

University of Guelph
School of Engineering
Machine Design ENGG*3280

Instructor

Instructor: Marwan Hassan, PhD, PEng email: mahassan@uoguelph.ca
Phone: ext 52429
Office: Rm 2405 Office Hours: Tu Thu 1:30-2:30
Lectures times: Mon, Wed, Fri 08:30AM - 09:20AM Lecture room: MACK, Room 115

Teaching Assistants

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Textbooks

Machine Design: An Integrated Approach, By: Robert L. Norton

Course Description

Catalogue Description This course is intended to provide the concepts, procedures, and analysis techniques necessary to design the classical machine elements commonly found in devices and systems. Failure mechanisms are dealt with along with safety factors and reliability. The design of important machine components is studied, and common failure mechanisms of these components are related to design. Component design includes screws, fasteners, riveted joints, bearings and lubrication, gears and, shafts, brakes. The emphasis is on the use of readily available materials, standard component, and appropriate design approaches to achieve safe and efficient design of components and systems.

Required Background It is expected that the student taking this course have a good background and problem solving skills in: calculus, engineering mechanics, material, strength of materials, kinematics and dynamics of machinery.

Course Objectives This is course is designed

- To develop an understanding on the fundamentals of the mechanical design process.

- To develop good and careful problem formulation and solution skills for designing selected machine components and systems.
- To develop an ability to make proper analysis and assumptions by employing the concepts and theories.
- To develop an understanding of standards, tolerances and fits.
- To develop a working knowledge in the use of various standard procedures and catalogue information in the identification and selection of engineering materials.
- To develop an understanding of the importance of safety, reliability, and cost factors in design.
- To develop an ability to work well as a part of a team.

Specific Learning Outcome Course Outcomes in terms of CEAB attributes

A knowledge base for engineering The knowledge of analytical equations for design of mechanical engineering components, as outlined above, with a required level of strength or with a required safety factor.

Problem analysis The ability to use given load and/or geometry information to determine stresses in components, select the appropriate design formulae, and rearrange as necessary to solve for the required quantities. Determine quantities common to multiple components that must function together as a system, where changes in one component design affect the design of other components.

Attribute testing The ability to demonstrate the validity and testing of the prototype through the progress report, demonstration, and final report.

Design An open-ended design problem is assigned to each student in order to develop their ability to:

- Devise solutions for complex open-ended engineering problem.
- Design mechanical linkage system including individual components that meet specified needs.

The problem is posed as a consumer- or an operator-need. The students are required to design, manufacture, and test a mechanical device. Therefore, students are required to pay attention to:

- Health and safety risks.
- Applicable standards.
- Economic, environmental, cultural and societal considerations associated with the product.

Use of engineering tools The students are required to demonstrate the ability to apply modern engineering tools to analyze and develop their ideas. These tools include:

1. CAD software.

2. Matlab programming.

Individual and team work The class is divided into groups of 3 students working together as a team in:

1. Devising the solution.
2. Analyzing the ideas.
3. Presenting the progress.
4. Discussing alternatives with the instructor.
5. Finalizing the design.
6. Building and testing the prototype.
7. Preparing the final report.
8. Delivering the final presentation. This develops their ability to work effectively in teams.

Communication skills The students are required to submit two individual project reports which are used to develop their ability to communicate complex engineering concepts through writing. In addition two formal presentations are also required (progress and final presentations) which are intended to develop the student ability to use verbal and visual medium for effective communication.

Economics and project management Each student within each group is faced with both budgetary and time constraints. Each project has a limited budget where the solution is not only to be functional but economically viable.

Attribute testing: Progress report and Final report.

Lecture Schedule

1. Review, combined stresses and static theories of failure
2. Failure Due to Variable Loading: Introduction to Fatigue; Endurance Limit; Fatigue Strength, Endurance-Limit; Effects of Stress Concentration & Notch Sensitivity;
3. The Design of Screws, Fasteners, and Connections
4. Shafts, Keys, and Couplings
5. Rolling Contact Bearings
6. Lubrication and Journal Bearings
7. Gear Design

Evaluation

Assignments (approximately 9)	0%
In tutorial Quizzes	10%
project	15%
In class tests	20%
Term Tests (1) Oct 18	20%
Final Exam	35%

No makeup/deferred exams or quiz will be offered. If acceptable justification was provided for the missed exam/quiz the next exam/quiz will serve as a replacement.

Assignment Details

Assigned problems are for practice with no marks. You are required to attempt solving them on your own. Partial solution outlining the main steps will posted at least a week later.

Quizzes

Quizzes will be held randomly during the class through out the term.

Miscellaneous

Assignments Assigned problems are for practice with no marks. You are required to attempt solving them on your own. Partial solution outlining the main steps will posted at least a week later. There will be in-tutorial quizzes (one every week), closely based on the assignment questions. Quizzes need to be written in the students assigned section in order for the quiz mark to count. Only in extenuating circumstances, when accompanied by appropriate documentation and timely instructor notification, will students be allowed to write a quiz in a section other than the one that they have been assigned to.

In-class tests The in-class tests will be held during lecture period, and will be announced at least one week in advance. Please note that other university policies specified in University Undergraduate Calendar apply. Please see the following website for details.
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

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Mark adjustments Requests for mark adjustments must be put forward within one week of the documents being returned to the students (no exceptions). The documents include quizzes, and exams. The document must be taken to the TA that marked it. Any paper that is re-marked will be re-marked entirely. Therefore, it is strongly suggested that you thoroughly review your entire document BEFORE making a re-marking request. Pencil-written works will not be remarked.

Attendance All students are expected to attend all classes. Important discussions will be held in class that may not be found elsewhere. Students questions and comments are highly valued.

Classroom Protocol Students should demonstrate their understanding of engineering as a profession and its responsibility to society. You should treat this class as if it were professional employment. This lecture and lab experience is intended to simulate real life. Students are expected to arrive in the classroom on time. You are responsible for all information, announcements, and course material presented in class. Professional behaviour reflecting the engineering profession is expected at all times. Cell phones are to be turned off during the class session. The use of laptops or tablets in class is restricted to taking class notes only. Any violation of the laptops or tablets rules will result in restricting the future use. Students may not use a cell phone as a calculator when calculators are needed for this course. If you have questions for the instructor you should set up a meeting with the instructor as if it was your supervisor. Prepare for the meeting by knowing what you want to accomplish and consolidate your questions in a short time period.

University Policy on Academic Misconduct: Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2008-2009 and School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Disclaimer: The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.