Faculty of Engineering
Department of Mechanical Engineering
COURSE OUTLINE

MECH 242 – DYNAMICS

Term – Summer 2016 (201605)

Instructor	**Office Hours**
Dr. Daniela Constantinescu	Days: T
Phone: 250.721.6040	Time: 12:30 - 1:30
E-mail: danielac@uvic.ca	Location: EOW 541

List all prerequisites and co-requisites: MECH 141 or ENGR 141; and CSC 110 or CSC 111; and MATH 101; and MATH 110 or MATH 211; and PHYS 110 or PHYS 122 or PHYS 120.

LECTURE DATE(S)

Section: A01 /CRN30573	Days: T, W, F	Time: 10:30 – 11:20	Location: ECS 123

TUTORIAL SECTIONS

Section: T01/CNR30574	Days: W	Time: 8:30 - 9:20	Location: ECS 125

TA Name	**E-mail**	**Office hours ECS 108**
Anaissia Franca	anaissia@uvic.ca	T,W 1:30pm – 2:00pm
Rebecca McWilliam	gagnonr@uvic.ca	T,W 1:30pm – 2:00pm
Kaveh Nazeri	nazerik@uvic.ca	T,W 1:30pm – 2:00pm
Xiang Sheng	xsheng@uvic.ca	T,W 1:30pm – 2:00pm

Required Text	**Optional Text**
Title: Engineering Mechanics - Dynamics	Any text on rigid body dynamics
Author: R.C. Hibbeler	
Publisher/Year: Prentice Hall, 2014 or any earlier edition	
Reference Materials:	

COURSE OBJECTIVES: This course aims to teach students how to model, analyze and predict the behavior of a planar system of rigid bodies subjected to a given input motion or to a given applied load.

The MECH 242 topics build: (1) on particle kinematics and kinetics concepts taught in PHYS 120; and (2) on equivalent systems of forces, body connections, moment of inertia and equilibrium of systems of rigid bodies concepts taught in ENGR 141. They also require knowledge of differential and integral calculus (MATH 100 and MATH 101). The Matlab assignments assume knowledge of matrix algebra (MATH 110 or MATH 211).

The concepts learned in this course are precursor to topics that students will study in MECH 330 Vibrations, MECH 335 Theory of Mechanisms, MECH 421 Vibrations II, MECH 430 Robotics, MECH 485 Mechanism and Manipulator Synthesis. They will also be relied upon in MECH 400 Design Project, MECH 446 Introduction to Ocean Engineering, MECH 459 Fundamentals of Hybrid Vehicles, and MECH 475 Aircraft Design.

Learning Outcomes next page

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

1. Write velocity and acceleration vector relationships to fully describe the kinematic constraints imposed on a planar mechanism by its connections.
2. Draw free-body and kinetic diagrams for all bodies of a planar mechanism.
3. Explain how each connection of a rigid body is represented in the free-body and in the kinetic diagrams of the respective body.
4. Write the vector relationships that completely model a planar mechanism with given input motion or given applied load.
5. Identify the vector relationships that need to be added to a partial model of a planar mechanism to complete the kinematics and/or the kinetics model of the corresponding physical system.
6. Use Matlab to implement the numerical computations required to solve a planar kinematics and/or kinetics problem, and to plot results.
7. Prepare assignment solutions and project reports according to professional writing standards for engineering problem sets and for formal reports.
8. Uphold the APEGBC Code of Ethics in their interactions with other students, their team members, the TAs and the instructor.

Weight & Date(s) of Assessments:	**Weight**	**Date**
Assignments:	24%	See the MECH 242 Course Plan for the due dates for each of the 12 assignments.
iClickers	6%	Each lecture.
Project	15%	See the MECH 242 Course Plan for the due dates for each of the 4 milestones.
Mid-term	15%	Date: June 16
Final Exam	40%	Date: TBA

ASSIGNMENTS (Description & Method of Delivery)

1.Twelve problem sets will be distributed over the course of the term via the MECH 242 course website www.me.uvic.ca/~mech242. Most assignment problems will require both hand calculations and Matlab to complete.
2. Assignments must be handwritten on "Engineer's pad" paper using only the front side and the Matlab plots must be printed on US letter paper to be accepted. **Any other paper will be rejected**.
3. **40% of assignment grades will be allocated to presentation**. For full presentation grades, a submitted assignment should comply with all requirements for the preparation of engineering problem sets outlined at http://web.mit.edu/me-ugoffice/communication/pset-format.pdf. If unclear about any requirements, please clarify them with the instructor in advance of the assignment due date.
4. Assignments must be submitted to the box marked "MECH 242" beside ELW A144 by 4:00pm on the Tuesday of the week following the week when they are given. **Late Assignments will not be accepted.**
5. The solutions to the Assignments will be posted on the course website as soon as the due time has passed.

Assignment #	**Modules**	**Start**	**Due (4 pm)**
1	1: Kinematic analysis of planar rigid body motion.	05.04	05.10
2	1: Kinematic analysis of planar rigid body motion.	05.11	05.17
3	1: Kinematic analysis of planar rigid body motion.	05.18	05.24
4	1: Kinematic analysis of planar rigid body motion.	05.25	05.31
5	1: Kinematic analysis of planar rigid body motion.	06.01	06.07

6	2: Kinetic equations of planar rigid body motion.	06.08	06.14
7	2: Kinetic equations of planar rigid body motion.	06.15	06.21
8	2: Kinetic equations of planar rigid body motion.	06.22	06.28
9	3: Work and energy methods for planar rigid body motion.	06.29	07.05
10	3: Work and energy methods for planar rigid body motion.	07.06	07.12
11	4: Impulse and momentum for planar rigid body motion.	07.13	07.19
12	4: Impulse and momentum for planar rigid body motion.	07.20	07.26

PROJECTS:

1. **Students will work in teams to complete the project.** Each team will have 5 members. The instructor will assign the students to teams.
2. Projects will be graded for technical accuracy and for presentation. **40% of the team's project grade will be allocated to presentation.** For full presentation grades, a project report should comply with the second set of requirements (requirements 8 to 16, that deal with the problem solution itself) for the preparation of engineering problem sets outlined at http://web.mit.edu/me-ugoffice/communication/pset-format.pdf. If unclear about any requirements, please clarify them with the instructor in advance of the project due date.
3. **50% of the student's project grade will be allocated to student's individual contribution to the project**. The student's team members will evaluate the student's individual contribution at each project milestone outlined in the MECH 242 Course Plan.
4. Project reports, their associated Matlab/Simulink files and a readme file explaining how the Matlab/Simulink files should be run to obtain the results presented in the report must be submitted electronically, via email to the instructor, by 11:59pm on the day they are due.

NOTE:

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

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.

Assignment of E grade and supplemental examination for this course will be at the discretion of the Course Instructor. The rules for supplemental examinations can be found in the current Undergraduate Calendar.

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.

"**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

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

Course Schedule (see the MECH 242 Course Plan for more details)

Module	Topics	Date/Week
1	Kinematics of planar rigid body motion. Analysis using translating axes. Translation. Rotation about a fixed axis. Planar motion. Instantaneous Centre of Zero Velocity. Analysis using rotating axes.	05.03 – 06.10
2	Kinetic equations of planar motion rigid body motion. Newton-Euler equations of motion. Coulomb (dry) friction. Rolling.	06.14 – 06.29
3	Work and energy methods for planar rigid body motion. Kinetic energy. Work of a force and of a couple moment. Conservative and non-conservative force fields. Potential energy.	07.05 – 07.15
4	Impulse and momentum methods for planar rigid body motion. Linear and angular momentum. Principle of Impulse and Momentum. Conservation of momentum. Impact.	07.19 – 07.29