ENS 214 - Dynamics
Spring 2020-2021
Course Outline

Course Instructor	Bekir Bediz Mechatronics Engineering Program	Office Hour: E-mail:	Thursday 11:00-12:00 bbediz@sabanciuniv.edu
Course Assistants	Kazi Sher Ahmed Andisheh Choupani Peiman Khandar Shahabad Fiyinfoluwa Oluwatoyosi Abioye	Office Hour: Office Hour: Office Hour: Office Hour:	TBA TBA TBA TBA

Course Schedule

Lecture:
Tuesday 9:40-10:30 @ Zoom (Meeting ID: 990 8735 2696, Passcode: Dynamics)
Wednesday 8:40-10:30 @ Zoom (Meeting ID: 990 8735 2696, Passcode: Dynamics)
Recitation:
Monday 15:40-17:30 @ TBA

References

- (textbook) Hibbeler, R. C., *Engineering Mechanics, Dynamics*, 14^{th} Edition in SI Units, Pearson-Prentice Hall.
- Meriam, J. L., and Kraige, L. G., *Engineering Mechanics*, Dynamics, Sixth Edition (SI Version), John Wiley and Sons Inc., 2008.
- Beer, F. P., Johnston, E. R., Clausen, W. E., *Vector Mechanics for Engineers*, Dynamics, Eight Edition in SI Units, McGraw-Hill.

Purpose of the course:

This course is designed for undergraduate students to **(i)** develop an understanding of particle and planar rigid body kinematics and kinetics **(ii)** obtain an understanding of Newton's Laws of Motion, and **(iii)** gain the ability to apply energy and momentum methods to particles and rigid bodies in planar motion.

Learning outcomes:

- Understand the basic kinematics concepts: displacement, velocity, and acceleration (and their angular counterparts)
- Be able to draw free-body diagram for a particle or a rigid body in motion
- Understand the basic concepts of force, momentum, and energy
- Understand and be able to apply Newton's laws of motion
- Understand and be able to apply work-energy, impulse-momentum principle
- Extend all of concepts of linear kinetics to systems in general plane motion

Course Content

- Part I. Dynamics of Particles
  1. Introduction to Dynamics (a short summary)
     - History and modern applications
     - Basic concepts
     - Newton's Laws
     - Units & dimensions
  2. Kinematics of Particles
     - Rectilinear motion
     - Plane curvilinear motion
     - Rectangular coordinates
     - Normal & tangential coordinates
     - Polar coordinates
     - Space curvilinear motion
     - Relative motion
     - Constrained motion of connected particles
  3. Kinetics of Particles

- Force, mass, and acceleration
- Work and energy
- Impulse and momentum

4. Kinetics of Systems of Particles
   - Generalized Newton's second law
   - Work and energy
   - Impulse and momentum
   - Conservation of energy and momentum

- Part II. Dynamics of Rigid Bodies

1. Plane kinematics of rigid bodies
   - Rotation
   - Absolute motion
   - Relative velocity
   - Instantaneous center of zero velocity
   - Relative acceleration
   - Motion relative to rotating axes
2. Plane kinetics of rigid bodies
   - Force, mass, and acceleration
   - Work and energy
   - Impulse and momentum

- Part III. Introduction to 3D Dynamics

1. Kinematics
   - Translation
   - Fixed-axis rotation
   - Parallel-plane motion
   - Rotation about a fixed point
   - General motion
2. Kinetics
   - Angular momentum
   - Kinetic energy
   - Momentum and energy equations of motion
   - Parallel-plane motion
   - Gyroscopic motion

Course Requirements

- ENS 204 - Mechanics

Online Class Policies

- Online lectures will be held via Zoom. Recordings will be shared through SUCourse+.
- You need to sign in to the Zoom lectures with your SU credentials.
- All announcements will be made through SUCourse+, students are responsible from following the announcements.
- Students cannot share or post to the Web any document or recording of any of the course material with third parties.
- Do not forget that we are all responsible for creating a safe and inclusive classroom experience for everyone in the class.

Grading Policy

The tentative grading policy is as follows:

1. Quizzes(15%)
2. Midterm I & II (25% each)
3. Final (35%)

- There will be around 15 pop-up quizzes (around 5-10 minutes) during the semester. They will be based on that day's lecture notes.
- Midterm and Final will be proctored exams. For proctored exams, your webcam and microphone should be on during the exam. In the case of non-compliance with this and other declared exam procedures, your exam will be void. Make sure to check that your webcam and microphone function properly before the exam. Exam dates will be announced at SUCourse+.
- Throughout the semester, random oral exams will be made. You may be called upon to explain your homework/project/exam solution and answer course related questions in a one-to-one meeting with the TA/instructor. Students who fail to explain their work or answer related questions will get zero (0) credit from the related exam/homework/project
- Your attendance and participation in the lectures may affect your final grade, especially for borderline cases. Note that you must be present in the lecture for at least 40 minutes.
- Zero credit for late homework unless arrangements are made in advance. You can discuss the problems with your classmates but copying work is against University regulations.
- One make-up examination, covering the whole course material, will be given after the final exam date for the students who missed the midterm and/or final examination due to a valid excuse approved by the faculty/medical center. All examinations will be closed book and notes. The necessary formula will be provided to the students.
- All solutions (homework, exam, project) must be written in a professional manner. You may lose points for poorly written answers.
- No extra homework/exam/project/etc. will be given to increase your grade at the end of the semester.
- Students who miss any of the exams will get N/A from the course.

Disclaimer

- Time conflict requests can be accepted for the one hour only (both for lectures and recitations). Students who are registered to the course with time-conflict override accept the responsibility of any inconvenience that might occur due to missed content and/or quizzes. No make-up will be available for missed quizzes/content. To get approval for time conflict, you need to send an e-mail stating you are aware of these facts and you accept the responsibility.
- This syllabus and course details might need to be updated throughout the semester because of the uncertainties the pandemic brings. Any modification will be announced at SUCourse+ and also during the class. Students are responsible from following the announcements.

Academic Integrity

Students are expected to be familiar with and comply with Sabanci University Academic Integrity Statement. Any form of academic dishonesty (plagiarism, copying/using other people's work, attending classes/exams on behalf of other people, *etc.*) will be penalized with a failing grade for the related assignment, quiz, or exam and disciplinary actions will be taken.