Dynamics (14:440:222)

Instructor: Liping Liu Phone: 848-445-7969 (or 0278)
Email: liuliping@rutgers.edu Time: MW 12:00-1:20pm
Location: Monday: Sec 117 (or to be announced); Wednesday: EN-B-120

Office hours: M W 1:30-3:00pm and Appointments at B-122a.
Office hours: (with TA ROOHOLLAH HASHEMI): T, Th 5:00-6:00pm (D-150)
Course website: https://sakai.rutgers.edu/portal
Homework assignments and submissions: http://www.masteringengineering.com
(course ID: MELIU99076)

The required textbook is by Hibbeler, Dynamics, R. C. Hibbeler, 13th Ed., Pearson, 2013. Reference books will be suggested as needed.

Prerequisites: Calculus I-II, III, Statics. STUDENTS who have not yet taken these courses but still want to enroll in this course need to get the permission from the instructor.

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The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.
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Major Assignments/Exams

Homework problems will be given in class. Homework will not be graded. Nevertheless, it is **strongly** recommended that you complete the homework independently (Imagine you are in an exam) since the problems in exams will be related, if not identical to the homework problems.

Exams	Percentage	When (Tentative)	Time
HWs masterengineering	10%		
HWs sakai	0%		
1st Mid-term	20%	TBD	1hr 20 min
2nd Mid-term	25%	TBD	1hr 20 min
Final exams	45%	TBD	3hr

Exams Policy: Closed book, closed note, no calculator, etc. Only pens are allowed in the exams. Write your answers on papers provided by the instructor. Do not staple. Detailed

policy will be further announced in class. **DO NOT CHEAT!** You would get an absolute **F** if you do so.

Learning Objectives

This course is an introduction to Dynamics. It is intended to give a rigorous foundation for the analysis of motions of particles and rigid bodies and the physical laws governing the motions of particles and rigid bodies. The exposition in this course will be quite traditional, but examples will be chosen to reflect modern trends in technology and research.

Note that the lectures may not be the same order as the textbook. Taking in-class lecture notes is strongly recommended.

1. Review of Basic Physical Laws
    (a) Newtonian Laws
    (b) Concept of equilibrium, Free body diagram

3. Kinematics of a particle
    (a) Continuous motion (Rectilinear and curvilinear)
    (b) Velocity, acceleration
    (c) Motion of a projectile
    (d) Tangential and normal components of motions
    (e) Cylindrical system
    (f) Motions with constraints

5. Kinetics of a particle
    (a) Newton's Second Law
    (b) **Equation of Motion**
    (c) Examples: normal & tangential motions, cylindrical coordinates

6. Work and Energy
    (a) The work of a force
    (b) Conservation of energy: a single particle and a system of particles
    (c) Power and efficiency
    (d) Conservative forces and potential energy

7. Impulse and Momentum
    (a) Linear Impulse of a force
    (b) Conservation of linear momentum
    (c) Angular Impulse of a force
    (d) Conservation of angular momentum

8. Kinematics of a rigid body
    (a) Planar motion / 3D motion

(b) Translation and rotation
(c) Relative motion analysis: velocity and acceleration

9. Dynamics of a rigid body
(a) Equation of motion
(b) Linear impulse, angular impulse and work of a system of forces
(c) Principle of linear and angular impulse and momentum, work and energy
(b) Conservation laws: linear momentum, angular momentum and energy