DEPARTMENT SCIENCE

COURSE OUTLINE – WINTER 2018

PC1310 (A3): MECHANICS – 4.3 (3-1-3/2) 82.5 Hours for 15 Weeks

INSTRUCTOR:	Dr. Greg Ballentine	**PHONE:**	780-539-2008
OFFICE:	C 414	**E-MAIL:**	gballentine@gprc.ab.ca

OFFICE HOURS: 10:30 – 11:30 AM Monday to Friday (or whenever else can be arranged – come check my office at any time)

CALENDAR DESCRIPTION: Kinematics and dynamics of particles; gravitation; work and energy; linear momentum; angular momentum; systems of particles; introduction to dynamics of rigid bodies.

PREREQUISITE(S)/COREQUISITE: MA 1000, EG 1300, PC 1300, MA 1010

REQUIRED TEXT/RESOURCE MATERIALS: *Engineering Mechanics, Statics and Dynamics,* 14th Ed., R. C. Hibbeler Publisher: Prentice Hall, *Fundamentals of Physics,* 10th Edition Extended, Halliday, Resnick and Walker, Publisher: Wiley. **AND** PC 1310 Lab Manual

DELIVERY MODE(S): Lectures (WF 13:00-14:20 J203), Seminars (S1 R 13:00-13:50 J228), Labs (alternating weeks – see Moodle schedule – F 14:30-17:20 J103 and J101)

COURSE OBJECTIVES: This course is designed to be an introduction to kinematics and dynamics with a calculus based level, specifically for students in Engineering. Kinematics and dynamics will be applied to the 1-D and 2-D behavior of rigid body particles in motion. Free body diagrams will be used to calculate the behavior of particles or a system of particles and the associated translational or rotational momentum, work and energy. Laboratory experiments will be conducted to verify the principles presented in class.

LEARNING OUTCOMES: Students will have the knowledge to be able to analyze the rectilinear and curvilinear motion of rigid particles in 1-D and 2-D under the influence of forces. They will be able to calculate a particle's linear and angular momentum, work and energy. Students will know and be able to explain the underlying basis for general planar kinematics,

TRANSFERABILITY: UA, UC, UL, AU, Augustana UA, CUC, GMU, KUC

***Warning:** Although we strive to make the transferability information in this document up-to-date and accurate, **the student has the final responsibility for ensuring the transferability of this course to Alberta Colleges and Universities**. Please consult the Alberta Transfer Guide for more information.

You may check to ensure the transferability of this course at Alberta Transfer Guide main page http://www.transferalberta.ca or, if you do not want to navigate through few links, at http://alis.alberta.ca/ps/tsp/ta/tbi/onlinesearch.html?SearchMode=S&step=2

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

EVALUATIONS:

Assignments	10%
Labs	20% (Must pass Lab to pass course)
Seminars	5%
Midterm #1	15% (or 0%*) February 16th
Midterm #2	15% (or 0%*) March 23rd
Final Exam	50% (or 35%*) Cumulative. Time and Location TBA by Registrar's Office

* The lowest midterm will be dropped and its weight will be added to the final exam if it improves your mark

Midterm Exams: Students are allowed a formula sheet (handwritten 8.5 x 11 inch both sides), a calculator (any calculator WITHOUT communication features) and HB pencil(s) and eraser.

Final Exam: This exam is cumulative. Students are allowed the same items as for a midterm exam.

GRADING CRITERIA: (The following criteria may be changed to suite the particular course/instructor)

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100		C+	2.3	67-69
A	4.0	85-89		C	2.0	63-66
A-	3.7	80-84		C-	1.7	60-62
B+	3.3	77-79		D+	1.3	55-59
B	3.0	73-76		D	1.0	50-54
B-	2.7	70-72		F	0.0	00-49

COURSE SCHEDULE/TENTATIVE TIMELINE:

NOTE: The course schedule is on moodle and may be updated there if necessary. This schedule is preliminary but gives a good idea of which sections in the textbooks you should read to be caught up with the class lectures

Date	Topic	Sections in Hibbeler	Sections in HRW*
Jan 5th	Introduction	1-1, 1-2, 1-3, 1-4, 1-5	
Jan 10th	Basic Kinematics	12-1, 12-2, 12-3	2-1, 2-2, 2-3, 2-4
Jan 12th	Curvilinear Motion	12-4, 12-5	4-5
Jan 17th	Projectile Motion	12-6, 12-7	2-5, 4-4
Jan 18th	Seminar – Kinematics		
Jan 19th	Rotating and Translating Axes	12-9, 12-10	4-1, 4-2, 4-3
Jan 19th	Lab 6 - Acceleration of Gravity		
Jan 24th	Newton's Laws	13-1, 13-2, 13-3	5-1, 5-2, 5-3, 13-1, 13-2
Jan 25th	Seminar – Projectiles		
Jan 26th	Freebody Diagrams	13-4, 13-5	6-1, 6-2
Jan 31st	Newton's Laws Examples		
Feb 1st	Seminar- Newton's Laws		
Feb 2nd	Work and Energy	14-1, 14-2, 14-3	7-1, 7-2, 7-3, 7-4, 7-5
Feb 2nd	Lab 7- Non-Uniform Motion		
Feb 7th	Power and Efficiency	14-4	
Feb 8th	Seminar – Work and Energy		
Feb 9th	Conservative Forces	14-5	8-1, 8-2, 8-3, 8-4
Feb 14th	Energy Examples	14-6	8-5
Feb 15th	Seminar- Conservative Forces		
Feb 16th	Midterm #1		
Feb 28th	Impulse	15-1, 15-2	9-1, 9-2, 9-4
Mar 1st	Seminar- Difficult problems from midterm		
Mar 2nd	Momentum	15-3	9-3, 9-5
Mar 2nd	Lab 8- Atwood's Pulley		
Mar 7th	Collisions	15-4	9-6, 9-7, 9-8
Mar 8th	Seminar - Momentum		
Mar 9th	Angular Momentum	15-5, 15-6	11-6, 11-7
Mar 14th	Angular Impulse	15-7	
Mar 15th	Seminar – Angular Momentum		
Mar 16th	Rotation and Translation	16-1, 16-2, 16-3	10-1, 10-2, 10-3
Mar 16th	Lab 9– Collision on a ramp		
Mar 21st	Rotational Examples		

Mar 22nd	Seminar - Rotational Kinematics		
Mar 23rd	Midterm #2		
Mar 28th	Moments of Inertia	17-1	10-5
Mar 29th	Seminar- Difficult problems from midterm		
Apr 4th	Rotational Motion Equations	17-2	10-6, 10-7
Apr 5th	Seminar – $\tau = I\alpha$		
Apr 6th	Rotation and Translation	17-3, 17-4, 17-5	11-1, 11-2, 11-3, 11-4
Apr 6th	Lab 10 – Moment of Inertia (handout different from manual)		
Apr 11th	Rotational Kinetic Energy	18-1	10-4
Apr 12th	Seminar- Review		
Apr 13th	Conclusion		

Hibbeler is our textbook as it is calculus based. The sections in Halladay, Resnick and Walker are also given as an algebra based reference. Both are useful to read and should be available to the student.

STUDENT RESPONSIBILITIES:

Refer to the College Policy on Student Rights and Responsibilities at https://www.gprc.ab.ca/about/administration/policies/fetch.php?ID=69

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the College Calendar at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.gprc.ab.ca/about/administration/policies

**Note: all Academic and Administrative policies are available on the same page.