

Engineering Design and Junior Project
Elizabethtown College Spring 2018
Monday 8:15 - 9:15

Instructors:

Lecture instructors mentor the theory portion of the course covered in the Monday class sessions.

John Angelis (Assistant Professor of Management)	Kurt DeGoede (Professor of Engineering and Physics)
Hoover 219 (right next to steps)	161-B Esbensshade Hall (next to the Hideaway)
Office Phone: 361-1284	Office Phone: 717-361-1380 (anytime)
	Cell (text): 717-419-9568 (before 10:00 PM, with no calls between 1:00 PM Saturday and 4:00 Sunday)
Email: angelisi@etown.edu (preferred)	Email: degoedek@etown.edu
Scheduled Office Hours: M 11-12, T 2-5, W 3:30-4:30	Scheduled Office Hours: M 12:30 – 1:50; Tu, F 2-3:20, Or by appointment. Please feel free to stop by my office anytime, if my door is closed please leave a note.

Project work will be supervised by various faculty in the department – 1 advisor for each team.

- Dr. Sara Atwood, Associate Professor, Engineering and Physics
161 C Esbensshade Hall atwoods@etown.edu (717) 361-1434
- Dr. Kurt DeGoede, Professor, Engineering and Physics
161 B Esbensshade Hall degoedek@etown.edu (717) 361-1380
- Dr. Tomas Estrada, Associate Professor, Engineering and Physics
160 A Esbensshade Hall estradat@etown.edu (717) 361-3755
- Dr. William Gordon, Adjunct Professor, Engineering and Physics
161 C Esbensshade Hall gordonw@etown.edu (717) 938-1923
- Dr. Brenda Read-Daily, Assistant Professor, Engineering and Physics
160 D Esbensshade Hall readb@etown.edu (717) 361-1348

Course description:

This course explores design methodology and practice under the supervision of the instructor. Project reports including a final report and presentation are required. Hours: lecture 1 and project work. For most students this project will become the senior project completed through EGR491 and/or EGR492.

Course Outcomes:

Students will leave this course 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)

Textbooks:

Total Design, by Stuart Pugh (reproduced course pack on reserve in Department)
Selected readings from AccessEngineering and Knovel databases.

Outline of Monday Seminar/Lecture Topics

1. Teamwork and project management
2. Teamwork and project management
3. Defining the Problem
4. Market Research - User Needs and Demands
5. Research II
6. Pugh Design Review
- Design for X Series:
 7. Design for Quality
 8. Design for Six-Sigma
 9. Design for Manufacture and Supply Chain
 10. Design for Serviceability and Environment
11. Testing and Analysis
12. Engineering Economics
13. Engineering Economics II

Grading:

<i>Lecture Assignments</i>	<i>20% of Course Grade</i>
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80% of the course grading will be determined by your project supervisor based on:

<i>Required Project Management Elements</i>	<i>10%</i>
<i>Project Reports</i>	
<i>PR1</i>	<i>5%</i>
<i>PR2</i>	<i>5%</i>
<i>PR3</i>	<i>10%</i>
<i>PR4</i>	<i>10%</i>
<i>Individual Reflections</i>	<i>10%</i>
<i>Final Progress, Presentation or Poster, and Paper</i>	<i>30%</i>

At approximately weeks 5, 9 and 14 peer evaluation must be completed by all students. **The evaluations at week 5 are formative, but those at weeks 9 and 14 will influence overall course grading.** The results of the peer assessments should be discussed in project reports and in the final report: as a team, how are teamwork issues being addressed? We will use the CATME (www.CATME.org) tool for assessing teamwork skills.

Required PME: The following elements will be assessed on completeness, clarity, and the level to which the individual and team are making appropriate progress on the project

- Submit weekly team meeting minutes (you must meet as a team at least once each week of the semester)
- Individual weekly work reports (you are expected to work a total of 3 hours every week on the project portion of the course) Submit to team, and evaluate with provide rubric as a team, each week.
 - Specific hours worked
 - Outcome report for above work hours: this report must be specific about what you learned (research), wrote (include your draft), or completed.
 - List goals for next week
 - Any questions you have on the project?

Individual Reflections (250-500 words): These will be evaluated with the engineering department writing rubric.

Week 5: How does your team structure utilize your strengths and those of your teammates?

Week 8: What goals and expectations do you have for this project? How will your problem solution make a difference?

Week 13: Reflect on what went well or not so well this semester. What do you anticipate as you head into EGR491 and 492?

Project Reports: Develop 2 or 3 ideas for your team project for the week 2 report. All subsequent reports are for the one selected project (selected from the ideas in the first report in consultation with your project advisor). Project reports should be clear and complete. Quality of writing is assessed. These are formal documents and should be thought of as sections of your final report. Each report must include formal response to feedback from your mentor on the previous report. All reports must include appropriate citations and bibliographic details {<http://pitt.libguides.com/citationhelp/ieee>}.

A typical sequence of project reports for this course:

- Jan 26: Initial Report – What are your proposed problems? Why do you need to solve these problems? Who cares?
- Feb 2: Project Management: Initial Timing & Teamwork Plan/Contract
- Mar 2: Market Analysis – What’s out there? Where will your design fit in market?
Provide a Formal Problem Statement for your project.
- Apr 6: Full Product Design Specification
See Pugh’s *Total Design* text

Final Progress, Paper, Presentation

Paper due May 4: brings all of above together and begins design work at the conceptual level.

The Final Report should encapsulate your junior project work and likely will serve as the introductory, background, and conceptual design portions of your senior project paper. This paper is a written document submitted before the end of the semester and should include:

- a 200 word maximum **Abstract**
- Introduction** providing an overview of the project, answer the “who cares?” question, teamwork plan, appropriate professional code of ethics (i.e. NSPE at <http://ethics.iit.edu/ecodes/node/4098>). {PR1}, {PR2}
- Formal Problem statement {PR3}
- Background** material on what other people have done and where your project fits in, any industry standards applicable. {PR3}
- Discussion of **Social, Ethical, and Environmental issues** relevant to your design.
- Detailed **Specifications** and Constraints (PDS). {PR4}
- Initial Design** The result of this Design process should include a completed conceptual design process.
- Key decisions:** Design is an iterative process leading to a best design from numerous possible solutions. Decisions should be explained clearly and analytically.
- Timeline / Schedule**
- Projected Budget** required to complete the work projected for 491 and 492
- Bibliography** / List of referenced material from research

Presentation on May 10 9:30 AM – 12:00 PM (tentative): EGR391 requires a public presentation of your work. These 10-minute public presentations should always be considered an abstract of your final written report, focusing on design highlights and outcomes.

The *Final Progress, Paper, Presentation* grade will be determined by (1) the quality and quantity of the engineering work you have done this semester (multiplier), (2) the content of the Design Paper (50%), (3) the writing quality (25%), and (4) the quality of the public presentation of that work (25%).
Example (1) 9.0/10, (2) 9.5/10, (3) 7.5/10, (4) 8.0/10; score = $0.90*(50*0.95 + 25*0.75 + 25*0.80)$.

Due Dates: All written work is due before midnight (end of day) on the date listed on the syllabus/Canvas. A grace period is available until 8:59 am the next morning. No penalty for work submitted by the grace period, but no work will be accepted after the grace period. Pay attention to all required assignments; you will not receive reminders to submit required weekly reports or the three required individual reflections. Submitting all work on time is YOUR professional responsibility.

Ethics: Students are to act in accordance with the Pledge of Integrity:

Elizabethtown College is a community engaged in a living and learning experience, the foundation of which is mutual trust and respect, Therefore, we will strive to behave toward one another with civility and with respect for the rights of others, and we promise to represent as our work only that which is indeed our own, refraining from all forms of lying, plagiarizing, and cheating.

and the NSPE code of ethics (Cannons attached).

Students will be asked to reaffirm their commitment to the pledge with their signature on each submitted report. Dishonest practice can result in failure of the course and possibly expulsion from the college.

You must research the background and literature of 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 project mentor.

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.

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.

School Closure: In the event that the school is closed during regularly scheduled class time, a virtual learning experience, independent reading, or extra session will be provided to make up for any missed content.

Fine Print: The above information represents the intent of the course and is subject to change at the discretion of the instructor.

NSPE Code of Ethics Cannons, with 2017-18 Etown guidelines and examples.

Hold paramount the safety, health, and welfare of the public. For example:

- ✓ Take training and assignments seriously and approach tasks as learning opportunities.
- ✓ In an internship, take your job seriously and be responsible.
- ✓ Do not try to do something you don't know how to do (For example, don't use the mill machine if you don't know how to work it).

Perform services only in the areas of their competence.

- ✓ Consult someone of higher competence if you are unsure of how to do something (Don't just try to "wing it", figure out how to do it correctly.)
- ✓ Ask for assistance from a more qualified colleague when they are faced with a problem that is beyond their level of capability in a certain area.
- ✓ Consult someone with the necessary knowledge if you are unsure of how to operate certain equipment.

Issue Public Statements only in an objective and truthful manner.

- ✓ Be objective and do not let emotion or opinion affect you.
- ✓ All information should be presented, even if it is not favorable (do not hide anything).
- ✓ Do not embellish or exaggerate skills you do not have on a resume or in social media.
- ✓ When writing a report, all statements should be factually true. Log hours and report outcomes faithfully.

Act for each employer or client as faithful agents or trustees.

- ✓ Put your project teammates or employer's interests before your own.
- ✓ While working as an intern, keep projects/duties/information confidential if employer requests confidentiality.
- ✓ While working in a group, make sure that you do your fair share of work or more.
- ✓ Always talk to group members before making decisions for the group.

Avoid deceptive acts.

- ✓ Do not plagiarize, cite all sources.
- ✓ Do not falsify data.
- ✓ Do not cheat on an exam or homework.
- ✓ Report to the proper authorities anyone believed to be guilty of unethical or illegal practices.

Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

- ✓ Be willing to own up to your mistakes.
- ✓ Complete all assignments using integrity while following the student code of conduct.
- ✓ Care about your work and take responsibility for your actions and decisions.
- ✓ Conduct themselves in a manner that represents Elizabethtown College or whatever institution at which they are employed in a positive light.

Examples written by Etown Engineering students Classes of 2019-20
Cannons: <https://www.nspe.org/resources/ethics/code-ethics>