Meetings: M,W 1:10-2:00 PM, F 12:10-2 PM, Stocker 103

Instructor: Dr. Greg Kremer, Stocker 253, 593-1561, kremer@ohiou.edu
(team taught with Dr. Urieli & Lab Coordinator Randy Mulford, with ME Advisory Board assistance)

Office Hours: Open door policy, email or call if you prefer an appointment

Course catalog description:
This course is the first of a three course sequence that will provide a comprehensive, capstone, senior design experience for mechanical engineering majors. Course includes studies in the analytical techniques of design, as well as the design, construction, and evaluation of the performance of an actual engineering system.

Prerequisite courses: ME 403, ME328

Schedule and course details: See online course calendar, SrD Operating Procedures (To Be Developed collaboratively with students) and Blackboard course website

Course outcomes:
1) Problem solving skills, including the ability to convert an open-ended problem statement into a statement of work or a set of design specifications.
2) The ability to generate creative and feasible alternative solutions to open-ended design problems, using precedent, lessons learned, and methods such as brainstorming or functional block diagrams.
3) The ability to use common methods such as decision matrices for comparing alternatives and making engineering decisions
4) An ability to describe the importance of patents and intellectual property rights
5) (SrD) An ability to deal with engineering standards and most of the following constraints in engineering design: economic, manufacturability, health and safety, environmental, sustainable, ethical, social, political.
6) (SrD) An ability to work effectively on project teams in both member and leader roles, with team members who may have different backgrounds and technical skill levels. This may include the ability to:
   a. work cooperatively with others
   b. analyze ideas objectively
   c. encourage active participation of others
   d. build consensus
   e. deal productively with conflict
   f. take leadership roles as the need arises to accomplish the group's objective
7) (SrD) Achievement of a professional engineering identity
   (ABET-f) Demonstrate an understanding of professional and ethical responsibility.
   (ABET-h) Demonstrate broad education necessary to understand the impact of engineering solutions in a global and societal context.
   (ABET-i) Demonstrate a recognition of the need for, and an ability to engage in life-long learning
   (ABET-j) Demonstrate a knowledge of contemporary issues.
8) (SrD) An ability to model, analyze, design, and realize physical systems and components, and to work professionally in the Mechanical Systems Area

Notes on expectations, Course Format, etc.:

This is a professional-level course, so students (and instructors) are expected to demonstrate
- professional attitude, professional behavior, professional-quality work, ...

Instructional Methods:
- Learning in this class is based on the "guided discovery" model, not lecture.
The intent is to learn by doing (and by making some mistakes) with appropriate assistance and feedback given as needed. Please take a positive attitude and work on developing the skills for independent, lifelong learning.

**Process / Product / Professionalism:**

The focus in this class is not solely on product (making something that works) but more broadly on:

- **Process** (proper procedures that lead to good designs) and
- **Professionalism** (what it means to be a "good" engineer).

- Status reports and design reviews are product focused (present the progress of the design itself with justification)
- Reflection reports are focused on the process used to arrive at the design and effective teamwork.
- Activities promote development of an engineering mindset or identity
- What directly transfers from this capstone experience is process and professionalism. You are not supposed to be learning to be a designer of a particular product, you are supposed to be learning what it means (in the big picture) to be a mechanical engineer and how to design any product or complete any project and work with any type of person as effectively as possible.
- The emphasis on process and professionalism is our response to directives from industry employers and the engineering profession (ABET, ASME, NAE, etc.)

**Class Format:**

- Part of the "learning experience" in this capstone design experience is role playing. You are expected to act professionally (i.e. act like an engineer) as you prepare to interview and/or start work as a professional and an engineer.
- Class meetings and any individual or group meetings with faculty are normally treated like working meetings in industry - instructors acting as supervisors and classmates as fellow employees.
- The supervisors normally organize the meetings (classes), but you are expected to be active contributors, not passive listeners. You also have some control over meeting topics and procedures. If there is some information that you need for your project let us know and we will do our best to help you find appropriate resources or will present info on that topic to the class.

**Administrative Details**

**Textbook:** None required, but a necessary reference is: R.L.R.L.Norton, Machine Design: An Integrated Approach. Materials will be distributed in class and posted on the web, accessible via the course websites.

**Attendance policy:** (To be discussed as part of SrD Operating Procedures)

Professional behavior means that you are expected to be in every class and meeting. If circumstances require you to be absent or late, it is expected that you will inform the person in charge in advance of the absence (or in case of an emergency, as soon as possible). We understand that you will need to miss some classes, but unexcused absences will be treated as unprofessional behavior and will impact your overall grade.

**Academic dishonesty policy:**

- The foundation of professionalism is integrity. Any integrity violations will at a minimum significantly impact your overall grade and may have further repercussions (in accordance with the OU student manual).
- Please be particularly careful about plagiarism, and make sure you fully understand proper citations and cite your reference sources in all reports and projects.
- Team participation (not taking credit for work that you did not adequately contribute to) is also an integrity issue. If you are unable (or unwilling) to fully contribute to the work done by your team, you are expected to work honestly with the instructor and your team in order to ensure an equitable grade distribution.
Grading guidelines: (Details to be discussed as part of SrD Operating Procedures)

- This is a "professional practices" course. You will be graded both individually and as a team, and some grades will be based on relatively subjective criteria. The way you reach your design decisions and the way you present your decisions are as important as the appropriateness of the decisions.
- To clarify expectations there will be collaboratively developed guidelines for presentations and reports in the form of "grading rubrics."
- Our purpose is to help you develop into competent, professional engineers. You will be given prompt feedback on each activity and will be required to redo unacceptable work, just as in industry.
- Please remember: CRITICISM OF YOUR WORK IS NOT CRITICISM OF YOU!

<table>
<thead>
<tr>
<th>Planned Activities</th>
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<tbody>
<tr>
<td><strong>Design Project activities</strong> (Documented in reports, presentations, discussions,...)</td>
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<tr>
<td>( &gt; \text{FOCUS - voice of the customer surveys, observations,...} )</td>
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<td>( &gt; \text{Defining the problem and translating customer needs into specifications} )</td>
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<td>( &gt; \text{Conceptual Design, including sufficient proof of feasibility and effectiveness} )</td>
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<td><strong>Note:</strong> The Conceptual Design Feasibility Review is a pass/fail activity, and those teams that fail will be given an incomplete grade in the course and required to demonstrate feasibility by the first week of winter quarter.</td>
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<tr>
<td>( &gt; \text{Scheduling/Planning/Project Management} )</td>
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<td>( &gt; \text{Design Concept Refinement, and Initial Application of Design Methods} )</td>
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<td><strong>Interactions with ME freshmen (ME101)</strong></td>
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<td>( &gt; \text{Mentoring / Teaching / Collaborating in the context of shared activities and case studies in Engineering Ethics.} )</td>
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<td><strong>Professionalism:</strong></td>
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<td>( &gt; \text{Team formation and Team effectiveness (team operating procedures, agendas, action items, etc.)} )</td>
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<td>( &gt; \text{Showing initiative and an ability to get things done with minimal oversight} )</td>
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<td>( &gt; \text{Participation in industry-style performance reviews and peer reviews} )</td>
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<td>( &gt; \text{Planning and completing professional development activities} )</td>
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<td>( &gt; \text{Project documentation, including a design notebook} )</td>
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<td>( &gt; \text{Process and teamwork reflections, documented in an electronic journal or blog} )</td>
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<td>( &gt; \text{Participation in collaborative development of and adherence to SrD operating procedures.} )</td>
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Assigning letter grades: (Details to be discussed as part of SrD Operating Procedures)

Although most major deliverables in this course are team deliverables (reports, presentations, designs, prototypes,...) individual grades will be determined as much as possible on demonstrated individual contributions to teamwork and the project and on demonstrated personal development, rather than on the model of "everyone on the team gets the same grade, with some redistribution based on peer ratings".

Final grading in this class is based on an industry-style performance review model. Because of the nature of teamwork (different roles) and the diverse work required for a complex project (different tasks), not all students will be doing the same type and amount of work, and therefore there will not be a single way to compute grades for all students. The Instructor will review the level of challenge of your roles and tasks, the quality of all of your individual work and team-based work, and the peer ratings and comments from your teammates, and will use personal observations and discussions (as needed) to assign a grade based on your overall performance relative to the expectations for a student preparing to enter the profession.

Work that goes above and beyond "being a good student" is necessary to achieve a grade higher than a "C" in this class. "A" and "A-" grades are reserved for students who demonstrate a high level of performance in all aspects of the capstone experience, including teamwork, leadership, practical skills, and analytical skills.