Faculty of Engineering

Department of Mechanical Engineering

COURSE OUTLINE

ENGR 141 – Engineering Mechanics

Term – Summer 2016 (201605)

INSTRUCTORS

Instructor	Office Hours
Dr. Mohsen Akbari	Days: TBD
Phone: 250-721-6038	Time: TBD
E-mail: makbari@uvic.ca	Location: EOW 331

List all prerequisites and co-requisites: None

LECTURE SCHEDULE

Section: A01	CRN: 30393	Days: M,Th	Time: 10:00am-11:20am	Location: ECS 124

TUTORIAL SCHEDULE

Section: T01	CRN: 30394	Days: T	Time: 11:30 am - 12:20 pm	Location: Hickman Building 116
Section: T02	CRN: 30395	Days: T	Time: 11:30 am - 12:20 pm	Location: Engineering Comp Science 130

ATTENDANCE

Students are expected to attend all classes in which they are enrolled. An academic unit may require a student to withdraw from a course if the student is registered in another course that occurs at the same time.

An instructor may refuse a student admission to a lecture, laboratory, online course discussion or learning activity, tutorial or other learning activity set out in the course outline because of lateness, misconduct, inattention or failure to meet the responsibilities of the course set out in the course outline. Students who neglect their academic work may be assigned a final grade of N or debarred from final examinations.

Students who do not attend classes must not assume that they have been dropped from a course by an academic unit or an instructor. Courses that are not formally dropped will be given a failing grade, students may be required to withdraw and will be required to pay the tuition fee for the course." UVic Calendar, (2015) http://web.uvic.ca/calendar2015-09/FACS/UnIn/UARe/Atte.html

TEACHING ASSISTANTS

A team of 2 teaching assistants (TAs) will manage the tutorial sessions, help deliver the ENGR 141 seminars and assist in grading the handwritten assignment problems.

TA Name	E-mail
Pouya	pamid@uvic.ca
Eric	ethacher@uvic.ca

TEXTBOOKS & ONLINE COURSE MATERIALS (MASTERING ENGINEERING)

Required Text	Optional Text
Title: *Engineering Mechanics – Statics & Dynamics*	Any previous version of Hibbeler's textbook going back to a 6th edition will contain the material covered in lecture period. However, ***the section numbers/headings referred to in the***
Author: RC Hibbeler	

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Publisher/Year: Pearson Canada / ©2016	***"SYLLABUS" section of this course outline and all assignment problems are specific to the 14th edition***.
Reference Materials: Pages XIV-XV of the course textbook describe extra learning activities available through the Pearson "Statics Study Pack", video problem solutions and a solved problem workbook. The statics study pack is bundled with the course textbook for purchase at the UVic bookstore. The video solutions and solved problem workbook are available through the course Mastering Engineering website (see above).	

COURSE OBJECTIVES

ENGINEERING 141 – ENGINEERING FUNDAMENTALS I: is an introduction to ***mechanics***. This course deals with the concept of equilibrium as applied to rigid bodies- the case in which the forces and moments acting on a body do not result in an acceleration of the body. The course will define a methodology, the method of statics, used to determine certain forces and moments acting on and within rigid bodies, and structures and machines composed of rigid components, that are in equilibrium. The most important concept that will be introduced is the free-body diagram. The objective of this course is to instill the abilities to create and interpret free body diagrams and solve complicated mechanics problems ***in a clear and concise manner.***

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.

To ensure students are fluent in the method of statics, both physical systems of units, International System (SI) and US Customary (FPS), are considered throughout the course problem sets. To define and communicate three-dimensional vector quantities, Cartesian notation is applied throughout the course.

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 - 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 method of obtaining the internal shear and bending moment diagrams for beams is discussed thoroughly. Rounding out this course are studies of equilibrium problems involving friction and methods for locating centroids of lines, area and volumes.

LEARNING OUTCOMES: At the end of this course, students will be able to:

1	Sketch three-dimensional Cartesian reference frames, force vectors and moment vectors.
2	Assign reference points and calculate the moment of a force relative to those points.
3	Combine several forces and moments to form simpler equivalent force-couple systems.
4	Identify the forces and moments acting on a rigid body and draw the corresponding free body diagram (**FBD**).
5	Apply the method of statics to FBDs to solve for reaction forces and moments, including:
	a Divide a structure into sub-assemblies that can be analyzed using equations of static equilibrium.
	b Manipulate algebraic equations of equilibrium to solve for unknown forces and moments.
	c Judge whether the static equilibrium assumption is possible based on solutions to equilibrium equations.
6	Calculate internal forces and moments in truss and beam structures.
7	Recognize statically determinant and indeterminant mechanics problems by observation of FBDs.
8	Interpret parametric solutions to equilibrium equations to measure the ability of a structure or a machine to sustain loads.
9	Organize multiple FBDs in the solution of impeding motion problems.
10	Locate the centroids of lines, areas and volumes using single variable calculus and first moments of area.

CONTENT OVERVIEW

The lectures will attempt to cover the textbook sections as follows:

SECTION#	TOPICS COVERED	WEEK #	DATES (mm.dd)
1.1 – 1.6	Introduction: Course Overview, SI units, analysis procedure	1	**05.02-05.06**
2.1 - 2.9	Vectors: forces and positions, vector algebra, inner (dot) product	2	**05.09-05.13**
3.1 – 3.4	Particle Equilibrium, Equilibrium equations	3	**05.16-05.20**
4.1 – 4.8	Force system resultants: moment of a force, cross product, principle of moments, reduction to equivalent loads	4	**05.23-05.27**
5.1 – 5.7	Equilibrium of rigid bodies: Equilibrium equations, FREE-BODY DIAGRAMS, Interconnections (constraints)	5	**05.30-06.03**
	Reading Break	6	**06.06-06.10**
6.1 – 6.4	Truss analysis: methods of joints and sections	7	**06.20-06.24**
	Midterm Review	8	**06.27-07.01**
	Midterm Exam	9	**07.04-07.08**
6.6	Frames and Machines.	10	**07.11-07.15**
4.9, 7.1 – 7.2	Internal forces: distributed loads, shear and bending moment diagrams, method of sections.	11	**07.18-07.22**

7.3	Shear and bending moment diagrams: differential relations.	12	**07.25-07.29**
8.1, 8.2,8.3,8.4	Friction: dry friction, screw forces, wedges	11	**05.02-05.06**
9.1 – 9.2	Centroids: center of gravity, composite bodies, integral methods.	12	**05.02-05.06**
	Final Review	**13**	**05.02-05.06**

TUTORIALS

The weekly ENGR 141 tutorials are a mandatory course component. In the tutorial periods, students will complete assigned tutorial problems in groups. ***Each group will submit a draft hardcopy problem solution prior to the end of the tutorial period***. To allow each group a chance for reflection, ***a final draft hardcopy solution of the tutorial problem will not be submitted until the following tutorial period***. For example, a student group in T01 will submit their final draft hardcopy at 6pm to the tutorial instructor on the following Monday.

The tutorial problems (x2) will be posted the week prior on the course Mastering Engineering website. For the tutorial group work submission, students are responsible for ensuring that identification (including tutorial section, names and student numbers) are provided for those individuals who contributed to the submission. If students are away for the tutorial period, their names should not appear on the in-class draft submission, but they can still contribute to the final draft submission. Refer to the "HARDCOPY SUBMISSIONS" section of this course outline for instructions on how the final copy tutorial problem solutions are submitted for grading.

Tutorials will commence in week 2 of classes (week of Mon, Jan 11th). ***The tutorial procedures will be introduced and student groups will be formed***. Student groups will be changed in week 6 or 7.

INSTRUCTOR OFFICE HOURS

Students are encouraged to contact the instructors and TAs to arrange for help with course material.

ASSIGNMENTS

Success in this course results from practicing as many problems as possible and the assignments represent a baseline level of engagement with the course material. Students should use the seminar times to attempt additional problems.

Ten problem sets will be assigned over the course of the term. For each problem set, only 1 of the assigned questions will be completed and submitted in hardcopy (see the "HARDCOPY SUBMISSIONS" section of this course outline for submission procedures). The remaining assignment problems are completed on the Mastering Engineering on-line system. The Mastering Engineering problem numbers correspond to the problems in the required textbook; the Mastering Engineering assignments will not appear until an assignment's active week, but students can refer to the course textbook for the problem description at any time.

Note: many of the Mastering Engineering problems have randomized variables and the problem values in the on-line system will be different than what appears in the course textbook. For the Mastering Engineering problems, students must login, check the problem parameter values provided to them and complete the problem using those values.

Additional Mastering Engineering "tutorial" style problems can be completed in some assignments for extra credit. Tutorial problems are staged and hints will be available if requested. Grades for all Mastering Engineering tutorial 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.

Before students can attempt any of the Mastering Engineering assignment problems, a Mastering Engineering tutorial has to be completed. Access to the assignments will only be unlocked when this tutorial is completed.

The assignment schedule is provided below (note that all problem numbers are taken from the required textbook, "***Engineering Mechanics - Statics and Dynamics 14th Edition.***"). Note that all assigned problems are from the end-of-section "Problems" listings. Additional problems for practice can be found in the textbook's "Fundamental Problems" or "Preliminary Problems" listings in each section, but these listings are ***not*** used in the assignments.

Homework assignments will be assigned on a weekly basis. The assignments will be collected and evaluated as a bonus. Individual in-class quizzes based on the problems that are conceptually similar to the homework assignments. The quizzes will be conducted in a written format with open books and notes. Computers and wireless devices will not be permitted.

Assignment #	Modules	Start	Due (in class)
1	Introduction: Course Overview, SI units, analysis procedure	May 9th	May 16th
2	Vectors: forces and positions, vector algebra, inner (dot) product	May 16th	May 23rd
3	Particle Equilibrium, Equilibrium equations	May 23rd	May 30th
4	Force system resultants: moment of a force	May 30th	June 6th
5	cross product, principle of moments, reduction to equivalent loads	June 6th	June 13th
6	Equilibrium of rigid bodies: Equilibrium equations, FREE-BODY DIAGRAMS, Interconnections (constraints)	June 13th	June 20th
7	Truss analysis: methods of joints and sections	June 20th	June 27th
8	Frames and Machines.	July 4th	July 11th
9	Internal forces: distributed loads, shear and bending moment diagrams, method of sections.	July 11th	July 18th
10	Internal forces: distributed loads, shear and bending moment diagrams, method of sections.	July 18th	July 25th

HARDCOPY SUBMISSIONS

Hardcopy problems (for assignments and tutorials) must be submitted single sided on Engineering Computation paper that 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 diagrams, identify important problem parameters and understand the problem objective without reference to the course textbook.***

Hardcopy submissions are submitted to an ENGR 141 drop box located beside ELW A144. Multiple pages must be stapled together to form a single submission bundle – instructors cannot guarantee that unbound pages will be graded. There are ten ENGR 141 drop boxes. Each drop box is labeled by course and tutorial section.

Students are to submit their individual assignments during the class to the course instructor.

GRADING SCHEME

Assessment:	**Weight**	**Date**
Assignments	20%	See "ASSIGNMENTS" section above
Tutorials attendance[1]	5%	Weekly, starting May 9th
Pop quizzes (3)[2]	3×5%=15%	-
Test 1	15%	May 19th
Test 2	15%	June 2nd
Test 3	15%	June 27th
Test 4	15%	July 28th
Total	**100%**	

1. Attendance will be taken during the tutorials by the TAs.

2. Pop quizzes will be taken during the Tutorial sessions.

3. The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

COURSE LECTURE NOTES

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

CALCULATORS

Self-contained (with no wireless communication capability) calculators are allowed in all tests. Students should note, however, that the grading of assignment, test, and project problems in ENGR 141 will be based heavily on the methodology applied in calculating the final solution. ***A significant proportion of assignment, quizzes and tests marks are awarded based on a clear and logical presentation of the solution process including diagrams.***

GENERAL INFORMATION

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

Accommodation of Religious Observance (AC1210)
http://web.uvic.ca/calendar2015-09/GI/GUPo.html

Discrimination and Harassment Policy (GV0205)
http://web.uvic.ca/calendar2015-09/GI/GUPo.html

Faculty of Engineering, University of Victoria Standards for Professional Behaviour
"It is the responsibility of all members of the Faculty of Engineering, students, staff and faculty, to adhere to and promote standards of professional behaviour that support an effective learning environment that prepares graduates for careers as professionals…."

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour which contains important information regarding conduct in courses, labs, and in the general use of facilities.
http://www.uvic.ca/engineering/current/undergrad/index.php#section0-23

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the Undergraduate Calendar for the UVic policy on academic integrity.

Policy on Academic Integrity
http://web.uvic.ca/calendar2015-09/FACS/UnIn/UARe/PoAcI.html