Faculty of Engineering

Department of Mechanical Engineering

COURSE OUTLINE

ENGR 141 – Engineering Mechanics

Term – Spring 2017 (201701)

INSTRUCTORS

Instructor	Office Hours			
Dr. Brad Buckham	Days: Wed			
Phone: 250-721-6035	Time: 1:30-3:30pm			
E-mail: bbuckham@uvic.ca	Location: LIB 129			
Dr. Ben Nadler	Days: Thu			
Phone: 250-721-6050	Time: 1:30-3:30pm			
E-mail: bnadler@uvic.ca	Location: LIB 129			
Mr. Majid Soleimani nia	Days:	T	W	Th
Phone: 250-853-3182	Time:	2:00pm-3:30pm	12:00pm-2:00pm	12:00pm-2:00pm
E-mail: majids@uvic.ca	Location:	LIB 129		

List all prerequisites and co-requisites: None

LECTURE SCHEDULE

Section: A01 (Buckham)	CRN: 21389	Days: M,Th	Time: 11:30am-12:50pm	Location: BWC B150
Section: A02 (Nadler)	CRN: 21390	Days: M, W	Time: 4:30pm-5:50pm	Location: ECS 125

TUTORIAL SCHEDULE

Section: T01	CRN: 21391	Days: M	Time: 6:00pm-6:50pm	Location: CLE A307
Section: T02	CRN: 21392	Days: M	Time: 6:00pm-6:50pm	Location: CLE A308
Section: T03	CRN: 21393	Days: M	Time: 6:00pm-6:50pm	Location: CLE A202
Section: T04	CRN: 21394	Days: M	Time: 6:00pm-6:50pm	Location: CLE A206
Section: T05	CRN: 21395	Days: M	Time: 6:00pm-6:50pm	Location: CLE A205
Section: T06	CRN: 21396	Days: Th	Time: 5:30pm-6:20pm	Location: CLE A303
Section: T07	CRN: 21397	Days: Th	Time: 5:30pm-6:20pm	Location: CLE A308
Section: T08	CRN: 21398	Days: Th	Time: 5:30pm-6:20pm	Location: CLE A202
Section: T09	CRN: 21399	Days: Th	Time: 5:30pm-6:20pm	Location: CLE A206
Section: T10	CRN: 21400	Days: Th	Time: 5:30pm-6:20pm	Location: CLE A205

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, (2016)
http://web.uvic.ca/calendar2015-09/FACS/UnIn/UARe/Atte.html

TEACHING ASSISTANTS

A team of 10 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	Assignment #
Ahmad Esmaeilirad	aerad@uvic.ca	1
Patrick Maloney	pmaloney@uvic.ca	2
Premakumara Govindappa	premg@uvic.ca	3
Sean Blaney	blaney@uvic.ca	4
Mohammad Ali Pelaschi	pelaschi@uvic.ca	5
Cameron Wade	cameronwade@uvic.ca	6
Eric Thacher	ethacher@uvic.ca	7
Robert Thomas	robt@uvic.ca	8
McKenzie Fowler	mckenziefowler@uvic.ca	9
Yogesh Allapanda	chinnappaa@uvic.ca	10

TEXTBOOKS & ONLINE COURSE MATERIALS (MASTERING ENGINEERING)

Required Text	Optional Text
Title: *Engineering Mechanics – Statics & Dynamics, 14th ed.*	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 "SYLLABUS" section of this course outline and all assignment problems are specific to the 14th edition***.
Author: RC Hibbeler	
Publisher/Year: Pearson Canada / ©2016	

Mastering Engineering: The 14th 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 and access on-line resources posted by the course instructors (including notes, slides and sample problems discussed in lectures). The Mastering Engineering website includes an on-line study area with additional example problems (some presented in video format) that are cross-referenced against the textbook chapters/sections.

Those students who elect to purchase an older version of the course textbook must purchase a stand-alone access code for Mastering Engineering separately at the UVic Bookstore. As an alternative to the hardcopy version of the textbook, students can also purchase a personal e-copy of the course textbook which does include the Mastering Engineering access code.

Instructions on how to register in the ENGR 141 Mastering Engineering website will be distributed through the class email list. The registration process will require students to enter their first and last names, their UVic student number and the following Course ID code:

ENGR 141 Mastering Engineering Course ID: **MEBUCKHAM201701**

Each student will also have to provide a username and password for a new Pearson Education on-line account, and these login details are needed throughout the term. ***Record your username and password***.

Once registered, you can access the course home page (including assignments and the on-line resources) by going to www.masteringengineering.com and logging in - you will be automatically directed to the UVic ENGR 141 home page. The name of the course in the Mastering Engineering system is "ENGR 141: Engineering Mechanics, Spring 2017".

Reference Materials: Page XIV 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.	

SYLLABUS

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

SECTION#	TOPICS COVERED	WEEK #	A01 DATES (mm.dd)	A02 DATES (mm.dd)
1.1 – 1.6	Introduction: Course Overview, SI units, analysis procedure	1-2	**01.05-01.09**	**0.04-01.09**
2.1 - 2.9	Vectors: forces and positions, vector algebra, inner (dot) product	2	**01.09-01.12**	**01.09-01.11**
3.1 – 3.4	Particle Equilibrium, Equilibrium equations	3	**01.16**	**01.16**
4.1 – 4.8	Force system resultants: moment of a force, cross product, principle of moments, reduction to equivalent loads	3-5	**01.19-01.30**	**01.18-01.30**
5.1 – 5.7	Equilibrium of rigid bodies: Equilibrium equations, FREE-BODY DIAGRAMS, Interconnections (constraints)	5-6	**01.30-02.09**	**01.30-02.09**
	Reading Break	7	**02.13-02.17**	
6.1 – 6.4	Truss analysis: methods of joints and sections	8	**02.20-02.23**	**02.20-02.22**
	Midterm Exam	8	**02.25**	
6.6	Frames and Machines.	9	**02.27-03.02**	**02.27-03.01**
4.9, 7.1 – 7.2	Internal forces: distributed loads, shear and bending moment diagrams, method of sections.	9-10	**03.02-03.06**	**03.01-03.06**
7.3	Shear and bending moment diagrams: differential relations.	10	**03.09**	**03.09**
8.1, 8.2,8.3,8.4	Friction: dry friction, screw forces, wedges	11-12	**03.13-03.20**	**03.13-03.20**
9.1 – 9.2	Centroids: center of gravity, composite bodies, integral methods.	12-13	**03.23-03.27**	**03.22-03.27**
	Final Review	13	**03.30-04.03**	**03.29-04.03**

TUTORIALS

The weekly ENGR 141 tutorials are a mandatory course component. In the tutorial periods, students will complete one tutorial problem 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.

Two tutorial problems will be posted the week prior to each session 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 9th). ***The tutorial procedures will be introduced and student groups will be assigned in the first class***. Student groups will be changed following the reading break.

INSTRUCTOR OFFICE HOURS & THE ENGR 141 SEMINAR SERIES

Students are encouraged to contact the instructors and TAs to arrange for help with course material. However, instructor assistance can only be assured during the ***ENGR 141 seminars***. The seminar hours are:

- TAs, Soleimani nia LIB 129 Tues 2:00 – 3:30 pm
- TAs, Soleimani nia, Buckham LIB 129 Wed 12:00 – 3:30 pm
- TAs, Soleimani nia, Nadler LIB 129 Thu 12:00 – 3:30 pm

Room LIB 129 is located on the library ground floor near the assistance desk. This room can accommodate ~30 people and space is available on a first-come first serve basis. The seminars offer students an opportunity to engage the course instructors directly, work with colleagues on tutorial and assignment problems and make steady progress through the course activities. Students are encouraged to work in groups at the seminars provided they do not disrupt the seminar session. At the seminars, instructors will address common questions on the board for the benefit of all attendees. While attendance at ***all*** seminars is not mandatory, participation in the seminar series does constitute a small portion of each student's overall grade. See the "GRADING SCHEME" section of this course outline for the seminar participation grade calculation.

ASSIGNMENTS

Success in this course results from practicing as many problems as possible and the assignments represent baseline 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.

Students must complete a Mastering Engineering introductory assignment before beginning assignment #1. The introductory assignment will ensure that students understand how to properly communicate information through the Mastering Engineering interface including free body diagrams, VM diagrams and Cartesian vectors.

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.

Assignment #	Mastering Engineering	Hardcopy	Due (5:00pm)
1	1.12, 1.16, 1.20, 1.21, 2.8	2.48	Jan. 13
2	2.68, 2.127, 2.124, 3.16	3.39	Jan 20
3	3.57, 3.59, 4.16, 4.42	4.50	Jan 27
4	4.55, 4.96, 4.106, 4.121	4.136	Feb 3
5	5.25, 5.45, 5.63, 5.73	5.75	Feb 10
6	6.12, 6.17, 6.24, 6.36	6.45	Mar 3
7	6.80, 6.87, 7.25, 7.56	6.91	Mar 10
8	7.76, 7.79, 8.19, 8.22	7.84	Mar 17
9	8.35, 8.50, 8.58, 8.68	8.65	Mar 24
10	9.22, 9.41, 9.47, 9.68	9.80	Mar 31

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 assignment work and tutorial group work 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***.

MIDTERM EXAM

There in one midterm examination in ENGR 141 worth 15% of the final grade. The midterm exam will be held ***on Saturday, February 25th in the ECS building***. Students will be assigned to a seat in one of the ECS classrooms and the seating plan will be provided on the course's Mastering Engineering website. The time of the exam is yet to be determined and will be announced in lecture period, a\nd on the Mastering Engineering website, with no less than two weeks' notice. The midterm exam is closed book.

FINAL EXAMINATION

The Final examination will be scheduled by the University administration. The final examination will be closed book, 3 hours long and may include material from all textbook sections listed in the "SYLLABUS" section of this course outline.

GRADING SCHEME

Assessment:	Weight	Date
Assignments	17.5%	See "ASSIGNMENTS" section above
Tutorials[1]	15%	Weekly, starting 9 January
Seminar Participation[2]	2.5%	Weekly
Mid-term[3]	15%	25 February
Final Exam[4]	50%	TBA

1. The tutorial grade is calculated based on in-class submissions of draft problem solutions, submission of final hardcopies to the appropriate ENGR 141 drop box and peer assessment.

2. The course instructors and TAs will take attendance at the seminars. Students do not have to attend all the seminars nor do they need to attend complete sessions. Each seminar attended for at least 0.5 hours (discussion with instructors, individual work, group work, etc) will count as an "attended session." For each attended session, students will earn 0.5% towards their final grade to a maximum of 2.5%. For example, a student who attended a seminar one day for 45 min, another day for 1.0 hour and a third day for 30 min would earn 1.5% towards the final grade (0.5% for each of the 3 "attended sessions").

3. In all mechanical engineering courses, if a student is unable to write a midterm exam due to illness, or another acceptable reason as specified in the "Academic Concessions" section of the UVic Calendar, the midterm exam's contributions to the overall grade will be transferred to the final exam.

4. Failure to pass the final exam will result in a failing grade for the course

5. 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.

6. Assignment of E grade and supplemental examination for this course will be at the discretion of the Course Instructors. The rules for supplemental examinations can be found 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 exams. 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, midterm and final exam 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 Mechanical Engineering Department by email or the Chair's Secretary to set up an appointment.

Resource Centre for Students with Disabilities
http://www.uvic.ca/services/rcsd/

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

Equality
This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Resource Centre for Students with a Disability located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.