Faculté de génie
Génie mécanique

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Faculty of Engineering
Mechanical Engineering

GNG 1105 - ENGINEERING MECHANICS

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Course Text: Vector Mechanics for Engineers, 7th Edition in SI Units, F.P. Beer and E.R. Johnson, McGraw-Hill (both the Statics volume and the thin Dynamics supplement are required).

Web page: http://by.genie.uottawa.ca/profs/hallett/gng1100/gngweb.htm

OUTLINE OF COURSE MATERIAL

	TEXT SECTIONS
1. Introduction	1.1-1.5
2. Statics of Particles	
2.1 Addition of Forces	2.1-2.8
2.2 Equilibrium of a Particle	2.9-2.11
2.3 Forces in Three Dimensions	2.12-2.15
3. Statics of Rigid Bodies	
3.1 Principle of Transmissibility of a Force	3.1-3.3
3.2 Moment of a Force	3.4-3.8
3.3 Moment of a Couple	3.12-3.18, 3.20
3.4 Equilibrium of a Rigid Body	4.1-4.4, 4.6, 4.8-4.9
3.5 Centre of Gravity	5.1-5.5
4. Structures	
4.1 Trusses	6.1-6.5, 6.7
4.2 Frames and Machines	6.9-6.12
5. Friction	
5.1 Static Friction	8.1-8.5
6. Dynamics of Particles	
6.1 Rectilinear Motion	11.1-11.6
6.2 Curvilinear Motion	11.9-11.14
6.3 Forces, Momentum and Angular Momentum	12.1- 12.5, 12.7 - 12.9

Objectives:

This course will introduce you to the basic principles of engineering mechanics. Most of this course - sections 1 to 5 above - is concerned with the calculation of forces acting on static (ie non-moving) objects and structures. The last part of the course deals with dynamics - determining how objects move under the action of forces. Calculation of forces is a basic step in the design of anything that has to bear a load, whether it be a bridge (CVG), machine, vehicle (MCG), reactor vessel (CHG), or an electronic component (ELG). The dynamic response of systems to forces is an essential part of designing moving machines (MCG), robots (MCG, ELG, CEG, SEG), and control systems (MCG, CHG, ELG, SEG), as well as in the analysis of the flow of liquids, gases and two-phase mixtures (CHG, MCG, CVG). As you will see from the problems covered in your textbook, the material in this course can be applied directly to a wide range of practical problems in every field of engineering and in everyday life. There are three main objectives of this course:

1. to be able to **calculate forces** on objects and in simple structures;
2. to be able to draw a **free-body diagram** of a structure or part of a structure (this is actually a pre-requisite to calculating forces, and an essential skill to learn);
3. to be able to **calculate the motion** of a simple object under an applied force.

Two further, secondary objectives can be added to these:

4. to understand how structures support loads;
5. to develop an organized approach to problem-solving. You will be introduced to a general strategy for problem-solving which will be applied to problems throughout the course.

Problem Labs

The "discussion groups" (DGD) listed in the timetable for this course are problem-solving tutorials, and will be run by the teaching assistants. In each tutorial you will work through problems on the material currently being covered in class, and some or all of these problems will be handed in to be marked. Most sessions will include a quiz (20 - 30 minutes) on material from recent classes. **No advance notice will be given of these quizzes**. The marks from these labs will be added up to an overall tutorial mark for the semester. **Attendance at tutorial sessions is compulsory.**

You have already been assigned to a DGD section, denoted by a section number on your timetable (eg DGD 1). Because of limits on the capacities of the rooms and the need to keep the work load of the teaching assistants balanced, it will not be possible to change sections.

You will also be assigned a number of problems to work on every week. These will not be handed in or graded, but solutions will be available on the web site. These problems represent the minimum amount of work that you should be doing for this course, and it is strongly recommended that you solve additional problems to gain practice.

Expectations/Study Habits

You should be spending 6-8 hours per week studying for this course - about twice the amount of time that you spend in classes. Most of your time should be spent solving problems, beginning with simple ones and working up to more difficult ones. It is essential to *practise* your problem solving skills by actually doing problems - it is *not* sufficient to read example solutions.

Tests and Marking Scheme:

In addition to the weekly quizzes in the problem sessions, there will be one mid-term exam, to be held in class on **Thursday 18 October**. This will cover material up to the end of section 3.4 in the outline above (section 4.9 in the textbook).

The marks for the mid-term and the problem tutorials will be added to give the term mark T (out of 100) as follows:

Midterm Exam	60%
Problem Tutorials	40%
Total Term	100%

This will be combined with the final exam mark F (out of 100) to give the final mark. If $F > 60\%$ and $F > T$, the final mark will be calculated as

$$\text{MARK } (\%) = (F^2/100) + (100-F)T/100,$$

a weighting scheme which increases the value of the final exam as F increases above T, allowing one to recoup poor term performance on the final exam. If $F < 60\%$ or $F < T$, a simple weighting will apply instead, with the final exam worth 60% of the total:

$$\text{MARK} = 0.6F + 0.4T$$

Consultation

The course professors and the teaching assistants will be available for individual consultation at times to be posted later.

This outline, other announcements about the course, and some study aids are posted on the Web at http://by.genie.uottawa.ca/profs/hallett/gng1100/gngweb.htm (or go to the Mechanical Engineering home page and follow the Course Web Pages link).

- W. Hallett, A. Skaff September 2007