

PC1310 - Mechanics

Winter Session - 1999

University of Alberta Equivalent - Engineering Physics 131

4(3-1-1.5)UT

This course includes: kinematics and dynamics of particles; gravitation; work and energy; linear momentum, angular momentum; systems of particles; introduction to dynamics of rigid bodies are covered in the course.

Prerequisite: MA 1000, EG 2300

Corequisite: MA1010, Pre- or Co-requisite: PC1300

Note: Restricted to Engineering students only.

Term	<i>January to April, 1999</i>
Lecture	<i>Tuesdays and Thursdays, 9:30 - 10 :50 p.m., J229</i>
Seminar	<i>Thursdays, 1:30 - 2:20 p.m., E301</i>
Laboratory	<i>Mondays, 3:00 - 5:50 p.m., J103</i>
Instructor	<i>Dr. Jaime P. Santiago, J209, 539-2865</i>
E-mail	santiago@gprc.ab.ca

PC1310 - Mechanics

Course Information – Winter 1999

Instructor	Jaine P. Santiago Office Phone E-mail	Department of Science and Technology J209 539-2865 santiago@gprc.ab.ca
Schedule	Lecture Laboratory	09:30 - 10:50 a.m. Tuesdays and Thursdays 15:00 - 17:50 Mondays
Web Page	www.gprc.ab.ca/courses_and_programs/engineering/pc1310.html	
Lectures	Kinematics of rectilinear motion, position, displacement, velocity, speed and acceleration; kinematics of planar motion, cartesian components, projectiles, normal and tangential components, absolute dependent motion, relative motion; Dynamics of particles, Newton's laws of motion, Newton's law of universal gravitation, free body diagrams, friction, normal and tangential components, circular motion, central force motion; System of particles, center of mass; Work and energy, power, system of particles, conservative forces and Law of conservation of energy; Linear momentum and impulse, system of particles; Conservation of linear momentum, collisions; Introduction to rigid body mechanics, kinematics, dynamics, angular momentum.	
Laboratories	Five laboratory experiments performed every two weeks expanding on the concepts learned in the lecture. Microsoft WORD and EXCEL will be used to analyze and write the report.	
Assignments	All homework for marking is due at 9:30 a.m. on Tuesdays unless otherwise specified.	
Marks Distribution	Problem Sets Seminars Laboratory Work Midterm Exam Final Exam	5% 5% 20% 20% 50% Students must pass the lab and the final examination to pass the course.
Required Texts	R. C. Hibbeler: <i>Engineering Mechanics, Statics and Dynamics, 8th Edition</i> David Halliday, Robert Resnick and Jearl Walker: <i>Fundamentals of Physics, 5th Edition</i> University of Alberta: <i>Physics Laboratory Manual</i>	
Materials	3.5" floppy disks Engineering paper	

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Lecture Schedule - Winter 1999

TOPIC	TIME (Days)	CONCEPTS TO BE LEARNED
Introductory Material	1	Historical survey, fundamental quantities, idealizations, geometry, trigonometry and calculus review
Kinematics of Rectilinear Motion	4	Absolute motion along a line, position, speed, displacement, velocity and acceleration; constant and variable acceleration; graphical methods
Kinematics of Planar Motion	4	Position, displacement, velocity and acceleration vectors, Cartesian components; projectile motion; normal and tangential components; absolute dependent motion; relative motion
Dynamics of a Particle	4	Newton's laws for a single particle, inertial frames of reference; Newton's law of universal gravitation; friction, Cartesian component, normal and tangential components, circular motion; central force motion
Systems of Particles	1	Internal and external forces, center of mass and gravity, extension of Newton's laws to a system of particles
Work and Energy	3	Work done by a force; Principle of Work and Energy for a Particle; system of particles; power and mechanical efficiency; conservative forces, potential energy, Law of Conservation of Energy
Linear Momentum and Impulse	3	Definition of linear momentum, Principle of Impulse and Momentum; systems of particles, Conservation of Linear Momentum for a system of particles, collisions
Introduction to Rigid Body Dynamics	3	Rigid bodies; angular displacement, velocity and acceleration; kinetic energy; moment of inertia; moment of a force; Newton's laws for rotational motion
Angular Impulse and Momentum	2	Definition of angular momentum and impulse; Principle of Angular Impulse and Momentum; Conservation of Angular Momentum; angular momentum of a rigid body

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Assignment Schedule - Winter 1999

Assignment	Due Date	Problems
1	Jan 19	Hibbeler: 1-14, 1-17, 12-4, 12-10, 12-19
2	Jan 26	Hibbeler: 12-21, 12-27, 12-34, 12-54, 12-62
3	Feb 2	Hibbeler: 12-81, 12-82, 12-91, 12-95, 12-104
4	Feb 9	Hibbeler: 12-118, 12-126, 12-173, 12-182, 12-202
5	Feb 16	Hibbeler: 13-5, 13-6, 13-22, 13-29, 13-36
6	Mar 9	Hibbeler: 13-56, 13-68, 13-71, 13-81, 13-112
7	Mar 16	Hibbeler: 14-6, 14-15, 14-16, 14-35, 14-62
8	Mar 23	Hibbeler: 15-8, 15-34, 15-37, 15-40, 15-53
9	Mar 30	Hibbeler: 15-58, 15-69, 15-79 Halliday: Ch. 11 - 19P, 37P
10	April 6	Halliday: Ch. 11 - 43P, 72P, 86P Ch. 12 - 11P, 12P

Solutions to Problem Sets are in Adobe PDF format.



They require Adobe Acrobat reader. [Download it now for Free!](#)

Problem Set No.

Links will be activated after U of A due dates.

[1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#).

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Laboratory Schedule - Winter 1999

Lab. No.	Date	Title
1	January 11/18	Acceleration Due to Gravity
2	January 25/February 1	Kinematics of Non-Uniform Motion
3	February 8/March 1	Atwood's Pulley
4	March 8/15	Conservation of Mechanical Energy
5	March 22/29	Collision: Ramp
6	April 5/12	Moment of Inertia

Lab reports are due one week after the lab is performed.

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Examinations

Midterm Examination

- worth 20% of the course mark
- to be written on Thursday, 18 February, 1999
- a formula sheet will be provided

Click to download solution to [Midterm exam](#)

Download the [Adobe PDF](#) version.

Final Examination

- worth 50% of the final grade
- common exam with U of A (being arranged)
- Saturday, April 17, 1999 at 2:00 p.m.
2 hour closed book exam (U of A time restriction)
- a formula sheet will be provided
inside front cover of Hibbeler

Old final exams may be downloaded here. They are in zipped Word 6.0/95 format.

[1996 Final Exam](#)

[1995 Final Exam](#)