.

The Food and Nutrition Sciences faculty are located in Hitchner and Rogers Halls. Research facilities are equipped for food safety and microbiology, food processing, food composition, and food quality evaluation. The Sensory Evaluation Center offers computerized sensory evaluation services. A pilot plant for processing fruits and vegetables, seafood and dairy products is available on site. There is a fully-equipped kitchen for food product preparation and several research laboratories for applied human studies or animal research. Special facilities and equipment are available in the College and University, including DNA sequencing, electron and confocal microscopes, and a small animal care facility.
**Graduate Faculty**

**Alfred A. Bushway**, Ph.D. (Purdue, 1978), Professor Emeritus. Fruit and vegetable post-harvest quality and safety, and product development. Dr. Bushway is no longer accepting graduate advisees.

**Jason Bolton**, Ph.D. (University of Maine, 2012), Associate Extension Professor and Food Safety Specialist. Food safety; food processing; product development

**Beth L. Calder**, Ph.D. (University of Maine, 2003), Associate Professor and Extension Food Science Specialist. Assisting the food industry with research, food testing and educational programs in the areas of food safety and technology. Director of the Process and Product Review Testing Services.

**Mary Ellen Camire**, Ph.D. (Texas Woman's University, 1989), Professor. Development, evaluation, and consumer acceptance of healthful foods; sensory science and consumer research, healthy aging, nutrition education and behavior; dietary fiber; whole grains

**Dorothy Klimis-Zacas**, Ph.D. (Pennsylvania State University, 1982), Professor. Cholesterol, lipoprotein, trace mineral nutrition and metabolism as related to chronic diseases. Berry bioactives and their role on inflammation and vascular function, metabolism and gene expression related to chronic diseases (cardiovascular disease, diabetes, metabolic syndrome). Trans-cultural studies on the role of Mediterranean diet(s) on chronic diseases.

**Robson Machado**, Ph.D. (Pennsylvania State University, 2016), Assistant Extension Professor and Food Safety Specialist. Helping Maine farmers and food entrepreneurs develop safe foods, while assisting processors to address changing regulations when commercializing local food and beverage products.

**Jade McNamara**, Ph.D. (University of Rhode Island, 2018), Assistant Professor of Human Nutrition. Exploring the relationship between nutrition and food literacy and dietary behaviors, developing curricula and interventions, theory-driven behavior change methods to influence healthy behavior change in youth and young adults, evidence-based instructional practices for critical thinking in health studies and higher education. Instrument/survey development to assess behavior and perceptions of health.

**L. Brian Perkins**, Ph.D. (University of Maine, 2002), Research Assistant Professor, Instructor and Program Coordinator. Chromatographic (HPLC, GC) method development for bioactive compounds phytonutrients, and toxic substances (naturally-occurring & synthetic) in food and environmental matrices.

**Jennifer Perry**, Ph.D. (The Ohio State University, 2010), Assistant Professor. Microbial food spoilage; non-thermal technologies, biocontrol and biopreservation; food safety; food processing.


**Kathryn L. Yerxa**, M.S., R.D. (University of Maine, 2003), Associate Extension Professor. Nutrition education; obesity prevention; food security.

**Associate Graduate Faculty**

**Neil Greenberg**, MSc. (University of Maryland, 1992), Assistant Director of Aquatic Operations. Aquaculture.

Lawrence Leblanc, Ph.D. (SUNY Stony Brook, 2001), Research Scientist. Environmental organic chemistry.

Lisa Phelps, Ph.D., Program Administrator, University of Maine Cooperative Extension. 4H.

Kathleen Savoie, M.S., R.D. (University of Massachusetts-Amherst, 1991), Associate Extension Professor. Community nutrition; food security; food safety; food preservation.

Susan S. Sullivan, D.Sc., R.D. (Boston University, 1995), Associate Director, School of Food and Agriculture. Clinical nutrition topics and vitamin D.

Sharon Tate, M.S., R.D., L.D. (Montana State University, 2002), Clinical Dietitian, Maine Medical Center. Portland, ME. Clinical nutrition.

Food Science and Human Nutrition

The School of Food and Agriculture provides students with the opportunity to obtain an M.S. degree in Food Science and Human Nutrition, and a Ph.D. in Food and Nutrition Sciences. Faculty research programs include nutrition behavior change, obesity prevention, berry bioactives and their role in disease prevention and amelioration, food processing and preservation, food safety and quality, seafood quality, sensory evaluation, and product development.

The M.S. program includes three tracks: 1) Food Science and Human Nutrition; 2) Dietetic Internship; 3) UMaine Online Combined Human Nutrition and Food Technology. Tracks 1 and 2 have a thesis and non-thesis option, track 3 has only a non-thesis option. Track 3 is completely delivered through UMaine Online. Students in track 3 are not eligible for assistantships or fellowships and cannot apply to the doctoral program upon completion of the online M.S.

Applicants in track 1 with a Food Science focus must have successfully completed undergraduate training with either a major or minor in one of the biological or physical sciences with courses in organic chemistry and biochemistry or an undergraduate degree in food science, food technology, food engineering or processing. Applicants in track 1 with a Human Nutrition focus should have an undergraduate degree in nutrition (or approved by the Academy of Nutrition and Dietetics), human ecology, chemistry, biochemistry, or in an appropriate combination of biological sciences with courses in nutrition, organic chemistry, biochemistry, and human physiology. Track 2 is only available to students who have obtained a verification statement from an Accreditation Council for Education in Nutrition and Dietetics (ACEND) accredited undergraduate program and who have matched into the University of Maine Dietetic Internship Program. Applicants selecting the combined Human Nutrition and Food Technology UMaineOnline program (track 3) should have had one year of college-level chemistry, one year of college-level biology (with one semester being Anatomy & Physiology), and an entry-level nutrition course.

The School of Food and Agriculture also offers a Double-Up program in which students can earn their B.S. and M.S. with a focus in food science in 5-6 years. Double-Up students begin taking graduate-level courses in their Junior or Senior year. Three courses- FSN 502 Food Preservation, FSN 585 Sensory Evaluation I, and FSN 587 Food Analysis - may be applied towards the M.S. requirements, resulting in significant tuition savings. Additional information about the Double-Up program (also referred to as a 4+ program) can be found below.

The Master of Science in Food Science and Human Nutrition (thesis) requires: 30 credit hour minimum, typically taking two years to complete

- 12 credit hours of FSN formal coursework minimum (see list of applicable courses below), with no more than 4 credits at the 400 level, exclusive of seminars and special problems courses.
  FSN 501 Advanced Human Nutrition; FSN 502 Food Preservation; FSN 506 Nutritional Assessment;
  FSN 508 Nutrition & Aging; FSN 510 Trace Mineral Nutrition, Metabolism, and Clinical Applications;
FSN 512 Current Food Safety Systems; FSN 517 Food Safety and Quality Control; FSN 520 Food Product Development; FSN 524 Responsible Design, Conduct and Analysis of Research; FSN 528 Food Microbiology; FSN 529 Food Microbiology Laboratory; FSN 530 Integrative and Functional Nutrition; FSN 538 Fermented Foods and Probiotics; FSN 540 Advanced Clinical Topics; FSN 545 Utilization of Aquatic Food Resources; FSN 555 Organic and Natural Foods; FSN 565 Type 2 Diabetes, Obesity and Food; FSN 580 Food Chemistry; FSN 584 Lipids, Diet and Cardiovascular Disease; FSN 585 Sensory Evaluation I; FSN 586 Sensory Evaluation II; FSN 587 Food Analysis; FSN 603 Nutrients in the Food System; or SFA 551 Infectious Diseases and Food Safety- From Plants to Humans.

- 2 credit hours graduate seminar, FSN 571 and FSN 671
- 3-4 credits of statistics at the 400 or higher level
- one approved Responsible Conduct of Research course (see list below)
  - FSN 524 - Responsible Design, Conduct and Analysis of Research (3 credits) (may also be used to fulfill the statistics requirement)
  - INT 601 - Responsible Conduct of Research (1 credit)
  - BIO 505 - Professionalism in Biology (2 credits)
  - CMJ 600 - Introduction to Graduate Study in Communication (2 credits)
  - PSY 603 - Ethics and Professional Problems (3 credits)
  - SFR 521 - Research Methods (3 credits)
  - SMS 691 - Marine Science Seminar (1 credit)
- no more than 6 credits as FSN 581, Problems in Food Science & Human Nutrition
- minimum GPA of 3.0 for graduation

The Master of Science in Food Science and Human Nutrition (non-thesis) requires:

- 30 credit hour minimum, typically taking two years to complete
- 15 credit hours of FSN formal coursework minimum, with no more than 4 credits at the 400 level, exclusive of seminars and special problems
- 2 credit hours graduate seminar, FSN 571 and FSN 671
- 3-4 credits of statistics at the 400 or higher level
- 3 credits of FSN 695 Food Science and Human Nutrition Practicum
- Minimum GPA of 3.0 for graduation

The Dietetic Internship and Master of Science degree, thesis or non-thesis, requirements are the same as those listed above except for:

- 34 credit hour minimum, typically taking two years to complete
- FSN 650 Dietetic Internship Orientation and Application I, FSN 651 Dietetic Internship Orientation and Application II, FSN 652 Dietetic Internship Evaluation, and FSN 681 Dietetic Supervised Practice
- 12-15 credit hours of FSN formal coursework minimum including FSN 506 Nutritional Assessment and FSN 540 Advanced Clinical Topics, with no more than 4 credits at the 400 level, exclusive of seminars and special problems courses
- 3-4 credits of statistics at the 400 or higher level
- 21-month continuous enrollment to complete FSN 650, 651, 652, and 681. FSN 681 is completed as 1 credit in the summer and 5 credits in the fall or spring, depending upon an individual student's program

The Master of Science in Food Science and Human Nutrition: Combined Human Nutrition and Food Technology online track requires:

- 30 credit hour minimum, typically taking two years to complete.
- 27 credit hours of FSN formal coursework minimum including FSN 501 Advanced Human Nutrition, FSN 502 Food Preservation, FSN 524 Responsible Design, Conduct and Analysis of Research, and FSN 543
Communication in Nutrition and Food Technology. All other course selections must be approved UMaine Online FSN graduate courses carrying an 0990 section code (FSN 506 Nutritional Assessment; FSN 508 Nutrition and Aging; FSN 530 Integrative and Functional Nutrition; FSN 538 Fermented Foods and Probiotics; FSN 545 Utilization of Aquatic Food Resources; FSN 555 Organic and Natural Foods; FSN 585 Principles of Sensory Evaluation; and FSN 603 Nutrients in the Food System). Other courses offered are not eligible for the online tuition discount and may not be applied towards the degree or a graduate certificate.

- A minimum of 3.0 GPA to graduate

**Double-Up Accelerated Degree Program: 4 + 1 (nonthesis) and 4 + 2 (thesis):**

Students in the food science concentration of the B.S. program in Food Science and Human Nutrition may apply for "early admission" to the combined degree program in their third year of the food science curriculum. Interested students should have completed their organic chemistry/biochemistry sequence and BMB 300/305 by the end of the semester in which they apply for the 4+ program. Students are encouraged to discuss the program with faculty members and identify a potential advisor who may be different from the undergraduate advisor. A minimum GPA of 3.0, with no grades below C in FSN courses is required. Applications for the 4 + 1 program will not be accepted after the senior year has commenced or if 100 credits hours have already been earned towards the B.S. in Food Science and Human Nutrition. An application form and two letters of reference from faculty members including the future graduate advisor and a third letter written by a work supervisor or a faculty member should be submitted to the Graduate Coordinator for Food Science and Human Nutrition by February 15 of the student's third year of matriculation in the food science concentration. The faculty advisor will work with each student to create a plan of study that leads to graduation in 15 months (nonthesis) or 21 months (thesis) after matriculation in the master's program. The program of study and the provisional admission must be communicated to the Graduate School by the Graduate Coordinator.

The formal application for admission to the graduate program through the Graduate School can occur anytime during the fourth (senior) year of the undergraduate program. Graduate Record Examination (GRE) scores must be submitted with the Graduate School application. Students should apply for graduation when B.S. requirements are completed. The nine credits of 500-level coursework will be automatically transferred to the M.S. program.

Once admitted to the combined degree program, students may not enroll for more than 15 credits per semester. Grades of B- or lower may not be used towards the M.S. No more than nine credits of 500-level FSN classes required for the B.S. degree can be applied towards the combined degree. These classes are FSN 502 Food Preservation, FSN 585 Principles of Sensory Evaluation, and FSN 587 Food Analysis.

Students who take a dual-numbered course such as FSN 438/528 Food Microbiology are prohibited from taking both the 400- and 500-versions of those classes for credit. In addition to the nine credits shared by the B.S. and M.S. degrees, students must complete the following classes for the M.S.:

- FSN 571 Technical Presentations (1 credit)
- FSN 671 Advanced Graduate Seminar (1 credit)
- FSN 695 - Food Science and Human Nutrition Practicum (3-6 credits) or FSN 699 Graduate Thesis (6 credits)
- A minimum of 3 credits of statistics at the 400- or 500-level such as PSE 509 Experimental Design, FSN 524 Responsible Design, Conduct & Analysis of Research, STS 434 Introduction to Statistics, or STS 437 Statistical Methods in Research.

Additional graduate (500-600 level) FSN classes (2 (6-7 credits) for thesis students, and 3 (9-10 credits) for nonthesis students) such as FSN 501 Advanced Human Nutrition; FSN 506 Nutritional Assessment; FSN 508 Nutrition & Aging; FSN 510 Trace Mineral Nutrition, Metabolism, and Clinical Applications; FSN 512 Current Food Safety Systems; FSN 517 Food Safety and Quality Control; FSN 524 Responsible Design, Conduct and Analysis of Research; FSN 530 Integrative and Functional Nutrition; FSN 538 Fermented Foods and Probiotics; FSN 540 Advanced Clinical Topics; FSN 545 Utilization of Aquatic Food Resources; FSN 555 Organic and Natural Foods; FSN 565 Type 2 Diabetes, Obesity and Food; FSN 584 Lipids, Diet and Cardiovascular Disease; FSN 586 Sensory Evaluation II;
FSN 587 Food Analysis; FSN 603 Nutrients in the Food System; or SFA 551 Infectious Diseases and Food Safety-From Plants to Humans.

Thesis students and non-thesis students who want to work on federally-funded research projects must also complete a Responsible Conduct of Research (RCR) course before or during the first semester of graduate research.

Professional electives (not more than 4 credits at the 400-level, and no more than 3 credits as FSN 581 Special Topics in Food Science and Human Nutrition) selected by the student’s graduate advisory committee to total 141 credits for the combined degrees.

Graduate Faculty

Alfred A. Bushway, Ph.D. (Purdue, 1978), Professor Emeritus. Fruit and vegetable post-harvest quality and safety and product development. Dr. Bushway is no longer accepting graduate advisees.

Jason Bolton, Ph.D. (University of Maine, 2012), Associate Extension Professor, and Food Safety Specialist. Food safety; food processing; product development

Beth L. Calder, Ph.D. (University of Maine, 2003), Associate Professor and Extension Food Science Specialist. Assisting the food industry with research, food testing, and educational programs in the areas of food safety and technology. Director of the Process and Product Review Testing Services.

Mary Ellen Camire, Ph.D. (Texas Woman's University, 1989), Professor. Development, evaluation, and consumer acceptance of healthful foods; sensory science and consumer research, healthy aging, nutrition education, and behavior; dietary fiber; whole grains

Dorothy Klimis-Zacas, Ph.D. (Pennsylvania State University, 1982), Professor. Cholesterol, lipoprotein, trace mineral nutrition, and metabolism as related to chronic diseases. Berry bioactives and their role in inflammation and vascular function, metabolism, and gene expression related to chronic diseases (cardiovascular disease, diabetes, metabolic syndrome). Trans-cultural studies on the role of the Mediterranean diet(s) on chronic diseases.

Robson Machado, Ph.D. (Pennsylvania State University, 2016), Assistant Extension Professor, and Food Safety Specialist. Helping Maine farmers and food entrepreneurs develop safe foods while assisting processors in addressing changing regulations when commercializing local food and beverage products.

Jade McNamara, Ph.D. (University of Rhode Island, 2018), Assistant Professor of Human Nutrition. Exploring the relationship between nutrition and food literacy and dietary behaviors, developing curricula and interventions, theory-driven behavior change methods to influence healthy behavior change in youth and young adults, evidence-based instructional practices for critical thinking in health studies and higher education. Instrument/survey development to assess behavior and perceptions of health.

L. Brian Perkins, Ph.D. (University of Maine, 2002), Research Assistant Professor. Chromatographic (HPLC, GC) method development for bioactive compounds phytonutrients, and toxic substances (naturally-occurring & synthetic) in food and environmental matrices.

Jennifer Perry, Ph.D. (The Ohio State University, 2010), Assistant Professor. Microbial food spoilage; non-thermal technologies, biocontrol and biopreservation; food safety; food processing.

Denise I. Skonberg, Ph.D. (University of Washington, 1997), Associate Professor. Crustacean by-product utilization, quality evaluation of wild and farm-raised aquatic products, seafood product development.

Kathryn L. Yerxa, M.S., R.D. (University of Maine, 2003), Associate Extension Professor. Nutrition education; obesity prevention; food security.

Associate Graduate Faculty

Neil Greenberg, MSc. (University of Maryland, 1992), Assistant Director of Aquatic Operations. Aquaculture.


Lawrence Leblanc, Ph.D. (SUNY Stony Brook, 2001), Research Scientist. Environmental organic chemistry.

Lisa Phelps, Ph.D., Program Administrator, University of Maine Cooperative Extension. 4H.

Kathleen Savoie, M.S., R.D. (University of Massachusetts-Amherst, 1991), Associate Extension Professor. Community nutrition; food security; food safety; food preservation.

Susan S. Sullivan, D.Sc., R.D. (Boston University, 1995), Associate Director, School of Food and Agriculture. Clinical nutrition topics and vitamin D.

Sharon Tate, M.S., R.D., L.D. (Montana State University, 2002), Clinical Dietitian, Maine Medical Center. Portland, ME. Clinical nutrition.

Food Technology (Certificate)

The Food Technology graduate certificate program is ideal for professionals whose undergraduate education is in chemistry, microbiology, nutrition or engineering and would like to find employment in the food industry. The certificate also offers benefits for persons who have been working in the food industry but want to update their skill set with new knowledge on processing and quality assurance. Graduates of the certificate program will learn how to safely develop and market new foods.

The 12-credit graduate certificate in Food Technology is offered 100% online and will meet the needs of working professionals. The courses available to meet the 12-credit requirement are:

- FSN 502: Food Preservation
- FSN 517: Food Safety and Quality Control
- FSN 524: Responsible Design, Conduct and Analysis of Research
- FSN 538: Fermented Foods and Probiotics
- FSN 543: Communication in Nutrition and Food Technology
- FSN 545: Utilization of Aquatic Food Resources
- FSN 555: Organic and Natural Foods
- FSN 585: Principles of Sensory Evaluation
- FSN 603: Nutrient Changes in the Food System
The Food Technology graduate certificate program admission requirements include a baccalaureate degree from an accredited college or university with a minimum GPA of 3.0 on a 4.0 scale, one year of college level chemistry, one year of college level biology including one course of anatomy and physiology, and one college level introductory nutrition course.

Forest Resources

The School of Forest Resources (SFR), in the College of Natural Sciences, Forestry, and Agriculture, offers graduate study leading to a non-thesis Master of Forestry, a Master of Science in Forest Resources and a Ph.D. in Forest Resources. Several faculty in the School participate in interdepartmental degrees offered through the Ecology and Environmental Sciences Program. As of May 2018, the Master of Science and Ph.D. programs offered by the School may be in one of the following concentrations: Forest Ecosystem Science, Forest Policy and Economics, Human Dimensions of Natural Resources, Bioproducts Engineering and Parks, Recreation and Tourism.

Students may choose from a wide range of specialties, including forest biological sciences (forest ecology, silviculture, forest genetics, soils, entomology, physiology, and pathology), forest biometrics (inventory, modeling, remote sensing, GIS and spatial analysis), forest economics and policy, forest business administration, forest management and planning, forest operations science, wood science and technology (bioenergy, wood composites, wood engineering, renewable nanomaterials), and forest-based parks, recreation, and tourism.

The forestry program at The University of Maine is one of the oldest in the United States with undergraduate degrees accredited since the early years of professional forestry in the United States. All graduate forestry degrees are offered under full University accreditation and, in addition, the Master of Forestry degree is accredited by the Society of American Foresters, meeting the educational requirements for professional licensure.

The School of Forest Resources is housed in Nutting Hall, with well-equipped laboratories for both basic and applied graduate research, greenhouse facilities on campus, and several field research stations throughout the state.

Maine, the most heavily forested state in the United States, sets the context for SFR research, though projects reach beyond state and national boundaries. Much of the research in the SFR is field oriented, and there are a variety of ecosystems and socioeconomic conditions available for investigation. The College is responsible for the management of the Dwight B. Demeritt Forest, a 1,700-acre tract adjoining the campus, the 4,000-acre Penobscot Experimental Forest, and nearly 4,000 acres of other forest properties in Maine. In addition, Maine contains millions of acres of forest land that are
under diverse management by large ownerships, forest industries, small ownership parcels, state and federal forests, and Acadia National Park. Through the cooperation of these diverse landowners, opportunities exist for silvicultural, on-site wood processing, and ecological studies. Maine's systems of land use regulation and forest taxation and the state's long-standing reputation as a "vacationland" for forest recreation provide other categories of potential research interest.

The Barbara Wheatland Geospatial Analysis Laboratory provides a center of excellence for geospatial analysis in graduate student and faculty research, along with undergraduate education and professional development. The lab houses computer workstations equipped with image processing and GIS software, and research leverages a data acquisition and image analysis program using manned and unmanned aircraft. The program supports numerous basic and applied research projects with the primary focus on exploring innovative ways to leverage remote sensing and geospatial technology for forest and natural resource management, environmental monitoring and conservation, forest ecosystem science and climate change.

Forestry graduate study opportunities are strengthened by association with strong research programs within the SFR College of Natural Sciences Forestry and Agriculture, elsewhere on the Orono campus, and in the region. The Center for Research on Sustainable Forests was established in 2006. The Center brings together University of Maine researchers working in the interdisciplinary areas of forest resources. The Center is a resource for the public regarding Maine forest research and the sustainability of Maine's forests. The Cooperative Forestry Research Unit is funded by Maine landowners to conduct research on the intensive management of northeastern forest types. Graduate students studying in wood science & technology have access to world class equipment and researchers through strong ties to two research units on campus. The Advanced Structures and Composites Center (https://composites.umaine.edu/) houses a 100,000 ft^2 state of the art facility for materials and wood engineering research. The Forest Bioproducts Research Institute (www.forestbioproducts.umaine.edu) mission is to advance understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts. An Acadian Forest Ecosystem Research Program carries on long-term research on the nearby Penobscot Experimental Forest. The USDA Forest Service research program in Orono (through the Northern Research Station) employs scientists who hold appointments among the College's graduate faculty. A scientist from the USDA Forest Products Laboratory (FPL) is also stationed at the University of Maine facilitating scientific and research interactions with FPL scientists. Cooperative relationships also are common between the School of Forest Resources and several other University of Maine departments.
Admissions

Students are admitted to the graduate programs in the School of Forest Resources on the basis of academic records, Graduate Record Exam (GRE) scores, experience, and recommendations. All applicants requesting financial aid will be considered for the several teaching and research assistantships available each year; no additional forms are required. Several private or government funded research assistantships secured by individual faculty are also available on a competitive basis. Applications for admission in the fall semester should be submitted by January 15, especially if the applicant is seeking financial aid. Undergraduate students in the School of Forest Resources may opt for continuing their studies to earn the non-thesis Master of Forestry degree, providing certain academic requirements are met (see the SFR website). The SFR 4+1 MF option permits undergraduate students to take up to nine credits of graduate-level course work during their senior year which will apply to both BS and MF degrees. Undergraduates should apply to the SFR 4+1 program during their junior year.

Degree Requirements

In addition to meeting all of the requirements of the Graduate School, graduate students in the School of Forest Resources must select an advisory committee, develop a program of study, and prepare a thesis or project proposal as early in their programs as possible. Other course requirements are established by the student and her or his advisory committee. Master of Science students must pass a thesis defense upon completing their thesis without a dissenting vote of the advisory committee. Ph.D. students must take a mandatory comprehensive examination, consisting of both written and oral sections, usually administered after most of the student's course work has been completed. Both this comprehensive examination, the passage of which is a prerequisite to further study, and the final examination at the end of a Ph.D. program may be passed with no more than one dissenting vote of the examining committee.

Further Information

For details about specific aspects of the School of Forest Resources graduate programs, visit our web sites or contact the Graduate Coordinator, School of Forest Resources, via Cindy Paschal, Administrative Support Supervisor, Telephone: (207) 581-2841; e-mail: cpaschal@maine.edu.

Graduate Faculty

John J. Daigle, Ph.D. (Massachusetts, 1997), Professor of Forest Recreation Management.
Adam J. Daigneault, Ph.D. (Ohio State University, 2006), Assistant Professor of Forest, Conservation, and Recreation Policy.

Sandra De Urioste-Stone, Ph.D. (University of Idaho, 2008), Associate Professor of Nature-based Tourism

Ivan J. Fernandez, Ph.D. (University of Maine, 1981), Professor of Soil Science.

Shawn Fraver, Ph.D. (University of Maine, 2004). Associate Professor of Forest Ecology

Douglas J. Gardner, Ph.D. (Mississippi State, 1985), Professor of Wood Science and Technology.

Islam Hafez, Ph.D. (University of Minnesota, 2018), Assistant Research Professor.

Daniel J. Hayes, Ph.D. (Oregon State University, 2006), Barbara Wheatland Associate Professor of Geospatial Analysis and Remote Sensing.

Keith Kanoti,, M.S. (University of Maine, 2005), University Forest Manager.

Laura S. Kenefic, Ph.D. (Maine, 2000), Assistant Research Professor of Forest Resources.

Anil Raj Kizha, Ph.D. (Louisiana State University A&M, 2012), Assistant Professor of Forest Operations.

Christian Kuehnec, Ph.D. (Institute of Silviculture, 2004).

Jessica Leahy, Ph.D. (University of Minnesota, 2005), Professor of Human Dimensions of Natural Resources.

Ling Li, Ph.D. (University of New Brunswick, 2014), Assistant Professor of Sustainable Bioenergy Systems.

William H. Livingston, Ph.D. (Minnesota, 1985), Associate Professor of Forest Resources.

Parinaz Rahimzadeh Bajgiran, Ph.D. (University of Tokyo), Assistant Professor of Remote Sensing of Natural Resources.

Amber Roth, Ph.D. (Michigan Technological University, 2012), Assistant Professor of Forest Wildlife Management.

Stephen M. Shaler, Ph.D. (Pennsylvania State University, 1986), Director, School of Forest Resources, Professor of Wood Science and Technology, and Associate Director, Advanced Structures and Composites Center.

Mehdi Tajvidi, Ph.D. (University of Tehran, 2003). Associate Professor of Renewable Nanomaterials.


Jay Wason, Ph.D. (SUNY, 2016). Assistant Professor of Forest Ecosystem Physiology.

Aaron R. Weiskittel, Ph.D. (Oregon State, 2006), Professor of Forest Biometrics and Modeling.

External Graduate Faculty:

Jesse Abrams, Ph.D. (Oregon State University, 2011)

Mohammad Bataineh, Ph.D. (Stephen F. Austin State University, 2006)

Michelle Baumfleck, Ph.D. (Cornell University, 2015)

Jeffrey Benjamin, Ph.D. (University of New Brunswick, 2006)

John-Pascal Berrill, PhD. (University of California, Berkeley, 2008)

Steven Bick, Ph.D. (Virginia Tech, 1996)

Arun Bose, Ph.D. (University of Quebec, Canada, 2014)

Nathaniel Brunsel, Ph.D. (Utah State University, 2003)

Zhiyong Cai, Ph.D. (Purdue University, 1997)

Chris Colocousis, Ph.D. (University of New Hampshire, 2010)

Bruce Cook, Ph.D. (University of Minnesota, 2008)

Kara Costanza, Ph.D. (University of Maine, 2017)

Mindy Crandall, Ph.D. (Oregon State University, 2014)

Katherine Crowley, Ph.D. (Cornell University, 2009)

Anthony D'Amato, Ph.D. (University of Massachusetts, 2007)

Mark Ducey, Ph.D. (Yale University, 1996)

Marla Emery, Ph.D. (Rutgers University, 1998)

Joshua Fisher, Ph.D. (UC Berkeley, 2006)
Nicholas Fisichelli, Ph.D. (University of Minnesota, 2012)

David Foster, Ph.D. (University of Minnesota, 1983)

Rene Germain, Ph.D. (State University of New York, 1997)

Adam Gibson, Ph.D. (Colorado State University, 2011)

Tian Guo, Ph.D. (North Carolina State University, 2016)

Yousoo Han, Ph.D. (University of Wisconsin, 2002)

Ryan Hanavan, Ph.D. (University of Idaho, 2008)

Sean Healey, Ph.D. (University of Washington, 2002)

David Hollinger, Ph.D. (Stanford University, 1984)

Emily Silver Huff, Ph.D. (University of Maine, 2015)

Christopher G. Hunt, Ph.D. (University of Wisconsin, 2006)

Lloyd Irland, Ph.D. (Yale, 1973)

Tora Johnson, Ph.D. (University of Maine, 2015)

Laura Kenefic, Ph.D. (University of Maine, 2000)


Erin Lane, Ph.D. (University of Maine, 2004).

Donald MacKay, PhD. (University of Minnesota).

David MacLean, Ph.D. (University of New Brunswick, 1978).

Isabel Munck, Ph.D. (University of Wisconsin-Madison, 2008).


Kristin Peet, M.F. (University of Maine, 2013).

Peter Pekins, Ph.D. (Utah State University, 1988).

David Ray, M.S. (University of Maine, 1997).
Jean-Claude Ruel, Ph.D. (Universite Laval, 1987).

Anica Miller-Rushing, M.E. (Boston College, 2004).

Brian Roth, Ph.D. (University of Florida, 2010).

Todd Rushing, Ph.D. (University of Southern Mississippi, 2004).

Erin Seekamp, Ph.D. (University of Idaho, 2006).

Santosh Serchan, M.S. (Pokhara University).

Nathan Siegert, Ph.D. (Michigan State University, 2004).

Stephanie Snyder, Ph.D. (Johns Hopkins University, 1996).

William Carter Stone, M.S. (Florida State University, 2003).

Crista Straub, Ph.D. (University of Maine, 2012).

David Struble, M.S. (University of Maine, 1974).

Neil Thompson, Ph.D. (University of Northern British Columbia, 2017).

Bret Vicary, Ph.D. (University of Maine, 1986).

Jinwu Wang, Ph.D. (Washington State University, 2007).

Jeremy Wilson, Ph.D. (University of Washington, 1988).

Stephen Wyatt, Ph.D. (Universite Laval, 2003)

Emeritus Graduate Faculty:

Robert W. Rice, Ph.D. (Virginia Polytechnic Institute and State University, 1988), Emeritus Professor of Wood Science and Technology.

Robert S. Seymour, Ph.D. (Yale University, 1980). Emeritus Professor of Forest Resources.

G. Bruce Wiersma, Ph.D. (SUNY, 1968), Emeritus Professor of Forest Resources.
French

The Department of Modern Languages and Classics offers a Master of Arts in Teaching (M.A.T.) French, a Master of Arts in Teaching (M.A.T.) Spanish; a Master of Arts (M.A.) in French with optional concentrations in French Literature or North American French Studies. For details see the Modern Languages and Classics graduate web page or contact the graduate coordinator in the department.

Master of Arts in Teaching French

The M.A.T. in French (30 credits) has been redesigned with the collaboration of the campuses of the University of Maine System specifically to meet the needs of Maine's schools. The programs offer full-time instruction during the academic year to meet the requirements of pre-service teachers and an intensive institute during the summer for in-service teachers. Candidates take seven to eight courses (21-24 credits) in language, literature, culture and linguistics in the target language, one course in language pedagogy (MLC 466/566) and one course on teaching the exceptional student in English (SED 500). An oral exam and a professional teaching portfolio which illustrate the candidate's familiarity with Maine's teaching standards and his/her readiness to teach a second language in the K-12 classroom are the final requirements for both degrees.

Practicing teachers who are already certified to teach French or Spanish may opt to take additional courses in their target language, or they may resume the study of a second foreign language at the advanced (400 or 500) level in lieu of taking courses leading to certification.

Master of Arts in French

This program (30 credits) is intended for individuals with an interest in language, linguistics, literature, and culture and who are considering pursuing a doctoral degree in the field. The candidate will be expected to demonstrate both oral and written proficiency in French in the course of his or her studies. Candidates must complete 24 credits of course work, with a minimum of 12 credits at the 500-level. The program of study may include courses in other departments when these relate to the student's field of interest. Six hours of thesis credits are also required. Upon completion of the thesis, the Master of Arts candidate will defend the thesis before a committee of the graduate faculty at an oral examination which will also include questions on the student's course work.

Master of Arts with a concentration in French Literature

This concentration is intended for individuals with an interest in literature. Candidates specializing in French literature are expected to complete the requirements for the M.A. described above by including four courses in literature, three of which must be at the 500-level, in their program of study.
Master of Arts with a concentration in North American French Studies

North American French studies at the University of Maine developed from a natural link between the department and the geographic location of the university. The large number of francophone citizens who make up the population of the state of Maine, the significant communities with French heritage (Québécois and Acadian) that surround it, and the presence of Franco-American and Canadian-American Centers on campus have combined to create a strong interest and an expertise in North American French language and culture. The requirements for this degree are similar to those of the M.A. described above. The primary difference is that literature, language, and culture courses will be oriented to francophone North America.

Financial Aid

The Department of Modern Languages and Classics annually awards two Teaching Assistantships in French. Graduate teaching assistants generally teach one first or second-year French course per semester. Graduate degree candidates may also be nominated for Trustee Tuition Scholarships and Chase Distinguished Research Assistantships offered by the Graduate School. Others may qualify for Canadian-American Center Assistantships, New England, Atlantic Provinces, and Québec Fellowships, and Foreign Language and Area Study awards available through the Canadian-American Center.

The Graduate School
University of Maine
5775 Stodder Hall, Rm 42
Orono, ME 04469-5755 Orono, ME 04469
207-581-3291
graduate@maine.edu

Dept. of Modern Languages & Classics
University of Maine
214 Little Hall
Orono, ME 04469-5742
207-581-2095
carlos.villacorta@maine.edu

Graduate Faculty

Carlos Villacorta Gonzales, Ph.D. (Boston University, 2009), Assistant Professor of Spanish and Department Chair. Twentieth and 21st Century Latin American Literature and Culture; Contemporary Peruvian Poetry; Post-modernism in Latin American, Urban Studies.

Zachary Ludington, Ph.D. (University of Virginia, 2014), Assistant Professor of Spanish and Graduate Coordinator. Modern and Contemporary Spain, the international Avant-Garde, La Edad de Plata, Translation.
Susan Pinette, Ph.D. (University of California, Irvine, 1999), Professor and Director, Franco-American Programs. Francophone literature. Eighteenth century French literature.

Frédéric Rondeau, Ph.D. (McGill University, 2010), Associate Professor of French and Director of the Canadian-American Center. 20th Century Quebec Literature and Culture; Counter-Culture (transnational perspective); Post-68 Literature, Culture, and Politics (France-Quebec); Francophone Literature of North America; Quebec Poetry and Literary Journals; Literary Avant-gardes; Contemporary French philosophy


### Associate Faculty

Andrea Mercado, M.S./M.A. (Florida International University, Miami, FL 2009) Instructor. Specializations in teaching English language learners, Underrepresented populations, Student with Limited/Interrupted Formal Education, Family and Community Partnerships


### External Faculty

Nancy Erickson, Ph.D. (Michigan, 1992), Associate Professor, University of Southern Maine. French Renaissance literature. French women writers.


### Emeriti Faculty


**Geographic Information Systems (Certificate)**

Geographic Information Systems have become a common information management and analysis tool used across many academic disciplines, government agencies and businesses. Students from diverse backgrounds may advance their career potential by building knowledge in this area. Practitioners in business, industry and government may be interested in acquiring base skills in this area to keep up with changing information technology in their work environment. The graduate certificate program is designed to provide a foundation in key aspects of geographic information systems.

The Graduate Certificate in Geographic Information Systems requires completion of a minimum of 15 credits of required coursework. These fifteen credits of coursework must include the following three core courses:

SIE 509 - Introduction to Geographic Information Systems
SIE 557 - Database System Applications
SIE 510 - GIS Applications

The remaining 6 credits may be selected from among the following set of courses:

SIE 507 - Information Systems Programming
SIE 512 - Spatial Analysis
SIE 515 - Human Computer Interaction
SIE 516 - Interactive Technologies for Solving Real-World Problems
SIE 525 - Information Systems Law
SIE 550 - Design of Information Systems
SIE 505 - Formal Foundations for Information Science
SIE 555 - Spatial Database Systems
SIE 558 - Real-Time Sensor Data Streams
SIE 559 - Geosensor Networks
SIE 580 - Ontology Engineering Theory and Practice

Only courses in which the student obtained a grade of B or higher count towards the completion of the Geographic Information Systems Graduate Certificate.
GIS Graduate Certificate Admission

Students to be admitted into the Geographic Information Systems Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, an essay, and a current resume that includes contact information for three references. Students can apply to transfer up to 3 credits of graduate course work into the GIS Graduate Certificate assuming the credits have not counted toward an undergraduate or another graduate degree. If not waived, the three core courses must be taken at the University of Maine. The GIS Certificate Coordinator must approve any transfer credits after assessing whether they are appropriate or not.

Continuation of GIS Certificate to M.S. in Spatial Information Science and Engineering or M.S. in Spatial Informatics

When nearing or upon completion of the GIS Graduate Certificate, students may apply for the MS Spatial Information Science and Engineering (all courses are both on campus and online) or the MS Spatial Informatics (online only). They must meet all the master's requirements for admission. Students can transfer from the GIS Graduate Certificate those SIE courses in which they received a grade of B or higher.

Additional Information

Advising Notes and Applying: https://spatial.umaine.edu/graduate-certificates/

Course Descriptions: http://gradcatalog.umaine.edu/ > Graduate Courses or see SIE course descriptions

Spatial Computing and Information Systems Graduate Faculty

M. Kate Beard-Tisdale, Ph.D. (Wisconsin, 1988), Professor and GIS Graduate Certificate Coordinator. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

Max J. Egenhofer, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

Nicholas A. Giudice, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

Torsten Hahmann, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.
Nimesha Ranasinghe, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Gerontology (Certificate)

The Interprofessional Graduate Certificate Program in Gerontology is designed to increase the knowledge, skills and abilities of health and human service professionals who provide care to older adults in a variety of settings.

This 9-credit program, offered via distance-education technology, will meet the needs of working professionals who, because of the rapidly aging population, find themselves caring for a growing number of older adults and their caregivers.

Graduates of the certificate program will be prepared to function as members of interprofessional teams to effectively address the health and human service needs of an increasingly diverse aging population.

Graduate Certificate Program admission requirements include a baccalaureate degree in any field with a GPA 2.75 or higher. Individual courses in the certificate program may be taken as electives by graduate students from any program. In addition, students who are enrolled in an undergraduate program may request permission of the instructor to take individual courses.

More detailed information on the certificate program can be found at umaine.edu/gerontology.

Global Policy

The School of Policy and International Affairs (SPIA) administers the Master of Arts in Global Policy. Core seminars define the body of knowledge and skills considered fundamental to assume a role in global policy development and analysis. These core courses include:

• SPI 501 - Methods of Inquiry and Research (3 credits)
• SPI 502 - Issues in World Economy (3 credits)
• SPI 503 - International Relations (3 credits)
• SPI 510 - Public Service Seminar (1 credit)

All students must complete an international internship (2-6 credits); students with suitable employment experience may waive some course requirements with graduate coordinator approval. The M.A. in Global Policy has four concentrations - International Environmental Policy; Climate Policy; International Trade and Commerce; and International Security & Foreign Policy. Although each concentration consists of distinct required and elective coursework, all focus on policy and policy choices. Other electives can be taken with preapproval from the graduate coordinator. Requirements of the M.A in Global Policy degree include a minimum of 33 graduate-level credit hours. SPIA only accepts grades of B or better in core seminars. See SPIA's Graduate Handbook for additional requirements. Requirements: An undergraduate degree in international affairs or a global policy field is not essential for admission. However, all students must complete certain prerequisites before finishing the program, including:

• Introductory Microeconomics (equivalent to UMaine's ECO 120) and Macroeconomics (equivalent to UMaine's ECO 121); and
• Demonstrate an intermediate-level proficiency in a foreign language.
**Financial Aid:** SPIA awards a limited number of scholarships and fellowships to well-qualified students on a competitive basis. Travel grants and internship scholarships are also available to students working on professional, research, and teaching projects. The Graduate School offers a few tuition waivers and modest fellowships. All applicants are considered for funding opportunities at the time of admissions review; no additional application is required.

**Students:** SPIA has approximately 30 graduate students from around the world with diverse undergraduate academic backgrounds, including majors in Political Science, International Affairs, Economics, Education, Business Administration, Engineering, History, and English.

**Applying:** SPIA reviews complete applications on a rolling basis. A complete package includes three letters of recommendation, and transcripts of all previous college work. Applications are available at The Graduate School website at http://www.umaine.edu/graduate/. Website: For more information about SPIA, please visit: www.spia.umaine.edu/

Correspondence:
The Graduate School
5775 Stodder Hall, Rm 42
University of Maine
Orono, ME 04469-5755
207-581-3291
graduate@maine.edu
www.umaine.edu/graduate

The School of Policy and International Affairs
5754 North Stevens Hall, Rm. 239
University of Maine
Orono, ME 04469-5754
207-581-3153
spia@maine.edu
http://spia.umaine.edu/

**Cooperating Graduate Faculty**

**Pankaj Agrrawal,** Professor of Finance

**George Criner,** Associate Dean of Instruction; Professor, School of Economics

**Habib Dagher,** Founding Executive Director of the Advanced Structures & Composites Center

**Elizabeth DePoy,** Professor of Interdisciplinary Disability Studies and Social Work

**William B. Farrell,** Principal Consultant, Swordfish Consulting International

**Per Erik Garder,** Professor of Civil and Environmental Engineering

**Stephen Gilson,** Coordinator and Professor of Interdisciplinary Disability Studies; and Professor of Social Work

**Kenneth M. Hillas,** Adjunct Professor of International Affairs

**Stephen Hornsby,** Director, Canadian-American Center, Professor of Geography and Canadian Studies

**Michael Howard,** Professor of Philosophy
High Leverage Practices to Promote Inclusion

Data from the National Center for Education Statistics indicate that 62% of all students identified with a disability are educated in the general education setting for 80% or more of the school day. The High Leverage Practices to Promote Inclusion Graduate Certificate responds to this critical and growing need for teachers to have appropriate support for serving all students in their classrooms, including students with disabilities, at risk students, and typical learners.

In the [Graduate Certificate in High Leverage Practices to Promote Inclusion](#) program, you will learn the practical tools to implement instructional changes that promote diversity and foster inclusivity in your classroom and within the school culture. You will join students from a variety of backgrounds and fields and participate in active learning experiences using evidence-based inclusive practices for students. You will learn about high leverage practices (HLPs) that are critical to helping students learn and for supporting students' social and emotional development. Field-based experiences are threaded throughout the program and candidates receive first-hand opportunities to translate research and theory into practice.
Certificate program objectives:

- Students will understand current issues and challenges relating to effective learning interventions,
- Students will apply the latest research in educational intervention,
- Students will promote positive learning and inclusive education,
- Students will interpret assessment data, and
- Students will develop knowledge and skills to better meet the diverse needs of students in all educational settings.

There are two tracks for the Graduate Certificate in High Leverage Practices to Promote Inclusion:

1. Special educators enroll in the following courses:
   - SED 532  Behavior management
   - SED 546  Intervention for Writing Difficulties
   - SED 566  Executive functioning
   - SED 545  Intervention for reading difficulties
   - SED 544  Math methods in special education

2. General educators or others supporting individuals with autism enroll in the following courses:
   - SED 546  Writing intervention for students
   - SED 566  Executive functioning
   - SED 545  Intervention for reading difficulties
   - SED 544  Math methods in special education

For more information, please visit the College of Education and Human Development.

Higher Education

HIGHER EDUCATION PROGRAMS (M.Ed., E.d.S., Ed.D., Ph.D.)

The programs in Higher Education advance the knowledge and skills essential for effective programmatic leadership in a variety of professional areas in today's colleges and universities. All programs emphasize the integration of oral and written communication skills, critical thinking skills, a cognitive understanding of colleges and universities as complex organizations, the social context within which they function, the individual identity development of the students they serve, and the effective use of technology in curriculum and communication.

Student Development in Higher Education (M.Ed., E.d.S)

M.Ed.: The Master of Education (MEd) in Student Development in Higher Education prepares entry-level professionals for a variety of positions in student affairs in postsecondary education in increasingly diverse and technologically advanced colleges and universities. Master's level academic coursework provides solid theoretical and practical grounding for understanding the student services profession in the context of colleges and universities as complex organizations including: student development, socio-cultural identity differences/diversity, ethical professional practice, research, and technological competence. The practical implications of coursework are explored through class discussions of application, internship experiences, and graduate assistantships in a variety of campus offices.

The Master's Program in Student Development in Higher Education encompasses a body of knowledge and theory that provides a basis for professional practice. It is designed around the guidelines established by the Council for the
Advancement of Standards for Student Services/Development Programs. Theory-to-practice internships provide hands-on experience in a student affairs setting. The 36-credit-hour graduate program in Student Development in Higher Education includes three major components:

1. Student development in higher education core (19 credit hours): A set of courses required of all students in the program providing a base of knowledge about colleges and universities and student development as a field. The core includes at least 3 credit hours of internship experience and 3 credits of electives. The program culminates in an integrating capstone seminar and final paper.
2. Research Core (6 credit hours): Two courses providing a basic understanding of assessment, research design and statistical methods for conducting and/or interpreting research.
3. Focus Block/Concentration (11 credit hours): An area of emphasis specific to the student's interests: Options include: educational leadership, women's studies, counseling, and an individualized option.

E.d.S.: The College of Education and Human Development provides an option for an Education Specialist providing a cohesive program of professional development beyond the master's level for educational specialists. The program of study is individually planned by the student and his or her advisor. A minimum of 30 semester hours of work beyond the master's level is required to earn the E.d.S. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. A master's degree in the E.d.S. subject matter is required for admission to the program.

At the master's level students typically hold graduate assistantships with offices and programs at UMaine for which they apply directly to the specific offices.

Additional information regarding the program and the supplemental admissions process is available from Higher Education admissions, 136 Shibles Hall, University of Maine, Orono, Maine 04469 or by visiting the program's website https://umaine.edu/edhd/graduate/higher-education-masters-cas/

Application deadline for the M.Ed. is April 1st for Fall enrollment, but those seeking graduate assistantship positions should apply no later than December 1st for preferred consideration.

Ph.D./Ed.D. in Higher Education

The doctoral program in Higher Education prepares ethical, visionary, informed, and competent programmatic and institutional leaders for increasingly diverse and technologically advanced colleges and universities.

Through its structure and content, the doctoral degree in Higher Education provides mid-career professionals with the theoretical and practical frameworks to understand colleges and universities as complex organizations within the American social context including foundations in leadership, law and policy, socio-cultural identity differences/diversity, ethical professional practice, historical context, and research. Students develop advanced research skills to explore critical questions related to these areas through coursework, evaluating existing scholarship, and by conducting original research.

Graduates of the Higher Education doctoral program will provide leadership characterized by:

- High-level analytic thinking
- Advanced research design and analysis skills
- Problem-solving skills
- Ethics-based decision making
- Understanding of the dynamics of socio-cultural identity differences
- Historical perspectives
• Understanding of colleges and universities as complex organizations
• An understanding of professional responsibilities, networks/communities, and ethics in the field
• Effective, persuasive, and inclusive written and oral communication skills
• Understanding the social context and complexities of higher education
• Comprehension of the impact of social, economic, political, and legal trends
• Computer literacy
• Flexibility and confidence to provide leadership in times of change

The structure of the program entails 90 credit hours past the bachelor's degree. Admission requires a master's degree for which variable credits may be applied to the doctoral degree, upon approval of program faculty and in accordance with Graduate School guidelines. The master's need not be in Education. The disciplinary backgrounds and the applied experience mid-career students bring with them are central to the learning environment. Students are expected to learn from one another as well as from faculty and others with specific expertise in areas of higher education. The student's program consists of a variety of group and individualized experiences culminating in the dissertation including:

• The Professional Core: a broad, common strand of doctoral level course work required of all students in the Higher Education program (18 credit hours)
• Research Foundation: a set of courses to provide expertise in evaluating and conducting research in educational settings including basic statistics and introductory qualitative research, research design and either advanced statistics or advanced qualitative research (a minimum of 12 credit hours)
• Professional specialization: a set of interdisciplinary courses tailored to the individual professional goals, needs, and interests (a minimum of 18 credit hours which may include master's work and work transferred from other institutions)
• Dissertation research structured to solve problems or produce knowledge with direct applicability to higher education practice (a minimum of 6 credit hours)

Additional information regarding the program and the supplemental admissions process is available from 136 Shibles Hall, University of Maine, Orono, Maine 04469 or by visiting the program website https://umaine.edu/edhd/graduate/higher-education-phd-edd/

Application deadlines: Students should check the program website to see if program is accepting doctoral applicants this year.

History

The Department of History offers both the M.A. and the Ph.D. degrees. There are two programs of study for the master's candidate. The thesis option requires the satisfactory completion of an extended essay based upon research in one's area of concentration as well as 24 additional hours of course work. The non-thesis option requires the satisfactory completion of 30 hours. While students who follow the thesis option must defend their written work, non-thesis students must pass a comprehensive oral examination.

A master's degree candidate may concentrate in American, Canadian, European, and East Asian history. The Ph.D. candidate may concentrate in either American, Canadian or International history and must become knowledgeable in two areas of history and in a related discipline. Other than these geographic areas of concentration, several faculty share expertise in borderlands, labor, Native American, environmental, and oral history. Faculty areas of specialization have also yielded much graduate work in women's history, science and technology, military history, historical geography, intellectual history, trans-national history, cultural history, and ethnic history among others.

M.A. students, in conjunction with a major advisor, select a) an area of concentration such as American, Canadian, European, or East Asian history, or b) a topic of concentration such as Technology, Environmental, or International history.
The Ph.D. candidate may concentrate in either American, Canadian-American, or International history and must become knowledgeable in two areas of history and in a related discipline. Comprehensive written and oral examinations in these areas usually are scheduled at the end of two years of preparation. The candidate also must submit a scholarly and substantial piece of original research (dissertation) and defend it before his or her committee. Candidates at both the master's and doctoral levels are expected to demonstrate competence in a foreign language. The student's advisory committee is responsible for determining specific requirements.

The Raymond Fogler Library is the historian's research center. Among its most significant collections are journals, books, and documents in Maine, New England, Canadian, and maritime history. The Maine History journal is edited out of the Department and provides opportunities for graduate students to learn about the editing, layout, graphics, and printing of a journal. Small travel grants are available for dissertation work at research centers in other cities.

Admission to the graduate program in history is based upon the requirements of the Graduate School, including GRE scores. The History Department currently awards on a competitive basis several teaching assistantships annually which pay a stipend and include a waiver of tuition. Students also may compete for other University scholarships.

In recent years, topics of theses and dissertations have included Black reformers and the early civil rights movement in Pittsburgh 1915-1945, managing the river commons in New England 1760-1860, cookbooks and the negotiation of domesticity in Anglo-America 1830-1880, Acadian sorcerers and Miꞌkmaq shamans in Acadian folklore, Jonathan Fisher and early American education 1780-1830, the Gospel of the northeastern frontier 1744-1764, Mothers' Aid in Maine and New Brunswick in the early 20th century, the 1994-1995 public debate over proposed national history standards, and divergent visions of technology within American-Egyptian relations in the 1950s.

Graduate Faculty

**Joel Anderson**, Ph.D. (Cornell, 2015), Lecturer, Medieval Europe, Viking and medieval Scandinavia, cultural and religious history.

**Mary Freeman**, Ph.D. (Columbia, 2018), Assistant Professor, New England and Maine History


**Mazie L. Hough**, Ph.D. (University of Maine, 1997), Associate Professor. U.S., Women, Political, Legal.

**Anne Kelly Knowles**, Ph.D. (University of Wisconsin-Madison, 1993), Professor. Historical Geography, Holocaust, Antebellum US, Labor and Immigration, History of Cartography, Geovisualization, and Historical GIS.

**Michael Lang**, Ph.D. (University of California, Irvine, 1997), Associate Professor. Modern Europe, historiography, intellectual history, international relations.


**Mark J. McLaughlin**, Ph.D. (University of New Brunswick, 2013), Assistant Professor of History and Canadian Studies. Environmental History, Canadian History, History of Science and Technology, Comics Studies.

**Stephen M. Miller**, B.A. (Tufts University); M.A. (New York University); Ph.D. (University of Connecticut), Adelaide & Alan Bird Professor and History Department Chair. Great Britain, South Africa, Military, Imperialism.
Micah Pawling Ph.D. (University of Maine, 2010), Assistant Professor, ethnohistory of Native North America, Native American, Wabanaki, environmental, United States, and Canadian history.

Liam Riordan, Ph.D. (University of Pennsylvania, 1996), Professor. Colonial British America, American Revolution, and Early U.S. Republic, cultural and social history.

Collaborative and Affiliated Graduate Faculty

Libby Bischof, Professor of History, University of Southern Maine

Stephen Hornsby, Professor of Geography, University of Maine

Michael J. Socolow, Professor of Communication and Journalism, University of Maine

Stefano Tijerina, Lecturer, Business School, University of Maine

Emeritus Graduate Faculty

William J. Baker, Professor Emeritus
John F. Battick, Associate Professor Emeritus
Richard Blanke, Professor Emeritus
Jay A. Bregman, Professor Emeritus
Alex Grah, Professor Emeritus
Richard W. Judd, Professor Emeritus
Jerome J. Nadelhaft, Professor Emeritus
Warren C. Riess, Associate Research Professor Emeritus
Scott W. See, Libra Professor Emeritus
William H. TeBrake, Professor Emeritus

Horticulture

The graduate Horticulture program at the University of Maine is available through the School of Food and Agriculture. It is a multi-dimensional program that offers graduate students the opportunity to explore the many aspects of horticulture through course work, teaching, extension, and scholarly research. Opportunities exist in a broad range of horticultural commodities such as: ornamental plant selection and evaluation, low-temperature tolerance, landscape plant production, blueberry physiology and hardiness, greenhouse production and management, pomology, tissue culture, and weed management. Students are encouraged to participate in all aspects of the Horticulture program and develop a well-rounded curriculum of study.

Students entering the graduate Horticulture program will be required to develop an original research project in one of the many facets of horticulture. In doing so, students will have access to extensive facilities such as the horticulture greenhouses, The Lyle E. Littlefield Ornamentals Trial Garden and Research Center, tissue culture and other lab equipment, as well as several other research facilities. Also, an extensive relationship exists with local, state, national, and international horticulture professionals, and graduate students are encouraged to not only take advantage of these resources, but to also provide a conduit between the program and industry members. Prospective students are encouraged to contact a faculty member directly for more information on individual research interests and potential courses of study. Additional information concerning graduate studies in Horticulture may be obtained from Dr.
Tsutomu Ohno (Graduate Coordinator) (ohno@maine.edu), or from the website, (http://umaine.edu/foodandagriculture/).

**Graduate Faculty**

**Stephanie Burnett**, Ph.D. (University of Georgia, 2004), Associate Professor of Horticulture.

**Lily Calderwood**, Ph.D. (University of Vermont, 2015), Extension Wild Blueberry Specialist and Assistant Professor of Horticulture.


**Matthew Wallhead**, Ph.D., (University of New Hampshire, 2016), Extension Ornamental Horticulture Specialist and Assistant Professor of Horticulture.

**Human Development**

The graduate program in Human Development is designed to provide advanced training, with special emphasis on child development and family relations. This program is designed for those interested in working in the human development field in such leadership positions as center director, director of services, program coordinator, case manager or project manager.

*The curriculum is designed to:*

- train students in the fundamentals of professional practice in agencies serving children, adolescents, adults and families
- provide students with advanced content in one or more research areas (e.g., early childhood, human sexuality, family relationships)
- provide students with internship opportunities in human service programs or in applied research mentored by a faculty member

**Degree Requirements**

The Master of Science degree in Human Development requires a minimum of 30 credit hours.

**Core Courses**

All candidates for the M.S. degree in Human Development must complete the following 6 core graduate courses:

- **HUD 551 - Fundamentals of Human Development** Credits: 3
- **HUD 552 - Professional Practices in Human Development** Credits: 3
- **HUD 553 - Program Planning and Evaluation in Human Development** Credits: 3
• HUD 554 - Legislation and Policy in Human Development Credits: 3
• HUD 555 - Grant Development in Human Development Credits: 3
• HUD 556 - Introduction to Research Methods in Child Development and Family Relations Credits: 3

Seminars

In addition to the coursework outlined above, students must complete six credit hours of HUD elective courses.

Internship

In their second year, students must also complete 6 credits of:

• HUD 601 - Supervised Fieldwork in Child Development and Family Relations Credits: 1-6
  Or
• HUD 699 - Graduate Thesis/Research Credits: Ar

Internship Options

The internship experience entails high-quality, professional placement with an agency or work on a research project with a faculty member in human development.

Option A: Leadership in an Agency. This option is appropriate for students with an interest in a career in a variety of settings, including federal, state or local governments, and public or private agencies that directly service the needs of children, adolescents, adults or families. In addition to the formal course requirements, students complete a 300-hour internship in a public or private agency in their last semester. If currently employed in a human development field, the employer would need to add new leadership responsibilities to the position.

Option B: Applied Research. This option is appropriate for students with an interest in pursuing graduate education in a doctoral program (typically in human development and family studies) or those otherwise interested in a career in research. In addition to the formal course requirements, students complete a research project based on original research supervised by a member of the faculty. Students complete a research article suitable for submission to an academic journal. Students in this option are encouraged to take one class in statistics or qualitative research design.

Application deadline is April 1st for Fall admission. A limited number of graduate assistantships are available on a competitive basis each year. Students interested in an assistantship should apply by January 15 and send a letter to the Associate Dean, College of Education and Human Development, requesting to be considered.

Applicants are evaluated on criteria including undergraduate GPA, letters of recommendation and matching program interests.
Human Nutrition (Certificate)

The Human Nutrition graduate certificate program is designed to enhance the knowledge and skills of health care professionals, exercise physiologists, and health educators in the area of human metabolism, nutrition assessment, and food systems. Dietitians can explore new areas of study such as integrative and functional nutrition, gerontology, and sustainability. Responsible conduct of research training is provided to enhance students' ability to work on research projects with nonprofit organizations or other institutions. Graduates of the Human Nutrition graduate certificate program will develop a foundation in nutrition science, be able to identify and evaluate current research on nutrition and health and use evidence-based nutrition strategies.

The 12-credit graduate certificate in Human Nutrition is offered 100% online and will meet the needs of working professionals. The courses available to meet the 12-credit requirement are:

- FSN 501: Advanced Human Nutrition
- FSN 506: Nutritional Assessment
- FSN 508: Nutrition and Aging
- FSN 524: Responsible Design, Conduct and Analysis of Research
- FSN 530: Integrative and Functional Nutrition
- FSN 538: Fermented Foods and Probiotics
- FSN 542: Sustainability, Nutrition, and Health
- FSN 543: Communication in Nutrition and Food Technology
- FSN 555: Organic and Natural Foods

The Human Nutrition graduate certificate program admission requirements include a baccalaureate degree from an accredited college or university with a minimum GPA of 3.0 on a 4.0 scale, one year of college level chemistry, one year of college level biology including one course of anatomy and physiology, and one college level introductory nutrition course.

Individually Designed Education

INDIVIDUALLY DESIGNED (M.Ed., Ed.S.)

M.Ed.: The college-wide individually designed Master of Education provides a cohesive program of professional development for educators. The program of study is individually planned by the student and their advisor. A minimum of 33 semester hours of work is required to earn the M.Ed. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. In lieu of a thesis, students must complete a comprehensive paper, project, portfolio, or oral examination, generally during the final semester or year of study. The purpose of this requirement is to enable demonstration of learning that has taken place across the program as a whole. The M.Ed. program is individually designed; however pre-planned concentrations are available in Art Education.
Ed.S.: The college-wide Education Specialist program provides a cohesive program of professional development beyond the master's level for educational specialists. The program of study is individually planned by the student and his or her advisor. A minimum of 30 semester hours of work beyond the master's level is required to earn the Ed.S.. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600 level at the University of Maine. A master's degree in the Ed.S. subject matter or related field is required for admission to the program.

Information Systems

Information Systems

The Master of Science in Information Systems program focuses on technical, managerial and policy issues associated with constructing and managing computer-based information systems for modern organizations. All areas of private and public enterprise rely on information systems for communication, planning, providing services, control and supporting decisions. The objectives of this program are to meet the growing demand in society for graduates with high-level information system skills and provide a path for women and men from diverse fields to rapidly transition to information system career paths by providing them with foundation graduate level courses in information systems. The program is explicitly designed to accommodate students from wide ranging undergraduate degree backgrounds.

Students develop knowledge and technical skills in foundation areas of formal methods, programming, information system design, human computer interaction and information law and ethics. Students gain working familiarity with one or more programming languages if not already acquired. Based on this foundation, students have leeway to craft a remaining selection of courses in consultation with and approval by their academic adviser and the MSIS steering committee. Flexibility is provided to accommodate the particular backgrounds, interests and information system professional career aspirations of each student as well as to be responsive to the ever-changing technological and business environments. Thus students might choose to focus additional coursework within a specific information systems domain or pursue course interests among several applications and theory domains including business, engineering, computer science, psychology, education and additional germane science areas. The goal is to prepare graduates to succeed as information system professionals in a variety of roles and settings.

Degree Requirements

The Master of Science in Information Systems (MSIS) consists of 30 credits, all earned in course work. The program consists of five three-credit required core courses and a minimum of fifteen additional credits from a list of elective courses approved for the program drawn from a range of disciplines. If some required courses are duplicative of courses that may have been taken in the student's undergraduate degree program, those courses need not be repeated, and the student will select in consultation with the Graduate Coordinator and the Steering Committee additional approved courses to arrive at the total of 30 credit hours. The MSIS is offered wholly on-campus as well as entirely online.

Required Courses

The following five courses must be taken and all count toward the graduate degree unless they were counted in a student's undergraduate program or are waived.

- SIE 507 - Information Systems Programming Credits: 3
- SIE 515 - Human Computer Interaction Credits: 3
- SIE 525 - Information Systems Law Credits: 3
- SIE 550 - Design of Information Systems Credits: 3
- SIE 505 - Formal Foundations for Information Science Credits: 3
Elective Courses

Students must take at least fifteen additional credits that are approved in advance by the MSIS Steering Committee from the following approved elective course listings in order to arrive at the total required of 30 credits. Students should NOT assume that any combination of the following courses will be approved by the Steering Committee. Students should obtain approval of their full program of study prior to taking elective courses to ensure that they count toward their degree requirements. Students may propose additional graduate courses than those listed below be included on their program of study on a case-by-case basis or added to the list. The MSIS Steering Committee assesses the reasonableness of such requests and makes the final decision on whether specific additional courses serving the objectives of the MSIS program and the needs of the student may be included.

Some of the elective graduate courses listed may require prerequisites in addition to the minimum required for general admission to the MSIS graduate program. Some schools and departments grant enrollment preference to graduate students in their own programs so check with the relevant department or college as appropriate.

Business

- BUA 601 - Strategic Data Analysis Credits: 3
- BUA 680 - Foundations of Business Intelligence and Analytics Credits: 3
- BUA 681 - Data Management and Analytics Credits: 3
- BUA 682 - Data Pre-Processing for Business Analytics Credits: 3
- BUA 683 - Information Visualization Credits: 3
- BUA 684 - Business Data Mining and Knowledge Discovery Credits: 3
- BUA 685 - Problem Solving and Decision Analysis Credits: 3
- BUA 686 - Predictive and Business Forecasting Credits: 3

Computer Science

- Any formally approved 400 level COS courses and above including those addressing machine learning, cloud computing, computer vision, and including:
  - COS 435/535 - Engineering Privacy in Software Systems
  - COS 565 - Data Visualization
  - COS 570 - Topics in Artificial Intelligence

Data Science and Engineering

- Any formally approved DSE graduate courses

Digital Curation

- DIG 500 - Introduction to Digital Curation Credits: 3
- DIG 510 - Metadata Credits: 3
- DIG 540 - Digital Collections and Exhibitions Credits: 3
- DIG 550 - Digital Preservation Credits: 3

Education
SIE 504 - The Beauty and Joy of Computing Credits: 3
EDT 520 - Methods of Teaching with Computer Technology Credits: 3
EDT 545 - Information Security in the Educational Environment Credits: 3

**Electrical and Computer Engineering**

Any 400 level ECE courses and above

**Interdisciplinary**

INT 601 - Responsible Conduct of Research Credits: 1

**Spatial Information Science and Engineering**

SIE 508 - Object Oriented Programming Credits: 3
SIE 509 - Principles of Geographic Information Systems Credits: 3
SIE 510 - Geographic Information Systems Applications Credits: 3
SIE 512 - Spatial Analysis Credits: 3
SIE 516 - Interactive Technologies for Solving Real-World Problems Credits: 3
SIE 517 - Spatial Interaction Design Credits: 3
SIE 554 - Spatial Reasoning Credits: 3
SIE 555 - Spatial Database Systems Credits: 3
SIE 557 - Database System Applications Credits: 3
SIE 558 - Real-Time Sensor Data Streams Credits: 3
SIE 559 - Geosensor Networks Credits: 3
SIE 580 - Ontology Engineering Principles Credits: 3
SIE 590 - Information Systems Internship Credits: 3-6

**Detailed Requirements**

- Programs of Study are approved for each student by the Steering Committee for the MSIS graduate program. This committee consists of the MSIS Graduate Program Coordinator and two additional graduate faculty members in the department or affiliated with the program.
- Each student's Program of Study must include the five required core courses with the remainder of courses to be selected from an approved course list maintained by the department or proposed by the student and assessed for possible approval. The list is regularly updated and includes appropriate courses drawn from across campus and other UMS campuses. Each student's Program of Study must be approved in advance by the MSIS Steering Committee.
At least 15 credits of the 30 required on a student's program of study must be at the 500 level or above.

Up to two courses may be taken at other universities by distance methods or otherwise if contained on the student's graduate program of study and approved in advance by the MSIS Steering Committee.

Up to two graduate courses may be transferred into the student's graduate program of study if taken prior to admission to the Graduate School, the courses did not count towards the student's undergraduate or other graduate degree requirements, and the courses are approved by the MSIS Steering Committee.

The MSIS Graduate Coordinator serves as the advisor for each student admitted to the program and the MSIS Steering Committee serves as the graduate committee for each student in the program.

All students must complete the entire M.S. graduate program of study within a six-year period (as established by the Graduate School).

Admission Requirements

Admission to the University of Maine Master of Science in Information Systems is competitive but on a rolling basis. In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully and achieve positions of leadership in the private or public sectors. While the submission of GRE scores and letters of recommendation are encouraged, they are not required. We generally seek an undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a four-year international equivalent. Within their curriculum, all applicants should have completed a university course in Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are recommended but not required. The review committee considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School. The entire application packet including transcripts, test scores, (if required), essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. To be considered for Fall admission, completed applications should be received if at all possible 8 weeks prior to the beginning of the term.

Concurrent Graduate Certificates - Applicants applying for the MS Information Systems that desire to acquire as well a Graduate Certificate in GIS, Information Systems, or Data Science and Engineering along the way to acquiring the MS, should apply additionally for the Graduate Certificate prior to completing the MS course requirements. For model curriculum examples that combine the MSIS with other graduate certificates, see Graduate Certificates.

Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students - High-performing undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the MS Information Systems graduate degree program. Applicants to the Accelerated Four Plus One should submit the Application for Admission to the SIE or MSIS Four Plus One Program. Such applications are not accepted after the senior year has commenced. For further details, see the MSIS Four Plus One Program.

Cooperating MSIS and Business Graduate Programs - A range of opportunities exist for gaining business graduate credentials while pursuing the MSIS. Please consult the MSIS and MBA Dual Degree and Cooperating MSIS and MBA Programs
Spatial Computing and Information Systems Graduate Faculty

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Information Systems (Certificate)

Information Systems (Certificate)

Technology is transforming today's organizations and information has become the lifeblood of modern enterprises. Information systems are vastly increasing the efficiency and effectiveness of organizations and allowing industry and commerce to provide innovative new services and products. As the need for information and its supply expands, the demand for knowledgeable analysts, integrators, designers, developers and administrators of such systems will continue to grow.

The Graduate Certificate in Information Systems requires completion of the following five courses:

- **SIE 507 Information Systems Programming** (3 credits)
- **SIE 515 Human Computer Interaction** (3 credits)
- **SIE 525 Information Systems Law** (3 credits)
- **SIE 550 Design of Information Systems** (3 credits)
- **SIE 505 Formal Foundations for Information Science** (3 credits)
All of these required courses are available in either the fall or spring semester simultaneously on-campus and online. Typically, distance students view class sessions over the internet that have been recorded with the on-campus students although some sessions may be pre-recorded. Students in both class sections accomplish the same assignments and exams. Online students may, at their option, participate in most classes live over the internet. Work sessions and/or office hours are typically offered at times convenient for online students.

If one or more courses are waived due to previous course work or acquired skills, the graduate coordinator in consultation with the student selects appropriate replacement courses.

Course Descriptions

Descriptions for courses in the program as well as alternative more advanced courses if core courses are waived may be found through the school's MS Information Systems Curriculum website. For more detailed descriptions and sample syllabi see the Spatial Computing Courses.

Student Eligibility and Admission Criteria

Students desiring to acquire the Graduate Certificate in Information Systems should apply by completing the Graduate Certificate Application. The entire application packet including transcripts, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. The time limit for completion of the Graduate Certificate is the same as that set by the Graduate School for completion of a master's degree.

Note 1: Combining the Graduate Certificate in IS with a Master's Degree - Upon or near the completion of the Graduate Certificate, students may choose to extend their coursework to earn a full Master's degree. For model curriculum examples that combine the Graduate Certificate in Information Systems with various sample online Master's degrees, see Graduate Certificates (Section III).

Note 2: Combining the Graduate Certificate in IS with the MBA - This combination is for the student most interested in a graduate business degree but who wants further information systems skills and knowledge. Thus, in addition to the MS degrees noted above, pursuing the Graduate Certificate in Information Systems in combination with the MBA is another popular option.

Spatial and Information Systems Graduate Faculty

M. Kate Beard-Tisdale, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

Max J. Egenhofer, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

Nicholas A. Giudice, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.
Torsten Hahmann, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

Nimesha Ranasinghe, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Innovation Engineering (Certificate)

The Graduate Certificate in Innovation Engineering gives students a complete array of tools and a systematic approach to creating, communicating and commercializing ideas in response to problems and opportunities in any field; they also learn how to lead the process of innovating within organizations-businesses, nonprofits, governments, educational institutions, arts organizations, etc. Graduate students in any field will benefit from having a Graduate Certificate in Innovation Engineering noted on their transcripts, in particular when they want to communicate their credentials to future employers.

Graduate students matriculated in any field may take the graduate coursework in Innovation Engineering; these students should notify the Director of Academic Programs in Innovation Engineering of their intention to complete the Certificate, and apply through the Graduate School.

Graduate non-degree students (students who have earned a Bachelor's degree or its equivalent) may apply for admission to the Graduate Certificate in Innovation Engineering with demonstrated depth of experience or expertise towards implementing projects in a specific area; to apply, send cover letter and resume to the Director of Academic Programs in Innovation Engineering, Foster Center for Student Innovation, University of Maine, Orono, ME 04469-5798, and submit the Graduate Certificate Application through the Graduate School.

Educational Objectives

Students will be able to use Innovation Engineering tools and methods to create and realize innovative, meaningfully unique solutions to problems in their chosen fields.
Students will be able to communicate the benefits of their innovations to target audiences.
Students will be able to apply fundamental theories and methods to work with teams or client groups to solve problems in any field.

Required Courses

- INV 510 Innovation Engineering Accelerated
- INV 511 Experience: Innovation Engineering Case Study
- INV 590 Using Innovation: Proposal & Project
Graduate students earn the Graduate Certificate in Innovation Engineering by completing, in this order, INV 510, INV 511, and INV 590 with a grade of B- or better in each course. Students must complete the coursework for the certificate within a period of five years.

**Instructional Design (Certificate)**

**Graduate Certificate in Instructional Design**

*A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine*

The University of Maine Graduate Certificate in Instructional Design helps students become leaders in effective and innovative uses of current and emerging technology. The required coursework, research, and clinical experiences are designed for educators working in a variety of contexts. Students will engage in inquiry-based curriculum and build capacity to continually assess their local context; implement technology to enhance teaching, learning and assessment; build professional learning networks to support ongoing professional development; and, develop expertise in current and emerging instructional technologies. Essential to this program is a commitment to local community, advocacy for accessibility, and social justice, especially in the context of the potential for new technology to influence educational settings.

Required for the **Certificate in Instructional Design**

1. EDT 540 Instructional Design and Project Management
2. EDT 541 Advanced Instructional Design
3. EDT 542 Supporting Technology Integration through Professional Development and Coaching
4. EDT 543 Practicum in Instructional Design

For more information: https://online.umaine.edu/contact-us/ or umaineonline@maine.edu

**Instructional Technology**

*A collaborative degree between the University of Maine, the University of Maine Farmington, and the University of Southern Maine.*

**Master of Education in Instructional Technology**

The University of Maine Master's program in Instructional Technology is a 33-credit fully online degree. It is designed to help students become leaders in effective and innovative uses of current and emerging technology. The required coursework, research, and clinical experiences are designed for educators working in a variety of contexts. Students will engage in inquiry-based curriculum and build capacity to continually assess their local context; implement technology to enhance teaching, learning and assessment; build professional learning networks to support ongoing professional development; and develop expertise in current and emerging instructional technologies. Essential to this program is a commitment to local community, advocacy for accessibility, and social justice, especially in the context of the potential for new technology to influence local educational settings.

The Masters in Instructional Technology is designed to investigate the following central questions:
● **Learning Environments**: How do educators leverage technology to create environments that support the development of diverse skills, and emphasize challenging learning experiences?

● **Teaching and Learning**: How can technology enhance teaching and learning partnerships that support and promote innovative models of deeper learning?

● **Digital Citizenship**: How can educators promote an understanding of the social, ethical and legal issues and responsibilities related to a globally connected society?

● **Professional Practice**: How can educators develop and model pedagogical and andragogical principles of learning to promote professional growth and practice in a globally connected society?

● **Leadership**: How can educators align vision, implementation, and practice to foster learning enhanced by technology?

Core Courses (21 credits)

- EDT 520 Digital Age Teaching and Learning Methods
- EDT 531 Studio in Computing for Learning
- EDT 540 Instructional Design and Project Management
- EHD 510 Introduction to Educational Research
- Technology for All Learners (speak with advisor for options)
- EDT 559 Leadership for Educational Technology
- Capstone - 1 of the following
  o EDT 657, Educational Practicum
  o EDT 693, Educational Internship
  o EDT 543, Practicum in Instructional Design

Electives (12 credits of approved electives)

In accordance with the Graduate School, with approval students may transfer up to six graduate-level credits taken within the last five years prior to matriculation. For more details on transfer credits, please refer to the Graduate School General Policy on transfer credits.

**Requirements for Admission:**

- Online application
- Official academic transcripts
- Résumé detailing your professional experience
- An essay describing your motivation for obtaining an M.Ed. in Instructional Technology

**Educational Specialist in Instructional Technology**

The University of Maine, in collaboration with the University of Southern Maine and the University of Maine at Farmington is pleased to announce a new, 100% online Education Specialist degree in the field of Instructional Technology. This is an advanced degree for students to build upon work during a masters and to enhance their leadership skills and knowledge. Students must have completed a master's degree, in education or a related field, to be accepted to this program.
The Education Specialist (Ed.S.) in Instructional Technology will require a minimum of 30 credit hours to complete. The exact course of study will be planned in careful consultation with an academic advisor. We look forward to working with you as you define your new direction and grow as a professional and leader in the field of instructional technology.

A minimum of 30 semester hours past a master's degree is required to earn the Ed.S. Coursework is taken at the 500/600 level. A minimum of 18 credits must be from the Instructional Technology program; a maximum of 12 credits may be from outside the program with permission of the academic advisor. Students also are required to complete a capstone experience, such as an action research project or internship. All work for the Ed.S. must be completed within a six-year period.

Requirements for Admission:

- Online application
- Official transcript for earned bachelor's degree
- Official transcript for earned master's degree
- Graduate GPA of 3.25 or above
- A 500-700 word statement describing the educational challenges you have encountered in your work, and how you think the Ed.S. program might help you overcome those challenges and lead to a desired goal. You are encouraged to review the available course listings and mention a few specific courses from the instructional technology program, or other graduate areas, that would be relevant to your goals.
- One letter of recommendation from a current administrator

For more information: https://online.umaine.edu/contact-us/ or umaineonline@maine.edu

**Interdisciplinary Program**

The Interdisciplinary Ph.D. (IPhD) program allows well-qualified graduate students the opportunity to pursue study in multidisciplinary areas of inquiry where expert faculty are available to guide doctoral research.

For such a program to be feasible, there must be at least one member of the Graduate Faculty who is a specialist in the area of the student's interest, and three additional Graduate Faculty members (in at least two departments) who are prepared to supervise the proposed research. The fifth member of the committee is usually an outside scholar. The chairperson and the majority of advisory committee members must have experience in supervision and direction of doctoral students and have a strong record of research and scholarly activity. Students will not be able to gain admission to the IPhD program unless they can demonstrate evidence of an interdisciplinary research focus and a suitable dissertation advisory committee to the IPhD policy and admissions committee.

**General Eligibility and Admission Criteria**

- A master's degree (or equivalent) in a discipline related to the proposed area of study.
- Submission of a detailed program of study and a prospectus discussing the proposed research focus. The student's program of study must identify and be endorsed by the UM Graduate Faculty who have agreed to supervise the coursework and the dissertation.
- All other materials required by the Graduate School for students applying to doctoral programs.
While this program may be individually planned, it is not a program that is conducted independently of the UM campus, nor by distance education. The majority of coursework is taken through the University of Maine, and except for the admission procedures, the policies and regulations governing the Interdisciplinary Ph.D. are the same as those for other Ph.D. programs.

Graduate assistantships for this program are usually limited to advisors' current grants or to competitive selection for a Graduate School assistantship or fellowship, see Financial Information section of this catalog. In some instances, departments have funded teaching assistantships for Interdisciplinary Ph.D. students.

Before submitting the application, arrangements must be made to meet with a representative of the Graduate School office to explore academic and professional goals and to assess the University's capabilities to offer graduate coursework in the student's proposed area. The IPhD admission guidelines, https://umaine.edu/graduate/resource/interdisciplinary-phd-guidelines/ will also be reviewed at this meeting.

Application materials include a description of the applicant's goals and objectives, program of study, research prospectus, vitae of the proposed advisory committee, and supporting academic credentials (e.g. transcripts, letters of recommendation). Application deadlines are November 1 for spring admission and April 1 for summer or fall admission.

Some interdisciplinary faculty groups at the University of Maine have established formal concentrations within the Interdisciplinary program. Those are noted elsewhere in this catalog. In these interdisciplinary concentrations, applications are reviewed by the program admissions committees after receipt by the Graduate School.

**Interdisciplinary Studies**

The Master of Arts in Interdisciplinary Studies (MAIS) program offers mature students with appropriate academic qualifications (minimum 3.0 undergraduate GPA) the opportunity for interdisciplinary graduate work. Students who enter the program may pursue their study on a full-time or part-time basis.

The program is based on the assumption that technical competence and specialized training are best employed in combination with knowledge traditionally fostered by the liberal arts and sciences. Through core seminars, an individualized program of study, and the completion of a master's project, students may explore major issues and synthesize knowledge from several disciplines.

Similar programs have attracted professionals who feel they need further study to investigate complex issues connected with their work or interests. Some teachers and librarians find such a course of study an alternative to graduate work in education or in another single discipline. Others see the program as an improvement over a self-directed study of reading or participation in a series of unrelated courses beyond the baccalaureate degree. By emphasizing the integration of knowledge in different disciplines, the program offers a unique alternative to traditional graduate study.

Prior to making application to the Interdisciplinary Studies program, students must contact the Graduate School to arrange an interview to discuss interests and academic goals. Applicants to the Maine Studies and Peace Studies concentrations may contact the coordinator of that concentration in lieu of the Graduate School.

After the interview, applicants whose academic goals are consistent with the mission of the program must ensure that the Graduate School receives the following materials:

1. An e-mail to graduate@maine.edu from a faculty member at the University of Maine who has agreed to serve as the primary advisor.
2. Two letters of recommendation. Students are strongly encouraged to use the online letter of recommendation feature within the online application or have recommenders send an electronic copy to graduate@maine.edu.
3. Official college/university transcripts from all institutions attended.
4. Application for graduate degree. The online application feature allows applicants to include an essay which presents student's life experiences as well as objectives and reasons for applying to the program.
5. Online application fee of $65.00.

Admission is contingent upon the positive vote of the majority of the members of the Admissions Review Committee. General application deadlines are the first Monday in November for the Spring semester and the first Monday in April for the Fall or Summer terms. Completed applications for the concentrations in Maine Studies or Peace Studies may be considered up to six weeks before the beginning of the term of admission.

**Degree Requirements:**

Students in the program must complete:

- 6 to 9 semester hours of interdisciplinary core seminar (IDS 500) credit or interdisciplinary 500-/600-level courses as deemed appropriate by the advisor
- 15 to 21 semester hours of additional graduate level credit approved by the student's advisory committee to meet the individual student's academic interests
- 3 to 6 semester hours of Master's Project (IDS 699) credit developed from the student's coursework and research

Of the minimum 30 semester hours total credit required, at least 15 hours, not including the credit for the master's project, must be in 500- and/or 600-level courses.

In addition to the self designed option, formal concentrations within the Interdisciplinary Studies program are available in Disability Studies, New Media, Maine Studies, and Peace and Reconciliation Studies. The Maine Studies and Peace Studies concentrations may be completed via distance education with careful planning and close advising from the coordinators of the concentrations.

Further information on the Interdisciplinary Studies M.A. program and the coordinator contact information for individual concentrations is available from the Graduate School. ([http://www.umaine.edu/graduate/mais](http://www.umaine.edu/graduate/mais))

**Intermedia (Studio)**

The MFA in Intermedia is an interdisciplinary, studio-centered program committed to hybrid creative research, experimental technological production, as well as development and production in forms of art such as time-based media, digital and video art, installation, performance art, artists' books and multiples, community-based social art practices, conceptual art, net art, and other forms that the students may generate from their own Intermedial explorations. These newer forms are however, not without grounding in, or connections to, traditional art forms in the visual arts, music, writing, performance studies, and media studies.

The MFA focuses on the intersection of new technologies and creative production. The name of the program "Intermedia" reflects our aim and intent - that is to work with and study creative processes that fall conceptually and physically between known/used media, as well as between traditional disciplines such as photography and computer science, biology and sculpture, or music and sociology. Students will develop diverse skills grounded in methodologies from many disciplines that foster the experimental, analytic, and speculative processes necessary for innovative production and creative thinking in Intermedia.

**Program Requirements**
The three-year IMFA degree in Intermedia at the University of Maine provides graduate students with the opportunity to engage in innovative, creative and theoretical work in a flexible program that encourages individual research and development within an interdisciplinary context. The 60-credit curriculum is designed for 18 credits per year with 6 credits in summer of the third year for Thesis Exhibition preparation and presentation, but it may also be completed on a part time basis over a longer period of time.

Financial Aid

In addition to University fellowships and scholarships listed elsewhere in this catalog, the Intermedia Program offers graduate assistantships to qualified students. Graduate assistantships can take the form of either a RA or TA position. RA positions include working independently or with faculty, in a variety of research and program support roles dependent on the student's background and skills. TA positions are offered in conjunction with undergraduate New Media classes and thus require specific media and/or programming knowledge. Teaching assistants are carefully supervised and develop instructional skills that prove useful in later professional careers. Assistantships are nine-month appointments that include tuition waiver and/or monthly stipends. Applicants interested in an assistantship should indicate this in their initial application for admission and contact the Intermedia Program for information on specific available assistantships.

Course of Study

Given the nature of Intermedia as a non-disciplinary specific, research-based activity it is central that the program be simultaneously structured but flexible to allow for varieties of student choices and areas of study. The standard conceptual and structural elements of the program consist of the following areas or categories:

- Basic creative approaches, history and theory
- Ongoing individualized research and creative production
- Praxis production and research studio work
- Individualized technical and theoretical areas
- Field experience/study abroad experience

Contact Information:

Dr. Susan L. Smith, Director, susan.lynn.smith@maine.edu

207.581.4470

Area One

This area consists of two foundational classes:

- IMD 500 - Creative Concept Development Credits: 3
- IMD 501 - Histories and Theories of Intermedia Credits: 3
These two classes will be required of all first-year MFA students and will give them strong foundations in diverse approaches to creative and research work as well as historical and theoretical foundations in Intermedia.

Area Two

Ongoing individualized research and creative production will be facilitated through Intermedia Studio Critique classes:

- IMD 570 - Intermedia Studio Critique I Credits: 3
- IMD 571 - Intermedia Studio Critique II Credits: 3
  
  In these classes students will gain practical experience in conceptualization of work, design implementation, physical production, and presentation of research/creative work.

Area Three

Praxis production and research studio work consists of three primary areas taken in three different classes (one taken each year).

- IMD 560 - Research Studio I: Critical Research Methods for Creative Production Credits: 3
- IMD 561 - Research Studio II: Projects in Collaborative Production Credits: 3
- IMD 562 - Research Studio III: Professional Development and Large-scale Practices Credits: 3

Area Four

Individualized technical and theoretical areas are explored through elective offerings each semester. Every full-time student will take one elective course related to his or her interests and foci each semester. These can be drawn from IMD 520, IMD 530 and IMD 540 topical courses or graduate level courses from across the campus as they relate to individual IMFA student's areas of research and work.

Area Five

Field or Study Abroad Experiences are expected of all IMFA students. As part of the Intermedia Program students are expected to take at least one field study course (but may take up to three such courses) that adds to their interdisciplinary study in the IMFA Program. This can include study in another subject area, a residency, or an apprenticeship. Students can also choose to take one semester (usually the first semester of the third year) to study or work abroad to meet this requirement.

Applications
Applications are accepted once a year. The priority deadline is February 15th (for consideration for RA/TA Awards) of the year in which you wish to start your graduate studies, but rolling acceptance continues through June until all open positions are filled. Applicants must complete an application to the Graduate School as well as send a CV, portfolio and letters of reference to the Intermedia Program.

Correspondence

The Graduate School
5775 Stodder Hall Room 42
University of Maine
Orono, ME 04469-5775
207-581-3291
graduate@maine.edu

Intermedia Program

101 IMRC Center, Stewart Commons
University of
Orono, ME 04469-5785
207-581-4390
Vfiggins@maine.edu
207-581-4389
ofsmith@maine.edu

Kinesiology and Physical Education

A general, science-based curriculum provides the foundation for this 30 credit hour Graduate program. However, the curriculum is designed with 6-9 credit hours of electives, allowing the student to focus on his/her specific academic interest within the field. Classroom and laboratory experiences are designed to provide the student with an applied understanding of the scientific basis of exercise/training in different populations.

The program offers two paths towards a Master's degree. Each includes a minimum of 30 credit hours.

M.Ed.: (non-thesis) Admission to this track requires scores from either the Miller Analogies Test (MAT) or the Graduate Record Examination (GRE).

M.S.: The M.S. requires carrying out an original piece of research resulting in a written thesis. Admission to this track requires scores from the GRE.

Library and Media Specialist (Certificate)
A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine

The Graduate Certificate in Library and Media Specialist is a 100% online program preparing teachers, educational leaders, and resource specialists to facilitate and advocate for equitable access to information for all students. Aligning to the current standards for school librarianship by the American Library Association and the American Association for School Librarians, this program develops the knowledge and skills to manage school library and information services. Students in this program also learn how to:

- Become an effective educator of learning in the digital age including instruction, assessment, and curriculum development
- Demonstrate efficient and ethical information-seeking behavior and teach this behavior to students
- Apply theories of Library Information Science to school libraries including teaching, management, and leadership
- Strategically plan, facilitate and advocate for flexible, open access to library resources and services
- Be an ethical, forward-thinking leader in the field of education and in school libraries

Required for the Certificate in Classroom Technology Integration

- EDT 515: Dynamic PK-12 Library Management
- EDT 516: Reference and Research for Digital Age Teaching, Learning and Libraries
- EDT 520: Digital Age Teaching and Learning Methods
- EDT 531: Studio for Computing in Learning
- EDT 561: Technology-Supported Inquiry-Based Teaching and Learning

For more information: https://online.umaine.edu/online-graduate-certificate-in-library-and-media-specialist/

https://online.umaine.edu/contact-us/ or umaineonline@maine.edu

Literacy Education

LITERACY EDUCATION PROGRAMS (M.S., M.Ed., Ed.S., Ph.D.)

The Master of Education, Educational Specialist, and Doctor of Philosophy programs in the Literacy, Language and Culture Program provide practicing teachers and advanced professionals in literacy and related areas with the opportunity to explore current issues of literacy research and instruction with nationally and internationally recognized faculty in an atmosphere that encourages discussions and inquiry. While Maine is a national leader in many measures of literacy achievement in schools, changing global needs require continual examination and implementation of best literacy practices. Coursework, with faculty who have extensive experience with schools and public school students, balances theoretical and practical issues to inform and change literacy practices. Because all literacy courses require on-going practical classroom experiences, applicants seeking admission to graduate courses and programs in literacy should normally have a minimum of two years of successful teaching experience.
Application for admission is conducted online through the Graduate School and requires three letters of recommendation, a statement of intent, Miller's Analogy Test scores for Master's students (waived for students whose undergraduate GPA was 3.0 or higher), and GRE scores for Ph.D. students, transcripts from all previous institutions and the application fee.

Interested applicants are encouraged to contact a faculty member in the Literacy, Language and Culture Program prior to application to address any questions and for assistance in selecting the most appropriate program for the applicant's goals.

Master's programs in literacy are sometimes offered to cohorts in various sites around the state.

Master's Programs in Literacy

M.Ed. in Literacy Education (33 credits)
The M.Ed. in Literacy Education is designed to further elementary and secondary teachers' knowledge of literacy theories, practices, and research. Applicants should normally hold certification in either elementary or secondary education and have a minimum of two years of successful teaching experience. The M.Ed. in Literacy Education does not lead to Maine certification. The M.Ed. in Literacy Education program has a required core of 15 hours of coursework. To fulfill elective requirements, students consult with their advisor to identify appropriate courses.

Required Core Courses:
(15 credits)
EHD 510 Introduction to Educational Research (3 credits)
ERL 517 Literature for Children or ERL 518 Literature for Young Adults (3 credits)
ERL 540 Writing in Schools and Colleges (3 credits)
EEL 561 Literacy Processing I (3 credits)
EEL 562 Literacy Processing II (3 credits)
ERL 601 Seminar in Reading (3 credits)
Elective Requirements for Elementary Teachers:(18 credits)
ERL 534 Literacy and Language Development (3 credits)
ERL 553 Assessment in Literacy (3 credits)
Electives: 15 additional credits. Three of five courses must be in Literacy. The remaining electives may come from any college or university program.
Elective Requirements for Secondary Teachers:(18 credits)
Three of six courses must be in Literacy. The remaining electives may come from any college or university program, including English.

Contact:
Elementary Focus: Dr. Susan Bennett-Armistead (susan.bennett-armistead@maine.edu)
Secondary Focus: Dr. Rich Kent (richard.kent@maine.edu)
The M.Ed. program in Literacy Education also offers the following concentrations: Literacy Specialist, and Individualized.

M.Ed. in Literacy Education (Literacy Specialist Concentration) (39 credits)
The M.Ed. in Literacy Education (Literacy Specialist Concentration) leads to Maine certification as a Literacy Specialist, K-12. Applicants must hold certification in either elementary or secondary education and have two years of successful teaching experience. The program is designed to reflect the International Reading Association's 2010 Standards for Reading Specialist/Literacy Coach competencies in the areas of literacy acquisition, assessment, individual learner and program evaluation and development, and literacy leadership. The
program is rigorous and tightly scheduled, with few choices. As such, applicants are encouraged to speak with an advisor early in the process to prepare a course plan.

Literacy Specialist Program Requirements include:

- EHD 510 Introduction to Educational Research (3 credits)
- ERL 517 Literature for Children or ERL 518 Literature for Young Adults (3 credits)
- ERL 534 Language and Literacy (3 credits)
- ERL 537 Literacy Across the Curriculum (3 credits)
- ERL 540 Writing in Schools and Colleges (3 credits)
- EEL 561 Literacy Processing I (3 credits)
- EEL 562 Literacy Processing II (3 credits)
- ERL 553 Literacy Assessment (3 credits)
- ERL 569 Clinical Practices (6 credits)
- EEL 652 Intervention Designs for Struggling Learners I (3 credits)
- EEL 653 Intervention Designs for Struggling Learners II (3 credits)

Contact:

Dr. Susan Bennett-Armistead (susan.bennett-armistead@maine.edu)

Individualized Concentration in Literacy, Language and Culture (33 credits)

The individualized concentration in the M.Ed. in Literacy Education offers students with the opportunity to focus on Writing and the Teaching of Writing as a low-residence option. The course of study is planned in consultation with a faculty advisor and includes online academic year courses and on-campus summer options. The program also includes an online practicum guided by a writing mentor.

Required Courses:

- ERL 590 Maine Writing Project Summer Institute (3 credits)
- ERL 544 Digital Writing in Classrooms (3 credits)
- ERL 540 Writing in Schools & Colleges (3 credits)
- ERL 541 Writing and the Teaching of Writing (3 credits)
- ERL 590 Special Topics in English Language Arts: Seminar in Fiction (3 credits)
- ERL 590 Special Topics in English Language Arts: Seminar in Crafting Story (3 credits)
  or
- ERL 590 Special Topics in English Language Arts: Seminar in Memoir (3 credits)
- EHD 657 Writing Practicum (3 credits)

Plus additional electives (3 credits)

Contact:

Dr. Rich Kent (richard.kent@maine.edu)

See MaineWritingProject.org

Ed.S. in Literacy
The Education Specialist Program in Literacy Education (30 credits)
The College of Education and Human Development's Education Specialist programs provide students with a cohesive program of professional development beyond the master's level. The program of study is individually planned by the student and their advisor. A minimum of 30 semester hours of work beyond the masters level is required to earn the Ed.S. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. A master's degree in Literacy Education or a closely related field is required for admission to the program.

Ph.D. Program in Literacy Education

The Ph.D. program in Literacy Education is designed for individuals exhibiting leadership in literacy, such as curriculum development, teacher research, publishing, professional presentations, and theoretical research. It prepares candidates for academic positions in universities, positions in administration and supervision of literacy programs at the local, state and federal levels, textbook and other kinds of publishing endeavors, and employment in various departments of government. Each candidate's program is individually developed based on the student's background, goals and objectives, and the requirements of the degree. A primary function of the Ph.D. program is to develop competency in diverse educational research strategies as a significant means of advancing knowledge. Applicants must interview with the faculty in the Literacy, Language, and Culture Program, and must provide evidence of successful teaching experience, a record of professional leadership and responsibilities, and samples of professional writing. Application information is available from the Graduate School. For additional information about the program, please contact Dr. Susan Bennett-Armistead (susan.bennett-armistead@maine.edu).

Program of Study for the Ph.D. in Literacy Education

The Ph.D. program consists of five components: required coursework, coursework in research methodologies, elective coursework, practica experiences, and the dissertation. Specifically:

1. Literacy Coursework (minimum 15 credit hours). At least four seminars (ERL 590) must be completed at C.A.S./doctoral level. It is normally assumed the student is a recent graduate of a literacy master's degree program. For students with different backgrounds, a core of at least 15 credits of prerequisite literacy master's degree coursework may be required.

2. Research Methods (minimum 15 credit hours). Students are required to complete a minimum of 15 hours selected from courses such as the following in consultation with their doctoral program committee (e.g., EDG 595; EDS 521/EDS 522 Statistical Methods I and II); EDS 571/EDS 572 Qualitative Methods; Dissertation Pilot Course or other approved research coursework within the Literacy, Language, and Culture Program area).

3. Elective Coursework (minimum 12 credit hours typically outside of the Literacy, Language, and Culture Program area).

4. Practica Coursework. Students must complete either EDG 657 (Educational Practicum)
or EDU 690 (Methods of College Teaching).


Special Programs in Literacy

Reading Recovery® and Comprehensive Literacy Interventions
(For further information, call the University Training Center for Reading Recovery and Comprehensive Literacy (207) 581-2493.)
The College of Education and Human Development is a nationally-affiliated Reading Recovery Training Center, providing initial training and ongoing professional development for teacher leaders and teachers, as well as ongoing support for implementation at affiliated Reading Recovery sites. Interested applicants must have the involvement of the superintendent and school board in order to apply for Teacher Leader or Teacher Training. Reading Recovery coursework may be applied to graduate programs if approved by one's faculty advisor.

Courses for Reading Recovery teacher training consist of 2 courses spanning a school year:
EEL 598 Reading Recovery Teacher Training I (3 credits)
EEL 599 Reading Recovery Teacher Training II (3 credits)

Courses for Literacy Lessons™ teacher training (Special Education and ELL) consist of 2 courses spanning a school year:
EEL 596 Literacy Lessons™ Teacher Training I (3 credits)
EEL 597 Literacy Lessons™ Teacher Training II (3 credits)

Teacher Leader training requires a year-long training of 24 graduate credits, including:
EEL 655 Seminar: Issues Related to Reading Recovery Theory and Practice (3 credits)
EEL 656 Seminar: Issues Related to Reading Recovery Theory and Practice (3 credits)
EEL 657 Reading Recovery Internship I (3 credits)
EEL 658 Reading Recovery Internship II (3 credits)
EEL 659 Reading Recovery Practicum I (3 credits)
EEL 660 Reading Recovery Practicum II (3 credits)
and additional coursework in literacy interventions.

The Reading Recovery Training Center also provides initial training and support for a portfolio of literacy interventions for teachers of grades PreK-12 in instructional Tiers I to IV of a comprehensive literacy model.

Courses offered on campus or in affiliated Reading Recovery sites include:
EEL 561 Literacy Processing: Exploring How Students Learn to Read and Write I (3 credits)
EEL 562 Literacy Processing: Exploring How Students Learn to Read and Write II (3 credits)
EEL 563 Literacy Processing in Middle and High School Settings I (3 credits)
EEL 564 Literacy Processing in Middle and High School Settings II (3 credits)
EEL 565 Small Group Interventions for Middle and High School Students I (3 credits)
EEL 566 Small Group Interventions for Middle and High School Students II (3 credits)
EEL 596 Literacy Lessons™ Teacher Training (3 credits)
EEL 646 Dyslexia Studies Within a Literacy Processing Framework I (3 credits)
EEL 647 Dyslexia Studies Within a Literacy Processing Framework II (3 credits)
Maine Literacy Partnerships in Comprehensive Literacy (MPCL)

Maine Partnerships in Comprehensive Literacy (MPCL) at the University of Maine (UMaine) is a PreK to grade 12 Tier I continuous school improvement model. The model is dedicated to increasing the academic achievement of all students through ongoing professional development for educators. Literacy achievement is the tool used for measuring school improvement in four related areas: student learning, teacher perceptions, school climate, and school processes.

MPCL affiliated schools establish a partnership with the University Training Center (UTC) at UMaine to creating a system for successful literacy education. This commitment includes the:

- Training and support of a literacy coach within the school.
- Collection of data to monitor the progress of every student.
- Provision of safety nets for at-risk students.
- Establishment of a school leadership team.
- Development of a long-term professional development plan that includes every teacher.

Interested MPCL coach applicants must have a Master's degree and secure the approval of the building principal and district superintendent. MPCL coach coursework requires a yearlong, 9 credit course of study provided by the MPCL Trainer, including EEL 580/581 Theoretical Perspectives within MPCL Coaching I and II, and EEL 582/583 Clinical Practices in MPCL Coaching I & II. A subsequent coaching class, EEL 585 Reflective Practice in MPCL Coaching is offered on a regular basis.

The MPCL coach provides ongoing professional development for teachers at the school site, while the school team oversees and monitors the learning of all students. University of Maine graduate courses are taught at the school level by the MPCL coach. These courses include EEL 553/554 Literacy Teaching and Learning I and II; EEL 552 An Exploration of Writers Workshop in PreK-12 Classrooms; EEL 554 An Exploration of Readers Workshop in PreK-12 Classrooms; EEL 556 An Exploration of Language Workshop in PreK-12 Classrooms.

The school and coach maintain a partnership with the MPCL Trainer for ongoing professional development and implementation support. For further information, go to https://umaine.edu/maineliteracy.

National Writing Project

The Maine Writing Project is one of 200 sites of the National Writing Project, a network of K-college educators dedicated to the improvement of the teaching of writing and learning in America's schools. The annual institute of the Maine Writing Project is a six-credit course sequence focusing on current theory, research, and effective practices. in either a four-week, on-campus summer format or a spring semester online course (ERL 545) and a seven-day on-campus summer institute. Participants engage in developing and sharing effective teaching practices by crafting their own creative and expository writing, and by creating a workshop presentation in an area of their expertise. Participants earn six credits that fit most College of Education and Human Development programs of graduate study. At the completion of the institute, participants become Teacher-Consultants in the National Writing Project. They are eligible to further their study with the Seminar in Mentoring (ERL 547) and Advanced Institute in Teacher Leadership (ERL 548).

Contact Dr. Susan Bennett-Armistead for more information (susan.bennett-armistead@maine.edu) or visit the MWP website at http://umaine.edu/mainewritingproject/
Maine Arts and Humanities in Medicine (Certificate)

The Arts and Humanities in Medicine Certificate program is designed around a fellowship year where the physician or provider works at Northern Light/EMMC under the auspices of the Graduate Medical Education Committee while enrolled in the Program at the University of Maine. Art and Design can build creative bridges and new lines of communication between the external clinical experience and the internal turmoil within the patient. It can help shape their entire medical health experience by engaging multiple perspectives and senses, assisting the participant as they process complex layers of information and emotion.

Medical schools and medical education programs have begun to develop new approaches to cultivate interdisciplinary collaboration, both with the medical humanities and the arts, supporting creative approaches to health-related problems as well as providing the arts with a medical perspective that allows for bi-directional growth of both fields. Programs, journals, websites, and databases are dedicated to this form of interdisciplinary collaboration; however, many focus on literature that examines the intersection of various arts and medicine. Few focus on developing art and science-based projects that create new perspectives on medicine for and with the medical practitioner, where they collaboratively evolve a deeper understanding of both canons.

For more information, please contact the Program Coordinator, Owen Smith. ofsmith@maine.edu

Marine Biology

School of Marine Sciences

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resources and coastal zone management. More than 30 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; physiology and biochemistry; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

SMS faculty provide leadership in research programs that encompass all the world's oceans, with emphasis on the Gulf of Maine. Faculty are headquartered at both the Orono campus of UM and its coastal marine laboratory, the Ira C. Darling Marine Center (see Research Resources), and the Gulf of Maine Research Institute. Further information about SMS is on the web at: www.umaine.edu/marine. Further information about the Darling Marine Center is on the web at: https://dmc.umaine.edu/

The School of Marine Sciences offers the following graduate degrees:

- M.S. and Ph.D. degrees in Oceanography;
- M.S. and Ph.D. degrees in Marine Biology;
- M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources (administered jointly with The School of Food and Agriculture);
- M.S. degree in Marine Policy; and
• Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.
• P.S.M. (Professional Science Masters) degree in Marine Science.

The School of Marine Sciences offers core and advanced courses in all degree areas. Most specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

Master of Science and Doctor of Philosophy in Marine Biology

The Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Marine Biology are designed to provide students with a broad knowledge base in marine biology. Areas of study include, but are not restricted to behavior, cell and molecular biology, comparative morphology, development and ecology, evolution, genetics, physiology, taxonomy/systematics. Marine Biology is a dynamic field, and our programs are flexibly designed to accommodate new discoveries and technologies.

M.S. and Ph.D. Programs in Marine Biology are research-oriented, leading to completion of a thesis. To succeed, students will be required to learn to

a. formulate valid scientific questions
b. design appropriate experiments to answer those questions
c. develop the necessary technical skills to conduct the experiments
d. examine and interpret the results of the experiments.
e. apply results as appropriate.

Although some of the groundwork for this will be provided through formal course work, considerably more training will occur in less formal situations in which students work closely with one or more faculty members on focused topics. Marine Biology faculty of SMS provide expertise in an extensive range of phyletic groups of marine organisms from bacteria and viruses, through planktonic organisms, to marine algae, marine invertebrate and vertebrate animals. Their specialties encompass levels of biological organization from population biology, ecology and systematics, through physiology and biochemistry, to molecular biology.

Program Requirements

To maintain maximum flexibility, the majority of courses comprising a student's Program of Study will be determined by the student in consultation with his/her major advisor and advisory committee.

• Basic knowledge of descriptive oceanography equivalent to SMS 302 or SMS 484. Coursework taken prior to admission must be approved by Graduate Program Coordinator.

• SMS 500 - Marine Biology Credits: 4
• SMS 691 - Marine Science Seminar Credits: 1

• One semester of graduate level statistics.
• Participation in SMS Graduate Student Symposium during each year of full-time study.

Examples of existing elective courses include

• INT 510 - (BSC, SMS) Marine Invertebrate Zoology Credits: 5
• SMS 501 - Biological Oceanography Credits: 3
• SMS 525 - Marine Biogeochemistry Credits: 3
• SMS 531 - Coral Reefs Credits: 3
• SMS 562 - Fisheries Population Dynamics Credits: 3
• SMS 598 - Special Topics in Marine Science Credits: 1-3

Graduate Faculty


Emmanuel Boss, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

Damian Brady, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology)

Susan Brawley, Ph.D. (California, 1978), Professor. Area: Algal Physiology, Development and Ecology. (Marine Biology, Oceanography)

Ian Bricknell, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Aquaculture)

Kristina Cammen, Ph.D. (Duke University, 2014), Assistant Professor. Area: Marine mammal science, ecological and evolutionary genomics, ocean health, conservation biology. (Marine Biology)

Fei Chai, Ph.D. (Duke University, 1995), Professor. Area: Ecosystem Modeling; Tropical Oceanography. (Oceanography)

Yong Chen, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

Laurie Connell, Ph.D. (North Carolina, 1988), Associate Research Professor. Area: Molecular Ecology. (Marine Biology)

Kevin Eckelbarger, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

William Ellis, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

Keith Evans, Ph.D. (Iowa State University, 2011), Assistant Professor. Area: Economics, fishery management, applied econometrics, nonmarket valuation (Marine Policy)

Walt Golet, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology)

Heather Hamlin, Ph.D. (University of Florida, 2007) Associate Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)

Nishad Jayasundara, Ph.D. (Stanford University, 2012) Assistant Professor. Area: physiology and biochemistry (Marine Biology)

Teresa Johnson, Ph.D. (Rutgers University, 2007), Associate Professor. Area: Fisheries Management. (Marine Policy)

Peter A. Jumars, Ph.D. (Scripps Institution of Oceanography, 1974), Emeritus Professor. Area: Benthic Biological Oceanography, Organism-Environment Interactions at the Level of Individuals, Deposit Feeding. (Oceanography, Marine Biology)
Lee Karp-Boss, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

Heather Leslie, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor, and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Biology)

Sara Lindsay, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

Lawrence M. Mayer, Ph.D. (Dartmouth, 1976), Professor. Area: Marine Biogeochemistry. (Oceanography)

James D. McCleave, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)

Mary Jane Perry, Ph.D. (Scripps Institution of Oceanography/California, San Diego, 1974), Emerita Professor. Area: Phytoplankton Physiology and Ecology, Primary Productivity, Bio-optics. (Oceanography, Marine Biology)


Paul Rawson, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)

Jeremy Rich, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)


Jeffrey A. Runge, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

Malcolm Shick, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)


Joshua Stoll, Ph.D. (University of Maine, 2016), Assistant Professor. Area: ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

Andrew Thomas, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

David W. Townsend, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)


Rebecca Van Beneden, Ph.D. (Johns Hopkins, 1983), Professor and Director of School of Marine Sciences. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

Rhian Waller, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Marine invertebrate zoology, benthic oceanography, marine climate change. (Oceanography)

Mark Wells, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter.


Huijie Xue, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

Gayle Zydlewski, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology.

Cooperating Faculty

Daniel F. Belknap, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

Nick Brown, Ph.D. (Aquaculture Univ., Stirling, UK, 1998), Assistant Professor. Area: Aquaculture Technology

Adria Elskus, Ph.D. (Boston University, 1992), Associate Professor. Area: Molecular Environmental Toxicology.

Carol Kim, Ph.D. (Cornell, 1992), Associate Professor. Area: Zebrafish as a Model for Disease and Immune Function. (Marine Biology)

Michael Kinnison, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

Paul Mayewski, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

Bryan Pearce, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)

Michael Peterson, Ph.D. (Northwestern Univ., 1994), Professor. Area: Ultrasound, Instrumentation and Biomimetic Design. (Oceanography)

John Singer, Ph.D. (Georgia, 1983), Professor. Area: Marine Microbiology. Chair, Department of Biochemistry, Microbiology and Molecular Biology. (Aquaculture, Marine Biology)

Seth Tyler, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

Adjunct Faculty

Brian Beal, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias

Christopher Davis, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.


Richard Langton, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement. Buccoo Reef Trust
Marine Policy

Marine Policy

School of Marine Sciences

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resource and coastal zone management. More than 50 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

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- M.S. degree in Marine Policy;
- P.S.M degree in Marine Sciences; and
- Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.

The School of Marine Sciences offers core and advanced courses in all degree areas. Specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

Master of Science in Marine Policy

The Master of Science degree in Marine Policy in the School of Marine Sciences is designed to take advantage of the strong interdisciplinary nature of the School. All students in the program receive training in the human dimensions of marine resource management, marine sciences, and empirical methods. Students in the marine policy program may also be enrolled in the dual degree program. (see below).

The program offers both a thesis and a non-thesis option. Students selecting the thesis option will write a masters thesis that combines theoretical work and practical experience applied to pressing problems. Students selecting the non-thesis option will undertake an internship with a government agency or a non-governmental organization in the marine area directly concerned with management of marine resources and then write a final paper linking their internship experience with the theoretical and practical literature. Each student has an advisory committee of three faculty members, which must approve the thesis plan or internship plan and program of study.

Degree Requirements

A total of 30 credit hours, consisting of at least 24 hours of course credits and 6 credit hours for thesis/internship, are required to complete the M.S. in Marine Policy. Students are required to take SMS 691 - Marine Sciences Seminar (SMS 691) plus at least six credits of marine policy relevant courses and seventeen credit hours of elective coursework.
approved by the thesis committee. In order to complete the internship or thesis requirement, students will take at least six credits of either SMS 683 - Internship in Marine Policy Credits or SMS 699 - Graduate Thesis/Research Credits.

The program is designed to give students as much flexibility as possible so that they can take advantage of the various faculty specialties available to them within the School of Marine Sciences and elsewhere in the University.

**Examples of existing elective courses include:**

ANT 464 Ecological Anthropology (3 Credits)

ANT 521 Geographical Information Systems (3 credits)

ANT 550 - Anthro. Dimensions of Enviro. Policy (3 Credits)

ECO 477 - Economics and Environmental and Resource Management (3 credits)

ECO 581 - Socio-ecological Systems Modeling (3 credits)

SMS 500 - Marine Biology (3 Credits)

SMS 531: Coral Reefs (3 Credits)

SMS 544 Oceanography and Natural History of the Gulf of Maine (3 credits)

SMS 552 - Coupled Natural and Human Systems Credits: 3

SMS 553 - Institutions and the Management of Common Pool Resources Credits: 3

SMS 555 - Resource management in Cross Cultural Perspective

SMS 562 - Fisheries Population Dynamics Credits 3

SMS 563 - Fisheries Policy and Management Credits 3

SMS 567 - Knowledge and Participation in the Science Policy Process (Credits 3)

SMS 597 - Independent Study (Variable Credits)

SMS 598 - Special Topics (Variable Credits)

- SMS 552 - Coupled Natural and Human Sysyems Credits: 3
- SMS 553 - Institutions and the Management of Common Pool Resources Credits: 3

Additionally, students will take at least six hours in one of the following courses in order to complete the internship or thesis requirement:

- SMS 683 - Internship in Marine Policy Credits: 1-6
- SMS 699 - Graduate Thesis/Research Credits: Ar

Students will usually take all of their courses at the University of Maine campus or the Darling Marine Center, but courses taken at the University of Maine School of Law or elsewhere may be credited toward the degree.
Dual Master Degree in Marine Sciences and Policy

The School of Marine Sciences offers a unique, strongly interdisciplinary program in marine policy and science. It is intended for students interested in the application of science and policy in government agencies, non-government organizations (NGOs) or industry. The program is intended as a terminal degree but does not rule out continuation to a Ph.D. The course of study is three years. It leads to two masters degrees: one in marine science (specializing in oceanography or marine biology) and one in marine policy.

The marine science and policy program is based on the idea that good conservation requires:

1. a sophisticated understanding of the role and limits of science in the policy process,
2. an equally sophisticated understanding of the institutional processes at scales from local to global that are necessary to resolve communal dilemmas, and the wide dissemination of this knowledge among resource users and others concerned with the management of marine resources.

Students are required to complete the requirements for a masters degree in one of the marine sciences (marine biology or oceanography) as well as the requirements for a marine policy degree. Six hours of each degree can be counted as electives for the other; as a result a total of only 48 hours is required to complete both degrees (rather than the 2 X 30=60 usually required for two masters). The course requirements for the science and policy degrees are listed above.

The dual degree offers three thesis/internship possibilities: a single thesis combining a joint science and policy topic, two independent theses or a thesis and an internship.

For more information, visit the School of Marine Sciences website at www.marine.maine.edu.

Graduate Faculty


Emmanuel Boss, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

Damian Brady, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology, Marine Policy)

Susan Brawley, Ph.D. (California, 1978), Professor. Area: Algal Physiology, Development and Ecology. (Marine Biology, Oceanography)

Ian Bricknell, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Marine Biology, Aquaculture)

Kristina Cammen, Ph.D. (Duke University, 2014), Assistant Professor. Area: Marine mammal science, ecological and evolutilional genomics, ocean health, conservation biology. (Marine Biology)
Fei Chai, Ph.D. (Duke University, 1995), Professor. Area: Ecosystem Modeling; Tropical Oceanography. (Oceanography)

Laurie Connell, Ph.D. (North Carolina, 1988), Associate Research Professor. Area: Molecular Ecology. (Marine Biology)

Kevin Eckelbarger, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

William Ellis, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

Walt Golet, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology, Marine Policy)

Heather Hamlin, Ph.D. (University of Florida, 2007) Assistant Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)

Lewis Incze, Ph.D. (University of Washington, 1983) Research Professor Emeritus. Area: Physiology and biochemistry (Marine Biology)

Teresa Johnson, Ph.D. (Rutgers University, 2007), Associate Professor. Area: Fisheries Management. (Marine Policy)

Lee Karp-Boss, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

Heather Leslie, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Policy, Marine Biology)

Sara Lindsay, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

Lawrence M. Mayer, Ph.D. (Dartmouth, 1976), Emeritus Professor. Area: Marine Biogeochemistry. (Oceanography)

James D. McCleave, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)


Paul Rawson, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)
Jeremy Rich, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)

Jeffrey A. Runge, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

Malcolm Shick, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)


Joshua Stoll, Ph.D. (University of Maine, 2016), Assistant Professor. Area: Ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

Andrew Thomas, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

David W. Townsend, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)


Rebecca Van Beneden, Ph.D. (Johns Hopkins, 1983), Professor. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

Rhian Waller, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Area Marine invertebrate zoology, benthic oceanography, marine climate change (Oceanography)


Mark Wells, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter. (Oceanography)

Huijie Xue, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

Gayle Zydlewski, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology. (Marine Biology, Oceanography)

Cooperating Faculty


Daniel F. Belknap, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

Michael Kinnison, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

Paul Mayewski, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

Bryan Pearce, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)

Seth Tyler, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

Adjunct Faculty

Brian Beal, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias

Yong Chen, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

Christopher Davis, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.

Heather Deese, Ph.D. (University of Maine, 2009), Area: Oceanography.

Richard Langton, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement.
Master of Arts in Teaching (MAT)

Degree overview

The Master of Arts in Teaching (MAT) degree is an accelerated teacher licensure program that leads to initial teacher certification in a designated content area and a master's degree. It is designed for those already holding an undergraduate degree and interested in becoming a secondary school teacher. Content areas include: Math, Life Science, Physical Science, English, Social Studies, and World Languages.

Careers

The MAT program prepares graduates for teaching positions at the secondary school level (grades 7-12). Our faculty have expertise in a variety of educational disciplines and contexts, from Social Studies and STEM Education to rural and urban school settings.

Timeline and program delivery

The MAT can be completed full-time in as short as 15 months, May term through the end of the following Summer term. The program can also be completed full or part time on an individual schedule and started any semester. A full-time May to Summer program of study would include:

Initial summer term -

EHD501 - Social Context of Education (offered online)
EHD504 - Teaching and Assessing for Student Learning (offered online)
SED500 - Adapting Instruction for Students with Disabilities (offered online)
EHD511 - Classroom Based Prevention and Intervention (offered online)

Fall term -

EHD657 - Educational Practicum (in-school setting)

Content methods- one of ESS441, ESC452, EMA405, MLC466, ERL440

Spring term -

EHD693 - Educational Internship (in-school setting)
EDT520 - Technology in Education (offered online)

Final summer term -

ERL537 - Literacy Across the Curriculum (offered online)

As well as 6-credit hours of content specific coursework. Content coursework can be completed online or on-campus depending on campus offerings.
The MAT path of study will result in 24 credit hours of education requirements, 6 credit hours of content requirements, and 6 credit hours of student teaching.

To apply

Applications are processed through the University of Maine Graduate School. A bachelor's degree, 3.0 GPA, three letters of recommendation, and passing Praxis I score are required for admission to the MAT. For applicants with a GPA lower than 3.0 applying, please attach a brief essay detailing your suitability for the program including explaining any extenuating circumstances or subsequent areas of growth. Applications are accepted on a rolling or ongoing basis. For more information, please contact Bryan Silverman: bryan.silverman@maine.edu.

Mathematics & Statistics

The curriculum for the Master of Arts in Mathematics has been carefully constructed in order to provide students with a solid foundation in the basic tools and methodologies of their field of choice. Beyond the basic requirements, students—with the assistance of their advisors—can design a tailor-made program, which not only meets their specific needs and interests but is also geared toward their career goals. Throughout the program, students can be assured of continuing and effective mentoring through close contact with their advisors and professors.

Degree Requirements

I. Base Requirements: Students must complete a program of study consisting of at least 30 credit hours, which must be approved by their advisory committee (see also the Course Restrictions below). At least 15 of these credits must be 500/600-level MAT/STS courses (exclusive of thesis and seminar credits). Additionally, there are two subject requirements and a depth requirement:

(Depth) All students must take at least one two-semester sequence (STS 531/532, MAT 523/524, MAT 527/528, MAT 563/564, or MAT 577/578).

(Linear Algebra) All students must take one or more of: MAT 562 Linear Algebra, MAT 564 Abstract Algebra II, or a course in Linear Statistical Models.

(Real Analysis) All students must take MAT 523 Functions of a Real Variable I.

II. Choice of Option:

A. Thesis Option: Students choosing to write a thesis under the supervision of a member of the Graduate Faculty need to take a total of 5 credits of MAT 699 (Graduate Thesis), in addition to a 1-credit course on Responsible conduct of research (such as INT 601). The latter credit must be taken prior to enrolling in the fourth credit of MAT 699. Upon completion of the thesis, the student must present an oral defense.

B. Non-thesis Option: At least 24 credit hours must be at the graduate level, and at least 18 of these must be MAT/STS courses.

III. Seminar Requirement: All graduate students must successfully give at least two seminar talks. It is suggested that one seminar be given in each of the fall and spring semesters of the second year. As this is a credit-bearing requirement, it is necessary to register. The assigned course number is MAT 590. For students following the thesis option, one credit of MAT 590 is required, and the thesis defense fulfills the second seminar requirement. For students in the non-thesis option, MAT 590 must be taken twice, once for each of the two seminars given. The talks should be prepared in consultation with and under the supervision of the advisor. Students should submit a short advisor-
approved abstract to the graduate coordinator at least one week in advance of the seminar day, for inclusion in the announcement. The evaluation will be handled by the advisor in consultation with the members of the student's advisory committee. A clear statement of the problem should be given with a brief historical sketch. All technical terms, specific to the area of expertise, should be clearly defined before they are used.

IV. Course Restrictions With permission of the Graduate Coordinator in consultation with the advisory committee, degree credit may be given for MAT/STS courses at the 400-level or for classes in other departments which have a significant mathematical emphasis or particular relevance to the thesis project. However, the following classes cannot be used among the 30 credits for the MA degree in Mathematics:

* Undergraduate courses which are required for the BA degree in Mathematics at the University of Maine. This includes MAT 425, MAT 463, and STS 434.

* If both MAT 452 and MAT 527 are taken, only one of them can count toward the MA degree.

Student Advisory Committee
The student advisory committee will consist of the advisor together with at least two members of the graduate faculty. In addition, the graduate coordinator will serve as an ex officio member without the voting rights. The committee should be formed by the end of the first year via this form, and will meet with the student at least once each semester of the second year to get an overview of the student's progress. Thesis Administration The student should have his/her program plan which would include the courses to be taken as well as the thesis topic, ready for discussion and approval by the student advisory committee by the start of the first semester of the second year of study. Ideally, the thesis should be formatted in LaTeX. The LaTeX class package for UMaine theses is found here. A copy of the thesis will be provided to the graduate coordinator at least one week in advance of the date of the defense. The coordinator will make the thesis available to any member of the faculty for perusal prior to the defense. All public announcements relating to the thesis as well as the seminars will be made by the coordinator.
A. Thesis Option: Students choosing to write a thesis under the supervision of a member of the Graduate Faculty need to take a total of 5 credits of MAT 699 (Graduate Thesis), in addition to a 1-credit course on responsible conduct of research (such as INT 601). The latter credit must be taken prior to enrolling in the fourth credit of MAT 699. Upon completion of the thesis, the student must present an oral defense.

B. Non-thesis Option: At least 24 credit hours must be at the graduate level, and at least 18 of these must be MAT/STS courses. Two written qualifying examinations must be passed prior to graduation, chosen from analysis, algebra, and statistics. Decisions for retakes are up to the student's committee in consultation with the Graduate Coordinator.

III. Seminar Requirement: All graduate students must successfully give at least two seminars. It is suggested that one seminar be given in each of the fall and spring semesters of the second year. As this is a credit-bearing requirement, it is necessary to register. The assigned course number is MAT 590. For students following the thesis option, one credit of MAT 590 is required, and the thesis defense fulfills the second seminar requirement. For students in the non-thesis option, MAT 590 must be taken twice, once for each of the two seminars given. The talks should be prepared in consultation with and under the supervision of the advisor. Students should submit a short advisor-approved abstract to the graduate coordinator at least one week in advance of the seminar day, for inclusion in the announcement. The evaluation will be handled by the advisor in consultation with the members of the student's advisory committee. A clear statement of the problem should be given with a brief historical sketch. All technical terms, specific to the area of expertise, should be clearly defined before they are used.

IV. Course Restrictions:

With permission of the Graduate Coordinator in consultation with the advisory committee, degree credit may be given for MAT/STS courses at the 400-level or for classes in other departments which have a significant mathematical emphasis or particular relevance to the thesis project. The following classes cannot be used among the 30 credits for the MA degree in Mathematics:

* Undergraduate courses which are required for the BA degree in Mathematics at the University of Maine. This includes MAT 425, MAT 463, and STS 434.

* If both MAT 452 and MAT 527 are taken, only one of them can count toward the MA degree.

Admission to the Program

In addition to satisfactory performance of the candidate as an undergraduate, as evidenced by transcripts, letters of recommendation, and G.R.E. scores, the Department requires one semester of real analysis (equivalent to MAT 425) and one semester of abstract algebra (equivalent to MAT 463). Occasionally, students can be admitted with a deficiency in one of these areas if the deficiency is made up in the first year of graduate study. Prospective students are encouraged to follow the application procedure here: http://umaine.edu/mathematics/graduate-program/application-procedure/

Four Plus BA/MA Program

The Department offers the opportunity for ambitious mathematics majors to begin taking graduate courses during their senior year, with the possibility of double-counting these credits toward the BA and the MA. Students must apply for the program by February 1 of their junior year. Details may be found here: https://umaine.edu/mathematics/graduate-program/fourplus/

Teaching Assistantships A limited number of graduate teaching assistantships are available. Teaching assistants are expected to spend approximately 17 hours per week either teaching a course or assisting a faculty member and working in the Math Lab, an open tutorial center. Assistantships are awarded on a competitive basis among all applicants, and the decision to renew an assistantship is based on performance in the first year of the student's program of study.

Graduate Faculty

Eisso Atzema, Ph.D. (Utrecht University, Netherlands, 1993), Lecturer. History of mathematics, geometry, mathematics education.
**David M. Bradley, Ph.D.** (University of Illinois, Urbana 1995), Professor. Classical analysis, number theory, special functions, difference differential equations.

**Jack Buttcane**, Assistant Professor (Ph.D. University of California, Los Angeles, 2012). Analytic number theory.

**Tyrone Crisp, Ph.D.** (University of Pennsylvania, 2012), Group representations, operator algebras, and connections between the two.

**Robert Franzosa, Ph.D.** (University of Wisconsin, 1984), Professor. Applied topology.

**Ramesh C. Gupta, Ph.D.** (Wayne State University, 1970), Professor. Statistics, biostatistics, probability, stochastic processes, reliability theory, mathematical models.

**Brandon Hanson, Ph.D.** University of Toronto, 2015. Number Theory

**David Hiebeler, Ph.D.** (Cornell University, 2001), Professor. Mathematical ecology and epidemiology, modeling and simulation.

**Andrew Knightly, Ph.D.** (University of California, Los Angeles, 2000), Professor and Graduate Coordinator. Number theory.

**Franziska Peterson**, Assistant Professor (Ph.D. University of Wyoming, 2016). Mathematics education.

**Nigel Pitt, Ph.D.** (Rutgers University, 1992), Professor. Analytic number theory.

**Natasha Speer, Ph.D.** (University of California, Berkeley, 2001), Associate Professor. Mathematics Education.

**Peter Stechlinski, Ph.D.** University of Waterloo, 2014. Assistant Professor. Dynamic modeling and simulation; control and optimization; mathematical biology.

**Zheng Wei, Ph.D.** (New Mexico State University, 2015), Assistant Professor. Statistics.

**Associate Graduate Faculty**

**Keshav Aggarwal**, Fixed-term Assistant Professor (Ph.D. Ohio State University, 2019). Number theory.

**Timothy Boester**, Fixed-term Assistant Professor (Ph.D. University of Wisconsin, 2008). Undergraduate mathematics education.

**Shenhui Liu**, Fixed-term Assistant Professor (Ph.D. Ohio State University, 2017). Number theory.

**Julian Rosen**, Fixed-term Assistant Professor (Ph.D. University of Michigan, 2013). Number theory, arithmetic geometry, Galois theory.


**Mechanical Engineering**

Sciences, Uncertainty Quantification, and Engineering Education. Admission is based on an appropriate baccalaureate degree and satisfying the requirements of the Graduate School at UMaine. Applicants holding a bachelor's degree in another science or engineering discipline may be admitted; however, some undergraduate courses may be required without graduate credit.

Each graduate student, in consultation with his or her graduate committee, prepares an individual program of study. The MS degree program will include courses from both the engineering mechanics and thermofluid science fields. The PhD degree program is more narrowly focused on a topic of interest to the student and the faculty advisor. For students with a strong interest in other disciplines, excellent opportunities exist for an interdisciplinary program of study in which up to 40% of the MS degree credit is earned in another department in the university. Interdisciplinary PhD research is performed in collaboration with faculty in other disciplines as a part of a coherent graduate degree program in Mechanical Engineering.

The Master of Science degree with thesis requires a minimum of six credit hours of thesis research in addition to 24 credit hours of acceptable coursework. The non-thesis Master's degree requires a minimum of 30 credit hours of coursework and a comprehensive examination. Application submission deadlines are July 31 for spring semester admission and February 15 for fall semester. Prospective students are encouraged to contact the mechanical engineering faculty to discuss their interest when submitting an application. The department offers a limited number of teaching assistantship positions. Research assistantships may be offered by the individual faculty. Other forms of support through external fellowships are strongly encouraged. Faculty research interests are found on the departmental and individual faculty web pages at: http://umaine.edu/mecheng/graduate-program/.

The Graduate School
5775 Stodder Hall Room 42
University of Maine
Orono, ME 04469-5775
207-581-3291
graduate@maine.edu

Dr. Andrew Goupee, Graduate Coordinator
Department of Mechanical Engineering
5711 Boardman Hall, Room 206
University of Maine
Orono, ME 04469-5711
207-581-3657
agoupe91@maine.edu

Graduate Faculty

Vincent Caccese, Ph.D. (Drexel University, 1985), Professor. Nonlinear finite element analysis, hybrid connections, seismic behavior and vibration analysis and design, fatigue analysis, impact resistant materials for personal protection.

Sheila Edalatpour, Ph.D. (University of Utah, 2016), Assistant Professor. Near- and far-field radiative heat transfer, computational heat transfer, electromagnetic wave scattering, high performance computing.
Wilhelm Alexander Friess, Ph.D. (Rensselaer Polytechnic Institute, 1997), Associate Professor. Engineering education, energy efficiency in buildings, experimental fluid mechanics, sports engineering.

Andrew J. Goupee, Ph.D. (University of Maine, 2010), Libra Associate Professor. Simulation and model testing of floating offshore structures, solid mechanics, structural optimization.

Donald A. Grant, Ph.D. (University of Rhode Island, 1969), Emeritus Professor, Vibrations of discrete and continuous systems.

Babak Hejrati, Ph.D. (University of Utah, 2016), Assistant Professor. Control and dynamic systems, robotics, biomechanics, haptics.

Zhihe Jin, Ph.D. (Tsinghua University, 1988), Professor. Fracture mechanics, thermal stresses and thermal shock behavior of advanced materials, energy efficiency of thermoelectric materials, mechanics problems in geophysics.

Bashir Khoda, Ph.D. (University at Buffalo, 2013), Assistant Professor. Digital manufacturing, bio-manufacturing, advanced manufacturing processes, computer aided design & manufacturing (CAD&M), 3D printing.

Richard Kimball, Ph.D. (Massachusetts Institute of Technology, 2001), Professor. Marine renewable energy, offshore wind energy, marine propulsion design, diesel engines testing and emissions, advanced diesel fuel development.

Justin Lapp, Ph.D. (University of Minnesota, 2016), Assistant Professor. Solar thermal energy and thermochemistry; numerical heat transfer modeling for high temperature systems; thermal radiation; material behavior under solar thermal cycling; and thermal material properties.

Sharmila Mukhopadhyay, Ph.D. (Cornell University, 1989), Professor. Design, synthesis, characterization and testing of multifunctional nanomaterials; compact lightweight components for energy, environment, and biomedical applications; surface and interface phenomena; Multidisciplinary engineering research and education.

Olivier Putzeys, Ph.D. (University of California, Berkeley, 2007), Lecturer. Combustion and fire science; smoldering combustion and the transition to flaming; combustion in oxygen-enriched atmospheres; thermal modeling of animals using infrared thermography.

Masoud Rais-Rohani, Ph.D. (Virginia Tech, 1991), Department Chair and Richard C. Hill Professor. Structural and multidisciplinary design optimization, crashworthiness, lightweight and composite structures, structural reliability and uncertainty quantification, reduced-order and surrogate modeling.

Richard Sayles, Ph.D. (Brown University, 1981), Associate Professor. Fluid mechanics and heat transfer.

Mohsen Shahinpoor, Ph.D. (University of Delaware, 1970), Professor. Smart/intelligent materials, biomimetics and artificial muscles, mechatronics, electroactive polymers, advanced nanocomposites, biomedical engineering.

James Sucec, M.S. (University of Connecticut, 1963), Emeritus Professor. Transient forced convection heat transfer, heat transfer across turbulent boundary layers.

Senthil S. Vel, Ph.D. (Virginia Tech, 1998), Arthur O. Willey Professor. Solid mechanics, composite materials, finite element and meshless methods, simulation-based design of advanced material systems, smart structures, structural optimization.

Qian Xue, Ph.D. (Johns Hopkins University, 2012), Assistant Professor. Computational fluid dynamics, biofluids, microfluidics.

Yingchao Yang, Ph.D. (University of South Carolina, 2013), Assistant Professor. In situ mechanics of low-dimensional nanomaterials, structural and multifunctional nanocomposites, design and fabrication of micro-/nano-devices.
Xudong Zheng, Ph.D. (George Washington University, 2009), Associate Professor. Fluid mechanics, computational fluid dynamics, flow structure interaction, biofluids.

Microbiology

The Department of Molecular and Biomedical Sciences offers a variety of graduate degree programs. For the highly qualified student, a Ph.D. program in Microbiology is available. Also available is a thesis program leading to the M.S. as well as a non-thesis option, the Master of Professional Studies, designed for professionals who wish to upgrade their knowledge or skills.

Prerequisites for admission include a bachelor's degree in microbiology or other biological science with undergraduate work in organic chemistry, biochemistry, mathematics, and physics.

Curricula are planned to suit the interests and needs of the individual student and to provide a strong background in microbiology and molecular biology.

Teaching and research assistantships are available in various fields of microbiology.

The Department of Molecular and Biomedical Sciences is housed in Hitchner Hall, which is well equipped to do modern research in biochemistry, bacteriology, virology, molecular biology, genomics, bioinformatics, and immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, phase, confocal, and fluorescent microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals. Faculty members are actively involved in research that is supported at the federal level. Students admitted to the graduate program in Biochemistry may also carry out their research with faculty listed under Microbiology in this catalog, in a number of laboratories in other departments at the University, the Jackson Laboratory in Bar Harbor, the Maine Medical Center Research Institute (MMCRI) in Portland, or through cooperative institutional arrangements and Associate faculty or staff. (In addition to the University of Maine-based faculty listed below, several faculty at Jackson Laboratory, MMCRI, etc, mentor research students in this degree program.)

Graduate Faculty

Julie A. Gosse, Ph.D. (Cornell, 2005) Associate Professor and Graduate Coordinator. Biochemical, molecular, and cellular toxicology to aid in human environmental health risk assessment.

Robert E. Gundersen, Ph.D. (University of Texas-Austin, 1983) Chair and Associate Professor. The role of signal transduction during growth and development in eukaryotes.


Benjamin L. King, Ph.D. (University of Maine, 2016) Assistant Professor. Bioinformatics and Systems Biology of Stress Responses.

Melissa S. Maginnis, Ph.D. (Vanderbilt, 2007) Assistant Professor. Virus-host cell interactions that regulate JC Polyomavirus infection and pathogenesis.

Sally Molloy, Ph.D. (University of Maine, 2007) Assistant Professor. Genomics and Microbiology.
Melody N. Neely, Ph.D. (University of Michigan School of Medicine, 1998) Associate Professor. Host-pathogen interactions, with focus on Streptococcus.

Robert T. Wheeler, PhD (Stanford, 2000) Associate Professor. Genetics, genomics, biochemistry and cell biology of fungal pathogens with mammalian hosts.

Music

The Music Division offers graduate studies leading to the Master of Music degree with majors in music education (including an optional emphasis in advanced conducting) and performance. Individualized curriculum possibilities are designed to meet student interests and needs while offering a balanced program of academic and professional courses.

All applicants must meet the admission requirements of the Graduate School and the Division of Music. Students must have a baccalaureate degree in music. For more detailed information on admission requirements of specific degree programs, financial assistance, and graduate assistantships, visit https://umaine.edu/spa/graduate-studies/

Class of 1944 Hall, The University of Maine, Orono, Maine 04469, (207) 581-4703.

Graduate Faculty

Laura Artesani, D.M.A. (West Virginia, 1997), Associate Professor and Music Chair. Keyboard musicianship, music history, music education.


Isaac Bray, M.M. (Boston Conservatory, 2012), Instructor, Voice in Applied Voice


Philip Edelman, Ph.D. (University of Missouri-Kansas City, 2016), Assistant Professor. Music education, instrumental music.

Curvin Farnham, M.M. (Vandercook College of Music, 1982), Professor Emeritus, School of Performing Arts. Band, music education.

Stuart Marrs, D.M. (Indiana, 1989), Professor and Graduate Coordinator. Percussion, music history.


Nursing

The University of Maine School of Nursing developed its first graduate program in 1992 and the initial group of graduate students received their Master of Science in Nursing (MSN) in May 1994. For the first years, the MSN program focused on preparing the nurse for the advanced professional role of family nurse practitioner (FNP). Later, in response to the diverse graduate education needs of Maine nurses, our graduate program expanded to prepare nurses for professional roles such as nurse educator, nurse administrator, or other professional roles. Graduate program faculty are expert practitioners and leaders in a number of different specialties and are eager to assist students to individualized programs of study. Students may select a flexible program of study, either full-time or part-time. The University of Maine Bachelor of Science in Nursing (BSN) program and the MSN program are accredited by the Commission on Collegiate Nursing Education (CCNE).

The School of Nursing offers a variety of program plans for graduate study:

Family Nurse Practitioner (MSN-FNP)

The family nurse practitioner is prepared to provide healthcare to individuals and families across the lifespan (newborns, infants, children, adolescents, adults, pregnant and postpartum women and older adults). Primary care includes health promotion, disease and injury prevention, and the evaluation and management of common acute and chronic health problems. The focus of care includes individuals within families and the family unit; however the family chooses to define itself. Family nurse practitioners demonstrate a commitment to family-centered care in the context of communities.

The program of study may be tailored for full-time or part-time study. Course formats are a mix of online and classroom instruction. Clinical experiences are arranged to meet program outcomes and to accommodate the needs of the student. The Graduate Program Coordinator and the student’s academic advisor will help plan a program of study and timeframe that meets the academic and clinical requirements. The combined credit requirement would be approximately 49-51. The MSN-FNP curriculum meets the 2008 criteria for nurse practitioner programs published by the National Task Force on Quality Nurse Practitioner Education.

MSN-FNP graduates are eligible to take national certification examinations for Family Nurse Practitioners which are offered by the American Nurses Credentialing Center and by the American Academy of Nurse Practitioners (http://www.aanpcert.org/index). The University of Maine MSN-FNP program graduates have performed well on the national certification examinations.

Nurse Educator (MSN)

The Master of Science in Nursing Nurse Educator program is designed for the experienced nurse who wishes to have advanced knowledge in nursing combined with preparation to teach and evaluate learning. Course content in the education specialization includes curriculum development, didactic and clinical teaching methods, evaluation in nursing education, and population-focused care. It is intended to prepare nurses for careers in nursing faculty or in-service education roles.
A full time student can complete this program of study in two years; part time study (3 to 4 years). Faculty guidance is an integral part of each portion of the student's program of study. The Faculty Advisor serves as the chairperson of the project or thesis committee and provides ongoing guidance to each student as he or she progress through the program.

**Individualized MSN**

This theoretical and field-experience curriculum allows the student to develop a program of study that builds upon their professional interests and career goals. Through core courses, specialized courses, and experiential components, I-MSN students may prepare for professional careers in areas such as nurse administration and clinical leadership roles.

The program of study may be tailored for full-time or part-time study. The Graduate Program Coordinator and the student's academic advisor will help plan a program of study and timeframe that meets the academic and experiential requirements. The combined credit requirement would be approximately 35-49, dependent upon focus area.

A full-time student can expect to complete MSN degree requirements in 2 years. All work for the CAS or the MSN must be completed within a 6 year period.

**The Certificate of Advanced Study (CAS) for registered nurses with an MSN.**

The CAS offers a clinically focused program of study to registered nurses who already possess a MSN. Students in the CAS program must complete a minimum of 33 semester hours (500 and 600 level courses) within The University of Maine. Prerequisites include: graduate of an NLN or CCNE accredited MSN program; minimum graduate GPA of 3.25; current licensure as a registered nurse in Maine.

1. Individualized plans of study leading to an MSN for nurse practitioners, certified in various specialties, who hold a baccalaureate in nursing. The individualized program of study will reflect the applicant's scope of practice, currency of clinical knowledge, and prior credentialing. Waiver of credit, if deemed appropriate, is approved at the time of admission to the program. Prerequisites include: graduate of an NLN or CCNE accredited BSN program, minimum GPA of 3.0; satisfactory GRE or MAT scores; current licensure as a registered nurse in Maine. National certification in specialty area preferred; minimum 2 years practice as a nurse practitioner (NP), evidence of recent clinical practice. The NP to MSN candidate may choose to expand expertise as a FNP or may select the individualized MSN program (see description below).

*The master's degree program in nursing and the post graduate APRN certificate program at the University of Maine School of Nursing is accredited by the Commission on Collegiate Nursing Education, 655K Street NW, Suite 750, Washington, DC 20001, 202-887-6791*

**Graduate Faculty**

**Lisa Caruso,** D.N.P. (Massachusetts General Hospital Institute of Health Professions) Lecturer in Nursing

**Nancy Fishwick,** Ph.D. (Case Western Reserve) Associate Professor; Domestic violence, rural health, primary health care

**Eileen Owen-Williams,** Ph.D., DNP, FNP, CNM, AFN-BC, FAANP (University of Tennessee) Assistant Professor; Health disparities, elder abuse, rural health

**Patricia Poirier,** Ph.D. (University of Massachusetts, Boston) Professor, Graduate Program Coordinator; Oncology, Fatigue and Policy
Nursing Education (Certificate)

The 10-credit Graduate Certificate in Nursing Education program prepares expert nurse clinicians for the role of educator, particularly as clinical and laboratory instructors in associate and baccalaureate degree nursing programs and as staff educators in clinical agencies.

Educational objectives

The Certificate student will:

- Demonstrate specialized knowledge, skills, and abilities in the role of nurse educator.
- Facilitate adult learning through curriculum design, teaching, evaluation, and advisement responsibilities inherent in nursing faculty roles.
- Function as a nurse educator and apply evidence-based educational methods.
- Integrate technology in nursing education.

Required Courses

NUR 512 Curriculum and Course Development and Evaluation in Nursing Education 3 credits. This course is offered every fall semester and introduces the student to curriculum and course development and evaluation in nursing education with emphasis on organizational frameworks, teaching-learning strategies and evaluation of learning. This course will be conducted through asynchronous distance education technology (Blackboard) supplemented with in-class meetings.

NUR 515 Assessment, Measurement and Evaluation in Nursing Education 3 credits. The course introduces the certificate student to assessment, measurement and evaluation with an emphasis on nursing education. Evidence based evaluation strategies are discussed within the context of ethical, legal, social and political aspects of nursing education. The course will be delivered in hybrid format of asynchronous distance education and a limited number of campus-based sessions. Prerequisites: NUR 512.

NUR 516 Field Experience in Nursing Education 4 credits. The field experience integrates theory in a reality context of the teaching role. Students participate in classroom, laboratory, and clinical settings pertinent to their area of interest and they integrate teaching/learning theories in a practice setting. Asynchronous distance education technology supplements the field experience. Prerequisites: NUR 512 and approval by advisor.
Student Eligibility and Admission Criteria

- Bachelor of Science in Nursing or Master's or higher graduate degree in nursing from an accredited program.
- Undergraduate GPA minimum 3.0 on a 4.0 scale.
- College level statistics course, minimum grade of B
- College level research methods courses, minimum grade of B
- Experience as a Registered Nurse. Minimum two years is preferred.
- Licensure to practice as a Registered Nurse in Maine by date of admission.
- Pre-admission interview by School of Nursing faculty member (arranged)

Application to the Graduate Certificate in Nursing Education program:

https://umaine.edu/graduate/apply/

Nursing Education Certificate students who wish to achieve a Master's degree in nursing must apply separately to the School of Nursing MSN program. The three certificate courses may be transferable to the MSN program of study. For more information about the School of Nursing: http://www.umaine.edu/nursing

The master's degree program in nursing and the post graduate APRN certificate program at the University of Maine School of Nursing is accredited by the Commission on Collegiate Nursing Education, 655K Street NW, Suite 750, Washington, DC 20001, 202-887-6791

Oceanography

School of Marine Sciences

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resource and coastal zone management. More than 50 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

SMS faculty provide leadership in research programs that encompass all the world's oceans, with emphasis on the Gulf of Maine. Faculty are headquartered at the Orono campus of UM and its coastal marine laboratory, the Ira C. Darling Marine Center (see Research Resources), and the Gulf of Maine Research Institute. Further information on SMS is on the web at: www.umaine.edu/marine. Further information on the Darling Marine Center is on the web at https://dmc.umaine.edu/

The School of Marine Sciences offers the following graduate degrees:
• M.S. and Ph.D. degrees in Oceanography;
• M.S. and Ph.D. degrees in Marine Biology;
• M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources *administered jointly with Food Science and Human Nutrition*;
• M.S. degree in Marine Policy; and
• Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.

The School of Marine Sciences offers core and advanced courses in all degree areas. Most specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

### Master of Science and Doctor of Philosophy in Oceanography

Students in both the M.S. and the Ph.D. degree programs complete three core courses in, respectively, physical, chemical, and biological aspects of the marine system, and supplementary courses based on student needs and interests. Most of the course work is taken in Orono, especially during the student's first year, whereas thesis or dissertation research may be carried out at Orono or the University of Maine's marine laboratory, the Ira C. Darling Marine Center or at the Gulf of Maine Research Institute in Portland.

Research is a vital part of graduate education and its scope is limited only by the imagination of students and faculty. Oceanography students are in the midst of some of the most exciting ocean research being conducted today, and includes research on the Gulf of Maine as well as around the world. To match your research interests with a faculty member we invite you to explore our research clusters and the web pages of individual faculty.

A total of 30 hours of course credits are required to complete the M.S. in Oceanography. The program is designed to give students as much flexibility as possible so that they can take advantage of the various faculty specialties available to them within the School of Marine Sciences and elsewhere in the University. The student and his or her committee will design a program of study of courses beyond the core course sequence.

**Program Coordinator:**
Dr. Lee Karp-Boss  
Aubert Hall 345,  
University of Maine  
Orono, ME 04469-5741  
207 581 4305  
lee.karp-boss@maine.edu

**Required Core Courses**

- SMS 501 - Biological Oceanography Credits: 3
- SMS 520 - Chemical Oceanography Credits: 3
- SMS 541 - (SMS, CIE) Physical Oceanography Credits: 3
- SMS 691 - Marine Science Seminar Credits: 1
- SMS 699 - Graduate Thesis/Research Credits: Ar
- Participation in SMS Graduate Student Symposium during each year of full-time study.
Advanced Oceanography Courses

To be combined with core and other advanced courses to specifications of the student and thesis committee.

- SMS 525 - Marine Biogeochemistry Credits: 3
- SMS 531 - Coral Reefs Credits: 3
- SMS 540 - Satellite Oceanography Credits: 3
- SMS 585 - Marine System Modeling Credits: 3
- SMS 595 - Data Analysis Methods in Marine Sciences Credits: 3
- SMS 597 - Independent Study Credits: 1-3
- SMS 598 - Special Topics in Marine Science Credits: 1-3

Faculty


Emmanuel Boss, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

Damian Brady, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology)

Susan Brawley, Ph.D. (California, 1978), Professor. Area: Algal Physiology, Development and Ecology. (Marine Biology, Oceanography)

Ian Bricknell, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Aquaculture)

Kristina Cammen, PhD. (Duke University, 2014), Assistant Professor. Area: Marine mammal science, ecological and evolutional genomics, ocean health, conservation biology. (Marine Biology)

Fei Chai, Ph.D. (Duke University, 1995), Professor. Area: Ecosystem Modeling; Tropical Oceanography. (Oceanography)

Yong Chen, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

Laurie Connell, Ph.D. (North Carolina, 1988), Associate Research Professor. Area: Molecular Ecology. (Marine Biology)

Kevin Eckelbarger, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

William Ellis, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

Keith Evans, Ph.D. (Iowa State University, 2011), Assistant Professor. Area: Economics, fishery management, applied econometrics, nonmarket valuation (Marine Policy)

Walt Golet, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology)

Heather Hamlin, Ph.D. (University of Florida, 2007) Assistant Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)
Nishad Jayasundara, Ph.D. (Stanford University, 2012) Associate Professor. Area: physiology and biochemistry (Marine Biology)

Teresa Johnson, Ph.D. (Rutgers University, 2007), Professor. Area: Fisheries Management. (Marine Policy)

Peter A. Jumars, Ph.D. (Scripps Institution of Oceanography, 1974), Emeritus Professor. Area: Benthic Biological Oceanography, Organism-Environment Interactions at the Level of Individuals, Deposit Feeding. (Oceanography, Marine Biology)

Lee Karp-Boss, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

Heather Leslie, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor, and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Biology)

Sara Lindsay, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

Lawrence M. Mayer, Ph.D. (Dartmouth, 1976), Professor. Area: Marine Biogeochemistry. (Oceanography)

James D. McCleave, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)

Mary Jane Perry, Ph.D. (Scripps Institution of Oceanography/California, San Diego, 1974), Emerita Professor. Area: Phytoplankton Physiology and Ecology, Primary Productivity, Bio-optics. (Oceanography, Marine Biology)


Paul Rawson, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)

Jeremy Rich, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)


Jeffrey A. Runge, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

Malcolm Shick, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)


Joshua Stoll, Ph.D. (University of Maine, 2016), Assistant Professor. Area: ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

Andrew Thomas, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

David W. Townsend, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)

Rebecca Van Beneden, Ph.D. (Johns Hopkins, 1983), Professor and Director of School of Marine Sciences. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

Rhian Waller, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Marine invertebrate zoology, benthic oceanography, marine climate change (Oceanography)


Mark Wells, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter.


Huijie Xue, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

Gayle Zydlewski, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology.

Cooperating Faculty

Daniel F. Belknap, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

Nick Brown, Ph.D. (Aquaculture Univ., Stirling, UK, 1998), Assistant Professor. Area: Aquaculture Technology

Adria Elskus, Ph.D. (Boston University, 1992), Associate Professor. Area: Molecular Environmental Toxicology.

Carol Kim, Ph.D. (Cornell, 1992), Associate Professor. Area: Zebrafish as a Model for Disease and Immune Function. (Marine Biology)

Michael Kinnison, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

Paul Mayewski, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

Bryan Pearce, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)

Michael Peterson, Ph.D. (Northwestern Univ., 1994), Professor. Area: Ultrasound, Instrumentation and Biomimetic Design. (Oceanography)

John Singer, Ph.D. (Georgia, 1983), Professor. Area: Marine Microbiology. Chair, Department of Biochemistry, Microbiology and Molecular Biology. (Aquaculture, Marine Biology)

Seth Tyler, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

Adjunct Faculty

Brian Beal, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias
Christopher Davis, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.


Richard Langton, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement. Buccoo Reef Trust

**One Health and the Environment (Certificate)**

The graduate certificate in One Health and the Environment totals 12 credits and is designed to be completed in two years. The certificate will include both a core curriculum as well as electives that will allow students to specialize in specific areas related to One Health and the Environment. The two core courses will be offered every other year, but not in the same year (e.g., INT 598 could be offered in the fall in even years and EES 598 could be offered in the fall in odd years. The timing of the elective courses is not in our control; however, there is a significant number of elective courses to choose from. In addition, courses not in the approved lists could be included as certificate electives but will need to be reviewed and approved by the program steering committee. The certificate is highly interdisciplinary as it requires students to take two electives, one in biophysical science and one in social science, relevant to One Health. Current electives are offered by the University of Maine by the following units: School of Food and Agriculture, School of Biology and Ecology, School of Molecular and Biomedical Sciences, Department of Mathematics, School of Nursing, School of Forest Resources, School of Marine Science. Department of Communication and Journalism, School of Economics, Department of Anthropology, School of Social Work, Department of Wildlife, Fisheries and Conservation Biology. Other electives are taught by the School of Public Health at the University of Southern Maine.

**Dedicated faculty:**

Andrei V. Alyokhin, Professor, School of Biology and Ecology

Kathleen P. Bell, Professor, School of Economics

Sean Birkel, Research Assistant Professor, Climate Change Institute and School of Earth and Climate Sciences

Sandra Butler, Professor, School of Social Work

Kristina Cammen, Assistant Professor, School of Marine Sciences

Angela Daley, Assistant Professor, School of Economics

Sandra DeUrioste-Stone, Associate Professor, School of Forest Resources

Allison Gardner, Assistant Professor, School of Biology and Ecology

Teresa Johnson, Associate Professor, School of Marine Sciences

Pauline Kamath, Assistant Professor, School of Food and Agriculture

Debra Kantor, Associate Extension Professor, Cooperative Extension

Danielle Levesque, Assistant Professor, School of Biology and Ecology

Anne Lichtenwalner, Associate Professor, School of Food and Agriculture, Cooperative Extension

Bridie McGreavy, Assistant Professor, Communication and Journalism
Caroline Noblet, Associate Professor, School of Economics
Laura Rickard, Associate Professor, Communication and Journalism
Linda Silka, Senior Fellow, Senator George J. Mitchell Center for Sustainability Solutions
Kelley Strout, Associate Professor and Interim Director, School of Nursing
Mario Teisl, Professor, School of Economics
Judith Tupper, Practice Faculty, Public Health Program; Director, Population Health and Health Policy, Cutler Institute USM
Erika Ziller, Assistant Professor, Public Health USM

Physics

Degree Programs

Programs of study leading to the degrees of Master of Science, Master of Engineering (Engineering Physics), and Doctor of Philosophy are offered through the Department of Physics and Astronomy. Please see the Departmental web site for more detailed information than the summary below.

Doctor of Philosophy

Doctor of Philosophy: Typically, a total of 5-6 years are needed to complete the Ph.D. degree for a student who enters the program with a bachelor's degree. A dissertation presenting the results of an original investigation in a specialized area of physics is an essential feature of the program and must be completed and defended successfully. Requirements also include passing the Oral Proposal Defense within the prescribed timelines.

The program of study for each student in the Ph.D. program includes a minimum of 30 course hours. The following courses, or their equivalents, are required of all students: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, PHY 510 Graduate Laboratory, PHY 512 Statistical Mechanics, PHY 574 Methods of Theoretical Physics, PHY 603 Quantum Mechanics II, and PHY 624 Solid State I.

In addition to the courses listed above, students must take at least one advanced course, chosen from among PHY 575 Methods of Theoretical Physics II, PHY 598 Continuum Mechanics, PHY 598 Statistical Mechanics II, and PHY 625 Solid State II.

Students must also take at least one research specialty elective course, which must be approved by the student's dissertation advisory committee. These electives do not have to be PHY courses, and they cannot be from among the 400-level PHY undergraduate core courses in Mechanics, Electricity and Magnetism, Quantum and Atomic Physics, Thermodynamics, Statistical Mechanics, or Optics. In addition to class work, students must also complete a minimum of 5 thesis credits (PHY 699) and 1 credit of Responsible Conduct of Research training (INT 601). INT 601 must be completed before commencing with the fourth credit of PHY 699.

In general, additional courses beyond the above minimal requirements are expected to be included in a student's program of study, at the discretion of the student's dissertation committee. Each of the 400-level undergraduate core courses may be taken for graduate credit under this additional course expectation.
Master of Science

The program of graduate study for the master's degree, which normally requires two academic years, is developed around an original investigation, the results of which are presented as a thesis which must be successfully defended.

Of the minimum of 30 semester hours required for the Master of Science degree, 24 are devoted to courses in physics and such allied fields as other sciences, mathematics, and engineering. However, the following courses or their equivalents, which are offered every year, must be included: PHY 501 Mechanics; PHY 502 Electrodynamics I, and PHY 503 Quantum Mechanics I. In addition to the 24 credits of class work, students must complete a minimum of 5 thesis credits (PHY 699) and 1 credit of Responsible Conduct of Research training (INT 601). INT 601 must be completed before commencing with the fourth credit of PHY 699.

Master of Engineering (Engineering Physics)

http://physics.umaine.edu/graduate-programs/

A minimum of 30 semester hours is required for the Master of Engineering (Engineering Physics) degree with thesis. Of the total of 24 required course hours, nine hours must be selected from a meaningful engineering course sequence. In addition, nine hours must be selected from three of the following courses: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, and PHY 510 Graduate Laboratory. In addition to the 24 required course credits an additional minimum of 6 credits of thesis (PHY 699) is required. The thesis may be completed in either the Physics Department or the engineering department in which the engineering course sequence is taken.

A non-thesis option exists which requires 36 approved course credits (no thesis credits). Movement from a thesis to a non-thesis degree will be under exceptional conditions and requires approval of the Department Graduate Faculty.

Students in a non-thesis program shall not normally receive financial support.

Research

- Astrophysics: Optical, x-ray and radio observational and computational, primarily on galaxies and clusters of galaxies. https://physics.umaine.edu/research/astronomy/
- Biophysics: Ultra-high resolution microscopy and spectroscopy, influenza virus infection, function and lateral organization of biembranes coupled to the cytoskeleton, single molecule fluorescence photophysics https://physics.umaine.edu/research/biophysics-research-group/ and theoretical studies of chemically-driven microscopic motors and pumps.
- Environmental radiation & Radon Studies
- Surface Science: Physics and chemistry of surfaces, including microsensors, catalysis, adhesion, thin film growth, surface crystallography, phase transitions, tribology, and development of new instrumentation; https://umaine.edu/first/.
- Physics Education Research: Student reasoning in physics using dual-process theories of reasoning and decision-making; the teaching and learning of electronics in both physics and engineering; student use and understanding of mathematics in physics; K-12 teacher knowledge of content and students’ ideas and their use of formative assessment, particularly with energy concepts. http://umaine.edu/per/.
- Statistical Physics and condensed matter: Light scattering from liquid crystals and colloids.

Cooperative Research

A major interdisciplinary research organization at the University is the Frontier Institute in Sensor Technologies (FIRST) in which research opportunities exist in high technology areas related to surfaces, interfaces, and thin film materials. Specific information is available at https://umaine.edu/first/.
Departmental faculty also participate in collaborative research and K-20 STEM professional development with the Maine Center for Research in STEM Education (RiSE Center) http://umaine.edu/risecenter/.

Research Facilities

The **Frontier Institute in Sensor Technologies** (FIRST) unites researchers from the Departments of Chemistry, Physics, Electrical and Computer Engineering, and Chemical and Biological Engineering in many projects spanning aspects of surface and interface science, thin films, sensors, Microsystems, and nanotechnology. Current facilities include thin film synthesis, electron and optical spectroscopies, scanning probe microscopies, X-ray and electron diffraction, focused ion beam-scanning electron microscopy, fluorescence microscopy, device fabrication (Class1000 clean room with photolithography, metallization, wet and dry etch, PECVD, sputtering, mask generation, and packaging), and sensor testing (gas delivery systems, electrical and microwave test equipment, and data acquisition/integrated electronic test suites).

**Biophysics and Optics**: Three laboratories include a superresolution localization microscopy facility and four F-PALM microscopes, image processing computer cluster, tunable femtosecond pulsed Ti:Sapphire laser and optical parametric oscillator (OPO), cell culture facilities, polymerase chain reaction (PCR) thermal cycler, and other equipment for molecular biology, confocal and two-photon laser-scanning microscopes, fluorescence correlation and cross-correlation microscope, fluorimeter, spectrophotometer, Krypton-Argon and Argon ion lasers, numerous diode lasers spanning visible wavelengths from 400-700 nm, and optical tweezer.

The **Physics Education Research Laboratory** has facilities and equipment for conducting research on the learning and teaching of physics, including a classroom intended for curricular activities based on physics education research (PER) and dedicated clinical interview space to ensure the anonymity and privacy of students participating in our research work (as required by our institutional review board for testing with human subjects).

**Astronomy/Astrophysics**: The Emera Astronomy Center consists of two observatories, a planetarium, and a multipurpose classroom space. The Jordan Observatory houses a PlaneWave CDK20 (20 inch) telescope on a German Equatorial Mount with an Apogee Aspen CG16M CCD camera with 7 slot filter wheel for imaging and photometry. The telescope and dome both can be remotely controlled. Additionally, the facility has an historic Alvin Clark refractor (8 inch) housed in a roll-off roof observatory for visual observations. The Jordan Planetarium is a 10 meter 4K digital planetarium with 50 seats which can show a variety of astronomy and science visualizations, real time astronomical data, and full-dome films. The planetarium conducts regular public programs, school programs, and numerous special events. The facility has a multipurpose classroom housing a number of interactive displays and is used for astronomy labs and other university courses.

**Admission**

In addition to satisfying the general admission requirements of the Graduate School, candidates for advanced degrees in physics should have earned a bachelor's degree in Physics or a closely related discipline with a 3.0/4.0 GPA in physics and mathematics courses. Typical classes beyond the introductory level include mechanics, electricity and magnetism, quantum mechanics, statistical and thermodynamics, as well as laboratory courses in these areas and electronics. Mathematics should be completed at least through differential equations.

Candidates who have majored in other physical sciences or mathematics are encouraged to apply. For these candidates we would like to see substantial advanced physics courses.
Admission to the degree programs is competitive. We primarily admit students for the Fall semester with only occasional openings for the Spring semester. We begin review of completed applications in late January (apply through the Graduate School). We consider all eligible applicants for support. If support is not required, please be sure to note that in the application.

We require the GRE exam and the GRE Physics exam. As the Physics exam is offered infrequently we will consider applications without the exam. The TOEFL or equivalent (see Graduate School website) is required for International students. The Graduate School requires a minimum iBT TOEFL score of 92 (7.0 on IELTS) to be considered for support as a TA.

Financial Assistance

Teaching assistantships are available for the academic year and include remission of tuition for up to nine credit hours per semester and three credit hours in the summer session. These appointments provide for approximately half-time teaching and half-time study. Teaching assignments usually involve six contact hours per week. Some summer support is available for students in the program, but it is expected that students and advisors obtain summer research assistantships.

Research assistantships from grant funding are also available to provide graduate stipends and tuition support, information about these research assistantships is available directly from individual faculty members.

The University of Maine supports a number of University fellowships and tuition scholarships, primarily for current graduate students.

Application

Students are primarily admitted starting in the Fall semester (September). Applications for admission in the Fall (September) should be complete by January 5. We occasionally have openings for Spring semester (January). Contact the Graduate Coordinator. Late applications are accepted.

Additional Information

Individual faculty may be contacted via their email addresses below. The department's home page is http://physics.umaine.edu/.
Email the Graduate Coordinator.
Department physical address: Department of Physics and Astronomy, University of Maine, 5709 Bennett Hall, Orono, ME 04469
Telephone at (207) 581-1039.

Graduate Faculty

R. Dean Astumian, Ph.D. (Texas-Arlington, 1983), Professor. Design of microscopic mechanical and electrical pumps and motors powered by non-equilibrium isothermal chemical reactions.

David J. Batuski, Ph.D. (New Mexico, 1986), Professor. Astronomy, Astrophysics, Observational cosmology; largescale structure in the universe; weak gravitational lensing studies of dark matter in superclusters of galaxies; dynamics of superclusters; radio sources in galaxy clusters.
Neil F. Comins, Ph.D. (University College, Cardiff, 1978), Professor. Astronomy, Astrophysics, Cosmology & String Theory, Physics and other Science Education, Relativity & Gravitation, Observational and theoretical astrophysics; galactic evolution and stability; stellar systems; general relativity; astronomy education.

Saima Farooq, Ph.D. (Kansas State University, 2016), Lecturer. Physics and other Science Education. Research on teaching and learning, curriculum development and assessment, primarily at the introductory level. Critical thinking in physics labs; student reasoning with experimental data, methods, analysis, and the treatment of uncertainties.


Samuel T. Hess, Ph.D. (Cornell University, 2002), Professor. Biophysics. Experimental and theoretical biophysics; super-resolution fluorescence microscopy and spectroscopy; function and lateral organization of biomembranes; influenza virus infection; single-molecule fluorescence photophysics.

Robert J. Lad, Ph.D. (Cornell, 1986), Professor. Condensed Matter Physics, Nano Science and Technology. Surface physics; thin films; sensor technology; materials science; ceramics; electronic materials; photovoltaics; material characterization.

James McClymer, Ph.D. (Delaware, 1986), Associate Professor. Condensed Matter Physics, Optics, Other. Digital imaging and light scattering from equilibrium and nonequilibrium transitions in liquid crystals and complex fluids.

Susan R. McKay, Ph.D. (M.I.T., 1987), Professor. Nonlinear Dynamics and Complex Systems. Theoretical condensed-matter physics; nonlinear systems and transitions to chaos; phase transitions and critical phenomena; spin glasses; amorphous magnetism; quenched disorder; pattern formation; systems far from equilibrium; applications of network theory.

Robert W. Meulenberg, Ph.D. (University of California, Santa Barbara, 2002), Associate Professor. Condensed Matter Physics, Materials Science, Metallurgy, Nano Science and Technology. Experimental condensed-matter physics: electronic structure of nanoscale materials; surface and interfacial physics of nanostructures; magnetic materials; applications of synchrotron radiation to materials science.


John Thompson, Ph.D. (Brown, 1998), Professor. Physics and other Science Education. Research interest: Physics Education. Research on teaching and learning, curriculum development and assessment, primarily at the upper division (thermal physics, electricity and magnetism, and quantum mechanics). Student use of mathematics, mathematical
methods, and mathematical reasoning in physics (e.g., differentials, derivatives, and integrals in single variable, multivariable, and vector calculus); analysis via specific difficulties, symbolic forms, and conceptual blending.

**Michael C. Wittman**, Ph.D. (Maryland, 1998), Professor. Physics and other Science Education. Physics education. Research on teaching and learning. Learning theory development, curriculum development and evaluation, use of mathematics in physics, and teacher knowledge of student thinking, both at the college and the K-12 level, in particular middle school. Student and teacher understanding of energy and accelerated motion in middle school and in high school.

**Lipping Yu**, Ph.D (North Carolina State University, 2009). Assistant Professor. Materials Science, Metallurgy, Nano Science and Technology. Inverse materials design; defects in solids; semiconductor physics; energy materials (e.g., photovoltaics, catalysts, batteries, supercapacitors); flexible 2D electronics; surface and interface physics and chemistry; application of density functional theory and high-throughput computation.

**Research and Associate Graduate Faculty**


**Thomas Stone**, Ph.D. (Maine, 2010). Associate Professor of Mathematics and Physics, Husson University. Theoretical condensed matter physics.

**Cooperating Graduate Faculty**

**Jayendra C. Rasaiah**, Ph.D. (Pittsburgh, 1965), Professor. Statistical mechanics of electrolytes and polar fluids, computer simulation studies of solutions, fluctuation-dominated kinetics in heterogeneous media, theory of electron transfer reactions, and molecular biophysical chemistry.

**Plant Science**

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

**Doctor of Philosophy**

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

**Master of Science**

- Botany and Plant Pathology
- Ecology and Environmental Sciences
• Entomology
• Zoology
• Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

Animal Behavior and Behavioral Ecology, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

Applied Biology, including biological control and insect pest management, fisheries, and plant pathology.

Botany, Plant Biology, Mycology, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

Developmental and Cell Biology, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

Ecology, Environmental Biology, and Paleoecology, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

Entomology, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

Fisheries Biology, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

Freshwater Biology, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

Genetics and Molecular Biology, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

Plant Pathology, including control of fungal pathogens, and pest management.

Physiology and Physiological Ecology, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

Science Education, including course and program assessment and developing innovative instructional techniques.

Systematics and Evolution, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

Special Options

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.
Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

Facilities

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

Application

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: umbiosci@maine.edu, https://sbe.umaine.edu/.

Graduate Faculty

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Benildo G. de los Reyes**, Ph.D. (Oklahoma State University, 1999), Professor. Plant molecular genetics and functional genomics; molecular basis of plant responses to environmental stresses.
Francis A. Drummond, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

Adria Elskus, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

Jacquelyn Gill, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoeconomy and Plant Ecology. Climate change, extinction, and biotic interactions through time.

Hamish Greig, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates.

Eleanor Groden, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

David Hart, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

Clarissa Henry, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of segmentation and muscle development in Zebrafish.

Rebecca Holberton, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

Michael T. Kinnison, Ph.D. (University of Washington, 1999), Professor. Microevolution, aquatic ecology, population and conservation genetics, fish ecology (including salmonids).

Danielle Levesque, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

Joyce E. Longcore, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

Brian McGill, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

Brian Olsen, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.


Michelle Smith, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

Kristy Townsend, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

Mary S. Tyler, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in Drosophila; educational multimedia materials.

Seth Tyler, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.
Cooperating Faculty

Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

William O. Bray, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

Jim Dill, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

David Hiebeler, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

Sara Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

William H. Livingston, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

James D. McCleave, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

Paul Rawson, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

Alan M. Rosenwassar, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

Walter C. Shortle, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

Robert S. Steneck, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

Rebecca J. Van Beneden, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

Robert G. Wagner, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

Plant, Soil, and Environmental Sciences
Within the School of Food and Agriculture multidisciplinary research and graduate training programs emphasize the biogeochemistry and sustainability of agricultural, forested, horticulture, and wetland ecosystems. Areas of emphasis for graduate work include nutrient dynamics in agricultural and forest ecosystems, soil chemistry and plant nutrition, horticulture, soil microbiology, crop physiology, diversified cropping systems, weed ecology and management, wetland ecology, crop genetic resource conservation and management, and plant pathology. Thesis problems may be developed in a wide range of subject areas within the broad disciplines listed above. Facilities are available for laboratory, greenhouse, farm field, forest stand, and watershed-scale research.

Graduate students working in the areas of plant, soil, and environmental sciences can earn the Master of Science degree through programs in Plant, Soil, and Environmental Sciences; Horticulture; and Ecology and Environmental Sciences. The Doctor of Philosophy degree can be pursued through programs in Ecology and Environmental Sciences, Biological Sciences, Forest Resources, Plant Biology, and Plant Sciences. Several of our faculty have cooperating appointments in other departments, providing some of our students with additional degree options. Graduate training programs in these areas are built from foundations in soil science, agronomy, plant physiology, ecology, microbiology, plant pathology, and statistics. Prospective graduate students should have completed course work in chemistry, mathematics, and biology, and in subject matter areas closely related to interests of the student and his/her advisor.

Prospective students should contact faculty who might serve as their supervisors to discuss which degree option is appropriate for their particular interests and goals. To apply, go to the Graduate School's website, www.umaine.edu/graduate and click on the "Admissions" tab and follow the guidelines.

A limited number of departmental assistantships, involving both teaching and research, are available on a competitive basis. Additional opportunities for assistantship support are associated with faculty working on extramural grants and research contracts. Prospective graduate students are urged to contact faculty who might serve as supervisors for their graduate degree work to determine the availability of assistantship support. Additional information concerning graduate studies in these degree programs may be obtained from Dr. Tsutomu Ohno the Graduate Coordinator (ohno@maine.edu) and from the website (http://umaine.edu/foodandagriculture/).

**Graduate Faculty**

**Stephanie Burnett**, Ph.D. (University of Georgia, 2004), Associate Professor of Horticulture.

**Lily Calderwood**, Ph.D. (University of Vermont, 2015), Extension Wild Blueberry Specialist and Assistant Professor of Horticulture.

**M. Susan Erich**, Ph.D. (Cornell University, 1984), Professor of Plant and Soil Chemistry. Soil and environmental chemistry, plant-soil interactions, and soil testing.


**David Handley**, Ph.D. (University of New Hampshire, 1993), Cooperating Professor of Horticulture. Vegetable and small fruit variety evaluation, and integrated pest management strategies.

Mark Hutton, Ph.D. (University of New Hampshire, 1988), Associate Professor of Vegetable Crops and Vegetable Extension Specialist. Vegetable production, season extension technologies, disease and insect management, vegetable genetics and varietal evaluation.


Ellen Mallory, Ph.D. (University of Maine, 2007), Professor of Sustainable Agriculture. Sustainable agriculture, soil quality, nutrient management, cover crops.


Tsutomu Ohno, Ph.D. (Cornell University, 1983), Professor of Plant and Soil Chemistry. Environmental soil chemistry, soil organic matter, and kinetics of soil reactions.


Gregory A. Porter, Ph.D. (Pennsylvania State University, 1985), Professor of Agronomy. Crop physiology, dry matter partitioning in crop plants, plant pest interactions, and crop management.

Rachel Schattman, Ph.D. (University of Vermont, 2016), Assistant Professor of Sustainable Agriculture. Agroecology, climate change, vegetable and small fruit production, water use efficiency, decision making, behavior, risk assessment, mixed methods research.

Matthew Wallhead, Ph.D. (University of New Hampshire, 2016), Extension Ornamental Horticulture Specialist and Assistant Professor of Horticulture.

Prevention and Intervention (Emphasis)

Prevention and Intervention Studies (Ph.D. in Education concentration)

Prevention and Intervention Studies is a concentration within the Ph.D. in Education. The concentration focuses on issues related to risk, resilience, prevention, and intervention to increase positive academic and social-behavioral outcomes for prek-12 children and their families. Experiences are designed to prepare candidates to assume positions in teacher education, prek-12 schools, and local, state, or federal agencies. Candidates study and conduct research on risk and protective influences on development, as well as on evidence-based interventions to promote academic achievement and positive social behaviors in school. Potential candidates include special educators, classroom teachers, curriculum coordinators, administrators, and counselors who are committed to the goal of improving outcomes for preK-12 students who are at-risk for academic or social-behavioral difficulties. Study in this area may be of particular interest to individuals involved with design, implementation or evaluation of Response to Intervention in school or early childhood settings. Applicants must have a prior master's or C.A.S./Ed.S. degree in an educational field relevant to their intended area of research and prior experience working in preK-12 schools.

Program experiences generally take place within cohorts to enable students to experience directly the benefits of collaborative learning, and to model how the complex, real-world problems faced by schools can be addressed through collaboration among professionals who view education through different theoretical and practical lenses. Cohorts begin periodically depending on demand and availability of resources so potential applicants should contact the program coordinator, James Artesani (arthur.artesani@maine.edu), before submitting an application.
Professional Science Masters in Bioinformatics

The Professional Science Master's (P.S.M.) in Bioinformatics is a 100% online and asynchronous graduate program targeting working professionals offered through the Graduate School of Biomedical Science and Engineering (GSBSE) department.

Bioinformatics is the application of mathematical, statistical, and computational approaches to understand biological processes. The PSM in Bioinformatics brings together interdisciplinary classes across the fields of computer science, spatial information science and engineering, and molecular and cell biology taught by affiliated faculty across the GSBSE research consortium from the University of Maine, The Jackson Laboratory, Mt. Desert Island Biological Laboratory, University of New England, and Maine Medical Center Research Institute.

The PSM provides an opportunity for advanced training directly relevant to current knowledge for their professional careers. Students entering the program are expected to come from a cell and molecular biology background and require more intensive training in math, computer and information science, or from the mathematics, computer or information sciences disciplines and need training in cell and molecular biology. The program requires 30 credit hours for completion.

The home of the program is the GSBSE department which is a multidisciplinary research consortium connecting four external research organizations with the University of Maine as the degree-granting institution. The over 150 affiliated faculty conduct research in a variety of topics, including biomedical engineering, computational biology, bioinformatics, biophysics, bioengineering and nanotechnology, molecular and cell biology, neuroscience, and the molecular mechanisms of disease. The GSBSE contributes to learning and discovery on the emerging frontier of the biological, physical, clinical, and behavioral sciences, preparing new faculty, training scientists and engineers, and furthering Maine's biotechnology and biomedical infrastructure.

In addition to the PSM in Bioinformatics, the GSBSE also offers a Ph.D. in Biomedical Science and a Ph.D. in Biomedical Engineering.

More information on our program can be found on our website at: gsbse.umaine.edu.

Professional Science Masters in Engineering and Business

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a B.S. in engineering or engineering technology who want to advance into management positions. The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer. There are tracks in astronautics, computer engineering, wireless engineering, electrical engineering, and surveying engineering. Additional tracks will be added. The latest list of tracks may be found at:https://online.umaine.edu/grad/professional-science-masters-in-engineering-and-business/

Educational Objectives:

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
- Increased potential for career advancement.
Required courses:

- GEE 486 Advanced Project Management (3 credits)
- GEE 694 Professional Science Masters in Engineering and Business Internship (6 credits)

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For Additional Information about the Professional Science Masters Degree in Engineering and Business, contact:

Dana N. Humphrey, Ph.D., P.E.
Dean of Engineering
College of Engineering
Telephone: 207-581-2217
Email: danah@maine.edu

Psychology

The Department of Psychology offers graduate study leading to the M.A. degree in Psychological Sciences (including social, cognitive, and biological psychology) and to the Ph.D. degree in Psychological Sciences and Clinical Psychology.

Candidates for admission are expected to meet the general requirements of the Graduate School and to have completed fundamental courses in psychology as undergraduates, including a laboratory course in research methods of psychology and a course in basic statistics. Applications for the clinical program are due Dec. 1, all other programs are due Dec. 31, for a September admission.

The Department of Psychology believes the best graduate education involves close working relationships between faculty and students. Thus, a high faculty to student ratio and small class size characterize our graduate programs. Every incoming student works directly with a faculty mentor as a means of gaining valuable research, teaching, and professional experience. There also are opportunities for individualized study and experience in directed readings, research, and supervised teaching. A faculty committee, selected to represent the student's interest, will assist the student in planning an appropriate program of study.

The programs leading to the Ph.D. in Psychological Sciences and Clinical Psychology include a residence requirement as specified in the general section of the catalog. However, the time required to complete course work and a dissertation based upon an original investigation ordinarily is longer than that required for residence.

Program in Psychological Sciences

The goal of this program is to prepare students for careers in teaching and research. All students are expected to demonstrate a high level of competence in one of the specialty areas listed below. Students are also expected to demonstrate competence in statistics and experimental design, and in several areas of general psychology outside their specialty area. Competence is assessed in terms of performance in courses, research projects, teaching, and a comprehensive examination. The comprehensive exam is given at the end of the second year of graduate study or at the end of the first year for students entering with a master's degree from another university. The Department offers the following specialty areas within Psychological Sciences:
Cognitive and Biological Psychology

This program covers several basic areas of experimental psychology, including cognition, perception, biopsychology, and behavioral neuroscience. Students develop research skills and conduct research in at least one specialty area. Students also become familiar with areas of general psychology outside their specialty, and with statistics and experimental design. Students work closely with a research advisor, and begin research involvement in the first year. There are many opportunities for individualized study and directed readings. Opportunities for teaching are available to advanced graduate students. Applicants should write to faculty members in their area of interest, with whom they might want to do research. (Faculty: Cobo-Lewis, Ell, Fremouw, Hayes, Robbins, Rosenwasser)

Social Psychology

By emphasizing basic and applied research at the Ph.D. level, the social psychology program aims to produce well-rounded academicians and practitioners by fostering a solid understanding of theory and research in social psychology, as well as knowledge of how social research may be applied to solve practical problems. The program operates on an apprenticeship model by which students work closely with faculty members on theory-driven research. Students are trained to think conceptually and to acquire proficiency in research methodology, statistics, scholarly writing, oral presentation, and teaching. Faculty research specializations include stereotyping and prejudice, personal and social identity management, social cognition, political attitudes, attraction, person perception, nonverbal communication, and health disparities. (Faculty: LaBouff, Ruben)

Program in Clinical Psychology

The Clinical Psychology Training Program prepares students for the doctorate (Ph.D.) in psychology and for careers combining research and clinical practice. While students earn a master's degree (M.A.) on the way to earning their Ph.D., a terminal M.A. program in Clinical Psychology is not available. The program is accredited by the American Psychological Association and adheres to the scientist-practitioner model.

An academic core provides the foundation of knowledge in the areas of general and experimental psychology as well as psychotherapy, psychopathology, assessment, professional issues and ethics, and clinical research methods. Clinical training is centered on course work, individual tutorials in research, and clinical experiences supervised by professional models actively engaged in careers in those areas. Students are given increasing responsibility for the content and emphasis of their training by being encouraged to sample a wide variety of training opportunities at the University and in the community. They are encouraged to articulate career objectives early in training, and to contribute to modifications in the program to meet their goals. Applicants are urged to match their interests with those of the clinical psychology faculty and to specify areas of compatibility. All training is based on a generalist model, in which students are broadly trained to work with children, adolescents, and adults. Building on this foundation, students may also choose to specialize by completing one of two emphases; child clinical and neuropsychology. The Psychology Department's Psychological Services Center serves as the primary practicum training site with additional practicum experiences available at inpatient, outpatient, community, and hospital settings elsewhere in Maine. Core training in the traditional areas of clinical psychology is supplemented with opportunities for innovative approaches to psychotherapy and community involvement; geographic considerations permit special attention to rural problems.

Ph.D. training culminates with the doctoral dissertation and a full-year internship in an approved clinical setting. (Faculty: Ahmed, Erdley, Haigh, MacAulay, Nangle, Schwartz-Mette)

Research Facilities

Facilities for experimental and clinical research include laboratories for the study of human and animal behavior, cognition, perception, and emotion. Departmental research foci include mood disorders, peer relations, developmental psychopathology, cognitive aging, and biological, social and cognitive factors influencing health and well-being. There are rooms designed for observation and audio-visual recording of behavior, as well as electrically shielded rooms for psychophysiological recordings. The department also operates a psychology clinic (Psychological Services Center). Through faculty affiliation with Eastern Maine Healthcare, research opportunities are also provided at Eastern Maine Medical Center and other local health service providers.
Graduate Faculty

**Fayeza Ahmed, Ph.D.** (University of Georgia, 2011). Assistant Professor. Adult and geriatric neuropsychology, health factors/behaviors and risk for cognitive decline, dementia caregiver stress, and wellness/aging in place.

**Alan B. Cobo-Lewis, Ph.D.** (University of Wisconsin, 1992), Associate Professor. Visual perception; language development; statistical and computational methods.

**Shawn Ell, Ph.D.** (University of California, Santa Barbara, 2003), Associate Professor. Neurobiology of learning and memory, categorization, skill learning, implicit and explicit memory, computational modeling, working memory, basal ganglia, cognitive neuroscience.

**Cynthia A. Erdley, Ph.D.** (University of Illinois, 1992), Professor. Social cognition, children's peer relationship experiences and psychological adjustment.

**Thane Fremouw, Ph.D.** (University of Utah, 1998), Associate Professor. Cognition, brain, & behavior; auditory neurophysiology; auditory perception; neural basis of cognition, learning, and memory.

**Emily A.P. Haigh, Ph.D.** (Kent State University, 2009), Associate Professor and Director of Clinical Training. Cognitive vulnerability to mood disorders, biological correlates of the cognitive model of depression.

**Marie J. Hayes, Ph.D.** (Northeastern University, 1979), Professor. Behavior of human neonates; ontogeny of sleep and arousal mechanisms; and assessment of function in infancy.

**Jeffrey E. Hecker, Ph.D.** (University of Maine, 1986), Professor. Sexual offending risk assessment; anxiety disorders. Currently serving as Provost and Vice-President for Academic Affairs.

**Jordan P. LaBouff, Ph.D.** (Baylor University, 2011) Assistant Professor. Social psychology of religion and spirituality, intergroup bias, and humility; pedagogy and research methodology.

**Rebecca MacAulay, Ph.D.** (Louisiana State University, 2016). Assistant Professor. Aging, cognition, and emotion regulation across the adult life span, biopsychosocial models of cognitive aging and risk and resiliency for dementia, and neuropsychological assessment and foundations in clinical psychology training.

**Shannon McCoy, Ph.D.** (University of California, Santa Barbara, 2003), Associate Professor. Social psychological study of the self, social identity, and social stigma.

**Douglas W. Nangle, Ph.D.** (West Virginia University, 1993), Professor. Child and adolescent peer relations; close relationships and psychological adjustment; social skills assessment and intervention.

**Michael A. Robbins, Ph.D.** (University of Maine, 1985), Research Associate Professor. Biopsychosocial correlates of cognitive aging.

**Alan M. Rosenwasser, Ph.D.** (Northeastern University, 1980), Professor. Biopsychology and behavioral neuroscience; circadian and other biological rhythms; animal models of addiction.

**Mollie Ruben, Ph.D.** (Northeastern University, 2014), Assistant Professor. Social psychology of perceiving others accurately; nonverbal communication in social and professional (i.e., patient-provider) interactions; physical pain; LGBTQ health disparities.

**Rebecca Schwartz-Mette, Ph.D.** (University of Missouri, 2013). Assistant Professor. Psychopathology and peer relationships in adolescence; interpersonal theories of depression; ethics and graduate training in clinical psychology.
External and Affiliated Graduate Faculty:

Jonathan Borkum, Ph.D., Adjunct Associate Professor
M. Elizabeth Cuddy, Ph.D., Clinical Associate
Adam Davey, Ph.D., Adjunct Associate Professor
Rebecca Ellers, Ph.D., Professor Emerita
Merrill F. Elias, Ph.D., MPH, Professor Emeritus
William Farthing, Ph.D., Professor Emeritus
Nicholas Guidice, Ph.D., Cooperating Professor
Joel Gold, Ph.D., Professor Emeritus
Sebastian Helic, Ph.D., Faculty Associate
Gordon Kulberg, Ph.D., Associate Professor Emeritus
Peter LaFreniere, Ph.D., Professor Emeritus
Craig Mason, Ph.D., Cooperating Professor
Jeff Matranga, Ph.D., Clinical Associate
Karen Mosher, Ph.D., Clinical Associate
April O'Grady, Ph.D., Director of Psychological Services
Anthony M. Podraza, Ph.D., Clinical Associate Professor
Susan Righthand, Ph.D., Research Associate Professor
Raymond C. Russ, Ph.D., Faculty Associate
Sandra T. Sigmon, Ph.D., Professor Emerita
Linda Silka, Ph.D., Faculty Associate
Laurence D. Smith, Ph.D., Associate Professor Emeritus
Geoffrey L. Thorpe, Ph.D., Professor Emeritus
Anne Uecker, Ph.D., Clinical Associate
Tracy Wassdorp, Ph.D., Faculty Associate
Stacy Whitcomb-Smith, Ph.D., Clinical Associate

Resource Economics and Policy

The Master of Science in Resource Economics and Policy program emphasizes how economic theory and tools can be applied to environmental, natural resource, energy, agricultural, and economic development problems. Students enrolled in the program combine core training in microeconomic theory and quantitative methods with specialized environmental, natural resource, agricultural, and energy economics and policy training.

Graduate students acquire the skills and knowledge to apply economic theory and tools to address interesting policy and management problems. The School of Economics creates numerous opportunities for graduate students to expand their horizons by involving them in ongoing research projects, partnering them with public and private sector institutions, and placing them in innovative internship experiences.

Graduates from the Resource Economics and Policy program acquire strong analytical, quantitative, and communication skills, which prepare them for Ph.D. programs in economics, environmental policy, resource management, and related fields and employment with government agencies, consulting firms, businesses, and non-profit organizations. The program includes thesis and non-thesis options and prepares students for positions requiring advanced analytical skills, knowledge of economic systems and methods, and practical experience conducting economic analyses of policy issues.
Admission Requirements

Admission to the School of Economics is competitive. An undergraduate degree in economics or a related field is desirable, but not essential for admission. The School of Economics is much more concerned with the applicant's capacity for graduate study, quantitative reasoning and the quality of previous work. Below is a list of required and recommended courses. Applicants seeking admission generally achieve a B or better in these courses. Applicants seeking funding (see below for more information) generally achieve an A- or better in most of the required courses listed below AND have a 3.5 GPA or higher. Applicants with lower grades/GPA may be admitted/funded, especially if they have unique experiences that demonstrate strong knowledge, skills, determination, and ability to be successful in a rigorous graduate program and make a unique contribution to the School of Economics.

Required Courses (UMaine equivalent*):

• Intermediate Microeconomic Theory (ECO 350)
• Statistics (STS 215 or 232)
• Calculus I (MAT 126)

Strongly Recommended but Not Required (UMaine equivalent*):

• Calculus II (MAT 127)
• Calculus III (MAT 228)
• Linear Algebra (MAT 262)
• Mathematical Economics (ECO 480)
• Econometrics (ECO 485)
• Computer Programming experience (e.g., R, Matlab, Python)

*Descriptions for UMaine equivalent courses can be found in the UMaine Undergraduate Catalog: http://catalog.umaine.edu/

In addition to the required and recommended courses listed above, we expect: 1) a strong, well-written personal essay that clearly communicates why the applicant is a good fit for our program and why our program is a good fit for the applicant in the context of a set of clear academic and professional goals; the essay should also demonstrate the potential for the applicant to succeed when faced with challenges; 2) strong letters of recommendation from faculty that taught courses included in our admission requirements and/or other mentors of related work (e.g., thesis/research advisor, job supervisor, etc.), which demonstrate the applicant's ability to be successful in a rigorous graduate program; 3) a well-written and clear resume/CV that demonstrates a strong work ethic and interest in gaining applicable skills/knowledge outside of the classroom.

In the past, we have required the GRE. Due to the COVID-19 pandemic, we are currently waiving the GRE requirement for 2021 and 2022 admission but still strongly recommend it. GRE scores of admitted students in the past have been around 160 for each of the Verbal and Quantitative sections and 4 for the Analytical section.

Official English proficiency examination scores are required unless you received a degree from an English-speaking institution. For more information, visit the Graduate School website or the Admission section of this catalog. For admission, the School of Economics requires TOEFL scores to be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher. To obtain funding, scores should be higher: TOEFL above 98, 247 or 597 respectively, and the IELTS equal to 7.6 or higher.

Other general admission criteria are described in the Admission section of this catalog.
Degree Requirements

Successful completion of 30 credit hours of course work is required for the Master of Science in Resource Economics and Policy Degree. Students on a thesis track also must pass an oral examination and have their written thesis approved by their Advisory Committee. The thesis offers students an opportunity to complete an independent research project under the guidance of an economics faculty member. The non-thesis option is designed for students who wish to obtain greater breadth in their coursework and job experience through internships, independent studies, and/or additional electives.

The core required ECO courses for this M.S. degree provide students with the tools and problem-solving skills applicable to the economic analysis of a wide variety of public policy issues. Elective courses allow students flexibility in designing programs to meet their needs.

Graduate students in this program are required to complete the following sequence of courses:

- ECO 514 - Microeconomic Theory Credits: 3
- ECO 530 - Econometrics Credits: 3
- ECO 531 - Advanced Econometrics and Applications Credits: 3
- ECO 571 - Advanced Environmental and Resource Economics I Credits: 3
- ECO 572 - Advanced Environmental and Resource Economics II Credits: 3

  ECO elective credits 3-6
  Additional elective credits 6-9
  ECO 699 Graduate Thesis 6*

  *The THESIS track requires 6 credits of ECO 699 (the non-thesis track does not), which reduces the number of ECO elective credits to 3 and additional elective credits to 6 (compared to the non-thesis track, which requires 6 and 9, respectively).

  Elective coursework, independent studies, and thesis work are developed in consultation with the student's advisor(s). The areas of interest, background, and future needs of the student will be considered in planning the program of study

Funding Support

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for assistance with research, teaching, or administration. Efforts are made to match the student's interests and background with the needs of the School. Scholarship funding is also available. The faculty nominates top-ranking applicants for these awards. Funding support includes a stipend, tuition costs, and subsidized health insurance coverage. Additional funds are provided to students on a competitive basis to cover research expenses. Graduate assistantships require 20 hours of work per week. For details on funding opportunities visit the School of Economics Graduate Program website: https://umaine.edu/soe/graduate/

Dual Degree in Global Policy and Economics

The School of Policy and International Affairs and the School of Economics offer an interdisciplinary dual degree program in Global Policy and Economics (via the Economics M.A., M.S., or Resource Economics and Policy M.S.).
The dual-degree program is intended for students interested in the application of economics and policy in an international setting. The course of study is normally three years. It leads to two master's degrees: one in Global Policy (with a concentration in either International Trade and Commerce or International Environmental Policy) and one in one of our Economics or Resource Economics and Policy degrees.

Students are required to complete the requirements for a master's degree in one of the economic sciences (Economics; Resource Economics and Policy) and the requirements for either the Trade and Commerce or International Environmental Policy concentrations within the Global Policy degree.

Six hours of each degree can be counted as electives for the other (i.e., a total of 12 credits can be double counted); as a result, a total of only 51 hours is required to complete both degrees (rather than the 63 usually required for two completely independent masters degrees).

**Thesis / Internship options for the dual degree:**

1. *For thesis students in the Economics program: a thesis is written for the economics degree; an internship is completed for the Global Policy degree.*

2. *For non-thesis students in the Economics program: six credit hours in coursework replace the thesis requirement for the economics degree; an internship is completed for the Global Policy degree.*

3. *A separate thesis may be written for the economics degree and for the Global Policy degree.*

Students in the dual-degree program will have two graduate coordinators, one from SPIA and one from SOE. Graduate advising committees, whether thesis or non-thesis, must comply with the rules outlined for each graduate degree. Two separate programs of study, one for each degree, must be developed and approved by the respective unit's committee (SPIA and SOE) and the respective graduate program coordinators by the end of the second semester of the student's tenure in the program. The student may choose to have 2 separate committees with separate SPIA and SOE chairs or one integrated SPIA/SOE committee with two co-chairs (one from SPIA and one from SOE).

The programs of study will be designed to meet the requirements of BOTH degrees in which they are enrolled. However, the dual degree program gives the student and his or her committee additional flexibility to devise a program that supports their specific needs.

**Graduate Faculty**

The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy, and human ecology expertise.

- **Mario Teisl**, Ph.D. (University of Maryland), Professor and Director. Information economics, food safety, environmental and social marketing, and environmental economics.

- **Christine Beitl**, Ph.D. (University of Georgia) Cooperating Assistant Professor of Anthropology, Ph.D. Ecological and Environmental Anthropology. Intersections of socio-political, ecological, and economic systems.

- **Kathleen Bell**, Ph.D. (University of Maryland), Professor. Environmental economics, public economics, and spatial economics.

- **James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

- **Andrew Crawley**, Ph.D. (University of Glamorgan) Assistant Professor in Regional Economic Development. Economic impact, economic modeling.
Adam Daigneault, Ph.D. (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. Freshwater management, climate change mitigation and adaptation, invasive species control, valuing ecosystem services

Angela Daley, Ph.D. (Dalhousie University) Assistant Professor of Health Economics and Policy. Health and labor economics, poverty and inequality, social policy, children and families, rural and remote communities including aboriginal people

Keith S. Evans, Ph.D. (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery management; nonmarket valuation; applied econometrics

Todd Gabe, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance.

Sharon Klein, Ph.D. (Carnegie Mellon University), Associate Professor. Technical, economic, environmental, and social/policy impacts of renewable energy and energy efficiency, community-based sustainable energy adoption.

Jessica Leahy, Ph.D. (University of Minnesota) Cooperating Professor of Human Dimensions of Natural Resources. Environmental attitudes and behaviors towards forests, forestry, and other natural resource management topics.

Jonathan Malacarne, Ph.D. (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

James McConnon, Ph.D. (Iowa State University), Professor. Regional and community economic development, innovation, and small business management.

Caroline Noblet, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

Jonathan Rubin, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

Philip Trostel, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

Tim Waring, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

Tommy Wiesen, Ph.D. (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics.

Response to Intervention for Behavior (RTI-B) (Certificate)

Response to Intervention (RTI) is a model that focuses on evidence-based methods of prevention and intervention combined with data-based decision making to improve student behavioral and academic outcomes. The purpose of this certificate is to provide a sequence of courses that prepares school personnel to lead the development, implementation, evaluation, and sustainability of a three-tiered continuum of behavioral support and intervention in school settings.

This certificate program will provide a sequence of coursework based on a multi-tiered service delivery model consistent with requirements of federal and state law. Students will have the knowledge and skills to provide support to students with intensive behavioral needs, provide
leadership to their schools, serve as "coaches" in supporting school implementation in their schools. Visit the Education and Human Development website for additional information.

Science and Mathematics Education (MST)

The Master of Science in Teaching (MST) is offered by the University's Center for Research in STEM Education. The MST program is a content rich research based master's degree for the improvement of learning in science and mathematics. The program is designed to increase the number of qualified teachers in science and mathematics and to offer a research-based professional development opportunity for pre- and in-service teachers seeking Master's degrees. The program also attracts doctoral students interested in improving their knowledge of teaching.

The MST is a 31-credit Master's program requiring specific coursework, a research thesis, and guided teaching experiences in introductory science and mathematics courses on campus. Students will participate in and understand the results of education research in their discipline(s) and its application to teaching and learning. Students may use the degree to work toward teacher certification by choosing electives that meet some certification requirements, including a student teaching experience in a secondary classroom. The MST's initial certification track for secondary science and mathematics is approved by the National Council for Accreditation of Teacher Education.

MST Concentrations

Concentrations currently available:

- Earth Science
- Mathematics
- Physics and Astronomy
- Generalist

The Master of Science in Teaching program is designed for:

- Recent graduates from science, mathematics, and engineering programs who want to prepare for a career in secondary science or mathematics teaching.
- In-service teachers desiring a Master's degree containing courses that integrate content with research-based science or mathematics instruction.
- Scientists, mathematicians, engineers, and those in related fields wishing to make career changes into secondary science or mathematics teaching.

Program Highlights

- The MST coursework is rich in discipline-specific content and focused on the integration of that content with research-based instructional "best practices." Coupling this coursework with thesis research into student learning and supervised teaching experiences prepares MST students to engage in research-based instruction and develop teaching and learning philosophies consistent with it.
- Each MST student is required to conduct a thesis project based upon original research related to the teaching and learning of science or mathematics. Additional research opportunities exist for MST students through a UMaine collaboration with the Jackson Laboratory in Bar Harbor and through independent study projects in the UMaine science and mathematics departments.
- Courses are offered late in the day and rotated through the summer sessions, so part-time students may tailor their study to their individual schedules. Practicing teachers are encouraged to develop thesis projects that take advantage of the teaching and learning in their own classrooms. Since full-time students generally receive teaching or research assistantships, some teachers might find it beneficial to take a year's sabbatical
and spend it on campus completing part of the requirements for the MST, while being supported by a graduate assistantship.

Participants in this program will:

• Strengthen their backgrounds in the subjects that they teach;
• Study topics included in the Learning Results but often not covered in traditional introductory science and mathematics courses;
• Learn science and mathematics in courses taught using research-guided pedagogy and curricula, including hands-on, inquiry-based methods;
• Participate in courses that combine content and methods, rather than taking separate content and methods courses;
• Learn how to design, conduct, and interpret science and mathematics education research;
• Obtain training in the effective use of technology in the secondary classroom;
• Have supervised teaching experience in classrooms implementing best practices indicated from research; and
• Work toward certification to teach at the secondary level in their field (if desired).

Assistantships

Teaching and research assistantships, including stipends and tuition waivers, are available for students accepted for full-time MST study.

Applications

Applications are considered for full- or part-time study, beginning in the spring or fall semester. The MST application deadline is rolling, although, for full consideration for an assistantship, applications for fall admission should be received by January 15th and for spring admission should be received by October 31st. Applications received later will be considered for financial support if funds are still available.

Application and additional information may be obtained from:

• UMaine Graduate School Website: www.umaine.edu/graduate
• MST Website: https://umaine.edu/risecenter/graduate-studies/
• Professor Deborah Shulman, Director of the Center for Research in STEM Education and MST Graduate Coordinator, mstinfo@maine.edu

Further information about the MST program may be found at:

https://umaine.edu/risecenter/graduate-studies/

MST Prerequisites

The prerequisites for the MST program differ for each of the concentrations, but generally include:

• An undergraduate degree in a field closely related to science, mathematics, or secondary education
• A course in psychology
• Grades of B or better in undergraduate introductory science and/or mathematics courses (see the MST website for the specific requirements for each concentration)
• Passing score on all required Praxis exams (for students working toward certification)

RiSE Graduate Faculty

Asli Sezen-Barrie, Ph.D. (Penn State University), Assistant Professor of Science Education
email: asli.sezenbarrie@maine.edu

Francois Amar, Ph.D. (University of Chicago, 1979), Associate Professor of Chemistry
email: amar@maine.edu

David Batuski, Ph.D. (University of New Mexico, 1986), Chair, Dept. of Physics & Astronomy & Professor of Physics
email: batuski@maine.edu

Elizabeth Hufnagel, Ph.D. (Pennsylvania State University), Assistant Professor of Science Education
email: Elizabeth.hufnagel@maine.edu

Justin Dimmel, Ph.D. (University of Michigan), Assistant Professor of Mathematics Education and Instructional Technology
email: Justin.dimmel@maine.edu

Mitchell Bruce, Ph.D. (Columbia University, 1985) Associate Professor of Chemistry
email: mitchell.bruce@umit.maine.edu

Robert Franzosa, Ph.D. (Wisconsin, 1984), Professor of Mathematics
email: franzosa@math.umaine.edu

Christopher Gerbi, Ph.D. (University of Maine, 2005), Assistant Professor of Mineralogy/Rheology, Department of Earth Sciences
email: christopher.gerbi@maine.edu

Franziska Peterson, Ph.D. (University of Wyoming, 2016), Assistant Professor of Mathematics
email: franziska.peterson@maine.edu

Sara M. Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Science
email: slindsay@maine.edu

Sarah J Nelson, Ph.D. (University of Maine, 2007), Associate Research Professor in Watershed Biogeochemistry
email: sarah.j.nelson@maine.edu

Susan McKay, Ph.D. (Massachusetts Institute of Technology, 1987), Director, Center for Research in STEM Education and Professor of Physics
email: Susan.McKay@umit.maine.edu
More information on RiSE Center graduate faculty can be found here: https://umaine.edu/risecenter/about-us/faculty-page/

Further information, including research interests, may be found on the MST program website.

Secondary Education

Curriculum, Assessment and Instruction (M.S., M.Ed., E.d.S.) Secondary Education

Master of Science (M.S.): The M.S. is a research-oriented degree which culminates in conducting a master's thesis, guided by a committee of three faculty from the program or related fields. This is a 30-credit-hour program, including six credits of thesis research. Four courses (12 credits) are the same as for the M.Ed, as follows:

- EHD 521 - Classroom Practice to Improve Learning
- EHD 533 - Dynamics of the Curriculum
- EHD 519 - Formative Assessments: Research, Practice and Policy
- EHD 541 - Prevention and Intervention in School Settings
- EHD 510 - Introduction to Educational Research

In addition, students must complete six credits of thesis and three credits of research methods (Educational Research (EHD 575); Statistical Methods in Education (EHD 573); or Qualitative Research: Theory, Design, and Practice (EHD 571), as well as a three-course area of specialization chosen in consultation with the adviser and approved by the thesis committee. Depending on the student's prior coursework, experience, and the thesis topic, the thesis committee may require a second research methods course in place of one of the specialization courses.
**Master's of Education (M.Ed.):** The Master of Education program in Secondary Education with a concentration in Curriculum, Assessment and Instruction is designed for teachers who, while continuing a career in classroom teaching, seek to assume responsibility and leadership roles in enhancing standards in the areas of curriculum, assessment and instruction. The degree requires a minimum of 33 credit hours and is offered either completely online or through a combination of online and on-campus courses. The following six online courses (18 credits) are required of all students:

- EHD 521 - Classroom Practice to Improve Learning
- EHD 533 - Dynamics of the Curriculum
- EHD 519 - Formative Assessments: Research, Practice and Policy
- EHD 541 - Prevention and Intervention in School Settings
- EHD 586 - Seminar: Action Research in PreK-12 Schools - offered Fall only.
- EHD 587 - Practicum: Action Research in PreK-12 Schools - offered Spring only.

The **Education Specialist (Ed.S)** provides a cohesive program of professional development beyond the master's level for educational specialists. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be completed within six years.

**Social Work**

The School of Social Work offers graduate study leading to the Master of Social Work (MSW) degree. The goal of the program is to prepare graduates for advanced practice from a generalist perspective in a wide range of social work settings. Using a combination of cognitive work in the classroom and guided experience in field practica, the curriculum covers five course content areas: human behavior in the social environment, social welfare policies and services, research, social work practice, and field education. The curriculum provides opportunity for students to acquire, test, and refine the knowledge, skills, and values necessary for practice as professional social workers. There are two avenues to the Master of Social Work degree, the regular program and the advanced standing program. The MSW requires 63 credit hours of study for the regular program and 46 credit hours for the advanced standing program, and may be taken on a full-time or part-time basis. (Both the School's full-time and part-time programs are considered full time by the Graduate School and Financial Aid Office.)

Upon completion of the MSW degree, graduates are prepared to seek licensing as Licensed Master Social Workers (LMSW) by successfully completing the examination offered by the Maine State Board of Social Work Licensure. After a prescribed period of satisfactory, supervised post-MSW practice in a mental health setting, graduates who have met certain academic requirements are qualified to be examined for licensing as Licensed Clinical Social Workers (LCSW). The regular program consists of 45 credit hours of classroom work and 18 credits of supervised practicum. The practicum includes a minimum of 900 clock hours divided between two agency settings. The full-time (two-year) program is designed to be completed in four semesters. The part-time extended (four-year) program is designed to be completed in four years. The full-time (one-year) program for advanced standing students includes a nine week online summer session and two semesters. The part-time (two-year) advanced standing program includes the nine week summer session and four semesters.
Each year the School of Social Work offers a three-year (including summers) online-blended Program. Most classes are taught asynchronously online, but each class has two in-person meetings on Saturday on the Orono campus. The seminars that accompany the field practica are taught synchronously online. Advanced standing students may join the online-blended program for the final two years, after completing their summer bridge courses. The online-blended program is available only to residents in Maine, New Hampshire and Vermont.

Except for the online-blended program, classroom courses are offered in Orono on consecutive weekdays. Practicum sites are, when possible, selected near students' home communities.

Students with BSW or BASW degrees obtained no more than seven years prior to application, from undergraduate social work programs accredited by the Council on Social Work Education may be eligible for advanced standing upon meeting general eligibility requirements and submitting the following additional materials from their undergraduate program director: a statement that the student has had 400 or more clock hours in field practica, a description of the field experience, and the student's final field evaluation. Advanced standing students usually complete the program with 46 credit hours (36 credit hours of classroom work and 10 credits of supervised practicum). This includes three online bridging courses in the summer. Applicants who have completed some foundation content coursework in another CSWE accredited program within the past five years may request a review of that coursework for possible equivalency or elective credit. In no case can academic credit be given for prior work or life experience.

The MSW program was first accredited by the Council on Social Work Education in 1990 and has been reaccredited consistently since then, most recently in 2019.

To be considered for fall admission, completed applications must be received by January 1, 2021. If you are planning to apply to the MSW Program, please contact Lynne Gamperle, Administrative Specialist, School of Social Work, 112 Social Work Building (207 581-2389) or e-mail (lynnegamperle@maine.edu) to make sure you have the school's additional application material to complete your Graduate School application. For more information about the School of Social Work, visit http://www.umaine.edu/socialwork/

Graduate Faculty

Elizabeth Armstrong, Ph.D. (University of Michigan, 2017). Assistant Professor. Intimate partner violence, substance abuse, research methodologies.

Sandra S. Butler, Ph.D. (University of Washington, Seattle, 1991), Professor, Interim Director, and MSW Coordinator. Gerontology, Social policy, poverty, homelessness, advocacy.


Stephen, Gilson, Ph.D. (University of Nebraska, 1991), Professor and Coordinator of Disability Studies, disability, health policy, legislative advocacy.

Kelly Jaksa, M.S.W. (Boston University, 1994), Lecturer and BSW Coordinator. Practice with children and families.

Judith Josiah-Martin, PhD (Smith College, 2017). Lecturer, Cultural diversity, substance abuse, practice with marginalized populations.

Lenard Kaye, Ph.D. (Columbia University, 1982). Professor and Director of Center on Aging, Gerontology, Administration, Strategic Planning

Kayla Rodriguez, MSW (University of Denver, 2016). MSW Distance Program Coordinator. Advocacy and empowerment; trauma-informed care; crisis intervention.


Emeritus Faculty


Diane C. Haslett, Ph.D. (University of Illinois, Chicago, 1991), Associate Professor Emeritus. Group work, women's issues, adolescence and teenage pregnancy.

Jay Peters, Ph.D. (University of Maine, Orono, 2003). Assistant Professor Emeritus, research methods, trauma, child welfare.

Donald M. Pilcher, Ph.D. (University of California, San Diego, 1976), Professor Emeritus. Research and social policy.

Gail B. Werrbach, Ph.D. (University of Texas, Austin, 1988), Associate Professor Emeritus. Families and children, mental health, child welfare.

Spanish

Master of Arts in Teaching Spanish

The M.A.T. in Spanish (30 credits) has been redesigned with the collaboration of the campuses of the University of Maine System specifically to meet the needs of Maine's schools. The programs offer full-time instruction during the academic year to meet the requirements of pre-service teachers and an intensive institute during the summer for in-service teachers. Candidates take seven to eight courses (21-24 credits) in language, literature, culture and linguistics in the target language, one course in language pedagogy (MLC 466/566) and one course on teaching the exceptional student in English (SED 500). An oral exam and a professional teaching portfolio which illustrate the candidate's familiarity with Maine's teaching standards and his/her readiness to teach a second language in the K-12 classroom are the final requirements for both degrees.

Practicing teachers who are already certified to teach Spanish may opt to take additional courses in their target language, or they may resume the study of a second foreign language at the advanced (400 or 500) level in lieu of taking courses leading to certification.

The Graduate School
5775 Stodder Hall Room 42
University of Maine
Orono, ME 04469-5755
207-581-3291
graduate@maine.edu

Dept. of Modern Languages & Classics
University of Maine
214 Little Hall
Orono, ME 04469
Graduate Faculty

Carlos Villacorta Gonzales, Ph.D. (Boston University, 2009), Assistant Professor and Graduate Coordinator. Twentieth and 21st Century Latin American Literature and Culture; Contemporary Peruvian Poetry; Post-modernism in Latin American, Urban Studies.

Zachary Ludington, Ph.D. (University of Virginia, 2014), Assistant Professor of Spanish. Modern and Contemporary Spain, the international Avant-Garde, La Edad de Plata, Translation.

Susan Pinette, Ph.D. (University of California, Irvine, 1999), Associate Professor and Director, Franco-American Programs. Francophone literature. Eighteenth century French literature.

Frédéric Rondeau, Ph.D. (McGill University, 2010), 20th Century Quebec Literature and Culture; Counter-Culture (transnational perspective); Post-68 Literature, Culture, and Politics (France-Quebec); Francophone Literature of North America; Quebec Poetry and Literary Journals; Literary Avant-gardes; Contemporary French philosophy


Associate Faculty

Andrea Mercado, M.S./M.A. (Florida International University, Miami, FL 2009) Instructor. Specializations in teaching English language learners, Underrepresented populations, Student with Limited/Interrupted Formal Education, Family and Community Partnerships


External Faculty

Nancy Erickson, Ph.D. (Michigan, 1992), Associate Professor, University of Southern Maine. French Renaissance literature. French women writers.

Emeriti Faculty


Spatial Informatics

The master-of-science degree in Spatial Informatics (MSSI) provides an "all e-learning" "all coursework" degree for place-bound students that desire strong theory, computational, cognitive, analytical, policy and technical foundations in geographic information science and systems. As a general rule, students may view class videos and accomplish assignments at any time throughout a week in any of the offered program courses and have the weekly opportunity (or requirement) to participate in a one to two hour "live" discussion session at a mutually convenient time for distance class members prior to due dates for weekly assignments. The MS Spatial Informatics graduate degree is an "online only" version of the existing on-campus research-focused or project-focused MS in Spatial Information Science and Engineering degree.

The program focuses on advancing knowledge about spatial information particularly with respect to concepts needed in next-generation information systems. Emphasis is placed on learning and developing novel concepts and methods in the broad fields of spatial and geographic information science for sensing, storing, accessing, analyzing, and managing spatial data as well as modeling, extracting, integrating, visualizing, and communicating spatial information.

Spatial Informatics may be viewed as a field of study merging knowledge drawn from geographic information science, information science, cognitive science, computer science and engineering. Students build on foundations in computer
science, mathematics, physics, geography, cognitive science, neuroscience, artificial intelligence, engineering and related fields to study spatio-temporal phenomena, design intelligent spatial information systems and develop human-centered accessible technologies. In addition, the design of spatial information technologies requires a comprehensive understanding of the social, legal, economic, and institutional issues affecting such systems, a commitment to human users and ethical uses of such systems, dedication to the ethics of broad access to information, and commitment to quality of information. We view spatial informatics as a true systems science within the broader conceptual framework of spatial computing.

The program is designed to meet the growing demand in society for graduates with high-level geospatial technology skills. This student centered curriculum provides a path for women and men from diverse fields to rapidly transition to information system career paths by providing them with foundation graduate level courses in information systems and geographic information science. Similar to an MBA or Law degree, the spatial informatics graduate program accommodates students from wide ranging undergraduate degree backgrounds.

Objectives

Students develop knowledge and technical skills in foundation areas of formal methods, programming, information system design, human computer interaction and information law and ethics. All of these general information systems graduate courses draw on spatial technology examples or contextual environments. Based on the foundation, a wide variety of in-depth skills are developed in the areas of web-based database systems design and development, real-time data stream processing, spatial cognition, geosensor networks, spatial data science, ontology frameworks and virtual/augmented reality. Students gain working familiarity with one or more programming languages if not already acquired. The online graduate program specializes in preparing graduates to better utilize location information, geographic information systems, sensors, sensor networks and mobile technologies in accomplishing the day-to-day tasks of businesses and government and to help advance new innovations in these domains. In addition, students may propose courses within their program of study that provide an understanding of business and engineering applications and thus provide further foundations for effective communication with end users.

Master of Science in Spatial Informatics

The Master of Science in Spatial Informatics is available only to distance students. The program consists of the same courses as taken by on-campus graduate students in Spatial Information Science and Engineering taught by the same instructors. Online students view lectures and class discussions at times of their own choosing while deadlines for electronic delivery of assignments are often the same as for on-campus students. There is no thesis required although students may propose pursuit of a project-based course as part of their graduate program if desired.

As required by the University, all work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Spatial Informatics.

Degree Requirements

The Master of Science in Spatial Informatics (MSSI) consists of 30 credits, all earned in course work. The program consists of five three-credit required core courses and a minimum of fifteen additional credits from a list of elective courses approved for the program drawn from a range of disciplines but primarily from distance courses offered by the School of Computing and Information Science. If some required courses are duplicate of courses that may have been taken in the student's undergraduate degree program or another graduate program, those courses need not be repeated, and the student will select in consultation with the MSSI Graduate Coordinator and MSSI Steering Committee additional approved courses to arrive at the total of 30 credit hours.
Required Courses

The following five courses must be taken and all count toward the graduate degree.

- SIE 507 - Information Systems Programming Credits: 3
- SIE 515 - Human Computer Interaction Credits: 3
- SIE 525 - Information Systems Law Credits: 3
- SIE 550 - Design of Information Systems Credits: 3
- SIE 505 - Formal Foundations for Information Science Credits: 3

Elective Courses

Students must take at least fifteen additional credits that are approved in advance by the MSSI Steering Committee from the following approved elective course listings in order to arrive at the total required of 30 credits.

Among courses that are regularly available for distance students include:

- SIE 508 - Object Oriented Programming Credits: 3
- SIE 509 - Principles of Geographic Information Systems Credits: 3
- SIE 510 - Geographic Information Systems Applications Credits: 3
- SIE 512 - Spatial Analysis Credits: 3
- SIE 516 - Interactive Technologies for Solving Real-World Problems Credits: 3
- SIE 517 - Spatial Interaction Design Credits: 3
- SIE 554 - Spatial Reasoning Credits: 3
- SIE 555 - Spatial Database Systems Credits: 3
- SIE 557 - Database System Applications Credits: 3
- SIE 558 - Real-Time Sensor Data Streams Credits: 3
- SIE 559 - Geosensor Networks Credits: 3
- SIE 580 - Ontology Engineering Theory and Practice Credits: 3
- SIE 590 - Information Systems Internship Credits: 3
- SIE 693 - Graduate Seminar Credits: 1

Students may propose additional elective graduate courses than those listed to be included on their program of study on a case-by-case basis or added to the list. Some of the elective graduate courses may require prerequisites in addition to the minimum required for general admission to the MSSI graduate program.

Detailed Requirements

- Programs of Study are approved for each student by the Steering Committee for the MSSI graduate program. This committee consists of the MSSI Graduate Program Coordinator and two additional graduate faculty members in the department or affiliated with the program.
- Each student's Program of Study must include the five required core courses with the remainder of courses to be selected from an approved course list maintained by the department or proposed by the student and assessed for possible approval. The MSSI Steering Committee assesses the reasonableness of such requests and makes the final decision on whether specific additional courses serving the objectives of the MSSI program and the needs of the student may be included. Each student's Program of Study must be approved in advance by the MSSI Steering Committee. Students should NOT assume that any combination of program courses will be approved by the Steering Committee.
- At least 15 credits of the 30 required on a student's program of study must be at the 500 level or above.
- Up to two courses may be taken at other universities by distance methods or otherwise if contained on the student's graduate program of study and approved in advance by the MSSI Steering Committee.
• Up to two graduate courses may be transferred into the student's graduate program of study if taken prior to admission to the Graduate School, the courses did not count towards a previous undergraduate or graduate degree, and the courses are approved by the MSSI Steering Committee.

• The MSSI Graduate Coordinator serves as the advisor for each student admitted to the program and the MSSI Steering Committee serves as the graduate committee for each student in the program.

• All students must complete the entire M.S. graduate program of study within a six-year period (as established by the Graduate School).

**Admission Requirements**

Admission to the University of Maine Master of Science in Spatial Informatics is competitive but on a rolling basis. In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully and achieve positions of leadership in the private or public sectors. While the submission of GRE scores and letters of recommendation are encouraged, they are not required. We generally seek an undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a four-year international equivalent. Within their curriculum, all applicants should have completed a university course in Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are recommended but not required. The review committee considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School. The entire application packet including transcripts, test scores (if required), essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. To be considered for Fall admission, completed applications should be received if at all possible 8 weeks prior to the beginning of the term.

Concurrent Graduate Certificate Applications: Applicants applying for the MS Spatial Informatics that desire to acquire Graduate Certificate in GIS, Information Systems, and/or Data Science and Engineering along the way to acquiring the MS, should apply additionally for the Graduate Certificate(s) prior to completing the MS course requirements.

Students applying for Graduate Certificate programs are not required to submit GRE scores. Students that successfully complete a graduate certificate program in Information Systems, Geographic Information Systems, or Data Science and Engineering (all offered on-campus and by distance) and received a B or better in all of their certificate courses are not required to submit a GRE score for admission to the full non-thesis MS programs in Information Systems (offered on-campus and by distance), Spatial Informatics (offered by distance only) and Spatial Information Science and Engineering-Project Option (offered on campus only). All or most of such graduate courses completed for these graduate certificates may count toward the 10 courses required for the full MS degree.

Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students

High performing undergraduate students from any discipline at the University of Maine may apply for early admission, preferably early in the junior year, to the MS Spatial Informatics degree program. Applicants to the Accelerated Four Plus One should submit the Application for Admission to the SIE or MSIS Four Plus One Program. Such applications are not accepted after the senior year has commenced.

**Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale,** Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.
Max J. Egenhofer, Ph.D. (Maine, 1989), Professor, Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

Nicholas A. Giudice, Ph.D. (Minnesota, 2004), Professor and Director of VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

Torsten Hahmann, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

Nimesha Ranasinghe, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Spatial Information Science and Engineering

Graduate Programs, Certificates, Specializations, Emphases

The graduate programs in Spatial Information Science and Engineering focus on advancing knowledge about spatial information particularly with respect to concepts needed in next-generation information systems. Emphasis is placed on developing novel concepts and methods in the broad field of geographic information science for sensing, storing, accessing, analyzing, and managing spatial data as well as modeling, extracting, integrating, visualizing, and communicating spatial information.

Students build on a solid foundation in computer science, mathematics, physics, geography, cognitive science, artificial intelligence, engineering and related fields to study spatio-temporal phenomena and design intelligent spatial information systems. In addition to these concepts, the design of spatial information technologies requires a comprehensive understanding of the social, legal, economic, and institutional issues affecting such systems, a commitment to human users and ethical uses of such systems, dedication to the ethics of broad access to information, and commitment to quality of information.

The research interests of our faculty are currently predominantly in the area of Spatial Computing, including spatial cognition, spatio-temporal reasoning, spatial ontologies, spatio-temporal data streams, geosensor networks, spatial data science, and location privacy.

Graduate programs offered include the Ph.D. in Spatial Information Science and Engineering, Master of Science in Spatial Information Science and Engineering, Master of Science in Spatial Informatics, and Graduate Certificate in Geographic Information Systems.

Program Objectives:

The core objectives of the graduate programs include interdisciplinary study of the nature and function of spatial information systems, and the technical study of the design and evaluation of methods and processes to capture, represent and analyze spatial information.
Graduate courses cover formal representations of spatial phenomena, database systems, geographic information systems, human-centered design, and information policy. Research topics may be selected from any of the principal areas ranging from geographic information science, spatial cognition and spatial interface design, spatial database systems, artificial intelligence involving spatial information, geosensor networks, to legal and policy studies addressing location technology uses and advancements. Many research topics require an interdisciplinary approach and, therefore, courses taught in other graduate programs complement the programs offered.

Supplemental information supporting the program and course requirements that follow may be found in the current edition of the Graduate Student Guide available through the Spatial Informatics website.

Master of Science in Spatial Information Science and Engineering

The School of Computing and Information Science offers both a thesis and project option in the Master of Science in Spatial Information Science and Engineering. All work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Spatial Information Science and Engineering.

The thesis option is the scientific track, typically requiring a strong engineering, computer science, human-computer interaction, or mathematics undergraduate background. Prospective master's students with other disciplinary backgrounds are expected to make up the requisite math and engineering courses that would allow them to succeed in an engineering graduate curriculum. The thesis option includes a substantial piece of individual research as a basis for a master's thesis.

The project option is aimed at students who desire to focus primarily on course work rather than research at the master's level. The formal coursework is complemented by a one-semester project in which the student must demonstrate that he or she can apply the acquired knowledge for implementing a particular solution.

Degree Requirements

Master (Project Option)

Minimum of 30 graduate course credits (i.e., 400 level or above) on a program of study approved by advisors that includes:

- No more than 6 course credits, if any, at the 400 level
- At least 18 graduate course credits in SIE
- No more than 6 credits of independent study courses (SIE 598, SIE 698, or equivalent independent study courses in other graduate programs)
- SIE 589 Graduate Project (3 credits)
- SIE 507 Information System Programming
- INT 601 Responsible Conduct of Research (1 credit)
- Breadth Requirement: at least one 3-credit graduate course from 4 out of the 5 following breadth areas as specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy
- At least 3 graduate faculty on the advisory committee
- At least 2 must be SIE tenured or tenure-track faculty

Master (Thesis Option)
Minimum of 30 graduate course credits (i.e., 400 level or above) on a program of study approved by advisors that includes:

- At least 24 graduate course credits
- At least 6 thesis credits - SIE 699
- No more than 6 course credits, if any, at the 400 level
- At least 18 graduate course credits in SIE
- No more than 6 credits of independent study courses (SIE 598, SIE 698 or equivalent independent study courses in other graduate programs)
- SIE 501 Introduction to Graduate Research (1 credit)
- SIE 502 Research Methods (1 credit)
- SIE 507 Information System Programming (3 credits)
- SIE 693 Graduate Seminar (1 credit)
- INT 601 Responsible Conduct of Research (1 credit)
- Breadth Requirement - at least one 3-credit graduate course from 3 out of the 5 breadth areas as specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy
- At least 3 graduate faculty on the advisory committee
- At least 2 must be SIE tenured or tenure-track faculty
- Master's Thesis Defense

For either master's degree, a maximum of six credit hours of graduate course work taken prior to enrollment in the master's program, whether at this university or another, may be counted toward the master's degree. If the course did not count toward a completed undergraduate or graduate degree and if the student's graduate advisory committee formally approves acceptance of the courses on the student's Program of Study, then the credit hours may be transferred to apply toward the master's degree.

In order to meet the University of Maine Graduate School residency requirement, at least 50 percent of the coursework toward the degree must be taken through the University of Maine, whether on-campus or online. Requirements for on-campus presence for research and project work are at the discretion of the student's first advisor and advisory committee.

**Doctor of Philosophy in Spatial Information Science and Engineering**

The Ph.D. degree is the highest of academic degrees. The Ph.D. in Spatial Information Science and Engineering is awarded to those demonstrating outstanding achievement in Spatial Information Science and Engineering scholarship and primarily for demonstrated ability for independent research in the field. The preparation and defense of a dissertation embodying the results of an original investigation in a specialized area of Spatial Information Science and Engineering are essential features of the program.

All work for a doctoral degree must be completed within eight years. The timing starts with the first semester of registration after admission to the Ph.D. in Spatial Information Science and Engineering. Students must be admitted to candidacy within four years of registration for the first work presented for satisfaction of degree requirements. To be admitted to candidacy, the student must develop a dissertation proposal and orally defend it successfully in front of the student's graduate advisory committee. The dissertation proposal and its defense must demonstrate the student's knowledge related to the student's dissertation topic. The dissertation must be completed within four years of admission to candidacy. A full oral defense of the dissertation is required upon successful completion of the student's work.

For admission, students normally are expected to hold a Master's degree with a strong technical and analytical background, typically in engineering, computer science, cognitive science, mathematics, geography, or another area
related to their prospective advisor's research area. Graduate students without a Master's degree may be considered for
direct admission to the Ph.D. program with approval by the graduate program faculty. Any student enrolled in the PhD
program who completes the requirements for the MS degree (project option) before the Ph.D. may be awarded the MS.

Degree Requirements

A minimum of 12 dissertation credits (SIE 699) and 30 graduate course credits (i.e., 400 level or above) on a program
of study approved by the student's graduate advisory committee that includes:

- Up to 24 transfer credits of graduate course work
- SIE 507 Information System Programming
- At least 5 credits in Research Skills, including all of the following:
  - SIE 501 Introduction to Graduate Research (1 credit)
  - SIE 502 Research Methods (1 credit)
  - INT 601 Responsible Conduct of Research (1 credit)
  - SIE 693 Graduate Seminar (1 credit)
  - SIE 694 Doctoral Seminar (1 credit) once per year starting the year after completion of SIE 693

- Breadth Requirements: at least one 3-credit graduate course from 4 out of the 5 following breadth areas as
  specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy

- Depth Requirement: At least 12 graduate credits (400 level or above) not counted towards the breadth
  requirement. These credits must be in areas relevant to the student's dissertation topic as determined by the
  student's advisory committee, with at least 6 of those credits from SIE courses.

- At least 5 graduate faculty on the advisory committee
- At least 3 must be SIE tenured or tenure-track faculty
- Dissertation Proposal Defense

A maximum of 24 credit hours of graduate course work taken prior to enrollment in the Ph.D. program, whether at this
university or another, may be counted towards the Ph.D. degree. If the student's graduate advisory committee formally
approves acceptance of a course on the student's Program of Study, then the credit hours may be transferred toward the
doctoral degree.

The University of Maine Graduate School minimum residency requirement for the Ph.D. is automatically met by four
semesters of course enrollment in the program beyond the baccalaureate degree, whether by on-campus or online
enrollment. Requirements for on-campus presence for research and project work are at the discretion of the student's
first advisor and advisory committee.

Admission Requirements

Admission to the University of Maine Spatial Information Science and Engineering graduate programs is competitive.
In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully
and achieve positions of leadership in the private or public sectors. Unless the GRE requirement is waived for a
qualifying student, we generally seek students that score at the mean or above on the verbal, quantitative and analytical
segments of the GRE exam and in the 50th percentile or above on the exam overall. We generally seek an
undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum, an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a
four-year international equivalent. Within their curriculum, all applicants should have completed a university course in
Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are
recommended but not required. The graduate faculty considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School and typically the entire application packet including transcripts, test scores, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued. To be considered for Fall admission, completed applications should be received 8 weeks prior to the beginning of the term.

**Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students**

Undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the MS Spatial Information Science and Engineering (Project Option) graduate degree program. Applications for conditional "early admission" should be received preferably by the middle of the first semester of the junior year and are not accepted after the senior year has commenced. The final year in completing the Master's degrees may be taken either on-campus or online.

By taking a course overload of three credits in the second semester of the Junior year and course overloads in each of the semesters of the Senior year, a motivated student typically may acquire 9 credits (but no more than 12) for graduate school (at undergraduate tuition rates) prior to acquiring their undergraduate degree assuming that they receive a B or better in the courses. These courses, if chosen appropriately, may double count towards both the undergraduate and graduate degree. By taking a 3-credit Information Systems Internship graduate course with a corporation, agency or non-profit organization during the summer, a student may readily complete the coursework master's degree in a single year after their undergraduate degree. This master's degree will be highly complementary to an undergraduate degree in almost any field and attractive to employers.

To apply for early admission before or during the junior year, an applicant should expect to have an overall minimum undergraduate grade point average of 3.25, must have completed the University of Maine General Education Requirement in Math and must have three letters of recommendation from current or previous university instructors. Apply using the Application for Admission to the SIE or MSIS Four Plus One Program. Continuation in the graduate program is based primarily on performance in the graduate courses and overall grade point average upon graduation from the undergraduate program. Accepted Four Plus One students must complete the full graduate application in their senior year. The GRE exam is typically waived for these accepted high performing students. Below a 3.0 accumulated undergraduate grade point average should be assumed cause for discontinuation in the graduate program.

Students with two or fewer semesters remaining to complete their undergraduate degree program do not qualify for the accelerated “four-plus-one program” but their applications will be considered as applications within the regular graduate admissions process. In this case, one may transfer up to two graduate courses prior to formal admission assuming those courses did not count toward another degree.

**Financial Assistance**

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the School of Computing and Information Science offers graduate research assistantships to qualified students on externally funded research projects. A very limited number of teaching assistantships may be available. Consult as well Funding at the Graduate School web site.

**Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.
Max J. Egenhofer, Ph.D. (Maine, 1989), Professor. Qualitative reasoning, spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

Nicholas A. Giudice, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

Torsten Hahmann, Ph.D. (Toronto, 2013), Associate Professor. Ontologies, especially spatial ontologies with application to earth and geoscience applications, ontology engineering, knowledge representation, automated reasoning, information extraction, artificial intelligence, and logic.

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

Nimesha Ranasinghe, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

Special Education

The Special Education graduate programs integrate research with practice, support students as social advocates, advance education, community, and research to enhance the quality of life for persons with disabilities and their families. Our online programs are a flexible option and provide a foundation for education within a variety of settings, including business, educational and research centers, and national and state agencies. Students analyze current teaching strategies and evidence-based practices, learning and mentoring methods, and examine critical issues in special education. The Special Education graduate programs will expand career options and help to bring positive change to the education system.

Graduate programs in Special Education prepare educators to meet national standards of excellence in communication skills, professional knowledge, and teaching competence. Programs of study are offered for both entry-level and experienced professionals and include certification and non-certification options. The M.Ed. program offers concentrations in High Incidence Disabilities, Low Incidence Disabilities, Dual Low and High Incidence Disabilities, Early Intervention, and Individualized.

State Certification Options

Teacher of Students with High Incidence Disabilities (M.Ed.)

This 33-credit hour program prepares you to provide high-quality education to students with mild to moderate disabilities such as learning disabilities and/or emotional/behavioral disorders. You'll learn how to use the latest evidence-based strategies to adapt the general education curriculum in areas such as reading, math, writing. You'll also learn how to create safe, inclusive, and culturally responsive classrooms. By understanding how to apply best practices, you can provide students with the proper attention, assistance, and instruction to help them succeed. This is a 33-credit online program and provides a pathway to state certification as a Teacher of Students with Disabilities-282 (PK-8 or 7-12).
Educational Specialists for Students with Low Incidence Disabilities (M.Ed.)

This 33-credit hour program leads to state certification as a Teacher of Students with Severe Disabilities (286). This program prepares you to serve students with autism spectrum disorder, significant intellectual disabilities, and students with multiple disabilities. This program is appropriate for undergraduate majors in elementary and secondary education as well as related fields such as child development, psychology, communication disorders, occupational and physical therapy, and nursing. You will learn how to use the latest evidence-based strategies to develop needs-appropriate curricula and create safe, inclusive, and culturally responsive classrooms. By understanding how to apply best practices, you can provide students with the proper attention, assistance, and instruction to help them succeed. Courses are delivered via distance education technology.

Early Intervention Personnel (M.Ed.)

This 36-42 credit program provides a foundation in the field of early intervention/early childhood and preparation for leadership roles. You'll learn how to use the latest evidence-based strategies and advanced teaching methods, support and nourish family relationships, collaborate with other professionals, and gain hands-on teaching experience. The curriculum is designed to prepare students in the fundamentals of professional practice in early intervention for inclusive environments, provide students with advanced content in a variety of research areas (e.g., early childhood, early childhood special education, family relationships, collaborative consultation), and place students in practicum experiences with high needs children ages birth-5 and their families. The concentration is appropriate for students with a bachelor's degree in early childhood education or a related field who are currently working with, or have a desire to serve, high needs children with disabilities, ages birth to five, and their families. The program leads to state certification as Teacher of Children with Disabilities (282, birth to school-age 5). Courses are delivered via distance education technology.

Individually Designed

M.Ed. or E.d.S.: Individually designed programs are for professionals who already hold certification in special education or are not interested in certification as a special education teacher. M.Ed. programs require a minimum of 36 credit hours of study. E.d.S programs require a minimum of 30 credit hours for those with a master's degree in Special Education; 33-42 credit hours for those with a master's degree in a related field.

Potential candidates include:

- Experienced special educators who want to pursue more specialized study of a particular disability or topic (e.g., autism spectrum disorders, positive behavior interventions and supports, learning disabilities), or to combine study in Special Education with study in another field (e.g., Educational Leadership, Instructional Technology, Literacy);
- General education teachers who want to increase their expertise in working with students with disabilities in general education classrooms; and
- Related services personnel who want to increase their understanding of educational policies and practices pertaining to students with disabilities (e.g., instructional strategies, educational assessments, special education law).

With a faculty advisor, students select courses around their unique needs and interests. Courses are drawn from Special Education and other areas in the College of Education and Human Development, although at least 50 percent of the student's credits for the degree must be in Special Education.
Graduate Certificates- see the certificate program descriptions within this catalog or visit the web links below for more information.

Positive Behavior Intervention and Support: RTI for Behavior Certificate

Graduate Certificate in Autism Spectrum

Graduate Certification: High Leverage Practices to Promote Inclusion

Field Work, Research and Service for all Special Education Courses

Field work and internships are an important component of all graduate programs in Special Education. Faculty and students are an integral part of the social and educational service community in Maine, and close relationships are maintained with public schools and community agencies. Students also have the opportunity to participate in faculty research and service projects.

Admission

For admission to a graduate program in Special Education, students must meet basic standards of the Graduate School and special eligibility requirements of the program.

Applicants may take either the GRE (no advanced test required) (http://www.ets.org/gre) or the Miller Analogies Test (http://www.pearsonassessments.com/postsecondaryeducation/graduate_admissions/mat.html). For students with an undergraduate GPA of 3.0 or above, this testing requirement is waived.

Applicants seeking admission to programs that lead to certification must submit scores on Praxis Core Academic Skills for Educators with their applications (https://www.ets.org/praxis/about/core/). Candidates who are already certified in Maine and have taken Praxis previously may submit a copy of their certificates to document that they have met state standards on the test. For out of state candidates, Maine has reciprocity agreements with most states.

Applicants may be invited for a personal interview with the Special Education faculty. Students should request financial aid information from the University's Student Financial Aid Office. Special Education scholarships are sometimes available for candidates with documented financial needs. To be eligible, applicants must have applied for financial aid through the University's Office of Student Financial Aid.

State Certification

Teacher certification is granted by the Maine Department of Education, not by the University of Maine. Students who successfully complete ALL the requirements of our NCATE-approved, professional preparation programs (High Incidence Disabilities, Low Incidence Disabilities, Early Intervention) including documentation of fingerprinting, background check, and passing scores on Praxis II in Special Education will be eligible for certification. Specific information regarding certification is available from the Maine Department of Education, Certification Services, State House Station 23, Augusta, ME 04333.

Four Plus One Programs
The Special Education program offers students throughout the University of Maine system the opportunity to earn a Bachelor's degree in a student's focus area and a Master's degree (MEd) in Special Education at the University of Maine, Orono in five combined years of study (the Four Plus One option, an accelerated MEd program).

**Core Program Requirements:**

Students enrolled in the Four Plus One option earn a bachelor's degree at the end of their senior year and graduate with their class. In the Four Plus One option, the MEd is earned after the fifth year, through the combined graduate work completed in their undergraduate senior year and in the one additional graduate-level year (15 months).

During the senior year, which serves as a bridge year between the undergraduate and graduate programs, students may enroll in 9 credits of graduate-level course credits at the 500-level or above that count toward both degrees. Students must earn a grade of "B" or better to be counted toward the MEd degree. Over the course of earning the MEd degree, students are permitted a maximum of two 400-level courses in their field or concentration.

**Four Plus One Coursework and Project:**

Students must complete 33 credit hours of course work for the graduate degree. At least 24 credit hours must be taken at the graduate level. Special education faculty will work closely with the student and the student's undergraduate advisor to select courses that will support a student's interests and career path. The Special Education program offers multiple options for coursework, providing students pathways that will enhance their understanding, awareness and acceptance of individuals with disabilities.

**Four Plus One Admission**

Students apply for the Four Plus One during their junior year (at least 60 but no more than 100 completed credit hours applicable towards the undergraduate degree). Student must have an undergraduate GPA of 3.0 or higher. Deborah Rooks-Ellis will be the point of contact for the Four Plus One program.

The application deadline is February 1. Students complete the Four Plus One application (currently on file with UMaine Online and used for the Four Plus One special education program with UMM). Students will submit the application directly to the program point of contact rather than to the Graduate School. The Special Education Program Admission Committee will make admissions decisions no later than March 1.

Please note that admission to the Four Plus One option includes provisional admission to the Graduate School. **Formal application for admission to the MEd program (including payment of the application fee) must be made through the Graduate School and should occur no later than spring of the senior year.** The GRE requirement is not required for students in the Four Plus One option in special education. Also note that students must maintain a 3.0 GPA or higher through the completion of the undergraduate degree in order to gain full admission to the accelerated MEd program and be allowed to double count credits.

Students who meet the above requirements must matriculate in the MEd program within three months after receiving their undergraduate degree in order to apply the double-counted credits towards the MEd degree. Students in the Four Plus One option must complete the MEd curriculum within 15 months of matriculation. Under extraordinary circumstances, a student may petition to delay matriculation up to an additional 12 months.

Faculty contacts can be found here.
Maine Autism Institute for Education and Research

On January 1, 2014 the Maine Autism Institute for Education and Research (MAIER) was launched as a partnership between the Maine Department of Education and the University of Maine, College of Education and Human Development (COEHD). Our mission is to build statewide capacity to improve outcomes for individuals with autism spectrum disorder (ASD) through leadership, training, professional development, collaboration, and research.

Maine Autism Institute for Education and Research

5766 Shibbles Hall, 303
Orono, ME 04469

Phone: 207.581.2352
Fax: 207.581.9510
maineautisminstitute@maine.edu

For more information, see http://umaine.edu/autisminstitute/

**Special Education Leadership: Assistant Special Education Director (Certificate)**

Assistant Special Education Administrators assist the Special Education Directors in decision-making and providing students with disabilities the proper attention, assistance, and education to help them succeed. Graduates of the online Graduate Certificate in Special Education Leadership: Assistant Administration will learn how to: Positively affect the quality and future of special education and promote the general welfare of children with disabilities; Serve and support children with disabilities and their families; Protect the privacy of students and families in accordance with State and Federal laws; Foster and support maximum self-determination and independence on the part of exceptional children; Utilize impartial professional judgment in evaluating the needs of exceptional children and their families.

This certificate can lead to Maine certification in Assistant Administrator of Special Education (035). Earning certification in other states through this program may be very simple. Please visit your state's department of education for information or visit the United States Department of Education website. Specific information regarding Maine certification is available through the Maine Department of Education. Graduates can also find opportunities outside the
STEM Education (Emphasis)

STEM EDUCATION (PhD in Education concentration)

The STEM Education PhD is an interdisciplinary program for those who have an interest in improving the quality of science, technology, engineering, or mathematics (STEM) education through research. The program is housed in the College of Education and Human Development and governed by an interdisciplinary committee consisting of STEM education faculty in the COEHS and faculty associated with the Maine Center for Research in STEM Education (RiSE Center). The program prepares students for faculty positions in STEM education within discipline departments and in colleges of education, or for education research positions in museums, research centers, policy agencies, and think tanks. It requires a minimum of 45 credits of coursework and a dissertation.

The STEM Education PhD is a full-time program in which students are supported through graduate assistantships contingent on available funding and have a day-to-day presence on the University of Maine campus. Students in the program study and conduct research on a broad range of issues related to STEM education through coursework and interdisciplinary research apprenticeships, both of which combine rigorous research methodology with disciplinary perspectives on educational challenges and opportunities. The graduate assistantships may also involve teaching assistantship(s) in undergraduate coursework in science, education, or mathematics.

There are two pathways through the program. Pathway 1 is for interested students who hold both a bachelor's and a master's degree in a relevant field. Candidates for this pathway will likely have experience teaching STEM in K-12 school(s), informal learning center(s), or at the collegiate level; hold undergraduate and master degrees in education, science, or a combination of education and science; and/or have evidence of progressive professional development experiences in STEM education. Pathway 2 is for interested students who have not earned a master's degree in a relevant STEM field or STEM education. The following are some of the options for the master's degree component of the program:

- The MST program at University of Maine
- A master's degree in the Department of Physics & Astronomy with a research thesis in STEM education
- A master's degree in the Department of Mathematics & Statistics with a research thesis in STEM education
- A master's degree from another STEM department at the University of Maine that includes a research thesis in STEM education

In pathway 2, students can enroll concurrently in one of several of UMaine's master's degree programs and the STEM Education PhD program.
For both Pathway 1 and Pathway 2, students will be required to pass milestones in order to continue to advance in the program. Details of these milestones will be provided by the advisor and the program once the student is admitted but entail a qualifying paper their first year, comprehensive exams and their defense at or near the end of coursework, a dissertation proposal and defense, and a dissertation and defense.

Applicants for both pathways are strongly encouraged to look at research profiles of the STEM Education PhD faculty for alignment of research interests. These faculty members are: Drs. Justin Dimmel, Elizabeth Hufnagel, Asli Sezen-Barrie, Natasha Spear, and Michael Wittmann.

For further information, contact Jo Ellen Carr (joellen.carr@maine.edu, 207-581-2444) or Dr. Elizabeth Hufnagel (elizabeth.hufnagel@maine.edu).

Surveying Engineering (Certificate)

Surveying Engineering (Certificate)

Changing technologies in the surveying engineering world require working professionals to return to an academic world to expand their knowledge. Professional Land Surveyors with a BS degree in surveying or related field will expand on their undergraduate knowledge. Similarly professional land surveyors with a non-surveying undergraduate degree will be able to capture knowledge in their chosen second career.

The Graduate Certificate in Surveying Engineering requires completion of a minimum of 12 credits of coursework. The twelve credits of coursework must include four classes selected from this list of seven three credit graduate courses:

- SVT 501 Advanced Adjustment Computations
- SIE 509 Principles of Geographic Information Systems
- SVT 511 Geodetic United States Public Land Survey System
- SVT 512 Advanced Survey Law
- SVT 531 Advanced Digital Photogrammetry
- SVT 532 Survey Strategies in Use of Lidar
- SVT 541 Geodesy
- SVT 542 Applied Hydrographic Surveying

Only courses in which the student obtained a grade of B or higher count towards the completion of the Surveying Engineering Graduate Certificate.

Surveying Engineering Graduate Certificate Admission

Students to be admitted into the Surveying Engineering Graduate Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, essay, and one reference letter. Students can apply to transfer up to 3 credits of graduate course work into the Surveying Engineering Graduate Certificate. The Surveying Engineering Certificate Coordinator must approve such transfer credits after assessing whether they are appropriate or not.
Continuation to Professional Science Masters in Engineering and Business Surveying Engineering Concentration

Upon completion of the Graduate Certificate in Surveying Engineering a student may apply for admission to the Professional Science Masters in Engineering and Business Surveying Engineering Concentration (PSM). The twelve credits received in the certificate will count as the twelve surveying courses required in the PSM.

Additional Information

Course Descriptions can be found in this catalog using the navigation in the left menu.

Surveying Engineering Graduate Faculty

**Carlton Brown**, PhD, PE, PLS (University of Maine 2008), Associate Professor, cadastral surveys, land tenure, carlton.brown@maine.edu  
**Knud Hermansen**, PhD, JD, PE, PLS (West Virginia University 1989), Professor, boundary law, construction surveying, knud.hermansen@maine.edu  
**Raymond Hintz**, PhD, PLS (University of Wisconsin 1983), Professor and Graduate Coordinator, adjustment computations, photogrammetry, ray.hintz@maine.edu

Sustainable Agriculture (Emphasis)

Agriculture is rapidly changing. While many farming systems continue to specialize and exploit economies of scale, the "locavore" movement of the 2000's has inspired a new generation of farmers, millers, bakers, brewers, distillers and restaurateurs to serve new and growing markets. Demand for local and regional vegetables, fruits, grains, meats, milk and value-added continues to grow. To sustain agriculture, production must balance market demand with environmental stewardship and economic viability and operate within the context of an increasingly global food system and challenging climate variability.

To address these challenges, the University of Maine, through various degree programs, has offered a comprehensive research focus in Sustainable Agriculture since 1988, emphasizing:

- innovative crop production practices that provide opportunities for diversity and added value;
- building soil quality through efficient use of crop rotations, multiple cropping systems, animal manures, and recycled waste products;
- managing pests with multi-faceted, ecologically sound strategies that have minimal reliance on synthetic, broad-spectrum pesticides;
- protecting water quality, worker health, and food safety;
- increasing farm economic resilience and profitability by decreasing the costs of crop and livestock production;
- creating strong rural communities that can be sustained through years of fluctuating crop prices and unpredictable weather.

Graduate students performing research in Sustainable Agriculture at the University of Maine can earn one of the following degrees, depending on their specific interests:
Doctor of Philosophy
Biological Sciences
Ecology and Environmental Sciences
Plant Science

Master of Science
Botany and Plant Pathology
Ecology and Environmental Sciences
Entomology
Plant, Soil and Environmental Sciences
Resource Economics and Policy

Course work is drawn from the offerings of many departments. Research activities are conducted at University of Maine research farms in Old Town, Monmouth, Jonesboro or Presque Isle, and on working farms.

For more information about graduate research in Sustainable Agriculture at the University of Maine and the availability of financial assistance, prospective students should contact faculty members who might supervise their studies. General information about the program can be obtained from:

Dr. Eric Gallandt
School of Food and Agriculture
5722 Deering Hall
Orono, ME. 04469-5722
(207) 581-2933
gallandt@maine.edu

Program descriptions are also available online:
https://umaine.edu/foodandagriculture/graduate-programs/

Graduate Faculty

Lily Calderwood, Ph.D. (University of Vermont, 2015), School of Food and Agriculture. Integrated pest management, sustainable agriculture.

Susan Erich, Ph.D. (Cornell, 1984), School of Food and Agriculture. Plant-soil interactions, nutrient availability from alternative fertilizer materials.

Philip Fanning, Ph.D. (University College Dublin, Ireland, 2014), School of Biology and Ecology. Integrated Pest and Pollinator Management, biological control.

Eric R. Gallandt, Ph.D. (Wisconsin-Madison, 1994), School of Food and Agriculture. Sustainable agriculture, cropping systems, and weed ecology and management.
Mark Hutton, Ph.D. (New Hampshire, 1988), School of Food and Agriculture. Vegetable production, season extension technologies, disease and insect management, vegetable genetics and varietal evaluation.

John Jemison, Ph.D. (Pennsylvania State, 1991). University of Maine Cooperative Extension; Cooperating Associate Professor in the School of Food and Agriculture. Water quality, soil nutrient dynamics, nutrient management.

Ellen Mallory, Ph.D. (University of Maine, 2007), University of Maine Cooperative Extension and School of Food and Agriculture. Sustainable agriculture, soil quality and organic grain production.

Tsutomu Ohno, Ph.D. (Cornell, 1983), School of Food and Agriculture. Soil Chemistry, nutrient availability from alternative fertilizer materials.

Gregory Porter, Ph.D. (Pennsylvania State, 1985), School of Food and Agriculture. Potato cropping systems, crop physiology, soil fertility management, weed-crop interactions.

Rachel Schattman, Ph.D. (University of Vermont, 2016), School of Food and Agriculture. Agroecology, climate change, vegetable and small fruit production, water use efficiency, decision making, behavior, risk assessment, mixed methods research.

**Try on Leadership (Certificate)**

In the Try on Leadership Certificate, educators will be able to receive hands-on instruction from scholarly-practitioners and instructors who are able to help bridge the theory-practice gap that often occurs in education. Students will work closely with their instructor as well as their direct supervisor to best prepare them to know what it is like to serve as an administrator in a Maine school district. Educators will learn about high-quality instructional practices, organizational analysis, time management, and school and special education law.

For more information please visit the program [https://online.umaine.edu/online-graduate-certificate-in-try-on-leadership/](https://online.umaine.edu/online-graduate-certificate-in-try-on-leadership/)

**Wildlife Ecology and Wildlife Conservation**

The Department of Wildlife, Fisheries, and Conservation Biology, College of Natural Sciences, Forestry, and Agriculture offers graduate study leading to a Master of Science in Wildlife Ecology, a non-thesis Master of Wildlife Conservation, and a Doctoral degree in Wildlife Ecology. A broad range of ecosystems, modern laboratory facilities, and a diversified staff provide excellent opportunities for graduate study in wildlife ecology. Emphasis is placed on detailed studies of wildlife species and the habitats in which they live. Research may be conducted in such areas as terrestrial and aquatic ecology, fisheries, physiology, behavior, population dynamics, resource management, and the influence of environmental disturbances. The department is home to federal biologists with the U.S. Geological Survey, Maine Cooperative Fisheries and Wildlife Research Unit. These scientists have faculty appointments and advise graduate students. The Department of Wildlife, Fisheries, and Conservation Biology offers the following degrees:

- Ph.D. in Wildlife Ecology (thesis)
- M.S. in Wildlife Ecology (thesis)
- Master of Wildlife Conservation (non-thesis)

**Admissions**

Students are admitted to these graduate programs based on the strength of their academic records, GRE scores, experience, and recommendations. Please note the critical distinction in admission processes between: i) our research based programs (MS; Master of Science and PhD; doctoral) and ii) our MWC (Master of Wildlife Conservation) program.
1. Research based MS and PhD programs: Students are only admitted when teaching or research assistantships are available and are rarely accepted based on application to the Graduate School without prior communication with faculty. Because of this, interested students are strongly encouraged to contact and coordinate with prospective major professors to assess potential for support before applying. Available assistantships are posted on the Department web page. Note that these advertised assistantships often have unique deadlines and starting dates, different from the University pattern of January application for September starts. These assistantships include stipends and payment of tuition; additional funding is available for research expenses for most projects. For this reason, these positions are very competitive.

2. MWC program: This program is primarily course-work oriented and has no guaranteed financial support. Students seeking this degree are encouraged to apply directly to graduate school. Applications for the Master of Wildlife Conservation program are reviewed from January through March for programs that begin in September. March 31 is the deadline for application. For the most up to date details about specific aspects of the program and the availability of assistantships, visit http://umaine.edu/wle/graduate-program/ or write to the Department of Wildlife, Fisheries, and Conservation Biology. wildeco@maine.edu

WFCB Graduate Faculty


Noah Charney, Ph.D. (University of Massachusetts Amherst, 2010), Assistant Professor. Landscape Ecology, Climate Change Impact Modeling, Vernal Pool Conservation, Urban Ecology, Natural History, Unisexual Salamanders.

Stephen M. Coghan, Jr., Ph.D. (State University of New York, 2004), Associate Professor. Energetic ecology of Atlantic salmon, brook trout, and smallmouth bass; fish response to dam removal; role of anadromous fishes in stream food webs; ecology of headwater streams; fish foraging; fish-habitat relations.

Daniel J. Harrison, Ph.D. (University of Maine, 1986), Professor. Wildlife-habitat relationships, interactions among forest management practices and wildlife populations, predator ecology.

Malcolm L. Hunter, Jr., D. Phil. (Oxford University, 1978), Professor and Libra Professor. Conservation biology, forest wildlife management, landscape ecology, international conservation.

Jessica S. Jansujwicz, Ph.D. (University of Maine, 2011), Research Assistant Professor. Human dimensions of natural resources, environmental policy, sustainability science.

Cynthia S. Loftin, Ph.D. (University of Florida, 1998), Associate Professor of Wildlife Ecology and Unit Leader, Maine Cooperative Fish and Wildlife Research Unit. Systems ecology, landscape ecology, wetlands ecology, GIS applications.

Alessio Mortelliti, Ph.D. (University of Rome "La Sapienza", 2008), Associate Professor. Conservation biology, effects of land-use change on vertebrates, mammalogy, quantitative modelling, wildlife surveys and monitoring.

Amber M. Roth, Ph.D. (Michigan Technological University, 2012), Assistant Professor. Forest ecology and land use.

Joseph D. Zydlewski, Ph.D. (University of Massachusetts, 1998), Professor and Assistant Leader-Fisheries, Maine Cooperative Fish and Wildlife Research Unit. Physiology, behavior and ecology of migratory fishes both in the laboratory and in the field.
Zoology

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

Master of Science

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

Animal Behavior and Behavioral Ecology, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

Applied Biology, including biological control and insect pest management, fisheries, and plant pathology.

Botany, Plant Biology, Mycology, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

Developmental and Cell Biology, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

Ecology, Environmental Biology, and Paleoecology, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

Entomology, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

Fisheries Biology, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.
**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

**Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

**Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

**Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.
All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: umbiosci@maine.edu, http://biology.umaine.edu.

**Graduate Faculty**

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

**Eleanor Groden**, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.


**Rebecca Holberton**, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

Danielle Levesque, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

Joyce E. Longcore, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

Brian McGill, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

Brian Olsen, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.


Michelle Smith, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

Ek Han Tan, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

Kristy Townsend, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

Mary S. Tyler, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in Drosophila; educational multimedia materials.

Seth Tyler, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

Yong Jiang Zhang, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

**Cooperating Faculty**

Susan H. Brawley, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

William O. Bray, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

Jim Dill, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

David Hiebeler, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

Sara Lindsay, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

William H. Livingston, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and
Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

James D. McCleave, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

Paul Rawson, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

Alan M. Rosenwasser, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

Walter C. Shortle, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

Robert S. Steneck, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

Rebecca J. Van Beneden, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

Robert G. Wagner, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

Research Resources

Introduction to UMaine's Graduate Research

The discovery, synthesis, and dissemination of knowledge are the goals of graduate level study. The University provides varied sources of organized research and learning opportunities through which students are introduced to the concepts of independent thinking in order to reach these goals.

Research expenditures in 2020 totaled an all-time high of $165.1 million for sponsored research, teaching and public service activities of faculty. These activities include research in areas as diverse as Forestry and the Environment, Marine Sciences, STEM Education, Climate Change, Advanced Materials for Infrastructure and Energy, Civil Engineering, Mechanical Engineering, Electrical and Computer Engineering, Biomedical Science and Engineering, Data Science and Engineering, Nanotechnology, Sensor Systems, Sustainability Solutions and Technologies, Aging Research, Finance Education, Northeastern Americas Humanities Research and Education.

The University of Maine is the state's public research university. Classified as a High Research Activity Institution by the Carnegie Foundation for the Advancement of Teaching, UMaine consistently ranks among the top 20 percent of universities engaged in research.

UMaine Research Website: https://umaine.edu/research/
Interdisciplinary Research Centers and Institutes

Advanced Structures and Composites Center

Focus: The University of Maine's Advanced Structures and Composites Center (ASCC) is an interdisciplinary center for research, education, and economic development, encompassing material sciences, manufacturing, and the engineering of composites and structures. A University of Maine signature research area for Advanced Materials for Infrastructure and Energy, the UMaine Composites Center focuses on developing next-generation solutions that capitalize on Maine's vast natural resources to address the most pressing infrastructure and energy-related challenges.

Facilities: The Center is housed in a 100,000 ft² ISO 17025-accredited testing facility with fully equipped, integrated laboratories to develop and test durable, lightweight, corrosion-resistant material solutions for a wide variety of industries.

Website: composites.umaine.edu/

Advanced Manufacturing Center

Focus: The Advanced Manufacturing Center (AMC) is an applied manufacturing research facility that works directly with public and private sector clients to advance manufacturing technologies in the state of Maine.

Facilities: The AMC's 30,000 ft² facility is home to a host of CNC machines, additive metal manufacturing capabilities, and a full suite of materials testing equipment.

Website: umaine.edu/amc/

Aquaculture Research Institute

Focus: The Aquaculture Research Institute (ARI) brings together researchers and faculty from multiple disciplines at UMaine, key industry partners, and applied R&D opportunities, to enable innovation within UMaine's aquaculture research.

Facilities: The Institute includes some of the nation's most state-of-the-art aquaculture facilities. ARI is part of the UMaine MARINE initiative.

Website: umaine.edu/aquaculture/

Center for Community Inclusion and Disability Studies
Focus: The Center for Community Inclusion and Disability Studies (CCIDS) works closely with people with disabilities, families, state and local government agencies, community providers and others on projects providing training, technical assistance, service, research, and information sharing.

Facilities: The Center is Maine's University Center for Excellence in Developmental Disabilities (UCEDD). There are currently 67 UCEDDs; at least one in every U.S. state and territory.

Website: ccids.umaine.edu/

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**Center for Research on Sustainable Forests**

Focus: The Center for Research on Sustainable Forests (CRSF) is currently developing, integrating, and applying emerging geospatial technologies and informatics methods to address current and future issues to support the sustainable management of the region's natural resources.

Facilities: The Center works in forests throughout Maine and developed several interactive databases and tools including the Maine Forest Dashboard. It runs initiatives like the Forest Climate Change Initiative and Spruce Budworm Taskforce.

Website: crsf.umaine.edu/

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**Center for Undergraduate Research**

Focus: The Center for Undergraduate Research (CUGR) has facilitated faculty-mentored research and creative activities for undergraduate students across all academic disciplines since its inception in 2008.

Facilities: The center is located in the Innovative Media Research and Commercialization Center (IMRC) and coordinates the annual Student Symposium, which provides an opportunity for the public to interact one-on-one with UMaine students as they present their research and creative work.

Website: cugr.umaine.edu/

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**Center on Aging**

Focus: The Center on Aging promotes and facilitates activities on aging in the areas of education, research and evaluation, and community service to maximize the quality of life of older citizens and their families in Maine and beyond.

Facilities: The Center's central offices are located on the University of Maine at Augusta campus in Bangor. The center runs several statewide programs; the Senior and Retired Volunteer Program, the Senior Companion Program, Encore Leadership Core, and more.
Climate Change Institute

Focus: The Climate Change Institute (CCI) is a global leader in interdisciplinary climate change research, conducts climate change research expeditions throughout the world, and both produces and shares software that allows researchers and the public to understand climate change.

Facilities: The Institute supports expeditions and holds the Borns Symposium annually featuring presentations and discussion by Climate Change Institute graduate students and faculty on emerging research and topics related to global environmental change. The institute has a wide array of research laboratories and facilities to support its research.

Website: climatechange.umaine.edu/

Forest Bioproducts Research Institute

Focus: The Forest Bioproducts Research Institute (FBRI) advances the understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts as well as to provide and promote technology validation and partnerships that will meet societal needs for materials, chemicals and fuels in an economically and ecologically sustainable manner.

Facilities: The Institute includes the Process Development Center (PDC), a fee-for-service facility on campus devoted to pulp and paper research and development, a nanocellulose production facility, and a pilot paper machine that can be used to explore applications of nanocellulose in papermaking. It also includes the Technology Research Center (TRC), in Old Town, Maine, a commercial-scale facility dedicated to advancing developing fuel, chemical and advanced material technologies from forest bioproducts.

Website: forestbioproducts.umaine.edu/

Frontier Institute for Research in Sensor Technologies

Focus: The Frontier Institute for Research in Sensor Technologies (FIRST) has been active in carrying out research, teaching, and outreach activities in the broad area of surfaces and interfaces, thin films, microelectronic devices, sensor technology, and nanotechnology. A wide variety of on-going activities span the range from fundamental research to applied development to technology transfer.

Facilities: FIRST has an impressive array of instrumentation to synthesize and investigate materials properties at the atomic scale and up to macroscopic dimensions, as well as to fabricate and test a variety of micro/nano electronic devices and micro/nano systems.

Website: umaine.edu/first/
Innovative Media, Research and Commercialization Center

Focus: The Innovative Media Research and Commercialization (IMRC) Center is an interdisciplinary research and experiential learning facility that supports the creative and innovative intersection of arts and humanities, sciences, and technology.

Facilities: The Center provides research and prototyping laboratories, maker spaces, audiovisual production spaces, performance spaces, and classrooms, each designed and staffed to welcome, support, and engage all learners.

Website: imrccenter.umaine.edu/

Maine Center for Research in STEM Education

Focus: The Maine Center for Research in STEM Education (RiSE Center) is an interdisciplinary center organized to conduct research, graduate education, professional development, and to build community partnerships focused on improving the research and research-based practice of science, technology, engineering, and mathematics (STEM) education at all levels of instruction.

Facilities: Members of the RiSE Center engage in education research across multiple STEM departments and the College of Education at the University of Maine. The RiSE Center provides education and professional development for emerging educators through undergraduate and graduate opportunities, including teaching and research assistantships, a Master of Science in Teaching degree with a teacher certification option, and an interdisciplinary STEM Education PhD program.

Website: umaine.edu/risecenter/

Maine Sea Grant

Focus: The University of Maine is one of 34 NOAA Sea Grant programs operating throughout the coastal and Great Lakes states, and it is a federal-state partnership that supports research, outreach and education.

Facilities: Maine Sea Grant and the University of Maine Cooperative Extension partner to form the Marine Extension Team, which works on issues of concern to Maine's coastal communities. It sponsors scientific research that matters to those who depend on Maine's coastal and marine resources and develops tomorrow's marine workforce through formal and informal education programs, fellowships and scholarships.

Website: seagrant.umaine.edu/

Margaret Chase Smith Policy Center
Focus: The Margaret Chase Smith Policy Center has engaged in applied public policy research and community engagement with the goal of improving the quality of public discourse grounded in civility and a willingness to engage respectfully across political, social, and cultural differences. The MCS Policy Center's dedication to this nonpartisan mission advances relationships among policymakers, community leaders, and the students, faculty, and staff of the University of Maine System.

Facilities: The Center is based on the Orono campus and provides student fellowships. The Margaret Chase Smith Library is located in Skowhegan, Maine. The Center publishes the Maine Policy Review, a timely, independent, peer-reviewed analysis of public policy issues relevant to the state of Maine.

Website: mcspolicycenter.umaine.edu/

Senator George J. Mitchell Center for Sustainability Solutions

Focus: The Mitchell Center for Sustainability Solutions is widely recognized for stakeholder-engaged, solutions-driven, interdisciplinary research to improve human well-being while protecting the environment. In collaboration with diverse stakeholders, the Mitchell Center links knowledge with action to create a brighter economic, social and environmental future in and beyond Maine.

Facilities: The Center provides toolkits and support for sustainable solutions. For more than a decade, the Mitchell Center for Sustainability Solutions has been building its capacity for stakeholder-engaged, solutions-driven research that helps solve pressing problems, working with municipal officials, state legislators, farmers, tribal communities, and the waste management industry.

Website: umaine.edu/mitchellcenter/

Maine Established Program to Stimulate Competitive Research

Focus: The Maine Established Program to Stimulate Competitive Research (EPSCoR) develops partnerships between the state's higher education institutions, industry, government and others to effect lasting improvements in their R&D infrastructure, capacity and national competitiveness.

Facilities: Maine EPSCoR at the University of Maine oversees and implements the state's NSF EPSCoR programs.

Website: umaine.edu/epscor/

UMaine Institute of Medicine

Focus: The UMaine Institute of Medicine is a transformative and coordinated community of collaborating researchers and educators that in partnership with health care providers and other stakeholders are dedicated to the advancement of human health and wellbeing in the state of Maine and beyond, through discovery and learning in health and life sciences, from basic and translational research, to clinical practices and healthcare workforce development.
Facilities: The Institute provides seminars and works with healthcare organizations around the state to collaborate and innovate.

Website: https://umaine.edu/medicine/

Research Initiatives

Experiential Programs Innovation Central (EPIC)

Focus: Cutting-edge student-centered undergraduate education is the key focal point of the University of Maine Experiential Programs Innovation Central - UMaine EPIC. UMaine is the home to more than 9000 undergraduate students who are able to choose from 100 undergraduate majors and academic programs. With EPIC they have the opportunity to gain in-depth learning and invaluable skills through high impact experiential learning programs that have been closely integrated and coordinated for maximum educational impact.

Website: https://umaine.edu/epic/

Maine Center for Genetics in the Environment

Focus: The Maine Center for Genetics in the Environment aims to energize Maine's environmental genetics research community by promoting effective collaborations and new partnerships for transdisciplinary research, innovation and training.

Website: https://umaine.edu/mcge/

UMaine AI

Focus: The University of Maine Artificial Intelligence Initiative (UMaine AI) is a unique Maine-based venture that brings together university, industry, government, and community collaborators from Maine and beyond to advance the field of artificial intelligence, and through development of innovative technologies and applications find transformative solutions to enhance human life and societal well-being in Maine and beyond.

Website: https://ai.umaine.edu/

UMaine Arctic

Focus: UMaine Arctic develops and strengthens partnerships with other institutions and individuals in the region, participating in the New England Arctic Network, which operates as a regional hub for institutions in New England and have been members of the University of the Arctic (UArctic), a cooperative network of universities, colleges, research institutes and other organizations concerned with education and research in and about the North.
Portland Gateway

Focus: The Portland Gateway provides a one-stop connection and point of access to the vast array of innovative research, education and outreach resources, programs and services at the state's research university in Orono and its facilities statewide. The Portland Gateway offers opportunities for tailored partnerships to advance specific business or corporate needs, outreach and community engagement opportunities, and professional careers in connection with the UMaine Research enterprise.

Website: https://maine.edu/portland

Managing Offices & Services

The Office of the Vice President for Research and Dean of the Graduate School

The Office of the Vice President for Research and Dean of the Graduate School (OVPRGS) supports research and graduate study programs by providing services, oversight and resources. It is responsible for developing policies for research and related activities. It provides administrative oversight for 17 research centers and institutes; the Office of Research Administration; the Office of Research Compliance; the Office of Research Development; UMaine Coordinated Operating Research Entities (CORE); Advanced Research Computing (ARC); Research Initiatives; and the Graduate School. The Vice President for Research is the university-designated Scientific Misconduct Officer and monitors financial conflicts of interest in externally-funded research.

The Office of Research Administration

The Office of Research Administration has broad responsibilities for fostering and encouraging research and other scholarly activities throughout the campus. The office provides support services to faculty and staff seeking extramural funding for research, teaching, or public service projects, and to those who direct extramurally funded projects. On behalf of the University, the office oversees the submission of proposals and shares with the Principal Investigator or Project Director responsible for the management of grants, contracts, and cooperative agreements.

The Office of Research Compliance

The Office of Research Compliance's mission is to promote a culture of ethics, integrity, and compliance with applicable laws, regulations, and policies governing research. The office provides comprehensive regulatory guidance to the UMaine research community regarding specific components of research compliance, including protection of human subjects, humane care and use of animals, use of recombinant or synthetic nucleic acid molecules or infectious agents, financial conflict of interest, responsible conduct of research, and export control regulations.

The Office of Research Development
The Office of Research Development aims to enhance grant-seeking activities and facilitate internal and external collaborations to promote a culture of research excellence and extramural funding success. They are a resource to faculty and researchers who wish to increase their success in grant writing. The office also oversees the management and administration of internal grant programs and assists in the implementation of strategic initiatives.

The Coordinated Operating Research Entities

The Coordinated Operating Research Entities (CORE) office oversees the management of major research equipment and facilities at the University of Maine. The mission of CORE is to serve as UMaine's central repository for major research equipment and facilities, and to enable researchers and industrial partners from around the State to have easy access to state-of-the-art technology and services for their scientific research and scholarly activity. CORE research services are delivered by experts on a fee-for-service basis to enable, facilitate and enhance the research mission of UMaine.

University Resources

Raymond H. Fogler Library, Maine's largest library, is essential to education, research, and public service at the University of Maine and beyond. The library offers millions of print and physical items in addition to more than 1.5 million e-books, 155,000 online journals, 350 research databases, and 240,000 digital media items. Through Fogler Library, UMaine patrons can borrow print and digital materials from libraries throughout the state and around the world.

The library's staff serve as information experts who help patrons discover, use, and expand knowledge. The Reference and Information Literacy Department is a central location for research support on campus. Each academic program has a subject librarian who can provide individual consultations, classroom instruction, and subject-matter expertise across the different areas of study at UMaine. The department provides research support in-person and online via email, live chat, and Zoom (https://library.umaine.edu/ask-a-librarian/).

Fogler Library's Special Collections Department maintains an extensive collection of published bibliographical, historical, and descriptive works on Maine, as well as literary titles by Maine authors. These documents provide extensive insights into Maine cities, towns, counties, people, and institutions. The department also houses rare books and University of Maine publications and records. Special Collections staff support the research pursuits of students, faculty, and scholars at UMaine and around the world.

Fogler Library is also a regional depository for federal government publications; an official depository for Canadian federal and Maine state government publications; the designated State Research Library for Business, Science, and Technology; and the only Patent and Trademark Resource Center in Maine.

Access library resources, services, expertise, collections, and general information at https://library.umaine.edu. The general telephone number for the library is 207.581.1666.

University Services: Information Technology

The University of Maine System's Department of Information Technology (US:IT) is committed to providing and supporting the highest quality technology-based services for UMaine faculty, staff, and students. As the University's central technology support organization, US:IT strives to perform in the timeliest and most cost-effective manner. US:IT supports the University's land-grant and sea-grant mission of creating and disseminating knowledge to improve the lives of its students and Maine citizens through teaching, basic and applied research, and public service activities.
US:IT is also responsible for coordinating technology services provided to The University of Maine campus by the University of Maine System. US: IT's UMaine main office is located at 220 Alumni Hall.

US:IT List of Locations & Services:

**IT Support Services Center** (Fogler Library - Room 130, telephone 207.581.2506)

- Telephone, walk-in, and email assistance for UMS accounts (Google apps, MaineStreet, networking/wireless access, Brightspace, OneDrive, etc.), software applications, and all operating systems.
- Resource for the detection and removal of computer viruses and malware and data backup assistance.
- For more information or to request support call 207.581.2506. You can also visit our website at https://www.umaine.edu/it.

**Public IT Computer Clusters**

- Computer clusters are available on the 1st Floor of the Memorial Union, Room 144 (adjacent to Hackerspace) and at the Fogler Library Information Commons. Both PC and Mac devices are provided in these locations.
- Available software includes Microsoft Office Professional suite, UMaine licensed applications used to support classwork such as ArcGIS, JMP, SAS, SPSS, Mathematica, MatLab, ChemDraw, Adobe Creative Cloud.

**Printing**

- Every student receives $16.00 in print funds applied to their MaineCard each semester to use for printing via US:IT-supported printers.
- Print locations: Graduate School Print Station in Stodder Hall and IT Print From Anywhere release stations located in Fogler Library, Memorial Union Computer Cluster, Union Central (Memorial Union), York Dining Hall, and Hilltop Dining Hall.
- Visit the UMaine IT website at https://umaine.edu/it/resources/wireless-printing/ for instructions on printing from a personal device, UMS email, or via a mobile device.

**Media Services** (Shibles Hall - Room 19, telephone 207.581.2500)

- Classroom technology equipment support including audio and video equipment assistance.
- Video and web conferencing support for classes and meetings.
- Equipment-On-Loan at Fogler Library, Circulation Desk
  - To reserve Audio Visual equipment, call the Fogler Library Circulation Desk at 207.581.1641.
  - A valid MaineCard is required to sign-out AV Equipment.
- To reserve a video conferencing room, call 207.581.1610.
- For additional information or to request support call 207.581.2500.

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**Additional Research Resources**

**The Department of Industrial Cooperation**. ORED's Department of Industrial Cooperation (DIC) arranges all fee-for-service work and industry-sponsored collaborative research, matching companies with the appropriate UMaine expertise and facilities. DIC helps UMaine achieve its goals of research and public service, while avoiding conflicts of interest with the private sector and ensuring that the university is compensated for private use of its state-supported resources.

**The Office of Innovation and Economic Development**. (OIED) helps support new and existing businesses by linking them with industry experts; facilitating commercialization activities, such as new innovations developed at UMaine; and transferring university research and development into marketable products and services. Their work helps
innovation across Maine grow, creates future innovators and new jobs, and enhances the state economy. The office is also a responsive liaison, facilitating the relationship between the University of Maine at large and elected officials.

**University of Maine Cooperative Extension.**

University of Maine Cooperative Extension's community presence creates unparalleled opportunities for innovative work-study, internships and assistantships for students. UMaine Extension supports the university's public education and service role by delivering research-based outreach programs in every county in the state. Based in Orono, county offices across the state, and five farms of the Maine Agricultural and Forest Research Station, UMaine Extension includes almost 200 staff and thousands of volunteers who provide community-based education, with a focus on the Maine food system and 4-H, the most successful out-of-school youth development program in Maine.

UMaine Extension is part of a nationwide system, supported by a three-way partnership among the U.S. Department of Agriculture, the land grant colleges and universities, and county governments. It conveys community issues, needs and opportunities to inform University of Maine research and development. UMaine Extension's reach is amplified via partnerships with Maine Sea Grant, the Maine Food and Agricultural Center, and the Maine Agricultural and Forest Experiment Station.

UMaine Extension engages young people in a variety of roles. Students have achieved success and helped UMaine Extension move forward in such diverse areas as communications; Native American awareness and connections; and Maine 4-H Science, Technology, Engineering and Math (STEM) program development while working collaboratively with faculty and developing partnerships with community groups. In addition, UMaine Extension has had students work in personnel management, publications, IT support and new media development.

More information is available on our website, (extension.umaine.edu) or by contacting UMaine Extension at extension@maine.edu; 207.581.3188.

The **College of Education and Human Development** is setting a course through research, service and innovation. Alumni are leading in classrooms, schools and school districts throughout Maine, across the country and around the globe. They're changing lives as teachers, administrators, nonprofit and community leaders, and as student support professionals on college and university campuses. The athletic training and exercise science graduates are setting a course for professional, college and high school athletes, as well as creating lifelong wellness and personal fitness enthusiasts. Human development professionals are changing the world through intervention programs, advocacy, and social and community services. https://umaine.edu/edhd/

The **College of Natural Sciences, Forestry, and Agriculture**'s programs advance society's understanding of the natural world and the health of its citizens and communities. Our faculty, whose research spans both the health and natural sciences, represent the largest assemblage of scientific expertise in Maine. The College's extensive teaching and research facilities host some of the most sophisticated research equipment available and are spread throughout Maine to take advantage of the state's diverse opportunities for discovery. From Maine's rural hospitals and forests, to the depths of the Gulf of Maine and glaciers of Antarctica, our faculty and graduate students conduct science that transforms lives and informs decisions that will create a bright future for our world. www.nsfa.umaine.edu

The **College of Engineering**. As Maine's leading engineering program, the college prepares an educated workforce, conducts research that turns knowledge into innovative solutions, and provides outreach that includes STEM initiatives. The mission of the College of Engineering at the University of Maine is to produce the graduates and new technologies needed to move Maine's economy forward. As a UMaine signature area, the College continues to play a vital role in our state and beyond and is a key element in assisting several other signature areas. The College of Engineering at the University of Maine is Maine's only educational institution to offer 11 ABET accredited engineering and engineering technology degree programs. Our reputation is known world-wide, our facilities are world-class, and our research contributes significantly to scientific discoveries and economic development in Maine and beyond. Innovating engineering excellence since 1865. https://engineering.umaine.edu/
The College of Liberal Arts and Sciences is the heart of the University of Maine, contributing to the education of every undergraduate student on the Orono campus. Courses in our college provide the foundation in critical reasoning, communication skills and core knowledge needed to thrive in an ever changing, globalized world. With the diversity of a large institution and the friendly atmosphere of a small liberal arts college, UMaine's College of Liberal Arts and Sciences offers a broad range of disciplinary and interdisciplinary majors and minors in the humanities, fine and performing arts, social sciences and sciences. Scholars and creative artists work closely with undergraduate and graduate students in first rate facilities to advance understanding and appreciation of the human experience, the natural world, and the arts. Our goal is to ignite intellectual curiosity, to develop skills needed to pursue answers, and to cultivate creativity to pose the next generation of questions. It's learning that lasts a lifetime. https://umaine.edu/las/

The School of Forest Resources, in the College of Natural Sciences, Forestry, and Agriculture, offers graduate study leading to a non-thesis Master of Forestry, a Master of Science in Forest Resources and a Ph.D. in Forest Resources. Maine, the most heavily forested state in the United States, sets the context for SFR research, though projects reach beyond state and national boundaries. Much of the research in the SFR is field oriented, and there are a variety of ecosystems and socioeconomic conditions available for investigation. The NSFA College is responsible for the management of the Dwight B. Demeritt Forest, a 1,700-acre tract adjoining the campus, the 4,000-acre Penobscot Experimental Forest, and nearly 4,000 acres of other forest properties in Maine. In addition, Maine contains millions of acres of forestland that are under diverse management by large ownerships, forest industries, small ownership parcels, state and federal forests, and Acadia National Park. Through the cooperation of these diverse landowners, opportunities exist for silvicultural, on-site wood processing, and ecological studies. Maine's systems of land use regulation and forest taxation and the state's long-standing reputation as a "vacationland" for forest recreation provide other categories of potential research interest.

The Barbara Wheatland Geospatial Analysis Laboratory provides a center of excellence for geospatial analysis in student and faculty research, along with state-of-the-art resources for university education and professional development. The Lab houses computer workstations equipped with high-end image processing and GIS software, and research leverages a data acquisition and image analysis program using manned and unmanned aircraft. The program supports numerous basic and applied research projects with the primary focus on exploring innovative ways to leverage remote sensing and geospatial technology for forest and natural resource management, environmental monitoring and conservation, forest ecosystem science and climate change research.

The Forest Resources graduate study opportunities are strengthened by association with strong research programs within the SFR College of Natural Sciences, Forestry and Agriculture, elsewhere on the Orono campus, and in the region.

The Center for Research on Sustainable Forests (CRSF) was founded in 2006 to build on a history of leading forest research and to enhance our understanding of Maine's forest resources in an increasingly complex world. Forest research and its application are rapidly evolving due to unprecedented availability of data provided by emerging technologies such as high-resolution digital imagery and GPS. CRSF seeks to lead the development, integration, and application of these emerging technologies to address current and future issues in natural resources. Its mission is to conduct and promote leading interdisciplinary research on issues affecting the management and sustainability of northern forest ecosystems and Maine's forest-based economy. CFSF scientists study a variety of areas, including
forest-based research, nature-based tourism, and climate change. CRSF organizes and hosts several workshops, conferences and other events each year as a means to communicate directly with stakeholders, research partners and the public.

The Cooperative Forestry Research Unit (CFRU) is a stakeholder-driven research cooperative and is a core research program of CRSF at UM. It includes 33 member organizations representing over 8 million acres of Maine's forest (half of all forestland in the state). CFRU Cooperators include Maine forest landowners, wood processors, conservation organizations, and others that support the mission and objectives of the CFRU. The CFRU is funded by voluntary financial and in-kind contributions from its members to The University of Maine. For 40 years, CFRU has shaped the evolution of forest practices in the state and advanced the principles of sustainable forest management. Current CFRU research focuses on silviculture, forest productivity, forest modeling, and wildlife habitat issues related to the management of Maine's commercial forestlands. Closely related to CFRU is the Maine Adaptive Silviculture Network (MASN), a statewide series of operational-scale silvicultural treatments where future research on forest productivity and sustainability will be studied. Currently, there are 4 MASN sites established throughout Maine and plans to increase it to 12 sites by 2020.

The Center for Advanced Forestry Systems (CAFS) is a National Science Foundation Industry-University Cooperative Research Center (IUCRC). CAFS is one of the larger IUCRCs within NSF as it has 8 universities sites and over 150 members throughout the entire US. UM has been a CAFS site since 2008, and the lead center since 2017. CAFS submitted a proposal for Phase III funding in December of 2018 with a primary priority being the creation a national research agenda that will benefit the forest industry, recruiting non-profit members such as private foundations, and ensuring sustainability for the membership-based program after NSF funding ends. CAFS, like CFRU, brings important industry linkages.

Graduate students studying in the area of wood science & technology and bioproducts have access to world class equipment and researchers through strong ties to two research units on campus. The Advanced Structures and Composites Center (https://composites.umaine.edu/) houses a 100,000 ft^2 state of the art facility for materials and wood/composites engineering research. The Forest Bioproducts Research Institute's mission is to advance understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts.

Within SFR, the Laboratory of Renewable Nanomaterials (LRN) focuses on alternative applications of cellulose nanomaterials aimed at large volume production and end uses. Established in 2013, the LRN is well equipped for the production and characterization of advanced bio-composites and bioproducts. The Bio-energy Laboratory focuses on advanced technologies to improve the energy efficiency of energy-intensive wood industry and timber-based building sector, innovative carbon-neutral bioproducts, such as engineered wood products and mass timber panel products, numerical analysis of hydrothermal behavior of wood and engineered wood products; and utilization of sustainable and renewable biomass as bioenergy resources.

A federally funded Acadian Forest Ecosystem Research Program carries on long-term research on the nearby Penobscot Experimental Forest. The USDA Forest Service research program in Orono (a branch of the Northern Forest Experiment Station) employs scientists who hold appointments among the College's graduate faculty. A scientist from the USDA Forest Products Laboratory (FPL) is also stationed at UMaine facilitating scientific and research interactions with FPL scientists. Cooperative relationships also are common between the School of Forest Resources and several other University of Maine departments.
The Maine Agricultural and Forest Experiment Station.

For more than 135 years, the Maine Agricultural and Forest Experiment Station has undertaken research for Maine and its people. Originally devoted to research for Maine's farm community, the Experiment Station is now Maine's most important center for research in agriculture, nutrition and food science, forestry and wood products, marine fisheries and aquaculture, freshwater fisheries, wildlife, rural economic development, and tourism. The Experiment Station maintains its offices and principal research laboratories in Orono. Additional research facilities include Aroostook Farm in Presque Isle, Highmoor Farm in Monmouth, Blueberry Hill Farm in Jonesboro, J.F. Witter Teaching and Research Center in Old Town and Stillwater, the Lyle E. Littlefield Oramentals Trial Garden and the Roger Clapp Greenhouses in Orono, and the Dwight B. Demeritt Forest in Old Town and Orono. The off-campus facilities of the Experiment Station provide an essential platform for applied field research that is integrated with research at campus laboratories. Many students carry out Experiment Station research as part of their graduate program.

The Experiment Station's research programs improve the quality of life for Maine people by enhancing the profitability and sustainability of Maine's natural-resource-based industries and by protecting Maine's environment and the health of its citizens. Station scientists use cutting-edge tools to address current challenges for Maine's natural resource-based industry and provide the new knowledge that fuels innovation. Discoveries are translated into new production methods, new pest-management and disease treatments, new value-added products, and new programs to improve the nutrition of Maine citizens. http://umaine.edu/mafes/

Many College of Natural Sciences, Forestry, and Agriculture graduate students receive a significant portion of their funding from the Experiment Station. Some students conduct a portion or all of their data collection at the Experiment Station facilities off-campus, as well as at other areas of the state. See the College Research Map to view a sampling of research projects - https://nsfa.umaine.edu/research/research-map/.

The Pulp and Paper Foundation. Supported by private funding from more than 60 companies located in over 40 states as well as several hundred individual donations and endowment gifts annually, the $31 million foundation encourages a strong teaching and research program in Chemical Engineering, with a significant undergraduate scholarship program available to qualified students throughout the College of Engineering and the School of Engineering Technology.

The School of Marine Sciences (SMS) is a large unit of the University residing in the College of Natural Sciences Forestry and Agriculture. SMS is the focal home of both graduate and undergraduate academic programs, research, and public service activities related to scientific policy and resource topics of marine and coastal zone environments. At present, approximately 48 faculty are affiliated with SMS including full-time, part-time, and cooperating appointments. SMS, by its very nature, is an interdisciplinary unit dedicated to research, education and public service. Current areas of expertise and research include oceanography, aquaculture, marine biology, marine geology, seafloor ecology, fish and fisheries biology, fish pathology, seaweed biology, marine resource development and policy, and ocean engineering.

The School of Marine Sciences offers graduate programs leading to the degrees of M.S. and Ph.D. in Oceanography, M.S. and Ph.D. in Marine Biology, M.S. in Marine Policy and Masters in Professional Sciences. An M.S. in Aquaculture may be developed in the near future.

Faculty of SMS provide leadership in research programs with emphasis on the Gulf of Maine, its related coastal zone, and in other cold-water and global systems. SMS faculty are headquartered at both the University's Orono campus and its coastal marine laboratory campus, the Ira C. Darling Center (see below).
The School also develops and maintains relationships with other marine research institutions within the region. Examples include Maine Maritime Academy, the Mount Desert Island Biological Laboratory, Bigelow Laboratory, the Maine Department of Marine Resources, and the Maine Geological Survey.

The Darling Marine Center (DMC), the University’s marine laboratory, is located on the Damariscotta River estuary, approximately 100 miles south of the Orono campus in mid-coast Maine. Approximately 50 faculty, postdoctoral associates, graduate students, and support staff are in residence at the DMC and conduct research encompassing the disciplines of aquaculture and marine fisheries; biogeochemistry and microbial ecology; remote sensing, phytoplankton ecology, and ocean optics; invertebrate biology and biodiversity; marine archaeology; and marine conservation science and policy. A variety of unique field-oriented undergraduate and graduate courses are offered annually at the DMC including: Semester By the Sea, Summer University, and specialized Ph.D. and professional-level training workshops in biology and the marine and environmental sciences. The DMC is a full service marine field station with two flowing seawater laboratories equipped with ambient, heated, and chilled seawater for the culture of marine organisms. The laboratories have resident and visitor lab spaces, state-of-the-art instrumentation, and teaching classrooms. A small boat fleet (19’ to 42’) enables researchers to access a wide variety of near and offshore marine and estuarine habitats. Also available are oceanographic sampling gear, SCUBA support, and a marine library, as well as housing, meal service and meeting space for scientific and educational conferences. More information is available at https://dmc.umaine.edu/

The Lobster Institute, a unit within the College of Natural Sciences Forestry and Agriculture, fosters research, outreach, and education in support of the sustainability and profitability of the iconic lobster industry of the northeastern US and Atlantic Canada. The Institute serves to maximize the engagement of UMaine faculty, students and facilities with stakeholders in the fishery, working with industry leaders, scientists and policy makers to identify and address new challenges and opportunities.

The Department of Psychology. Facilities for experimental and clinical research include laboratories for the study of human and animal behavior, cognition, perception, and emotion. Among departmental research foci are depression and anxiety disorders, peer relations, developmental psychopathology, cognitive aging, and socio-cognitive factors influencing health and well-being. There are rooms designed for observation and audio-visual recording of behavior, as well as electrically shielded rooms for psychophysiological recordings. The department also operates a psychology clinic (Psychological Services Center) for instructional and research purposes. Through faculty affiliation with Eastern Maine Healthcare, research opportunities are also provided at Eastern Maine Medical Center.

The Psychological Services Center, maintained and administered by the Department of Psychology, has three interrelated functions. It is a community mental health clinic which serves central Maine residents of all ages through the provision of psychotherapy, and psychological assessment on site. Referrals are accepted from area physicians, family members, other mental health agencies/professionals, and from clients themselves. Graduate students in the Clinical Psychology doctoral program serve as clinic staff under direct supervision of licensed psychologists. Facilities for direct observation of treatment and audio-video recording are available. The clinic also provides mental health consultation services to community agencies. These services may involve consultation to agency staff on mental health matters, provision of direct services to individuals served by various agencies, and the provision of workshops and training seminars for residents and staff. The third function of the clinic is to serve as a clinical research facility. From time to time specialized treatment/research programs may be offered to the community free of charge. These programs aim to identify particular client populations and provide new and innovative approaches to the treatment of specific disorders.

The Canadian-American Center. Founded in 1968, the Canadian-American Center is one of the leading institutes in the United States for studying Canada. Designated a National Resource Center in Canada by the U.S. Department of Education in 1979, the Center coordinates all Canadian Studies activities at The University of Maine. The Center organizes international conferences, promotes student and faculty exchanges with Canadian universities, coordinates outreach activities in schools and in the community, and supports graduate research on Canadian-American topics.
The principal graduate programs in Canadian Studies are in the Department of Modern Languages, which offers an M.A. in North American French studies, and in the Department of History, which has a Canadian concentration at both the master's and doctoral levels. Individualized graduate programs are also available in many departments. The Canadian collection at the Fogler Library is outstanding. Holdings include numerous journals, newspapers, the pre-1900 Canadian series, government documents, dissertations, and the Mason Wade collection.

Students interested in graduate study on Canada or a Canadian-related field may contact the Canadian-American Center, 154 College Avenue, or contact Canadian Studies faculty in Anthropology, English, Modern Languages, History, and the Climate Change Institute.

The Maine Folklife Center is a unit of the College of Liberal Arts and Sciences. The staff teaches courses through the Department of Anthropology, and conducts research in folklore, oral history and related subjects. Undergraduate work-study students and interns conduct work in the podcasting studio and assist with other projects. Graduate assistantships are sometimes available; students should contact the Center for more information. The Center is located in South Stevens and is open by appointment. For further information, email: folklife@maine.edu, telephone 581-1891 or visit our website: www.umaine.edu/folklife.

The Center for Poetry and Poetics (CPP; formerly the National Poetry Foundation, or NPF) is a center for research on twentieth- and twenty-first-century poetry. Established in 1971 by Carroll F. Terrell (1917-2003) as a center for Ezra Pound scholarship, the CPP's mission was expanded by Burton Hatlen (director from 1990 until his death in 2008) to include the entire tradition of innovative poetry from modernism to the present day. CPP publishes a scholarly journal, *Paideuma*, which is devoted to scholarship on modernist and postmodernist poetry, as well as books of poetry and scholarly books on modern poetry. Poets whose collections have been published by CPP/NPF include Helen Adam, Joanne Kyger, Evelyn Scott, Ted Enslin, Armand Schwerner, and Constance Hunting. NPF also published the Modern Poets Series, which consists of substantial volumes of biographical and critical commentary on such poets as Louis Zukofsky, George Oppen, Basil Bunting, William Carlos Williams, Marianne Moore, H.D., T. S. Eliot, Hugh MacDiarmid, Mina Loy, and many others. Fifteen volumes have been published in this series, the most recent on Ronald Johnson. Graduate students have regularly found opportunities to provide editorial assistance in the development of CPP publications. CPP also organizes conferences that bring to the University of Maine major poets and poetry scholars. Past participants have included Allen Ginsberg, Carl Rakosi, Lewis Simpson, Ruth Stone, Hugh Kenner, Marjorie Perloff, Rachel Blau DuPlessis, Joan Retallack, Charles Bernstein, and many other distinguished poets and critics. University of Maine graduate students regularly participate in these conferences. For more information, go to the Center's blog: https://nationalpoetryfoundation.wordpress.com

The Child Development Learning Center, in the College of Education and Human Development, offers observational facilities and a setting in which to work with young children. Individuals have an opportunity to be involved in teacher training programs, curriculum development, and research focused on topics related to child and family development. Research may be interdisciplinary with other departments such as Communication Sciences and Disorders and Psychology. Graduate assistantships are available and assistants become part of the Center staff. http://www.umaine.edu/edhd/professionals/katherine-m-durst-child-development-learning-center/

The Madelyn E. and Albert D. Conley Speech Language and Hearing Center, located in Dunn Hall, is a center for clinical education and research as well as a facility for comprehensive state-of-the-art speech, language and hearing services. Both the Speech-Language Clinic and the Audiology Clinic provide services for individuals across the lifespan. The Speech-Language Clinic offers both evaluation and treatment services as well as outreach services to preschools, public/private schools, hospitals and group homes. The Audiology Clinic offers comprehensive services including hearing testing, hearing aid evaluations and hearing aid fittings. Additionally, the Conley Center offers speech therapy telepractice training and speech therapy services to children and adults across Maine and
internationally. This graduate level telepractice training program is one of the first in the country to teach telepractice as a service delivery model to future Speech-Language Pathologists. The training program has three learning components that are guided by ASHA requirements of knowledge and skills in providing speech therapy telepractice clinical services. Graduate students in Communication Sciences and Disorders complete supervised clinical practicum experiences in both Speech-Language Pathology and Audiology at the Conley Center. Additionally, graduate students complete clinical placements in hospitals, rehabilitation centers, nursing homes and community speech and hearing centers. The Master's Program at the University of Maine is accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) of the American Speech-Language-Hearing Association, 2200 Research Boulevard #310, Rockville, Maryland 20850, 800-498-2071 or 301-296-5700.

The Bureau of Labor Education (BLE) The Bureau of Labor Education is a department within the University of Maine's Division of Lifelong Learning. The Bureau maintains an undergraduate Minor in Labor Studies as well as a Labor Studies Track that is part of the Bachelor of University Studies degree. The Bureau also conducts educational programs and research on issues of interest to workers, labor unions and policy makers. Topics include labor and employment law, labor history, labor relations, political economy, collective bargaining, arbitration and administrative hearing advocacy, mock arbitration, Robert's Rules of Order, union officer training and leadership development.

The Center for Community Inclusion and Disability Studies (CCIDS) is an interdisciplinary research unit of the University of Maine. The work of CCIDS is guided by the principles of universal design/access, inclusion, diversity, and social justice. CCIDS faculty and staff represent diverse disciplines and engage in a broad range of initiatives that enhance the quality of life for individuals with developmental and other disabilities. CCIDS offers interdisciplinary undergraduate and graduate study, and supports the conduct of research, evaluation, and policy analysis in the areas of education and early intervention, autism, child care, health, employment, housing, transition, mobility, and other aspects of community living for individuals with disabilities and their families. As Maine's federally designated University Center for Excellence in Developmental Disabilities (UCEDD), CCIDS is a member of the Association of University Centers on Disabilities and collaborates with other universities and research centers throughout the country and internationally to address disability-related research, practice, and public policy. Graduate and undergraduate students from any discipline may become involved in the Center's activities through coursework, independent studies, projects, and research. For additional information, please contact the Center for Community Inclusion and Disability Studies, 234 Corbett Hall, phone 207.581.1084 or 800.203.6957, TTY users: call Maine Relay 711, or visit the CCIDS website: www.ccids.umaine.edu.

The Virtual Environments and Multimodal Interaction (VEMI) Laboratory

The VEMI Lab is an educational, research, and development facility based on a collaborative model where faculty, undergraduate, and graduate students from across more than a dozen disciplines learn about emerging technologies, scientific research, and creative problem solving. VEMI's mission is to conduct world-class research and to provide students with the training they need to be leaders in today's IT workforce or research-driven careers. For more information, please visit: https://umaine.edu/vemi/

Graduate Interdisciplinary Endeavors at The University of Maine

The University of Maine is firmly and deeply committed to the expansion of knowledge and understanding by encouraging various forms of interdisciplinary academic endeavor. Such activities have become the hallmark of academic excellence and a clear indicator of the intellectual vitality of modern institutions of higher learning. The University of Maine accordingly boasts a vibrant array of interdisciplinary activities that provide an exceptionally wide range of opportunities for all members of the University community - undergraduate students, graduate students,
faculty members, staff members, administrators - to participate in scholarly undertakings that involve multiple academic disciplines. The following list covers opportunities currently available to graduate students at the University of Maine; other endeavors may be in the planning stages, and the University actively fosters the expansion of this critical aspect of its overall mission of teaching, research, and public service. For more information, click here.

I. Interdisciplinary Graduate Programs

Aquaculture and Aquatic Resources

Autism Spectrum Disorders (graduate certificate)
Digital Curation (graduate certificate)

Disability Studies (graduate specialization and certificate)
Earth and Climate Sciences
Ecology and Environmental Sciences
Financial Economics
Food and Nutrition Sciences (Ph.D. program)
Gerontology (graduate certificate)

Forestry (MFY {non-thesis}, M.S., Ph.D.)
Interdisciplinary Ph.D. (various concentrations available, e.g., Engineering in the Natural Sciences)
Intermedia (MA and MFA)
Landscape Horticulture emphasis within the M.S. degree program in Horticulture
Master of Arts in Global Policy (SPIA)

Master of Arts in Interdisciplinary Studies (including New Media, Intermedia, Maine Studies and Peace Studies tracks)
Master of Science in Teaching (concentrations in Physics, Earth Sciences, Mathematics, or Generalist Option)
Plant Science (Ph.D. program; multi-departmental)
Professional Science Master's (PSM) degree
Quaternary and Climate Studies
Marine Policy (M.S.)
Marine Sciences and Marine Policy Dual Degree Program (3 years: with an M.A. in Policy and and M.S. in one of the marine sciences)

II. Other Interdisciplinary Endeavors

Academy of Public Service (joint endeavor of UM Dept. of Political Science; M.C. Smith Center, and the Muskie Institute of USM)
Advanced Structures and Composites Center
Canadian-American Center
Center for Community Inclusion and Disabilities Studies
Cooperative Extension
Division of Lifelong Learning
Forest Bioproducts Research Institute
Franco-American Center
Climate Change Institute
ITHCRA (Interdisciplinary Training for Health Care for Rural Areas Project)
Frontier Institute for Research in Sensor Technologies
Maine Folklife Center
Margaret Chase Smith Center for Public Policy
Pulp and Paper Process Development Center
Research Collaborative on Violence Against Women
Senator George J. Mitchell Center for Environmental and Watershed Research
Solar Vehicle Team (College of Engineering)
Cooperative Research Relationships
The University of Maine maintains active cooperative research relationships, formally and informally, with a variety of institutions and agencies in Maine, the United States and other countries. A partial listing follows:

- Augusta Mental Health Institute
- Bangor Counseling Center
- Bangor Mental Health Institute
- Bigelow Laboratory for Ocean Sciences
- Center for Learning Disabilities
- Eastern Maine Medical Center
- Huntsman Marine Laboratory, St. Andrews, New Brunswick, Canada
- Jackson Laboratory
- Maine Cooperative Wildlife Research Unit
- Maine Department of Inland Fisheries and Wildlife
- Maine Geological Survey
- Maine Medical Center
- Maine Municipal Association
- Mount Desert Island Biological Laboratory
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- The U.S. Geological Survey
- Veterans Administration Hospital, Togus

Catalog Home

Welcome to the University of Maine's electronic Graduate Catalog!

Information in this Catalog covers the academic year 2021-2022
The University of Maine reserves the right to revise, amend, or change items set forth in the Catalog from time to time. Accordingly, readers of this Catalog should inquire as to whether any such revisions, amendments, or changes have been made since the date of the publication. The University of Maine reserves the right to cancel course offerings, to set the minimum and maximum sizes of classes, to change the designated instructors in courses and to make decisions affecting the academic standing of anyone participating in a course or program offered by the University of Maine.

This catalog is based on information received by departments and other academic units as of August 23, 2021. Modifications to the catalog will only be done to correct inaccurate information, or to add new courses for the current academic year. Students should check individual program websites for specific academic policies.

The navigation menu on the left will guide you through useful information on admission requirements, policies, programs and courses, financial information and much more.
## Award Recipients

### Alumni Association Distinguished Maine Professor Award Recipients

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<td>1974</td>
<td>William G. Valleau</td>
</tr>
<tr>
<td>1973</td>
<td>John H. Dearborn</td>
</tr>
<tr>
<td>1972</td>
<td>Constance H. Carlson</td>
</tr>
<tr>
<td>1971</td>
<td>Douglas A. Gelines</td>
</tr>
<tr>
<td>1970</td>
<td>Joseph Scimecca</td>
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<tr>
<td>1969</td>
<td>Robert Thomson</td>
</tr>
<tr>
<td>1968</td>
<td>Jonathan Biscoe</td>
</tr>
<tr>
<td>1967</td>
<td>David W. Trafford</td>
</tr>
<tr>
<td>1966</td>
<td>Richard G. Emerick</td>
</tr>
<tr>
<td>1965</td>
<td>Vincent A. Hartgen</td>
</tr>
<tr>
<td>1964</td>
<td>Benjamin Speicher</td>
</tr>
<tr>
<td>1963</td>
<td>Walter S. Schoenberger</td>
</tr>
</tbody>
</table>

### Presidential Outstanding Teaching Award Recipients

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>Judith Josiah-Martin</td>
</tr>
<tr>
<td>2020</td>
<td>Sara Lindsay</td>
</tr>
<tr>
<td>2019</td>
<td>Jennifer Tyne</td>
</tr>
<tr>
<td>2018</td>
<td>Senthil S. Vel</td>
</tr>
<tr>
<td>2017</td>
<td>Harvey A. Kail</td>
</tr>
<tr>
<td>2000</td>
<td>Owen F. Smith</td>
</tr>
<tr>
<td>1999</td>
<td>Keith W. Hutchison</td>
</tr>
<tr>
<td>1998</td>
<td>Sandra L. Caron</td>
</tr>
<tr>
<td>1997</td>
<td>Fred H. Irons</td>
</tr>
<tr>
<td>1996</td>
<td>Paul B. Roscoe</td>
</tr>
</tbody>
</table>
2016 Howard M. Gray
2015 Kirsten E. Jacobson
2014 J. Malcolm Shick
2013 Richard H. Borgman
2012 Mary E. Rumpho
2011 Douglas W. Nangle
2010 Judith R. Pearse
2009 Leonard J. Kass
2008 Gail B. Werrbach
2007 Irving Kornfield
2006 Mary S. Tyler
2005 Patricia A. Burns
2004 Kim K. McKeage
2003 Robert Franzosa
2002 Eric N. Landis
2001 Constance M. Perry

1995 Barbara J. W. Cole
1994 William E. Glanz
1993 Saundra L. Gardner
1992 Christina L. Baker
1991 Kristin M. Langellier

Presidential Public Engagement Award Recipients

2021 James Dill
2020 Jean MacRae
2019 Susan McKay
2018 Ivan J. Fernandez
2017 Marcella H. Sorg
2016 Amy Fried
2015 Laura A. Lindenfeld
2014 Bruce E. Segee
2013 George Markowsky
2012 Karen J. Horton
2011 Kathleen March
2010 Thomas E. Christensen
2009 Kathryn J. Olmstead
2008 Alan B. Cobo-Lewis
2007 Herbert L. Crosby
2006 Carol B. Gilmore
2005 David H. Lambert
2004 Todd M. Gabe
2003 Harlan Onsrud
2002 Sandra L. Caron
2001 Ann Schonberger
2000 Walter G. McIntire
1999 George L. Jacobson, Jr.
1998 Dana N. Humphrey
1997 Sheila J. Pechinski

1996 Alfred A. Bushway
1995 James H. Breece
1994 Ray B. Owen
1993 Edward D. "Sandy" Ives
1992 Lucille A. Zeph
1991 William H. Whitaker
1990 Herbert Hidu
1989 David F. Wihr
1988 Robert C. Bayer
1987 James A. Wilson
1986 Vaughan H. Holyoke
1985 Barbara A. Barton
1984 Richard J. Campana
1983 Patricia M. Pierson
1982 Richard C. Hill

Presidential Research and Creative Achievement Award Recipients

2021 Elizabeth Allan
2020 Bob Steneck
2019 Jasmine Saros
2018 Yong Chen
2017 Marcella H. Sorg
2016 Amy Fried
2015 Laura A. Lindenfeld
2014 Bruce E. Segee
2013 George Markowsky
2012 Karen J. Horton
2011 Kathleen March
2010 Thomas E. Christensen
2009 Kathryn J. Olmstead
2008 Alan B. Cobo-Lewis
2007 Herbert L. Crosby
2006 Carol B. Gilmore
2005 David H. Lambert
2004 Todd M. Gabe
2003 Harlan Onsrud
2002 Sandra L. Caron
2001 Ann Schonberger
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1998 Dana N. Humphrey
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1996 Alfred A. Bushway
1995 James H. Breece
1994 Ray B. Owen
1993 Edward D. "Sandy" Ives
1992 Lucille A. Zeph
1991 William H. Whitaker
1990 Herbert Hidu
1989 David F. Wihr
1988 Robert C. Bayer
1987 James A. Wilson
1986 Vaughan H. Holyoke
1985 Barbara A. Barton
1984 Richard J. Campana
1983 Patricia M. Pierson
1982 Richard C. Hill
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Correspondence Information

Inquiries should be directed as indicated below.

Chancellor: Dannel P. Malloy, 15 Estabrooke Drive, Orono, ME 04469 (207)972-3205
E-MAIL: rowenac@maine.edu

President: Joan Ferrini-Mundy, 5703 Alumni Hall, Room 200, Orono, ME 04469-5703, (207) 581-1512.
E-MAIL: umpresident@maine.edu

Executive Vice President for Academic Affairs & Provost: John Volin, 5703 Alumni Hall, Suite 201, Orono, ME 04469-5703, (207) 581-1547
E-MAIL: john.volin@maine.edu

Associate Provost for Academic Affairs and Faculty Development: Jessica Miller, 5703 Alumni Hall, Suite 201, Orono, ME 04469-5703, (207) 581-1591
E-MAIL: jessica.miller@maine.edu

Associate Provost for Student Success and Strategic Initiatives: Brian Olsen, 5703 Alumni Hall, Suite 201, Orono, ME. 04469-5703, (207)5811537
Vice President for Enrollment Management: Christopher Richards, Heritage House, Room 101, Orono, ME 04469, (207) 581-1619
E-MAIL: christopher.michael.richards@maine.edu

Vice President for Innovation and Economic Development: Jake Ward, 5717 Corbett Hall, Room 430, Orono, ME 04469-5717, (207) 581-2201
E-MAIL: jsward@maine.edu

Vice President for Research and Dean of the Graduate School: Khodadad Varahramyan, 5703 Alumni Hall, Room 201, Orono, ME 04469-5703, (207) 581-1506.
E-MAIL: kody.varahramyan@maine.edu

Vice President of Student Life and Inclusive Excellence: Robert Q. Dana, 5748 Memorial Union, Room 315, Orono, ME 04469-5748, (207) 581-1406.
E-MAIL: rdana@maine.edu

Vice President and Chief Business Officer: Joanne Yestramski, Interim, 5703 Alumni Hall, Room 218, Orono, ME 04469-5703, (207) 581-1593.
E-MAIL: jyl@maine.edu

Chief of Staff: Joanne Testramski, Interim, 5703 Alumni Hall, Room 200, Orono, ME 04469-5703, (207) 581-2749.
E-MAIL: jly@maine.edu

Graduate School of Business: Norman O'Reilly, Dean, 707 Law Building, Graduate School of Business, University of Southern Maine, Portland, ME. (207) 780-4404
E-MAIL: normanoreilly@maine.edu

E-MAIL: faye.gilbert@maine.edu

College of Education and Human Development: Penny Bishop, Dean, 5766 Shibles Hall, Room 151, Orono, ME 04469-5766, (207) 581-2412.
E-MAIL: penny.bishop@maine.edu
College of Engineering: Dana N. Humphrey, Dean, 5796 Advanced Manufacturing Center, Room 210, Orono, ME 04469-5796, (207) 581-2216.  
E-MAIL: danah@maine.edu

College of Liberal Arts and Sciences: Emily Haddad, Dean, 5754 Stevens Hall, Room 115A, Orono, ME 04469-5754, (207) 581-1954.  
E-MAIL: emily.haddad@maine.edu

College of Natural Sciences, Forestry, and Agriculture: Diane Rowland, Dean, 5782 Winslow Hall, Room 105, Orono, ME 04469-5782 (207) 581-3202.  
E-MAIL: diane.rowland@maine.edu

Division of Lifelong Learning: Monique LaRocque, Associate Provost, 5713 Chadbourne Hall, Room 100, Orono, ME 04469-5713, (207) 581-3113.  
E-MAIL: mlarocque@maine.edu

Honors College: Ellen Weinauer, Dean, 5727 Estabrooke Hall, Room 145, Orono, ME 04469-5727, (207) 581-3262.  
E-MAIL: ellen.weinauer@maine.edu

Academic Support Services for Student Athletes: Margaret A. Maxim, Director, 5747 Memorial Gymnasium, Room 277, Orono, ME 04469-5747, (207) 581-1833.  
E-MAIL: maxim@maine.edu

Admissions (Undergraduate): Christopher Richards, Vice President for Enrollment Management, Heritage House, Room 201, Orono, ME 04469-5713, (207) 581-1583.  
E-MAIL: UM_ADMIT@maine.edu

Advanced Structures and Composites Center: Habib J. Dagher, Director, 5793 Advanced Structures and Composites Center, Orono, ME 04469, (207) 581-2123.  
E-MAIL: hd@maine.edu

Alumni Association: John Diamond, President/Executive Director, 1 Alumni Place, Buchanan Alumni House, Orono, ME 04469, (207) 581-1138.  
E-MAIL: john.diamond@maine.edu

Athletics: Ken Ralph, Director, 5747 Memorial Gymnasium, Room 303, Orono, ME 04469-5747, (207) 581-1052.  
E-MAIL: ken.ralph@maine.edu
Auxiliary Services: Richard Young, Interim, Executive Director, 5734 Hilltop Commons, Room 103, Orono, ME 04469-5734, (207) 356-2518.
E-MAIL: dsturrup@maine.edu

Bursar: William Elsemore, Bursar, 5703 Alumni Hall, Room 100, Orono, ME 04469-5703, (207) 581-1521.
E-MAIL: elsemore@maine.edu

Bureau of Labor Education: Marc Cryer, Director, 5713 Chadbourne Hall, Room 210, Orono, ME 04469-5713, (207) 581-4124.
E-MAIL: marc.cryer@umit.maine.edu

Canadian-American Center: Frederic Rondeau, Director, 154 College Avenue, Orono, ME 04469, (207) 581-4226.
E-MAIL: frederic.rondeau@maine.edu

Career Center: Crisanne Blackie, Director, 5748 Memorial Union, Room 300B, Orono, ME 04469-5748, (207) 581-1359.
E-MAIL: cblackie@maine.edu

Center for Aging: Lenard Kaye, Director, Camden Hall, 25 Texas Ave., Bangor, ME 04401, (207) 262-7922.
E-MAIL: len.kaye@maine.edu

Center for Community Inclusion and Disability Studies: Alan Cobo-Lewis, Director, 5717 Corbett Hall, Room 230, Orono, ME 04469-5717, (207) 581-1084.
E-MAIL: alanc@maine.edu

Climate Change Institute: Paul A. Mayewski, Director, 5790 Bryand Global Science Center, Room 303, Orono, ME 04469-5790, (207) 581-2190.
E-MAIL: paul.mayewski@maine.edu

College Success Program: Eric Chapman, Director, 5725 East Annex, Room 127, Orono, ME 04469-5725, (207) 581-2320.
E-MAIL: echapman@maine.edu

Conferences and Institutes: Will Biberstein, Director, 5713 Chadbourne Hall, Room 327, Orono, ME 04469-5713, (207) 581-4091.
E-MAIL: williamb@maine.edu
Cooperative Extension: Hannah Carter, Dean, 5741 Libby Hall, Room 102, Orono, ME 04469-5741, (207) 581-2811. E-MAIL: hcarte@maine.edu

Counseling Center: Douglas Johnson, Director, 5721 Cutler Health Center, Room 125, Orono, ME 04469-5721, (207) 581-1392. E-MAIL: doug.johnson@umit.maine.edu

Equal Opportunity: VACANT, Director, 5754 North Stevens Hall, Room 101, Orono, ME 04469-5754, (207) 581-1226. E-MAIL: equal.opportunity@maine.edu

Explorations: John Mascetta, Advising and Student Services Center Director, 5754 Stevens Hall, Room 105, Orono, ME 04469-5754, (207) 581-1957. E-MAIL: john.mascetta@maine.edu

Fogler Library: Joyce V. Rumery, Dean of Libraries, Fogler Library, Orono, ME 04469, (207) 581-1655. E-MAIL: rumery@maine.edu

Franco American Centre: Susan A. Pinette, Director, 5719 Crossland Center, Orono, ME 04469-5719, (207) 581-3790. E-MAIL: spinette@maine.edu

Franco American Studies: Susan A. Pinette, Director, 5742 Little Hall, Room 213, Orono, ME 04469-5742, (207) 581-1832. E-MAIL: spinette@maine.edu

Graduate School: Scott Delcourt, Assistant Vice President for Graduate Studies and Senior Associate Dean, 5775 Stodder Hall, Orono, ME 04469-5755, (207) 581-3291. E-MAIL: delcourt@maine.edu

Human Resources: Chris Lindstrom, Vice President, 5717 Corbett Hall, Orono ME 04469-5717, (207) 581-1640. E-MAIL: chris.lindstrom@maine.edu

Frederick C. Hutchinson Center: Kim Wilson-Raymond, Interim Director, 80 Belmont Avenue, Belfast, ME 04915, (207) 338-8020. E-MAIL: kim.raymond@maine.edu
Information Technologies: Robin Sherman, Associate Chief Information Officer, 5703 Alumni Hall, Room 100, Orono, ME 04469-5703, (207) 581-4443.
E-MAIL: robin.sherman@maine.edu

Innovation in Teaching and Learning: Peter Schilling, Executive Director, 5278 Fernald Hall, Room 102C, Orono, ME 04469-5713, (207) 581-3108
E-MAIL: peter.schilling@maine.edu

Institutional Research and Assessment: Debra Allen, Assistant Provost, 5703 Alumni Hall, Room 127, Orono, ME 04469-1703, (207) 581-1415.
E-MAIL: debra.allen@maine.edu

International Programs: Orlina Boteva, Director, 5727 Estabrooke Hall, Room 240, Orono, ME 04469-5727, (207) 581-1509.
E-MAIL: UMINTPRG@maine.edu

Maine Agricultural and Forest Experiment Station: Diane Rowland, Director, 5782 Winslow Hall, Room 105, Orono, ME 04469-5782, (207) 581-3202.
E-MAIL: diane.rowland@maine.edu

Margaret Chase Smith Center for Public Policy: Jonathan Rubin, Director, Building 4 York Complex, Orono, ME 04469-5715, (207) 581-1528.
E-MAIL: rubinj@maine.edu

Marketing and Communications: Margaret A. Nagle, Senior Director of Public Relations and Operations, 5703 Alumni Hall, Room 213, Orono, ME 04469-5703, (207) 581-3743
E-MAIL: nagle@maine.edu

Multicultural Student Life: Anila Karunakar, Director, 5748 Memorial Union, Room 312, Orono, ME 04469-5748, (207) 581-1437.
E-MAIL: anila.karunakar@maine.edu

Native American Programs: Darren Ranco, Director, 5717 Corbett Hall, Room 201, Orono, ME 04469-5717, (207) 581-4450.
E-MAIL: darren.ranco@maine.edu

Peace and Reconciliation Studies: Julie DellaMattera, Interim, Coordinator, 5749 Merrill Hall, Room 118B, Orono, ME 04469-5749, (207) 581-3118.
E-MAIL: julie.dellamattera@maine.edu
Public Safety: Roland LaCroix, Chief of Police and Director, Rangeley Road, Orono, ME 04469, (207) 581-4053. E-MAIL: roland.j.lacroix@maine.edu

Research Administration: Christopher Boynton, Director, 5717 Corbett Hall, Room 424, Orono, ME 04469-5717, (207) 581-1472. E-MAIL: christopher.boynton@maine.edu

Research Compliance: Amanda Ashe, Director, 5703 Alumni Hall, Room 310, Orono, ME 04469-5717, (207) 581-1480. E-MAIL: amanda.lashe@maine.edu

Safety Management: Jeremy Sales, Director, York Village, Building 7, Orono, ME 04469, (207) 581-4055. E-MAIL: jeremy.sales@maine.edu

Student Financial Aid: Connie Smith, Director, 5781 Wingate Hall, Room 101, Orono, ME 04469-5781, (207) 581-1371. E-MAIL: csmith@maine.edu

Student Health Services: Richard C. Young, Auxiliary Operations Director, 5721 Cutler Health Center, Orono, ME 04469-5721, (207) 581-4010. E-MAIL: ryoung@maine.edu

Student Records: Jack Campbell, Interim Registrar, 5781 Wingate Hall, Room 201, Orono, ME 04469-5781, (207) 581-1288. E-MAIL: jack.campbell@maine.edu

Summer University and Winter Term: Monique LaRocque, Associate Provost, 5713 Chadbourne Hall, Room 100, Orono, ME 04469-5713, (207) 581-3113. E-MAIL: mlarocque@maine.edu

UMaine Online and UMaineGOLD: Monique LaRocque, Associate Provost, 5713 Chadbourne Hall, Room 100, Orono, ME 04469-5713, (207) 581-3113. E-MAIL: mlarocque@maine.edu

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E-MAIL: john.b.mitchell@maine.edu