EGR 492 Senior Project II
Elizabethtown College
meetings – TBD with advisors

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Please see the schedule outside our doors for posted office hours, or email for an appointment. Feel free to stop by our offices anytime. If the door is closed please leave a note or send an email.

Textbooks: None

Course Description:
A demanding, and perhaps original, engineering project performed under close supervision of a faculty member. The project must include design processes with appropriate constraints and use of standards. The scope of the project typically includes detail and final design work and construction of a working prototype. Progress reports, a final report, and a public seminar are required.

Course Outcomes:
Students will leave this combination of courses (391, 491, 492) with an improved ability to:
1. Design a system, component, or process to meet desired needs (ABET-c)
2. Identify, formulate, and solve engineering problems (ABET-e)
3. The ability to design and conduct project-based experiments; analyzing, interpreting, and displaying the resulting data. (ABET-b)
4. Consider and analyze appropriate financial, social, environmental, and ethical issues pertaining to a design project (ABET-f and h)
5. Communicate effectively orally and in writing (ABET-g)
6. Use the modern engineering tools to complete a design and build project. (ABET-k)

Advising Model:

This year we will be implementing a group faculty advising model with each project group being assessed by all of the EGR 492 faculty advisors.

Advising Meetings: Project teams are required to meet with faculty advisors five times over the course of the semester. They should meet with each professor at least once. Each faculty advisor will maintain specific project advising office hours. Teams are encouraged to sign up for project advising appointment using StarFish. All members of the team are not required to attend. In fact, one or two team representatives may be preferable. Project teams failing to attend all of the required meeting will receive a 1/3 letter grade deduction on their final grade.

Advisor Grading: Project reports will be assessed by two faculty members using a common rubric. Detailed feedback will not be provided. However, students are strongly encouraged to meet with faculty during EGR 492 Advising Office Hours. Teams are also encouraged to post any specific questions for feedback in their reports. PMEs will also be assessed by all faculty advisors on a rotating basis.

Grading: *Project Management Elements…………………..10%*
Project Report 492A (week 2) ………………….10%
Project Report 492B (week 5) ………………….15%
Project Report 492C (week 8) ………………….15%
Project Report 492D (week 11) ………………..15%
Final 492 Project Report (week14) ………………20%
- *Paper Content (50%)*
- *Technical Writing (20%)*
- *Presentation (30%)*

Your grade will be influenced by your team contribution. At approximately weeks 4, 8 and 14 peer evaluation must be completed by all students. The evaluations at week 4 are formative, but those at weeks 8 and 14 will influence grading when a team member is not performing. The results of the peer assessments should be discussed in each project report and in the final report: as a team, how are teamwork issues being addressed? We will use the CATME (www.CATME.org) tool for assessment.

Course Elements:

We have adopted an Agile methodology for EGR491/2. This methodology is based on breaking a project into smaller segments or subsystems. Each Project Report represents a project segment or subsystem. For overall project planning it should be noted that EGR492 will follow a similar plan with Project Reports due at week 2, 5, and 8. Report 2 will have a similar format to the week 2 report in 491. A *Best Draft* of the final project report will be due on the Friday before SCAD. All work on the project itself must be completed by that date.

Required PMEs: The following elements will be assessed on completeness, clarity, and on the level to which the individual and team are making appropriate progress on the project
- Weekly team meeting minutes (you must meet in-person as a team at least once each week of the semester)
- Individual weekly work reports (you are expected to work a total of 6 hours every week)

Students will be required to evaluate one another's progress using the rubric provided in Canvas. Professors assessing PMEs will use the score determined by the team unless they observe discrepancies.

Project Reports (PR): Project reports should be clear and complete. Quality of writing is assessed. These are formal documents and should be thought of as chapters/sections of your final report. Think of these papers as team papers. While they will become sections of your final report, they also must be stand-alone documents. Each report should include appropriate background materials and a bibliography of cited works, as well as appropriate appendices. All reports are due on the Monday following the indicated week of the semester and will be posted publicly (to all enrolled students) as submitted on the course Canvas page. Each report should indicate progress on specific objectives for that PR and include detailed specific objectives for the next PR.

- 492A (week 2): Initial Report (See Rubric)
  - Updated Team Contract for the semester
  - Formal report as indicated in previous PR: Progress reported (Contract Fulfillment)
  - Specific objectives for completion by next PR: Strong planning for next Sprint (Contract Proposal)
  - Updated rough plan for all project reports and final reports through the end of the project

- 492B, C & D (weeks 5, 8 and 11) – See Rubric
  - Formal report as indicated in previous PR: Progress reported (Contract Fulfillment)
  - Specific objectives for completion by next PR: Strong planning for next Sprint (Contract

Proposal)
- o Updated rough plan for all project reports and final reports through the end of the project

Individual Reflection: 250-300 word **final draft** reflection at weeks 10. If the reflection is submitted after the week 10 deadline but before the week 12 deadline, the student's reflection will be scored at 75% of the assessed value. If the reflection submission is after the 12 week deadline but before the 14 week deadline, the reflection will be scored at 50% of the assessed value. Reflections will not be accepted for credit following the week 14 deadline. See Canvas for the specific questions and submission deadlines.

Final Product, Paper, Presentation: This grade will be determined by the (1) quality and quantity of the engineering work you have done this semester as presented in the final Design Paper, the (2) quality of the Design Paper itself, and the (3) quality of the public presentation of that work.

Senior Design Paper Outline:
- ☐ **Abstract – a 200 word (maximum)** overview of your entire project to date including your up-to-date problem statement.
- ☐ **Introduction and Background -** Using your problem statement as a guide, what is the problem? Why is it a problem? Provide some context in light of the social, environmental, and environmental concerns. (Note: the Social, Ethical, and Environmental Implications section is where you will do detailed analysis of those issues.) How has this problem previously been addressed? What is the current state of the art in the field? (i.e., where it stands with other research/designs/projects)
- ☐ **Project Design Specifications (PDS) and Market Analysis** – Provide an overview of the PDS. What are the key elements? What specifications were the most difficult to meet and why? How did your PDS evolve? Also, include a discussion of the market analysis as appropriate. Who is the customer? What are their requirements?
- ☐ **Project Management -** Describe what tools and resources you used to manage your project. Specify the type of tool you used (such as BaseCamp or Gantt Chart). How did your team keep on task? How did you assign tasks? What project management challenges did you face? How did you communicate with one another? How did you hold one another accountable? Provide rationale behind your intended timeline and schedule in addition to the timeline/schedule itself.
- ☐ **Budget -** Describe in detail each component of your budget. Include a list of where each product was purchased, the quantity, and cost. Make sure to include shipping and handling fees as well as Fabrication Laboratory fees (time and plastic for 3D printer for example). Describe any difficulties you encountered with meeting your budget. What substitutions or adjustments did you have to make? What cost savings strategies did you use?
- ☐ **Social, Ethical, and Environmental Implications -** Provide a thorough and detailed discussion of the social, ethical, and environmental implications of the design, and any applicable standards. Consider the engineering professional code of ethics and discuss your decision-making in this context (http://www.nspe.org/resources/ethics/code-ethics). Describe how society will be impacted by your project (good and bad, short and long term). For some projects you can think about the sustainability of the product or the process. Consider conducting a basic life cycle assessment (where you account for the sources of raw materials, transportation, manufacturing/assembly, useful life of product, and disposal if applicable). Discuss how your design is an improvement upon previous designs given these factors.
- ☐ **Design -** This section should include the design problem, methodology, and results of design analyses. *Remember all senior projects must include DESIGN within appropriate constraints (costs, usage, manufacturability, etc).* Design is an iterative process with data driven decisions your report should demonstrate this process. What alternatives were considered, and why were they eliminated? Make sure to include Pugh type decision matrices. Includes both system level design and detailed design of specific components. For many projects this section fill the

majority of the report. Make sure to provide a detailed description of the calculations you performed with references to your *complete* work in the appendices. Provide the results of your calculations, analyses, etc. and describe what they mean.

- ☐ **Implementation/Fabrication report** - Design modifications and adaptations during this process.
- ☐ **Testing results and analyses -** How was the prototype tested, and what were the results of those tests? Make sure your testing relates directly to the PDS, and that you record all results.
- ☐ **Manufacturing plan –** Describe the plan for mass production where applicable.
- ☐ **Final discussion and conclusions -** Go beyond summarizing the project. What aspects of your project worked? What aspects did not? Why not? Did you satisfy your PDS? If not, how did you have to adjust the PDS along with the problem statement? Discuss what work would need to be done to continue the project if it was not completed. What would you do differently if you had to do it again in terms of the project management and the design?

Bibliography - List of referenced material from research. Students should use a technical standard (find a technical journals submission requirements) for format, citations, and equations. For example, the IEEE standard can be found at: https://ieee-dataport.org/sites/default/files/analysis/27/IEEE%20Citation%20Guidelines.pdf

> **Appendices -** Including but not limited to the following: full project design specifications, ALL hand calculations, computer code, SolidEdge drawings, team contract, team meeting minutes, hand drawings of design alternatives (if applicable), notes from client interviews or emails (if applicable). The appendices should be complete, well organized, and easy to follow.

Many projects will include participation by students in other majors (for example International Business or Political Science). In these cases, this report will be further expanded to include an extensive business plan and model including socio-political implications. When multiple sub-teams collaborate on a project, separate reports are often appropriate but these reports should work together to tell the complete story.

Further, the above template is a guide as to scope; the model will not work for all projects. If one of these topics does not seem to fit your Senior Project, discuss with the instructor to find a broader theme or constraint which will include these topics. The final paper developed in the 391 course will often be the starting point for this report, along with the reports from previous EGR491/2 teams. The final report, like the earlier project reports, will be graded on technical writing, organization, and professionalism of the written presentation.

Final presentations take place during SCAD as a poster session. Exact date, time, and location TBA. Your poster or slides are due in Canvas at least 2 weeks ahead of time for revision and printing.

Honor Policy:
Students should familiarize themselves with the College's policies on plagiarism as given in the student handbook: http://www.etown.edu/offices/dean-of-students/student-handbook.aspx
You must research the background, literature, and previous work. All work that it is not your own, must be clearly cited. Engineers and scientists must conform to the highest ethical standards; if you have any question about what is permissible and not permissible please ask your instructor.

Disabilities Statement:
Elizabethtown College welcomes otherwise qualified students with disabilities to participate in all of its courses, programs, services, and activities. If you have a documented disability and would like to request accommodations in order to access course material, activities, or requirements, please contact the Director of Disability Services, Lynne Davies, by phone (361-1227) or e-mail daviesl@etown.edu. If your documentation meets the college's documentation guidelines, you will be given a letter from Disability Services for each of your professors. Students experiencing certain documented temporary conditions, such as post-concussive symptoms, may also qualify for temporary academic accommodations and adjustments. As early as possible in the semester, set up an appointment to meet with me, the instructor, to discuss the academic adjustments specified in your accommodations letter as they pertain to my class.

School Closure:
If the college is closed (ie, for inclement weather), meetings with your team or instructor will be rescheduled. There is no formal meeting time. Since all work is assigned at the beginning of the semester and is turned in electronically, school closure will not affect deadlines.

Religious Observance:
The College is willing to accommodate individual religious beliefs and practices. It is your responsibility to meet with the class instructor in advance to request accommodation related to your religious observances that may conflict with this class, and to make appropriate plans to make up any missed work.

Fine Print: This syllabus represents the *intent* of the course and is subject to change at the discretion of the instructors.