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Pandemic Related Projects, Courses and Materials

College of Engineering

The chairs/faculty and center directors were asked to provide materials related to:

1. Projects directly relevant to COVID-19
2. Course materials/strategies/assignments/approaches to create infrastructures of support for students in the face of COVID-19.

The following two sections provide the information relative to the above categories.

1. Projects Directly Related to COVID-19

Unit	Contact	Description
Process Development Center (PDC), Chemical and Biomedical Engineering Department	Colleen Walker	In mid-March 2020, the PDC was asked by Professor Mike Mason in the Biomedical Engineering program, who was working with local hospitals and MEMA officials, to help produce hospital-grade hand sanitizer. PDC staff quickly reviewed federal guidelines for proper compounding, re-configured space in the PDC per those guidelines, developed and implemented standard procedures and began producing hospital-grade hand sanitizer by March 25, 2020. The PDC worked with Maine distillers to secure food-grade ethanol, as traditional suppliers lacked inventory. The PDC has produced over 2700 gallons of hand sanitizer to date for hospitals, care facilities, and emergency responders throughout the state. In late April 2020, the PDC was asked to help prepare test solutions for fit testing of N95 masks. PDC staff chemists have prepared 4000 bottles of both saccharin and Bitrex solutions which were sent to MEMA.
Chemical and Biomedical Engineering Department	Robert Bowie	<ol style="list-style-type: none"> 1. We were in contact with St Joseph hospital Respiratory care group on a chat of about 8 respiratory therapists, Dr Tilbury and intensivist ICU Dr Santhayadka to work on splitters and the testing. Brandon Dixon and Aimee Co printed out prototypes of different designs and I would take them to St Josephs for fit and leak tests. DEEMI ordered some vent tubing and connections to test them and we sent some to each student to improve our process. 2. Meanwhile we had requests for a negative pressure hood from Dr Vikram Kumar at Northern light EMMC. He and Dr Santhayda with myself worked on the idea and dimensions then John Belding prototyped the first negative pressure hood. After this the first one was dropped to St Josephs for testing and Version two iteration was improvement in the access door and dual suction ports and line notches in the base, and John Beldings group added some reinforcement V2 negative pressure hood went to Northern Light. Version 3 then had hinged covers and screw tabs and

		<p>John Belding relayed the design to plas-Tech in Gorham, Maine, who DEEMI paid to make 3, those were taken to local hospitals and I know we flew a procedure hood to Greenville CA Dean.</p> <p>3. The next project now in progress is per the request via Dr Mason from Dr Jon Busko at St Joseph ER, who requested a Charlotte valve 3D print for what is a snorkle mask with adapted fitting ie the charlotte valve as used in Italy. This provides positive assist pressure to help recruit aveloar opening and improve ventilation. I will include some pictures as well here. The valve has been printed by the students and is being delivered shortly to Dr Busko for leak tests. We next are looking at negative pressure hoods for EMS use.</p> <p><u>See images for these projects in Appendix A below.</u></p>
<p>Chemical and Biomedical Engineering Department</p>		<ol style="list-style-type: none"> 1. CHE Juniors worked on a scale-up problem in CHE368 Reaction Kinetics and design course on production of Hydroxychloroquine (HCQ) using flow reactors. This was an interesting exercise to simulate rapid transition to produce HCQ to meet rising demand. (Prof. Schwartz) 2. BIE Juniors discussed various means of sterilization of PPE (Personal protection Equipment), with limitations related to possible damage that may be caused affecting various materials of construction, in BEN 402 course on Biomaterials. Particular topic focused on possible decontamination of N95 masks where polypropylene (PP) is used. (Prof. Neivandt) 3. BEN 498/598 Quantitative Biomedical optics juniors discussed a research article on optical detection of viruses including Zika virus. (Prof. Tilbury) 4. One of the BEN 479 Capstone Design team of BIE seniors working on detecting health hazards in driver-less shared autonomous vehicles (SAV) focused on COVID-19 issues and significance explicitly .(Profs. Howell and Bowie) 5. CHE sophomores used several examples of COVID-19 related data in CHE 350 Statistical process Control course for hypothesis testing to check for statistical significance of differences between proportions. (Prof. Walton) 6. BIE first-year students used COVID-19 related database to analyze transmission and mortality rates using scientific graphing techniques in BEN 112. (Prof. Mason)
<p>College of Engineering</p>	<p>Dana Humphrey</p>	<p>The group project for GEE 230 Introduction to Engineering Leadership and Management was directly related to COVID-19.</p>

		See attached a copy of the project description in Appendix B below.
Surveying Engineering Technology	Anthony Vannozzi	The NSPS Student chapter held a zoom meeting/panel discussion on April 29th with four Boston area business leaders from the largest firms in the city to talk about how their businesses were responding to COVID-19 issues. They talked about such things as running their offices from home, social distancing while surveying on construction sites and the health monitoring protocols that companies implemented to keep their field personnel safe. This was helpful for the students, many of whom were going to be starting summer internships in May.

2. Course materials/strategies/assignments/approaches

Course	Faculty	Description
CHE361	Sara Walton	Summer <u>CHE 361</u> process control lab experiment for CHE juniors was switched to an inexpensive Arduino microcontroller based experiment that students could do at their homes.
BEN479	BIE Capstone Team	For BIE seniors working on capstone projects in <u>BEN 479</u> , faculty had the students break them down into three or four independent parts (sensors, sensors+program, etc.). Then each student was sent home with the hardware necessary to do their own individual part with a checklist with everything that went out and with whom it went. Each student did his or her own part, worked with their team to write a cohesive report that integrated all the parts, and then made part of the grade successfully returning everything in working order.
CHE361	John Hwalek	For ChE juniors, a lab project on process control in CHE 361 of a pilot-scale heat exchanger was modified so that students can run and control the hardware remotely using their control programs.
	Lisa Weeks	For BIE juniors a lab project on instrumentation was modified so that each student can design a sensor system and build it at home using a "kit" of components given to them when they left for the Spring Break.
EET174	Jude Pierce	All course material was delivered synchronously via zoom. Students were sent home with lab kits, and they performed the same labs as they would have during our regular lab periods.
EET275 & 115	Jude Pierce	Information was also delivered synchronously for EET 275, Digital Communications, and EET115, the new Creative Design with CAD course. Labs for digi utilized simulation software, while lab exercises for CAD, which were to be created on the IMRC laser cutters and 3D

		printers, were 3D models which the students presented using a variety of multimedia tools via zoom.
GEE230	Dana Humphrey	For GEE 230 shifted all lectures to asynchronous managed through Blackboard. There were two synchronous sessions: i) presentation of group projects; and ii) 2-hr Q&A session with members of the Dean's Advisory Council.
SVT courses	Anthony Vannozzi	<ol style="list-style-type: none"> 1. To start the post-break half of the semester I created a brief lecture to explain to the students what was different about remote learning and face to face learning to shape their expectations and understanding. This video was posted so they could watch it as soon as they returned to their studies after spring break. I also posted a follow-up video where I went over the details of a revised syllabus. This included, for example, how they would hand in homework and how I intended to structure the remaining exams. 2. I had drop in zoom office hours twice a day every week day. Both myself and Curtis Marson, who co-taught the course with me, would be on zoom. We held one set midmorning, so it overlapped their scheduled lecture and lab times, in case other faculty were running synchronous lectures. The second set of hours were in the evening for those students who found themselves working regular jobs while at home. 3. Even though I issued a revised syllabus which had all the new deadlines, etc. I created a short video every Monday morning that covered all the expectations for the week. I did this as a voice over the actual writing of the bulleted items on my document camera so at the end they also had the actual piece of paper to look at that I created while explaining the weekly expectations. This included the same "housekeeping" items that one normally covers at the beginning and/or end of a typical face to face lecture. The students commented to me that this was a big help because there was so much changing in so many classes it was hard to keep track of all the moving parts. 4. All assignments were submitted via blackboard as PDF's I provided the students with the name of a free phone app (CamScanner) which they used to photograph their assignments and the app automatically creates an optimized multi-page PDF. No pushback or issues from any students. I could then download the PDF's and grade them on my tablet with a stylus. Frankly it cut my grading time by 30%. I will never have students hand in a stack of green engineering paper ever again!
MET462	Karen Horton	<ol style="list-style-type: none"> 1. Reorganized homework so it would be due weekly, not the next class. Homework was always optional with the final course grade calculated with and without homework (the got the higher of the two) and this continued. I provided a schedule with all the assignments and due dates, all the quizzes, AND the associated expected time on task. I also posted complete and correct solutions to all the homeworks and quizzes so they could check their work. 2. I wrapped some "mandatory" homework questions into quizzes. So, for example, for Quiz 4, there was a 10-pt "Part 1" (mandatory

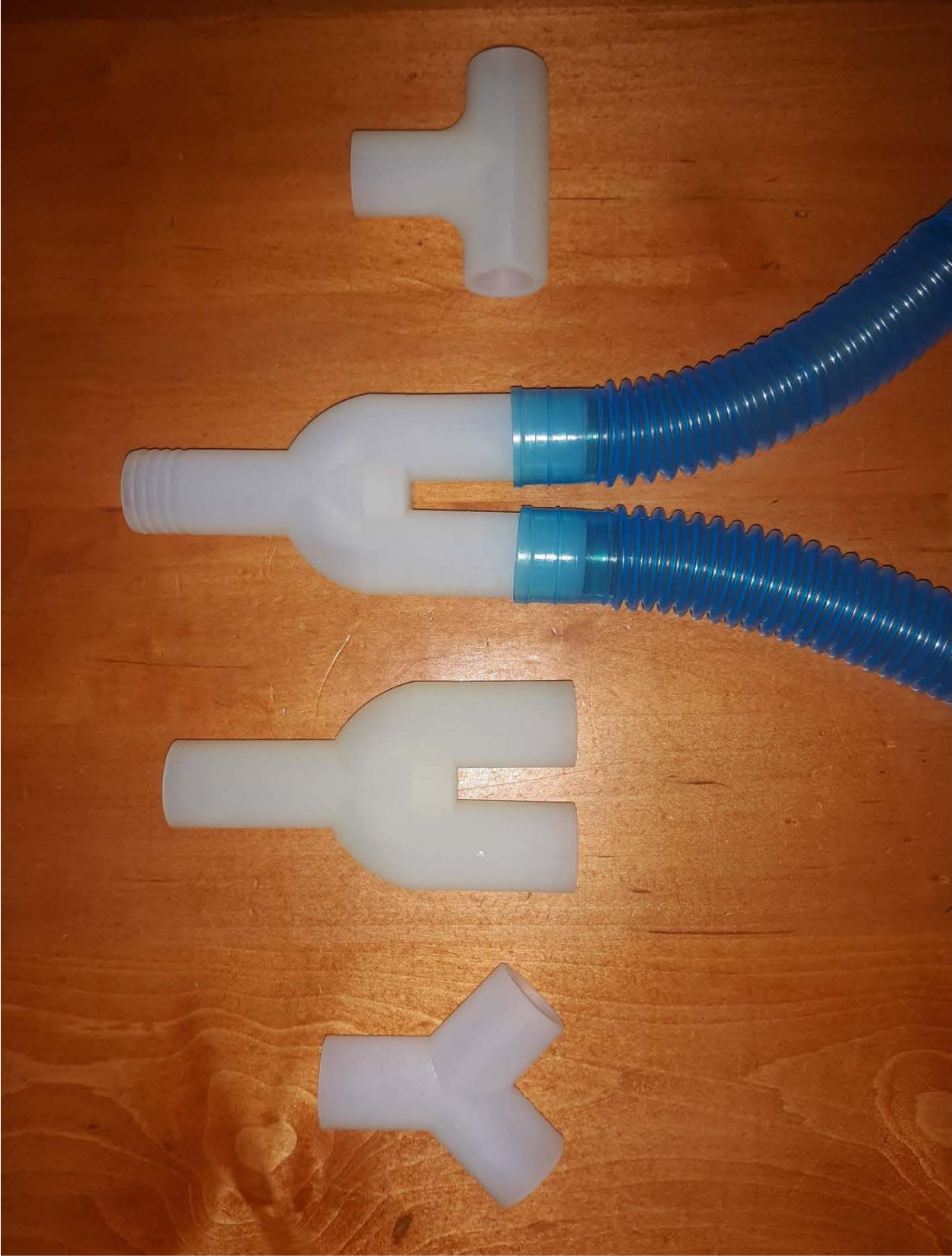
		<p>homework) one week, and a 90-pt "Part 2" (the quiz) the next week. I was AMAZED that students would do the mandatory homework when it was called Part 1 of a quiz!! Almost everyone did it. I did not grade it. The grader checked it for completion only, not correctness. I posted a solution so they could self-correct.</p> <ol style="list-style-type: none"> 3. Students had 24 hours to complete the open book quizzes rather than one hour they would have had in class. The grades were not really very different. One of the quizzes was a little longer than I would have given in class. 4. Originally the final course grade was calculated from the best 5 of 6 1-hour "quizzes" (really exams) plus a mandatory final exam, and optional homework if it improved the final grade. As modified the final exam was optional but it could not hurt the grade already earned. About a quarter of students took the final but only two had their grade increased by it. I graded the final very stiffly. They had two days to complete it, and there was no new material on it. I might maintain this practice no matter how the course continues. I do a LOT of evaluation in that class because they have to combine so many concepts and practice a consistent method of analysis. It takes them a number of times to get it. 5. I was in the middle of a course rewrite when we switched to online. I continued with the rewrite. <p>See attached course materials in Appendix C below.</p>
MET32 1	Karen Horton	<ol style="list-style-type: none"> 1. For MET 321 I had to video a couple of lab tests for students and provide them with data to work with. These involved spreadsheet calculations so I reviewed and graded their work, gave them suggestions and let them correct, and then gave them the grade on the corrected work. 2. I got a separate phone so that I would always answer it even if I didn't recognize the number. I encouraged students to text and call, which they did. I also had zoom office hours set and a number of students used them.
MET10 7 MET21 3	Joel Anderson	<ol style="list-style-type: none"> 1. MET213 - This is a lecture course that lent itself well to an online format. Courses were recorded and offered entirely asynchronously. My asynchronous recordings all started with a Word document showing everything that was due and when it was due. Details of my lecture were typed out so students did not need to take notes and could go back and review them. The Computer Aided Design and Computer Aided Manufacturing recordings were helpful to students who were able to pause and backup the recordings as needed. I continued using Google Classroom to present material and communicate with students, but also posted recorded lectures and gave online quizzes. I changed due dates for my Wednesday section to match my Thursday section. I made myself available for individual student zoom meetings as needed, from early in the morning until late at night. Overall, students did well with the online format of the class. The final project grades were higher than normal. The fact that I was already using Google Classroom likely helped with the

		<p>transition. 3 of 43 students chose pass/fail One of those would have had a C+ One of those would have had a C One of those would have had a C-</p> <p>2. MET107 - There were advantages and disadvantages to placing the lecture portion of this class online. I was already using Google Classroom and continued to do so, but added my asynchronous lectures, tests and quizzes online. My asynchronous recordings all started with a Word document showing everything that was due and when it was due. Details of my lecture were typed out so students did not need to take notes and could go back and review them. I made use of some excellent Youtube videos in my recordings to support lecture topics. Student online test and quiz scores were on par with in-class tests. I made myself available for individual student zoom meetings as needed from early in the morning until late at night. I was not able to show and hand around tools and other physical examples in class, while I lectured. The lab portion of this course was completely scrubbed. In addition to creating process sheets for their parts, students were originally required to manufacture the parts on lathes and milling machines. Since I couldn't send a lathe and a mill home with each student, I removed the manufacturing requirement and doubled the number of process sheets required from each student. I recorded the process for making each part, including special fixtures and tooling, and posted the recordings to Google Classroom. As a result of scrubbing the lab portion of MET107, these students do not have the prerequisite hands on skills needed for MET312. These students will undoubtedly be mixed in with other classes, which will make teaching MET312 challenging. Spring 2020 students will need to catch up. Teaching Assistants and I will have to be aware that some students will need more attention to maintain safety and learning.</p> <p>10 of 47 students chose pass/fail 3 of those would have had an A 7 of those would have had a B</p> <p>Students used free scanning apps for their phones to scan and post certain assignments to Google Classroom. Student participation in both classes was good, but I sent MANY reminders of upcoming assignments and tests. I did have a couple of students that did not keep up with the work. I extended deadlines and accepted very late work. Both students took advantage of the offer and passed. Unless otherwise specified, I kept the syllabus, course requirements and due dates the same. I spent around 4 hours per 1 hour of recording. I made 30 recordings.</p>
MEE Courses	Masoud Rais-Rohani	Most MEE faculty used a variety of tools to continue to teach their courses. Without discussing 40+ sections one by one, I can summarize the approaches used as follows: Video recording of

	<p>lectures at home or inside an empty classroom (alone with a TA doing the recording), Using screen recording apps to capture annotation on screen and voice, Using Kaltura to add voice over powerpoint presentation, Recording live Zoom lectures, holding Zoom office hours, Making lecture notes available on Blackboard.</p>
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Appendix A



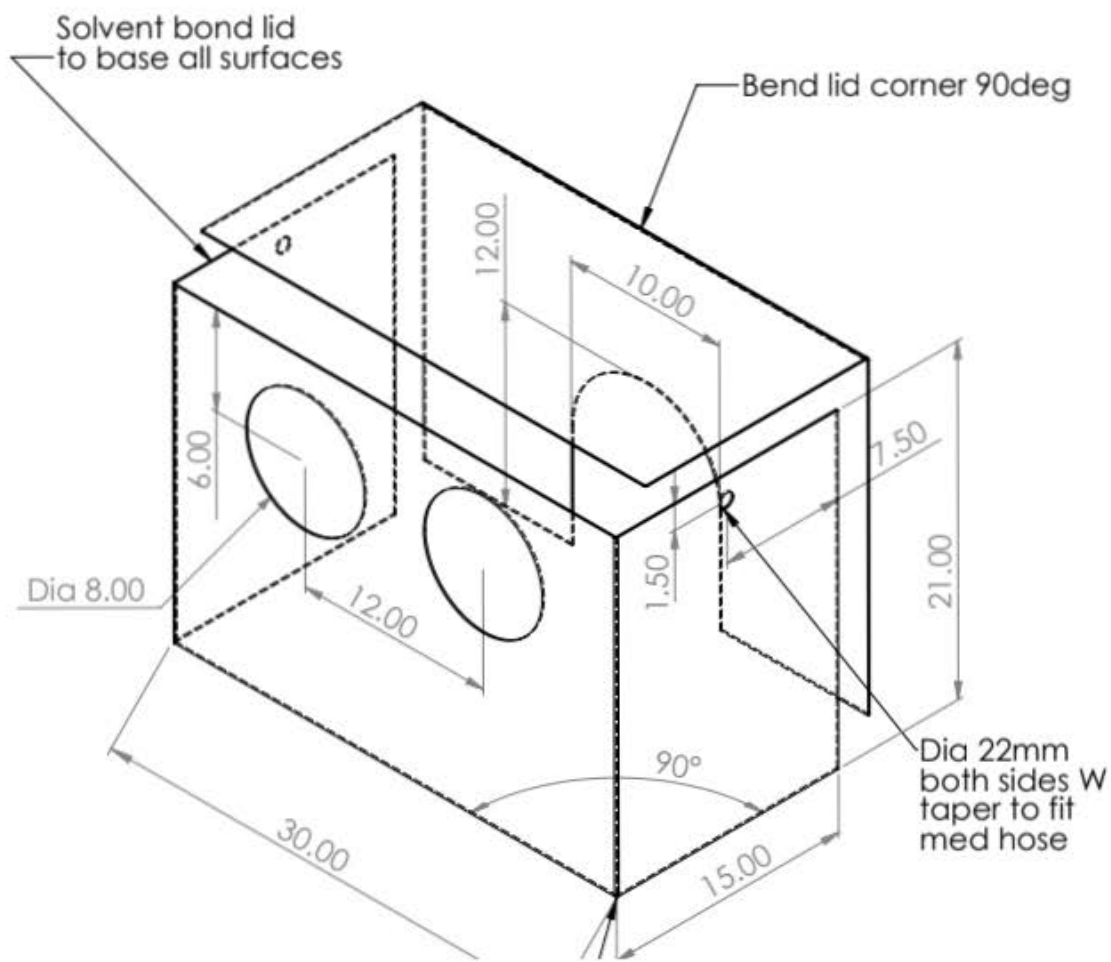


Passed leak
Test

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connection













Appendix B

GEE 230 – GROUP PROJECT
— REAL TEAMWORK —
Spring, 2020
Section 2

Solution space:

You work for a large manufacturing firm with a wide range of design and production capabilities. Moreover, your firm has strong relationships with a wide array of material suppliers and specialty subcontractors. The CEO of your company is greatly concerned with the dire shortages of personal protective equipment (e.g., N95 masks, protective gowns, face shields, gloves), hand sanitizer, respirators, and more that has been caused by the COVID-19 outbreak with potentially deadly consequences to medical professionals, patients, and the general public. Moreover, COVID-19 has resulted in a decrease in demand for the company's normal product lines, leaving the firm with unused design and production capacity. The CEO has asked your team to develop and execute (i.e., be in charge of overseeing and implementing) an emergency plan to produce and distribute one or more of the most critical items that are in short supply as a result of COVID-19. ~~The company must at least break even on the design, production, and distribution costs of whatever item(s) your group selects to produce.~~

Assignment:

Determine what critical item(s) the company should produce ~~along with rational on why they were selected~~ and develop an overall framework for design, production, and distribution of those item(s). All of this should be organized under the structure of the five basics of a real team. Thus, your oral and written report should have five sections, one for each of the five basics of real teams. There can be no other sections of your oral and written report, thus everything you want to say must fit under one of the five headings.

Notes:

1. Do not prepare a detailed plan with all the individual steps needed to design, produce, and distribute the item(s) you've selected. Rather, you need to present the overall structure that identifies all the critical functions and who among the members of your team would be responsible for those functions.
2. It is OK for a group member to be responsible for more than one function, provided those functions are distributed in a rational manner. For example, you don't want one person to be in charge of two functions that will be at their most critical point at the same time.
3. Take into account the real skills that the members of your group bring to this problem when assigning functions. For needed skills that are not present among the members of your team, make assignments based on who is most likely to be able to learn the skill.
4. Collaborate with your team members using what ever technological solutions you are most comfortable with.

Deliverables:

1. 10 minute oral report given via a Zoom meeting during your normal class time on April 20, 2020. All members of your team must have a speaking role in this presentation. I will be sending you a Zoom invitation.
2. Typed report, no more than two pages in length. The report should have five sections, one for each of the basics of real teams. Please clearly list your team name and the members of the team at the top of the report. If there are team members who did not participate, please note this. The report should be submitted to me via email (danah@maine.edu) no later than 5 PM on April 27, 2020.

Level of Effort Expected:

You should expect to spend about two hours working virtually as a group to develop your overall framework and your oral presentation. On April 20, 2020 you will give the oral presentation. It should then take your group about an hour to prepare the 2 page max. written report.

Grading:

Your team's grade will be based on: (1) oral report (25%) and (2) written report (75%). In both you must demonstrate how you met the five basics of a real team. All members of the team will get the same grade. Overall, the group project comprises 20% of your class grade.

Team Assignments:

Team Alpha	Team Ueta	Team Gamma	Team Delta	Team Epsilon
Baker, McKenna Jean	Dixon, Elliot	Hosford, Elise	Monahan, Kenzie Rose	Sheets, Julie
Carrine, Summer Anne	Elder, Kevin	Hunter, Michael	Ouellette, Hayden T	Trook, Jason Ryan
Chen, Jara	Felker, Brandon	Lamoneer, Wes L	Paradis, Alex	Tweed, Blair S
Connelly, Katie Young	Ferreras, Steven	Mason, Molly R	Roberts, Kirstin	White, Steven Lloyd
Craft, Michael Patrick	Gervais, Olivia	McKenna, Jarrod	Segni, John A	York, Mitchell R
Damoise, Olivia R	Gregory, Jordan M	Merchant, Erin N	Shea, Maeve Maureen	

Appendix C

MET 462 Modified Schedule and Online Learning "Just give me the basics"

Details given in "Modified Syllabus" and "Modified Schedule" files.

Grading: Still have 6 quizzes, graded on best 5/6. Quiz 4 and 5, 24 hours, Quiz 6, 5 or 6 days. Signature that your work is independent required. Quiz 6 is a spreadsheet for spring design – it is the easiest of all the quizzes so plan to take it. Homework still optional BUT if you start now I will ignore your earlier zeroes. It is not graded – you get a point per problem as long as you complete it. You will get feedback, and solutions will be posted after due date. Lab is still 30% of grade.

I will calculate the lecture portion of your grade after Quiz 6 and give it to you. Final is optional. I will give you the higher of your grade, with or without the final, so taking it cannot hurt your grade.

Video lectures, assignments, and quizzes will continue to "leap frog" with new material due before quiz of previous material. This is intentional in order to provide the structure most likely to develop your long term memory of the material, which requires recalling information at intervals. A few quiz points (quiz "Part 1" will be awarded during the weeks of the related lectures to encourage you to keep going.

Due dates: Required Quizzes (best of 5 but I urge everyone to take Quiz 6)

Quiz Section	Date posted	Date due, 4pm
Quiz 4 Part 1 10 pts	No later than Wed 3/25	Mon 3/30
Quiz 4 Part 2	Thur 4/2 4pm	Fri 4/3
Quiz 5 Part 1a 10 pts	No later than Mon 3/30	Mon 4/6
Quiz 5 Part 1b 10 pts	No later than Mon 4/6	Mon 4/13
Quiz 5 Part 2	Thur 4/16 4pm	Fri 4/17
Quiz 6 Part 1 10 pts	No later than Mon 4/13	Mon 4/20
Quiz 6 Part 2	Fri 4/24 8 am	Wed 4/29

Due dates: Optional but strongly recommended, cannot hurt your grade

Assignment	Date posted	Date due, 4pm
Assignment 1	No later than 3/25	Mon 3/30
Assignment 2	No later than 3/27	Mon 4/6
Assignment 3	No later than 4/3	Mon 4/13
Assignment 4	No later than 4/10	Mon 4/20
Assignment 5	No later than 4/20	Mon 4/27
Final Exam	Wed 5/6 12:30 pm	Fri 5/8, due 12:30 pm

Class calendar: Click on the three horizontal lines top left of class card - calendar is near the top of the menu. Due dates will automatically show up on this calendar after they are posted.



MET 462 Design I: Recommended Study Schedule March 25 to May 8, 2020

Remember that successful students spend 2 – 3 hours of work outside each hour of class time. If, up until now, you have been spending 6 hours per week on the lecture section outside of the three hours of class and you are not achieving a C grade, email me and tell me.

Below I offer a study schedule to help keep you going. It includes about 3 hours of video and about 6 hours of study including completing quizzes each week.

Date	Work due	Zoom office hours	Video topic	Reference materials ASM: Applied Strength of Materials, MEMD: Machine Elements in Mechanical Design	Homework and quizzes assigned	Suggested study time
M 3/9			Topic: Q4R 19 Beam deflection by successive integration	MEMD section 3-19 pp 112-113 ASM section 9-7 (pages posted)	Topic: Quiz 4 Resources Assignment 1 ASM: 9-77 by successive integration; EXTRA CREDIT 9-76 Due Monday, 3/30/2020 4pm	
F 3/13			Topic: Q4R 21 Combined Normal Stresses and Mohr's circle	MEMD section 3-21, Chapter 4 Sections 5-7 to 5-12 ASM sections Chapter 10 (posted)	Topic: Quiz 4 Resources Assignment 1 ASM: 10-3, 10-19 Due Monday, 3/30/2020 4pm	
W 3/25		3:00 pm	Topic: Q4R Videos: 22		Topic: Quiz 4 Quiz 4 Part 1 (10 points) Due Monday 3/30/2020 4pm	View Videos 22, Read, Assignment 1 2 hours
Th 3/26		7:00 pm				Assignment 1, begin Quiz 4 Part 1 2 hours
F 3/27			Topic: Q5R Videos: 23 Combined Stresses and Mohr's circle	MEMD sections 5-4 5-7 to 5-12 ASM Chapter 10 sections posted	Topic: Quiz 5 Resources Assignment 2 Topic: Quiz 5 Quiz 5 Part 1a All due Monday, 4/6/2020 4pm	View Videos 23, read, review, start Assignment 2 2 hours

MET 462 Design I Revised Syllabus March 25, 2020

Credit Hours: 4

Course Schedule: Asynchronous, materials online

Prerequisites: MET 219

Lecture Meeting Times and Locations: Asynchronous

Faculty: Karen J. Horton, P.E., Professor, MET

Office: 211 Boardman Hall

Office hours: Online office hours

Phone: You may call or text me at 207-703-3570. This is a cell phone I obtained exclusively for course work, advising, and so on. Please don't hesitate.

Email: khorton@maine.edu

Mailbox: SET office in 119 Boardman Hall

Lab Times and Location: Asynchronous, materials online

Faculty: Keith Berube, Ph.D., P.E., Assistant Professor, MET

Office: 204 Boardman Hall

Office hours: Zoom or phone office hours scheduled Monday 3:00 pm, Tuesday and Thursday 7:00 pm, and by appointment with you. See the Recommended Study Schedule.

Phone: 581-2342

Email: keith.berube@maine.edu

Mailbox: SET office in 119 Boardman Hall

Hardware and Software Required:

1. You must have a laptop that meets the SET laptop policy.
2. Ability to photograph or scan work
3. Microsoft Office Suite: free for students: Go to the University web page <http://www.umaine.edu/it/software/> and follow the link to Microsoft Office
4. Google Classroom: I will organize Google Classroom for online posting of materials, assignments, and receiving assignments.
5. Zoom: I will hold office hours using Zoom or you may call me
6. SMath Studio

Required Books

1. Robert L. Mott, Applied Strength of Materials, Fifth Edition, Prentice Hall, USA, 2008, OR Robert L. Mott and Joseph A. Untener, Applied Strength of Materials, Sixth Edition, CRC Press, 2016. Homework and reference.
2. Hard copy only of Robert L. Mott, Machine Elements in Mechanical Design, Sixth Edition, Prentice Hall, USA, 2017. This book will also be required in MET 463 Design II. You will complete open book quizzes that will not be possible to successfully complete without a hard copy of the book. It is an excellent and long lasting desk reference for any practicing mechanical engineer. ISBN-13: 978-0-13-444118-4
3. Go to <http://ncees.org/engineering/fe/> to download and print FE pages (Statics, Dynamics, Strength of Materials, Mechanical Engineering) to use during quizzes

Recommended Books

1. R.C.Hibbeler, Statics, Pearson, the edition you used for your MET 150 Statics class, or a similar reference
2. Michael R. Lindeburg, 1001 Solved Engineering Fundamentals Problems Third Edition, Professional Publications, Inc., 2005, or similar reference and practice book