ENS 204 - Mechanics
Summer 2021-2022
Syllabus

Course Instructor

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Course Assistant

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Course Schedule

Lecture:
Monday : 8:40 - 11:30 @ FENS L045
Tuesday : 14:30 - 17:30 @ FENS L045

Recitation:
Wednesday : 11:40 -13:30 @ FENS L045

References

Students are recommended to follow the references occasionally:

- Hibbeler, R.C., *Engineering Mechanics: Statics*, Prentice-Hall, Inc., New Jersey, 1998. (textbook)
- Beer, F.P., and Johnston, Jr., E.R., *Vector Mechanics for Engineering Statics*, McGraw-Hill Book Co., Boston, 1997.
- Merriam, J.L., and Kraige, L.G., *Engineering Mechanics, Statics*, John Wiley & Sons, Inc., New York, 1997.

Objectives:

At the end of the course student must demonstrate the ability to

- use vector algebra in calculation of forces and moments.
- apply equilibrium equations in the solution of 2- and 3-dimensional concurrent or non-concurrent force systems.
- solve for unknown forces and moments using both the scalar and vector methods.
- develop appropriate free-body diagrams and to use them in solution of statics problems.
- formulate and solve the equilibrium equations for rigid bodies made up of multiple members.
- calculate the geometric and mass properties of interest in solid mechanics.

Prerequisites:

A passing grade in NS 101, MATH 101 and MATH 102

Course Content (Tentative Schedule)

- General Principles (Week 1)
  - Mechanics
  - Fundamental concepts
  - Units of measurement
  - SI units
  - Numerical calculations
  - General procedure for analysis
- Force Vectors (Week 2)
  - Scalars and vectors
  - Vector operations
  - Vector addition of forces
  - Addition of a system of coplanar forces
  - Cartesian vectors
  - Addition of cartesian vectors
  - Position vectors

    - Force vector directed along a line
    - Dot product
- Equilibrium of a Particle (Week 3)
    - Condition for equilibrium of a particle
    - The free-body diagram
    - Co-planar force systems
    - Three-dimensional force systems
- Force System Resultants (Week 4-5)
    - Moment of a force - scalar formulation
    - Cross product
    - Moment of a force - vector formulation
    - Principle of moments
    - Moment of a force about a specified axis
    - Moment of a couple
    - Simplification of a force and couple system
    - Reduction of a simple distributed loading
- Equilibrium of a rigid body (Week 6)
    - Conditions for rigid-body equilibrium
    - Equations of equilibrium
    - Two- and three-force members
    - Constraints and statical determinacy
- Structural Analysis (Week 7-8)
    - Simple trusses
    - The method of joints
    - Zero-force members
    - The method of sections
    - Space trusses
    - Frames and machines
- Internal Forces (Week 9-10)
    - Internal forces developed in structural members
    - Shear and moment equations and diagrams
    - Relations between distributed load, shear, and moment
    - Cables
- Friction (Week 11-12)
    - Characteristics of dry friction
    - Problems involving dry friction
    - Wedges
    - Frictional forces on screws
    - Frictional forces on flat belts
    - Frictional forces on collar bearings, pivot bearings, and disks
    - Frictional forces on journal bearings
    - Rolling resistance
- Moments of inertia (Week 13-14)
    - Definition of moments of inertia for areas
    - Parallel-axis theorem for an area
    - Radius of gyration of an area
    - Moments of inertia for composite areas
    - Product of inertia for an area
    - Moments of inertia for an area about inclined axes
    - Mass moment of inertia

Grading Policy Quiz (20%), Midterms (50%), Final Exam (30%)

- There will be around 10-20 pop-up quizzes (around 5-10 minutes) during the semester and 80 % best of them will be included in your overall grade. They will be based on that day's lecture notes.
- There will be 2 midterm exams (around 90 minutes) throughout the semester. They will be scheduled to be held during recitation hours or weekends.
- One make-up examination, covering the whole course material, will be given during the Finals Week for the students who miss any of the exams 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 must be written in a professional manner. You may lose points for poorly written answers.
- No extra exam/project/etc. will be given to increase your grade at the end of the semester.
- If your attendance is less than 50%, you will fail the course automatically.
- Students who miss any two exams will get N/A from the course.
- Oral exam (that will be recorded) will be given to students whose quiz/exam answers seem suspicious.

Online Lecture Policy

- Lectures will not be hybrid/online.
- The lecture slides will shared as pdf files. There will be empty sections in the shared files and students are expected to complete them during the class.
- Students cannot share or post to the Web any document (lecture slides, quiz/exam questions, *etc.*) with third parties.

Disclaimer

- Time conflict requests can be accepted; however, 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.
- 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.