THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Physics

PHY 301- Analytical Mechanics I

COURSE PARTICULARS

Course Code: PHY 301
Course Title: Analytical Mechanics I
No. of Units: 3
Course Duration: Three hours of theory per week for 15 weeks.
Status: Compulsory
Course Email Address: phy301@gmail.com
Course Webpage: http://www.fwt.futa.edu.ng/courseschedule.php?coursecode=PHY%20204
Prerequisite: IMC 201

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This course is an application of Vector analysis to solve numerical problems in mechanics. It is designed to expose students to the use of vector theory as a tool to analyse and interpret numerical problems in both Dynamics and Statics. The knowledge of vector analysis of mechanical laws will also meet the requirement for proper understanding of other aspects of physics such as quantum mechanics and electromagnetic theory.

Topics to be covered are dynamics- Newton laws, work-energy theory, conservative forces, Rigid-body dynamics, central force problems, and oscillatory motion.

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to the use of vector analysis to solve problems in dynamics and statics.
- provide students with adequate tools to represent and interpret numerical problems in Dynamics and statics: e.g components of motions on a plane and in space.

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- express definitions, expressions and Dynamical laws in vector notations;
- classify and represent mechanical quantities in vector and scalar form;
- solve problems of motion and forces using vector analysis;

(Skills)

- use vector analysis to represent and analyse linear motion, curvilinear motion in several dimensions to solve particular problems such as:
    - motion of projectiles;
    - motion conveyor belts;
    - central force problems;
    - rigid body dynamics;
- understand the basics of oscillatory motion to be applied in the study of electromagnetic theory
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GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	10%
Assignments	10%
Test(s)	20%
Final Examination	60%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures tutorial classes. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with the lecturer.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted during lecture hours.

READING LIST

[1] Alonso-Fin, 1967: Fundamental University Physics. Vol. 1 Addison-Wesley publishing company, US.

Legend
1- Available in the University Library
2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview Newtonian Mechanics.	During this first class, the expectation of the students from the course will also be documented.
2 & 3	Motion of particles in one, two, and three dimensions • Work-energy theorem • Liner and Angular momentum	Relevant numerical problems will be solved and given as exercises.
4 & 5	Systems of particles and collision theory. • Curvilinear motion • Newtonian gravitation • Gravitational potentials	Relevant numerical problems will be solved and given as exercises.
6	Conservative forces and Potentials. • work done in conservative fields	Exercises will involve practical applications of energy conservation principles.
7 & 8	Oscillations • Types of Oscillations • Dynamics of oscillatory motion • Period, phase, frequency calculations •	Students will be requested to solve numerical problems as exercises. MID-SEMESTER TEST
9 & 10	Central force Problems • Trajectories in central force • Angular momentum • Torque •	Applications of torque and angular momentum will be discussed.

11 & 12	Rigid body dynamics • Moment of inertia • Energy of rolling bodies • Parallel axes theorem • Perpendicular axes theorem • Compound pendulum •	Determination of moment of inertia will be conducted in the laboratory during practical classes.
13 & 14	Mechanics of continuous media • Accelerated frames of reference •	Relevant examples and use of different coordinate systems will be included.
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.