Fall 2019

ME 315-HM1: Machine Design

Siva Nadimpalli

Machine Design – ME316 Fall 2019
TIER 111
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Office hours: Tue and Thu 2:00 pm to 2:30 pm

It is the responsibility of the student to read this document thoroughly and follow the course policy.

Required Text: Machine Design, 5th edition, Robert L. Norton, Pearson Prentice Hall 2014

Prerequisites: ME 215 Materials and Processes, ME231 Kinematics of Machinery, and ME315 Stress Analysis. ***Withdraw the course immediately if you lack any one of these prerequisites***

Communication: Various course materials will be disseminated and collected using Canvas, and the students will be communicated via NJIT email only. No course related material will be accepted after the final day of classes (i.e., 11th Dec, 2019).

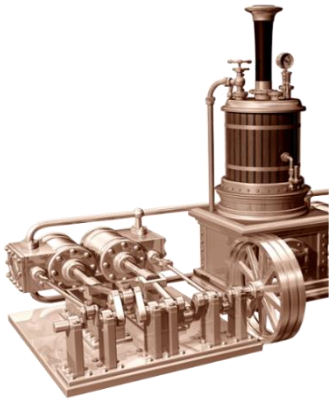

Image of an old steam engine obtained from www.asme.org
It shows some of the important components of machines. In this course, you will learn how to design such components.

Course Learning Objectives and Performance Criteria

1. Demonstrate a thorough understanding of fundamental principles of strength of materials and solid mechanics as they pertain to the design of machine elements. Evaluated through exam questions (80% of students will earn a grade of 75% or better on this)

2. Design new components while considering their functional requirements and constraints placed over them. Evaluated through exam and design project (80% of students will earn a grade of 75% or better)

3. Apply appropriate theories of failure in the design of new machine components under both static and dynamic loading. Evaluated on exams (80% of students will earn a grade of 75% or better)

4. Select a component from available designs such as bearings, gears, fasteners and springs. Evaluated on exams (80% of students will earn 75% or better on this question)

5. Describe the impact of issues such as safety, design codes and the environment on the mechanical design process. Evaluated through project report (Concepts so important to practicing engineers that nearly 100% of students must show understanding)

6. Select appropriate materials for the designed components. Evaluated through exams and project (80% of students will earn a grade of 75% or better)

7. Explain the manufacturing process required for producing the desired part. Evaluated on the project report (80% of students will earn a grade of 75% or better)

Grading:	Exam 1	20%, Oct. 15, 2019
	Exam 2	20%, Nov 14, 2019
	These dates are tentative and will be confirmed	
	Final Exam	35% (check NJIT Registrar's webpage)
	Project	20% (report due on Dec 10, 2019)
	Assignment	5% (due dates will be shown in Canvas)

A	Superior
B+	Excellent
B	Very Good
C+	Good
C	Acceptable
D	Minimum
F	Inadequate

Grading Policy: The weights shown for each exam, project, and assignment will be used to determine the final grade for the course. The table above shows the grade and corresponding level of proficiency expected from the student in the performance criteria. For example, a student with a score of below 50 will be considered to have inadequate understanding of the course material (or fail to meet course learning objectives) and hence receive an **F** grade. In general, a final score of above 90 corresponds to A and below 50 to F; however, this will be finalized at the end of semester based on the class average. ***Note that the external factors (such as level of effort, ability in other courses, personal obligations such as job, etc.) are not considered in computing the grade.***

Exam Policy: There will be no makeup exams. Absence from an exam should be validated by Dean of Students. Only after receiving communication from Dean of Students, further action will be taken regarding the absence. NJIT honor code will be upheld and any violations will be brought to the attention of Dean of Students. Use of cellphones, electronic devices (except non-programmable calculator), and other unauthorized aids during any exam will result in an automatic **F** grade for the course.

Assignment policy: There are 7 assignments for this course as shown in Table 2, and they will be collected via Canvas only, submission by other means will not be accepted. Students should upload a single PDF document per assignment. The solutions to the assigned problems will be posted after the assignment due date. At the end of the semester, a random sample of these assignments will be graded. Only those students who submit all the assignments will receive the grade for the assignments.

Design Project

You and your partner will undertake a detailed engineering design of a specified product (either problem #9-11 or #9-13. This will include:

- analysis of all functional requirement of the product
- consideration of various preliminary design options (possible solutions)
- detailed analysis of engineering performance (analytical/FEA); e.g. stress, deflection, stability (buckling etc.), fatigue, strength of joints (welds, bolts, screws, rivets, adhesives etc.)
- preliminary proposal of manufacturing methods and materials for custom components and overall assembly of the final product
- details of off-the-shelf components to be used
- cost estimate

Registration of the project team and topic should be done by **Thu 19th Sep. 2019 by 5:00PM** (late penalty 2% per day). Register by sending me an email with the names and email addresses of two team members and the design topic. Always CC your project partner in your email communication related to course project. **Final report due on Dec 10, 2019 at 5 PM** ***(submit via Canvas, late penalty 10% per day).*** It is important to decide work load distribution at the outset to avoid situations such as "my project partner didn't do anything, and I did everything" at the end of semester.

Make sure you discuss your plans and project progress with me regularly during office hours.

Reading Assignment

To follow along with the lectures, it is recommended that you read: Ch.1 Sections 1.3-1.6, 1.10 and Ch.2 Sections 2.2-2.8. This material will also be covered in the exams.

Table 1: Tentative Schedule for ME 316 Machine Design Fall 2019

Week	Topic	Date
1	Ch.3. Kinematics and Load Determination and Ch. 4	Sep 3 & 5, 2019
2	Ch.4 Stress, Strain, and Deflection	Sep 10 & 12, 2019
3	Ch4 and Ch.5 Static Failure Theories	Sep 17 & 19, 2019
4	Ch.5 Static Failure Theories Cont.	Sep 24 & 26, 2019
5	Ch.6 Fatigue Failure Theories	Oct 1 & 3, 2019
6	Ch. 6 Fatigue Cont.	Oct 8 & 10, 2019
7	**Exam 1** Ch.10 Shafts Keys and Couplings	**Oct 15** & 17, 2019
8	Ch.11 Bearings and Lubrication	Oct 22 & 24, 2019
9	Ch. 7 Surface Failure	Oct 29 & 31, 2019
10	Ch.15 Screws and Fasteners	Nov 5 & 7, 2019
11	**Exam 2,** and Ch. 15 and Ch.16 Weldments	Nov 12 & **14**, 2019
12	Ch.12 Spur Gears and Ch. 13	Nov 19 & 21, 2019
13	Ch. 14 Spring Design	Nov 26, 2019
14	Ch. 17 Clutches and Brakes	Dec 3 & 5, 2019
15	Ch. 17 Clutches and Brakes	Dec 10, 2019
15	**Final Exam**	**See Registrar webpage**

Table 2: Assignment problem sets

Assignment #	Problems
1	Ch. 1 and Ch.2 reading 2-1,2-4,2-5,2-13,2-15 3-1, 3-4, 3-5, 3-10, 3-17
2	3-7,3-8, 3-11, 3-15, 3-21,3-22, 4-3, 4-4, 4-7, 4-8,4-17,4-18, 4-19, 4-21, 4-22, 4-30a, 4-53, 4-67
3	5-1a,c,e, and j 5-3, 5-4, 5-7, 5-8, 5-10, 5-11, 5-17, 5-22, 5-49, 5-54
4	6-1b, c, and h, 6-2b, 6-3, 6-4a, 6-5a, 6-7, 6-20, 6-33a, 6-37,6-54, 6-55, 6-56, 6-57
5	6-19, 6-30, 6-34a, 6-38, 6-42
6	10-1a, 10-9a, 10-11a, 10-31a.
7	11-17a,7-2, 7-7, 7-13, 7-14, 7-16, 7-19, 7-24, 7-30

General expectations from Professor are to:

- Prepare well for the class, provide organized and well-planned notes, and answer all the questions from the students.
- Respond to student emails in a reasonable amount of time, i.e., within a day or two (unless in special conditions, emails will be replied only during business days from 8 am to 6 pm).
- Return the exams in a reasonable amount of time, i.e., in general one week from the day of exam.
- Provide adequate amount of resources (such as problem sets and/or examples of previous exams with solutions either posted in Canvas or discussed in the class)

General expectations from Students are to:

- Put adequate effort and time in reviewing the material covered in the class.
- Solve all the problems in problem sets honestly using the textbook and class notes, without looking at the solutions first.
- Ask critical questions about the problems and concepts.
- Discuss the project with Professor during office hours on a weekly basis.
- Seek help (during office hours) if you have difficulty in comprehending a concept or a problem.
- Attend all the lectures.

E-mail communication with the professor and each other is expected to be professional. Any e-mails received by the professor that are not professionally formatted and stated will not be answered. Examples of professional e-mail etiquette can be found at the following links:
http://www.wikihow.com/Write-a-Formal-Email
http://englishlive.ef.com/blog/write-perfect-professional-email-english-5-steps/
https://owl.english.purdue.edu/owl/resource/636/01/

NOTE: The above policies may be subject to change, and any such changes will be notified.