DEPARTMENT OF PHYSICS
General Syllabus
Physics 35100
Mechanics

Designation:
Required Undergraduate

Catalog description:
Newton's laws; Systems of particles; Small oscillations; Central forces and planetary motion; Rotations and rotating coordinate systems; Introduction to rigid body motion; Labrangian dynamics; Introduction to Hamiltonian dynamics.
4 HR./WK.; 4 CR.

Prerequisites:
Prereq.: Physics 20800; pre- or coreq.: Math 39100

Textbook and other suggested material:
S.T. Thornton and J.B. Marion; Classical dynamics of Particles and systems (5th ed.)
ISBN 0-534-40896-6; Thomsom Brooks/Cole

Course Objectives:
After successfully completing this course, students should be able to

1. understand basic Newtonian dynamics using vectors and vector calculus
2. understand linear oscillations, Fourier series
3. understand gravitation, gravitational potential
4. develop a working knowledge of the calculus of variations
5. understand Hamilton's variational principle, how it applies to classical dynamics
6. How to construct the Lagrangian and apply Lagrangian dynamics to various problems
7. understand the motion of planets and other central force examples
8. understand notions of center of mass and relative coordinates
9. understand rotations and motion in noninertial frames
10. understand rotational motion of rigid bodies and Euler's equations
11. understand coupled oscillations
12. understand how continuous systems can be described as limits of systems of particles
13. Elements of special relativity, Lorentz transformations

Topics Covered:

1. Matrices, vectors and vector calculus
2. Newtonian Mechanics of a single particle
3. Linear oscillations
4. Nonlinear oscillations and chaos
5. Gravitation
6. Calculus of variations
7. Hamilton's principle, Lagrangian Mechanics
8. Central force motion
9. Systems of particles
10. Dynamics in noninertial frames
11. Rigid body dynamics
12. Coupled oscillations
13. Continuous sytems and waves
14. Special theory of relativity

***Class schedule*:**
4 HR./WK.; 4 CR.

Relationship of course to program outcomes:

The outcomes of this course contribute to the following departmental learning outcomes:

a. students will be able to synthesize and apply their knowledge of physics and mathematics to solve physics-related problems in a broad range of fields in classical and modern physics, including mechanics, electricity and magnetism, thermodynamics and statistical physics, optics, quantum mechanics, and experimental physics.

c. students will be able to communicate their knowledge effectively and in a professional manner, in both oral and written forms.

Assessment Tools

1. Attendance
2. Homework assignments
3. Results of quizzes and midterm exam
4. Class participation
5. Results of Final Exam

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