THE UNIVERSITY OF VICTORIA
DEPARTMENT OF MECHANICAL ENGINEERING
Course Outline – Winter Session, First Term 2009

ENGR 141 - ENGINEERING FUNDAMENTALS I

http://www.me.uvic.ca/~engr141

INTRUCTORS

Lecturer

Dr. Brad Buckham:	EOW 531	Tel: 721-6035	Email: bbuckham@uvic.ca

Tutorial Instructors

Mr. Sandro Schopfer:	ELW B136	Tel: 721-7295	Email: sandros@uvic.ca
Mr. Carlos Escobedo:	ELW B264	Tel: 472-4202	Email: ce@uvic.ca

TEACHING ASSISTANTS

Mr. Ian Stewart:	Email: istewart@uvic.ca
Mr. Conrad Fox:	Email: clfox@uvic.ca
Mr. Brett Kerrigan:	Email: kerrigan@ uvic.ca
Ms. Kelly Stegman:	Email: kstegman@ uvic.ca
Mr. Andrew Gassner:	Email: agassner@uvic.ca

LECTURE / TUTORIAL LOCATIONS AND TIMES

Lecture Hours:

• MECH 141 A01 (CRN# 16110)	Tues	2:30pm – 3:50pm	ECS 123
	Fri	2:30pm – 3:50pm	ECS 123

Lecture hours will be devoted to introducing, reviewing, and discussing the course material as it is presented in the required textbook. It is the responsibility of the student to attend classes and observe the progress of the course. Students should note that the assignment, quiz and midterm scheduling provided in this course outline are tentative, and that notice regarding any changes will be given during the lecture periods.

Tutorial Hours:

• MECH 141 T01 (CRN# 16111)	Wed	9:30am – 10:20am	SSM A104
• MECH 141 T02 (CRN# 16112)	Wed	9:30am – 10:20am	COR A129
• MECH 141 T03 (CRN# 16113)	Wed	11:30am – 12:20am	ECS 108
• MECH 141 T04 (CRN# 16114)	Wed	11:30am – 12:20am	ECS 104

There are four tutorial sections for ENGR 141. ***Students must register for one of the four tutorial sections by Tuesday September 15th***. Quizzes administered during the term will be conducted within the tutorial sections and for this reason ***students must attend their specific section in order to ensure a proper distribution of students***. ***The first tutorial for all sections will be held on Wednesday September 16th.***

Success in this class results from practicing as many problems as possible. The tutorial provides the student with a chance to review relevant statics problems with the instructors and ask questions regarding the class material. The tutorials will be run by the tutorial instructors given above. The tutorial instructor will conduct example problems and solicit student input to the solution process.

ENGR 141 HELP CENTRE

During the term, assistance with homework problems will be provided at ***the ENGR 141 help centre*** located in ***ELW A221***. In addition, the instructors' office hours will be held at this location. The schedule of help centre hours is available for download from the course web page.

TEXTBOOK & *MASTERING ENGINEERING* (REQUIRED)

- R.C. Hibbeler, *Engineering Mechanics – Statics & Dynamics*, 12th Edition, Prentice-Hall Inc., ©2006.

The 12th Edition of Hibbeler's textbook includes an access code for Pearson's *Mastering Engineering* website which is required in order to complete the ENGR 141 assignments. The *Mastering Engineering* website also provides students with an editable e-copy of the course textbook and several example problems (some presented in video format) organized by textbook chapter.

The access code that comes with the 12th edition of Hibbeler's textbook can be obtained from the textbook information desk at the UVic bookstore upon presentation of the course textbook sales receipt. Students who purchase an older version of the course textbook (10th or 11th edition) should note that the end of section problems are different than those in the 12th edition, and they will have to consult a 12th edition to complete the ENGR 141 assignments. Those students who elect to purchase an older version of the course textbook can purchase an access code for *Mastering Engineering* separately at the UVic Bookstore.

Instructions on how to register in the ENGR 141 Mastering Engineering website are posted on the course home page. The registration process will require students to enter their name and student number, as well as the following Course ID and Course Title

Course ID: **MEBUCKHAM73523**

Course Title: **ENGR 141: Engineering Fundamentals**

ADDITIONAL REFERENCES

- Course web page: *www.me.uvic.ca/~engr141*.
  - A compilation of class handouts, transparencies, assignment solutions, and reference materials.
- F.P. Beer, E.R. Johnston, *Vector Mechanics for Engineers*, 5th Edition (or later), McGraw-Hill Inc., ©1988.
- F.P. Beer, E.R. Johnston, *Mechanics of Materials*, 2nd Edition (or later), McGraw-Hill Inc., ©1992.

COURSE OBJECTIVES

ENGINEERING 141 – ENGINEERING FUNDAMENTALS I: is an introduction to Mechanics. This course deals with the concept of equilibrium - the case in which the forces and moments acting on a rigid body do not result in an acceleration of the body. ***The main goal of the class is to define a methodology*** used to calculate certain forces and moments acting on, or within, rigid bodies, structures and machines that are in equilibrium. Within these calculations, vector algebra plays a significant role.

ENGR 141 will present the basic principles of vector operations that are re-used throughout a professional engineering career, regardless of one's engineering discipline. The most important concept that will be introduced is the creation of the free-body diagram. The main objective of this class is to instill the ability to use the free body diagram to solve complicated

mechanics problems ***in a clear and concise manner.*** This objective stems from Webster's definition of an engineer:

> *Main Entry*: **en·gi·neer**
> *Pronunciation*: "en-ju-'nir
> *Etymology*: alter. of earlier *enginer*, from Middle English, alteration of *enginour*, from Middle French *engigneur*, from Old French *engignier* to contrive, from *engin*
>
> **1**: a member of a military group devoted to engineering work. **2** (obsolete) : a crafty schemer : PLOTTER. **3** ***(a)*** : a designer or builder of engines ***(b)*** : a person who is trained in or follows as a profession a branch of engineering (***c) : a person who carries through an enterprise by skillful or artful contrivance.*** **4** : a person who runs or supervises an engine or an apparatus.

The lectures will closely adhere to Hibbeler's textbook sections. We begin with the study of vector algebra and rigid body equilibrium and then carry these principles forward to the basic study of structures that are assemblies of rigid bodies. The second half of the course starts by looking at ways of determining the internal loads in a structure or simple machine. In particular, a concise way of obtaining the internal shear and bending moment diagrams for beams is discussed thoroughly. Rounding out this course are studies of: friction, the centre of gravity, and rotation transformations of vector quantities.

OFFICE HOURS (TENTATIVE)

Students are welcome, and encouraged, to make inquiries regarding lecture material, and assignment problems at any time. However, the instructors can only guarantee their availability during scheduled office hours. Instructor office hours are tentatively scheduled at the following times. Note that the instructor office hours will be conducted at the ENGR 141 Help Centre.

• Dr. Buckham:	ELW A221	Thu	1:00pm – 3:00pm.
• Mr. Escobedo:	ELW A221	Wed	4:30pm - 6:30 pm.
• Mr. Schopfer:	ELW A221	Mon	12:30pm - 2:30 pm.

ASSIGNMENTS & QUIZZES

Five problem sets, each having 10 questions plus some on-line "tutorial" problems, will be assigned over the course of the term. For each problem set, 3 of the assigned questions will be written submissions. These handwritten problems must be submitted single sided on Engineering Computation paper, which is available in the UVic Bookstore. Handwritten submissions are expected to be in final copy form. ***Those handwritten submissions that are judged illegible, and those that are not submitted on Engineering Computation paper, will not be graded.*** Grades for handwritten submissions will be heavily dependent on the presentation and clarity of the solution process as well as the final answers. Special emphasis will be made on the use of diagrams in the problem solution. ***Handwritten solutions must be self contained – the marker must be able to interpret the important problem parameters and understand the problem objective without reference to the course textbook.***

The remaining questions of each assignment will be completed through the *Mastering Engineering* website. These questions will be a blend of "tutorial" and "end-of-section" problems. Tutorial problems are completed for extra credit. Tutorial problems are staged and hints will be available if requested. Grades for the on-line problems are assigned based on how many hints students elect to use, how many times the problem is attempted incorrectly,

etc. The grading policy can be viewed on-line for each assignment. In addition to the 5 graded assignments, ***there is a Mastering Engineering introductory on-line assignment that must be completed before 4:30 pm Friday September 18th.***

The handwritten submissions for each assignment are to be submitted into a ENGR 141 drop box located near ELW A136 by 4:30pm on the due date. There are four drop boxes. Each is labeled by course and tutorial section. ***Students are to submit their assignments to the drop box that corresponds to their tutorial section***. For example, a student enrolled in tutorial section T03 will submit assignment work into the box labeled "***ENGR 141-T03***". It is the student's responsibility to know which tutorial section they are enrolled in. Please note that ***no late student work will be accepted***. *Mastering Engineering* problems completed after the deadline will not count for credit.

Five closed book quizzes will be administered during the term within the tutorial time slots. Each quiz will be formed from problems in the course textbook similar to the companion assignment problems.

The proposed assignment and quiz schedule is as follows:

ASSGNMNT #	START DATE	DUE DATE	QUIZ DATE
ME INTRO	-	F, Sept. 18	-
1	F, Sept. 11	F, Sept. 25	W, Sept. 30
2	F, Sept. 25	F, Oct. 9	W, Oct. 14
3	F, Oct. 9	F, Oct. 23	W, Oct. 28
4	F, Oct. 23	F, Nov. 13	W, Nov. 18
5	F, Nov. 13	F, Nov. 27	W, Dec. 02

W = Wednesday, F = Friday

MIDTERM EXAMINATION

The mid-term examination is scheduled for ***Friday, October 30th, 2009 in ECS 123 between 2:30 pm and 4:00 pm.*** In the event of a scheduling change, the revision will be provided in a lecture hour, and on the course website, with no less than two weeks notice. The midterm is closed book.

GRADING

Final Examination†……..….**55**%
Midterm Examination*……..….**20**%
Assignments……..**15**%
Quizzes*…… **10**%

* In all mechanical engineering courses, if students are unable to write any quizzes or the midterm exam(s) due to illness (or any other acceptable reasons as specified in the UVic Calendar), their contributions to the overall grade will be transferred to the final exam.

† As per the Department of Mechanical Engineering course policy, a passing grade in the final examination must be obtained in order to pass the course.

CALCULATORS

Self-contained (with no wireless communication capability) calculators are allowed in all exams. Students should note, however, that the grading of assignment, test, and project problems in this class will be based heavily on the methodology applied in calculating the final solution. ***A significant proportion of quiz and exam marks are awarded based on a clear and logical presentation of the solution process including diagrams.***

CONTENT OVERVIEW

The lectures will cover the material presented in the textbook as follows:

SECTION#	TOPICS COVERED	WEEK #	DATES (mm.dd)
1.1 – 1.6	Introduction: Course Overview, SI units, analysis procedure	1-2	09.11 – 09.14
2.1 - 2.9	Vectors: forces and positions, vector algebra, inner (dot) product	2	09.14 – 09.18
3.1 – 3.4	Particle Equilibrium, Equilibrium equations	3	09.22
4.1 – 4.8	Force system resultants: moment of a force, cross product, principle of moments, reduction to equivalent loads	3-5	09.25 – 10.02
5.1 – 5.7	Equilibrium of rigid bodies: Equilibrium equations, FREE-BODY DIAGRAMS, Interconnections (constraints)	5	10.06 – 10.09
6.1 – 6.4	Truss analysis: methods of joints and sections	6	10.13
6.6	Frames and Machines.	6-7	10.16 – 10.20
4.9, 7.1 – 7.2	Internal forces: distributed loads, shear and bending moment diagrams, method of sections.	8-9	10.23 – 10.27
	Midterm	**8**	**10.30**
8.1, 8.2, 8.4	Friction: dry friction, screw forces	9-10	11.03 – 11.06
SUPP[1]	Change of basis: direction cosines, rotation matrices.	11	11.13 – 11.17
7.3	Shear and bending moment diagrams: differential relations.	12	11.20
9.1 – 9.2	Centroids: center of gravity, composite bodies, integral methods.	12	11.24
	Review	**13**	**12.01 - 12.04**

[1] The discussion of change of basis vectors (rotation matrices) is restricted to lecture slides and notes – the topic is not discussed in the course textbook. The lecture notes will draw on sections of the required textbook for MATH 110.