

ENGR320 MACHINE DESIGN AND SYNTHESIS

University of St. Thomas

School of Engineering

Fall 2009

Course Description (from St. Thomas Catalog): Focus is on advanced mechanics topics, failure theories (static and dynamic), and on an understanding of basic machine components. This course will develop the student's creative skills in conceptualizing machines to meet performance criteria by means of a design project. Machine designs will require the understanding and use of machine components such as springs, screws, bearings, basic 4-bar linkages, cams, and gears. Finally, a number of mini-labs/workshops on topics that support the design project such as dynamic analysis software, machine component design, and design for manufacture are given.

Objectives:

Machine design is a creative, multidisciplinary activity that builds upon knowledge acquired in such fields as statics, dynamics, and kinematics. Students will learn advanced mechanics concepts and become exposed to a wide variety of machine components (e.g. fasteners, springs, gears, linkages, bearings, etc.) and understand their limitations via failure theories. An integrated design experience with a computer-aided-engineering (CAE) emphasis will provide an opportunity for application of principles learned, including limited manufacture.

Schedule and Location:

Lecture: MWF 10:55 AM-12:00 PM (OWS 166)

Lab 01: T 8:00-11:35 AM (OSS LL15) Peer Mentor: Bryan Edlund

Lab 02: R 8:00-11:35 AM (OSS LL15) Peer Mentor: Brandon Turek-Krengel

Students must attend the lab section that they are assigned to.*Lecturer:****AnnMarie P. Thomas, Ph.D.**

107A O'Shaughnessy Science Hall, St. Paul campus

Phone: (651) 962-5751

Email: aphomas@stthomas.edu

Office Hours: MWF 9:30-10:30am

*I am **happy** to meet at other times, by appointment!***Lab Instructor:****Roy Jenson, MBA, MS**Email: rkjenson@stthomas.edu (*preferred contact method*)

Phone: Urgent only: (651) 962-5750 on-campus

(952) 935-1086 ext 3 off-campus

On campus office hours: (by appointment only)

ABET and St. Thomas School of Engineering self-study designation

Learning Outcomes:

Homework assignments and exams demonstrate the student's ability to apply knowledge of mathematics, science, and engineering to machine design problems. *(a)*

The **semester-long design project** requires students to work in teams *(d)* to design *(c)*, build, and test *(b)* a system to meet desired needs within set constraints. The open-ended nature of the project requires students to identify, formulate and solve engineering problems using the techniques, skills, and modern engineering tools necessary for engineering practice. The project will require the use of SolidWorks, handtools, machine tools, and analysis software. *(k)* Students must give presentations and write a report as part of the project. *(g)*

Lectures will include topics related to contemporary engineering topics, and the role of ethics in machine design. Examples of these topics include special considerations needed for the design of medical devices, machine design disasters and their causes *(j, f)*, and discussion of new machines currently in the news. *(j)* Two lectures will be dedicated to environmental impact issues related to machine design. *(h)*

Required Text:

Budynas, R. G., J. Keith (*Shigley's*) *Mechanical Engineering Design*, 8th edition, McGraw-Hill, 2008. ISBN: 978-0-07-312193-2

Grade Components:

Homework assignments:	10%
Final exam:	20%
Case Study:	5%
Project:	30%
Quizzes (5):	30%
Class Portfolio:	5%

Quizzes

Quizzes will be in-class, closed book and closed note. Students may bring one index card (3"x5", or smaller) of equations to the exam. (Both sides may be used. Note that the 5 index cards from the quizzes may also be brought to the final.)

Course Grading Scale (based on % of total possible points earned)

Note that I do not round

A: 92-100	B: 82-87.99	C: 72-77.99	D: 65-67.99
A-: 90-91.99	B-: 80-81.99	C-: 70-71.99	D-: 61-64.99

B+ : 88-89.99	C+ : 78-79.99	D+ : 68-69.99	F : Below 61
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Project Grading Guidelines and Deadlines

5%	Milestone 1: Concepts and Strategies (Individual Effort) <i>Due Monday, September 21, at the beginning of class</i>
5%	Milestone 2: Foam Core Model (Individual Effort) <i>Due in lab the week of October 5</i>
5%	Milestone 3: Design Review A (Team Effort) <i>Due in lab the week of October 12</i>
5%	Milestone 4: Project Timeline (Team Effort) <i>Due Monday, October 19, at the beginning of class</i>
5%	Milestone 5: Design Review B <i>Due in lab the week of October 26</i>
5%	Milestone 6: Design Review C <i>Due in lab the week of November 9</i>
5%	Milestone 7: Project Update (Team Effort) <i>Due Monday, November 16 at the beginning of class</i>
5%	Milestone 8: Machine Seeding Round and Safety Check <i>In Class on Monday, November 30</i>
5%	Lab notebook (Individual Effort)
5%	Peer Review (Individual Effort)
45%	Final Report (Team Effort)
5%	Workmanship of Final Machine

Homework Policies:

- Assignments will be due at the beginning of the class period. Late assignments ***will not be accepted***. If an emergency arises which prevents you from submitting an assignment on time you must contact the instructor immediately.
- All homework should include the coversheet for that assignment. Homework submitted without a coversheet will not be graded. Sheets with work should be stapled to the coversheet.
- Scoring:
 - 2 points will be given for problems that are completed with the correct answer
 - 1 point will be given for problems for which a good effort is made but the incorrect answer is given
 - 0 points will be given for problems for which a good effort is not made
 - NOTE that a slightly modified scoring method will be used for problems that have multiple parts
 - ****If an assignment will be using a different grading scheme it will be clearly marked on the coversheet.**
- If you would like additional practice problems for a given topic, please contact AnnMarie.
- Homework pages should be ***stapled*** together. Assignments that are handed in as a set of loose pages will lose points.

- If you think that your homework has been mis-graded, please let me know. I am happy to reconsider a grade, but only if the question is brought to me within a week of the homework being returned to you.

Digital Content (PowerPoint and Blackboard)

Many of my lectures will use PowerPoint. I will, however, do most sample problems by hand. Before each class I will post a *short* set of slides for that day's lecture. All of the lecture's key points will be in those slides, however the set I use in class will have more images, and break heavy text slides into multiple slides. *After* the day's lecture I will post the full set of slides. I do this so as to encourage you to only print out the slides that you need. I have found that students often like to write notes on printed out slides, and that by giving only the short set in advance, the amount of paper that is printed out is reduced. Again, you will receive access to the *full* set of slides after the day's lecture.

This class uses Blackboard heavily. I will post assignments, lectures, solutions, and handouts on the Blackboard site. Additionally, we will use the Discussion Board feature to hold discussions on the competition, unclear topics from class, and the historical perspective presentations that you will be doing. Please get into the habit of checking Blackboard daily.

“Most Unclear Detail” cards and discussion board

While I encourage students to ask questions during class, sometimes you will have questions that you don't want to ask in class, or things that still need more clarification. When you enter the classroom each day, please take a blank note card to your seat. At the end of class you can drop these cards off anonymously, with questions you would like me to answer online. I will post replies to all MUD cards, within 24 hours of receiving them, on the MUD discussion board on Blackboard. In addition, you can start your own topic thread, which I will answer.

Attendance Policy:

Students are expected to attend all class sessions. Attendance will not be taken during class, but students are responsible for getting notes on the material they miss. Additionally, if a graded exercise takes place, absent students who did not notify the instructor in advance will not be allowed to make up the work.

Attendance will be taken in lab. Contact the instructor and your lab partner if you will be missing class. More than 1 unexcused absence, or 2 unexcused late arrivals of more than 15 minutes, in lab will result in a loss of 5% of your total course grade.

Design Competition:

Students in this class will be working in pairs to build machines that will compete in a class design competition the evening of December 1. While the results of the competition *have no effect on the student's course grade*, the event is a chance to present your work to the broader UST community in a fun environment.

Class Portfolio:

All class notes, graded homework, quizzes, exams, and assignments should be kept in a course binder. This binder will be collected at the end of the semester, and will represent your work in the course. As documentation is an important part of engineering, consider this your documentation of ENGR320. You will be graded on completeness, and organization.

Disability Statement:

Classroom accommodations will be provided for qualified students with documented disabilities. Students are invited to contact the Enhancement Program – Disability Services about accommodations for this course within the first two weeks of the term. For further information, you can locate the Enhancement Program on the web at <http://www.stthomas.edu/enhancementprog/>.

Academic Integrity:

All students are expected to understand and follow the University of St. Thomas policies on Academic Integrity. These are described at: http://www.stthomas.edu/policies/student_policy_book/Academic_rights_and_procedures.htm