PC 1310 – Mechanics

Winter Session – 2000
University of Alberta Equivalent – Physics 109
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: MA 1010, Pre- or Co-requisite: PC 1300
Note: Restricted to Engineering students only

Instructor	Jaime P. Santiago	Department of Science and Technology
	Office	J209
	Phone	539-2865
	Email	santiago@gprc.ab.ca
Schedule	Lecture	10:00 – 11:20 Tuesday and Thursday
	Laboratory	14:30 – 17:20 Tuesday
	Seminar	10:00 – 11:00 Friday

Web Site (old)   http://www.gprc.ab.ca/courses_and_programs/engineering/pc1310.html
(new)   http://www.gprc.ab.ca/engineering/pc1310.html

Laboratories   Six weekly experiments every other Tuesday starting January 11, 2000. Microsoft WORD and EXCEL will be used to analyze data and write the reports.

Assignments   Up to 11 problem sets due every Tuesday starting January 11, 2000

Marks	Problem Sets	5 %	
Distribution	Seminars	5 %	
	Laboratory Work	20 %	Students must pass the lab to pass the course.
	Midterm Exam	20 %	Thursday, February 17, 2000
	Final Exam	50 %	Common exam with U of A

Required Texts   R.C. Hibbeler: *Engineering Mechanics, Statics and Dynamics, 8th Edition*
University of Alberta: *En Ph 131 Laboratory Manual*

Lecture Topics

TOPIC	TIME (Days)	CONCEPTS TO BE LEARNED
Introductory Material	1	Fundamental quantities; idealizations
Kinematics of Rectilinear Motion	4	Absolute motion along a line; position, speed, displacement, velocity and acceleration; constant and variable acceleration; erratic motion
Kinematics of Planar Motion	4	Position, displacement, velocity and acceleration vectors in 2 dimensions; Cartesian components; projectile motion; normal and tangential components; absolute dependent motion; relative motion
Dynamics of a Particle	4	Newton's Laws of Motion for a single particle, inertial frames of reference; Newton's Law of Universal Gravitation; friction, Cartesian components; normal and tangential components, circular motion; central force motion
Systems of Particles	1	Internal and external forces; center of mass and gravity; Newton's laws of motion for systems of particles
Work and Energy	3	Work done by a force; kinetic energy; Principle of Work and Energy for a particle, systems of particles; power and mechanical efficiency; conservative and non-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	4	Rigid bodies; angular displacement, velocity and acceleration; kinetic energy; moment of inertia; torque (moment of a force); Newton's laws for rotation motion
Angular Impulse and Momentum	2	Definition of angular momentum (moment of momentum) and impulse; angular momentum of a rigid body; Principle of Angular Impulse and Momentum; Conservation of Angular Momentum

Assignments

Assignment	Due Date	Problems
1	January 18	Hibbeler: **Please see U of A En Ph 131 Web site**
2	January 25	Hibbeler:
3	February 1	Hibbeler:
4	February 8	Hibbeler:
5	February 29	Hibbeler:
6	March 7	Hibbeler:
7	March 14	Hibbeler:
8	March 21	Hibbeler:
9	March 28	Hibbeler: Halliday:
10	April 4	Halliday:
11	April 11	Halliday:

Laboratory Schedule

Lab. No.	Date	Title
1	January 11/18	Kinematics of Non-uniform Motion
2	January 25/ February 1	Acceleration Due to Gravity
3	February 8/15	Atwood's Pulley
4	February 29/ March 7	Conservation of Mechanical Energy
5	March 14/21	Collision: Ramp
6	March 28/ April 4	Moment of Inertia

January

2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4 Physical quantities, idealizations	5	6 Kinematics in one dimension; position, displacement, velocity and acceleration	7 Seminar 1	8
9	10	11 a = constant; $a = a(t)$ Lab 1 Kinematics of Non-Uniform Motion	12	13 $a = a(v)$; $a = a(s)$	14 Seminar 2	15
16	17	18 Erratic motion Lab 1 Kinematics of Non-Uniform Motion Problem Set 1 due	19	20 Kinematics in two dimensions; Cartesian components	21 Seminar 3	22
23	24	25 Projectile motion Lab 2 Acceleration due to Gravity Problem Set 2 due	26	27 Normal and tangential components	28 Seminar 4	29
30	31					

February 2000

PC 1310 A3 - Mechanics

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 Absolute dependent motion, relative motion; Lab 2 Acceleration due to gravity; Problem Set 3 due	**2**	**3** Newton's Laws of motion, universal gravitation, Free Body Diagrams	**4** Seminar 5	**5**
6	**7**	**8** Cartesian components, friction; Lab 3 Atwood Pulley; Problem Set 4 due	**9**	**10** Normal and tangential components, circular motion	**11** Seminar 6	**12**
13 Midterm Exam Week – no labs, no problem sets due this week	**14**	**15** Central force motion, Kepler's Laws	**16**	**17** Midterm Exam	**18** Seminar 7	**19**
20 Winter Break	**21** Family Day	**22**	**23**	**24**	**25**	**26**
27	**28**	**29** Newton's laws for a system of particles; Lab 3 Atwood Pulley; Problem Set 5 due				

March

2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2 Work done by a force, kinetic energy	3 Seminar 8	4
5	6	7 Principle of Work and Energy, Power, Eff. Lab 4 Conservation of Mech. Energy Problem Set 6 due	8	9 Conservative forces, potential energy. Law of Conservation of Energy	10 Seminar 9	11
12	13	14 Principle of Impulse and Momentum Lab 4 Conservation of Mech. Energy Problem Set 7 due	15	16 System of particles, Conservation of Linear Momentum	17 Seminar 10	18
19	20	21 Collisions Lab 5 Collision:Ramp Problem Set 8 due	22	23 Rigid bodies, rotational kinematics, torque	24 Seminar 11	25
26	27	28 Kinetic energy, moment of inertia Lab 5 Collision:Ramp Problem Set 9 due	29	30 Newton's Law for rotational motion	31 Seminar 12	

April

2000

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4 Work and power, rolling motion Lab 6 Moment of Inertia Problem Set 10 due	5	6 Angular impulse and momentum, Principle of Angular Impulse and Momentum	7 Seminar 13	8
9	10	11 Conservation of angular momentum Lab 6 Moment of Inertia	12	13 Review	14 Start of Final Exams	15
16	17	18	19	20	21 Good Friday	22
23 Easter	24 Easter Monday	25	26	27	28	29
30						