UNIVERSITY OF PUERTO RICO
RIO PIEDRAS CAMPUS
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF PHYSICS
UNDERGRADUATE PROGRAM

Title: Intermediate Mechanics II

Code: FISI 4052 Section OU1

Number of Credits: 3

Prerequisites: FISI 4051

Co-requisite: FISI 4032 (Mathematical Physics II)

Description

This is the second part of the Classical Mechanics course for Physics majors. The topics include: Lagranges Equations; Center Mass reference frame and the 'Kepler Problem'; Non Inertial refenenes Frames; Coupled oscillations: the general problem of coupled oscillations, normal coordinates and modes, (v) Introduction to Hamilton's principle, and to matrix solutions of the coupled oscillator; The course concludes with an introduction to Special relativity

Objectives

After completing this course the student will know the fundamental axioms of classical mechanics and will be able to apply these to actual physical problems. The student will have mastered and practiced the application of simple mathematical techniques to solve problems of Classical Mechanics and Relativistic Mechanics

Course Content
The following is scheduled for this semester 2nd sem 2015-2016

I.. LAGRANGE'S EQUATIONS
(a) derivations
(b) examples of constrained syaytems
(c) Generalized momenta and ignorable coordinates
(d) Lagrange Multipliers and Constraint Forces.
(e) MORE EXAMPLES

EXAM I

II MECHANICS IN NON INERTIAL REFERENCE FRAMES
1. Planar Motion
2. The Angular Velocity Vector
3. Derivative of a vector in the rotating Frame.
4. General Motion of the Coordinate System.

Centripetal, Coriolis and Transverse Forces

5. Examples: plumb line; surface projectile; Foucault Pendulum

EXAM II

IVa GENERALIZED CORRDINATES & MOMENTS – HAMILTON'S EQUS

IVb THE COUPLED HARMONIC OSCILLATOR

Solution using second order equations.

IVc HAMILTON'S's 1st Order Equs. & the Coupled Harmonic Oscillator

function of a matrix; Eigenvalues and Eigenvectors

Superposition and Completeness; Solution of Hamilton's Equations; Normal Coordinates; Numerical examples

EXAM III

V. SCATTERING & COLLISION THEORY

VI. SPECIAL RELATIVITY

Instructional Strategy

The main instructional tool in this class is lecturing. The emphasis in this course is to introduce and train the student in solving mechanics problems using elementary mathematical methods, which are mainly based on solving differential equations arising from Newton's Laws. As such, pure theoretical derivations are kept to a minimum and are only used to introduce the basic concepts. Most of the lecturing time is thus dedicated to the demonstration of solving mechanical problems. Weekly homework assignments allow the student to practice problem solving techniques discussed in class and to develop a deeper understanding of the material. Solutions of homework problems are subsequently discussed in class, where a student usually presents his/her solution.

Minimum Require Facilities

Traditional lecture room.

Student Evaluation

Student Evaluation

There are three exams for 75 points and 5 Homework Assignments for 25 points.

Grading System

The overall score is determined by calculating the percentage of points obtained by the student. Grades are then assigned according to the standard curve: 100-90% = A, 89-80% = B, 79-70% = C, 69-60% = D, 59-0% = F.

Bibliography

TEXT : Classical Mechanics by John R. Taylor

ISBN-13:978-1-891389 ISBN-10: 1-891389-22-X

The content of this course is similar and on the level of the standard texts:

1. Classical Mechanics by Barger & Olsson, 1995, McGraw-Hill
2. Classical Dynamics by Marion & Thornton, 1995, Saunders College Publishing
3. Classical Dynamics: A Contemporary Approach by J.V. Jose and E.J. Saletan, 1998, Cambridge University Press

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The University of Puerto Rico complies with all federal and state laws and regulations regarding discrimination, including "The American Disabilities Act" (ADA law) and Law 51 of the Commonwealth of Puerto Rico. Students that receive services from the Vocational Rehabilitation Office should communicate with the professor at the beginning of the semester to discuss any academic accommodation and equipment he (she) needs in accordance to the recommendations from the Office of Disable persons affairs (OAPI) from the Student Dean Office. Other students that need assistance or accommodations should communicate with the professor.