USIU

UNITED STATES INTERNATIONAL UNIVERSITY

COURSE SYLLABUS FALL SEMESTER 2021

NSC 2215 A: INTRODUCTION TO PHYSICAL MECHANICS

INSTRUCTOR: DR. GITHIRI J.G

CREDIT: 3 UNITS Lecture Hours: FRIDAY 1.30PM – 5.10 PM

1. COURSE DESCRIPTION

NSC 2215 is an introductory course in physical mechanics and other related topics in Physics. The course mainly presents principles of motion of objects and Newtonian mechanics. It also includes basic concepts of thermal physics, electromagnetic waves, optics, electricity and nuclear radiation. The course is taught through lectures, assignments and class demonstrations. This course is for a non-science major in Physics.

2. PURPOSE OF THE COURSE

It is important that students are connected to variety of ways to everyday lives through technology like computers, collisions, energy and other physical processes. Students should try things and understand them, discover relationships between physical quantities and look for answers in the world around them. Be inquisitive and learn to solve the problems systematically using laws of Physics since it is the most fundamental of all natural sciences.

3. OBJECTIVES

The main objectives of the introductory physical mechanics course are three folds:

a) To present the student with a clear and logical concepts and principle of physical mechanics and other streams of Physics.
b) To strengthen an understanding of the concepts and principles of Physics.
c) To familiarize students with problem-solving methodology and actively involve them in the learning process.

4. COURSE LEARNING OUTCOMES

At the end of the course, the student should be able to:

a) identify physical quantities and their respective SI units
b) state basic physics laws on motion, energy, optics and electricity.
c) solve simple problems using above laws.
d) Identify and derive effective resistance and capacitance in a simple electric circuits
e) calculate power consumption by loads in electric circuits
f) mention and explain nuclear radiations and risks involved.

5. PROGRAMME LEARNING OUTCOMES

a) Higher order thinking
   i) Compile, analyze and evaluate the data for appropriate conclusion.
   ii) Design, develop and demonstrate the ability to think critically and creatively.

b) Literacy
   i) Students to develop skills to do independent thinking, research, referencing and achieving.
   ii) Develop competency in scientific, oral and written communication in an adequate scientific format.

c) Preparedness for careers
   To acquire mastery skills through intellectual knowledge and become confident in oneself.

6. COURSE CONTENT

Week One: ***Units and Dimension (pp 1 - 16)***

- Introduction
- SI units and sub-units
- Conversion of units
- Fundamental and derived physical quantities
- Dimensions and its applications

Week Two: ***Scalar and Vectors (pp 54 - 60)***

- Simple trigonometric functions
- Scalar and vector quantities
- Properties of vectors: Addition and Multiplication of vectors
- Components of vectors
- Problem solving examples

Term paper topic: Generation of Electricity

Week Three: ***Motion in one dimension (pp 24 - 42)***

- Co-ordinate system
- Concept of Displacement, velocity and acceleration
- Motion with constant acceleration
- Freely falling bodies
- Problem solving examples

Week Four: ***Force and Laws of Motion (pp 83 - 101)***

- Concept of force
- Newton's laws of motion
- Force of gravity and weight
- Problem solving examples

1st Assignment

Week Five: ***Work and energy (pp 119 - 147)***

- Work
- Energy: Kinetic and Potential energy
- Conservation of energy
- Power
- Problem solving examples

Week Six: ***Linear momentum and Collisions (pp 161 - 178)***

- Linear momentum and impulse.
- Conservation of momentum.
- Elastic and inelastic collisions in 1-D.
- Problem solving examples

Week Seven:

- *Revision and Discussion*
- Mid-Semester Examination

Week Eight: ***Electricity and magnetism (pp 497 - 531)***

- Types of charges
- Conductors and insulators, Lightning arresters
- Static and current electricity
- Basic magnetism.

Week Nine: ***Simple Electric Circuits (pp 696 - 701)***

- Potential difference, current and resistance: Ohm's law
- Simple series and parallel electric circuits
- KPLC Power and Energy
- Problems solving examples

Week Ten: ***Light and Optics (pp 732 - 748)***

- Electro-magnetic spectrum and its energy.
- Laws of reflection and Refraction of light
- Types of Lenses and Images formed
- Applications of reflection and refraction: e.g Optical Instruments
- Problem solving examples

Submission of Term Paper

Week Eleven: ***Heat and thermometry (pp 322 - 352)***

- Temperature and thermometers, Zeroth law
- Temperature scales: Celsius and thermodynamic scales
- Heat transfer
- Kinetic theory of gases and gas laws

- Problem solving examples

2nd Assignment

Week Twelve: *Nuclear Radiations (pp 913 - 937)*

- Introduction of an atom: Energy levels, Nucleus of an atom
- Isotopes of Elements
- Radioactivity
- Types of nuclear radiations

Week Thirteen: ***Nuclear Energy (pp 937 - 941)***

- Nuclear reactions: fission and fusion
- Applications of nuclear reactions: Dating, Energy, Nuclear reactors etc

Week Fourteen:

- Revision and Discussion
- Final Examination

7. TEACHING METHODOLOGY

- The course will be conducted mainly through lectures, hand-outs and notes.
- Selected numerical problems will be handled as a group activity in class where students will solve the problems.
- Students will be given take-way assignments to research on and submit results for grading
- Class discussions and participation of students encouraged

8. COURSE TEXTS

- *College Physics* by Vuille *et al*, 8th Edition

9. OTHER REFERENCE TEXTS

Students are advised to refer to the following text books to supplement their course text

- *Fundamentals of Physics* by Halliday & Resnick (Part 1 and 2)
- *World of Physics* by Alison
- *Physics of Scientists and Engineers* by Serway Beichner
- *Applied Physics* by Tippens
- *Fundamental of Physics* by Martindale
- *Advanced Level Physics* by Nelkon and Parker

10. RECOMMENDED SCIENTIFIC JOURNALS

- New Scientist.
- Scientific American
- Science Journal
- Journal of Science, Internet

11. COURSE EVALUATION

Participation	10%
Assignments	15%
Term paper	20%
Mid-quarter exam	25%
Final exam	30%

12. TERM PAPER

A comprehensive *Scientific Report* should be prepared by the students on a given topic. The report should include latest scientific information and presented in a scientific format of about ten typed pages, double spaced and with adequate references (at least six). Note references should include internet, journals and text books.

13. KEY INSTITUTIONAL ACADEMIC POLICIES

Students should note the following are key policies as outlined in the University Catalogue and Students Handbook.

a) Academic dishonesty

i) Any intentional giving or use of external assistance during an examination without the express permission of the faculty member giving the examination

ii) *Fabrication*: any falsification or invention of data, citation or other authority in an academic exercise.

iii) *Plagiarism*: any passing off of another's idea, words, or work as one's own.

iv) *Previously submitted work*: presenting work prepared for and submitted to another course.

b) Class Attendance

Students are expected to attend all classes. Upon being absent from seven classes in a 3 unit course, the instructor will give a student an "F" grade for that course.

14. GRADING

University grading scale will be applied

90	-	100	A
87	-	89	A-
84	-	86	B+
80	-	83	B
77	-	79	B-
74	-	76	C+
70	-	73	C
67	-	69	C-
64	-	66	D+
62	-	63	D
60	-	61	D-
	Below 59		F

EXAMINATION REGULATIONS

I. INVIGILATION

1. The supervisor should take the following steps prior to the commencement of he examination:

   i) Ensure that there are no materials on the board, walls, floor or furniture that might facilitate cheats.

   ii) Ensure that the seating plan does allow sufficient distance between candidates.

2. Candidates will be allowed into the examination room no earlier than 5 minutes before the commencement of the examination.

3. Only candidates with valid USIU student identity cards will be admitted into the examination room. A candidate is required to wear his or her identity tag throughout the duration of the examination. The invigilator should check the cards to ensure that they are authentic and that nothing is scribbled on them.

4. As candidates enter the examination room they must surrender the following before them take up their seats:

   * Bags
   * Overcoats
   * Caps/hats
   * Books
   * Notes
   * Papers
   * Cellphones
   * Calculators
   * Scientific watches
   * Portable audios and
   * any other objects that might be used for cheating

5. Calculators, log tables and geometrical sets shall not be allowed unless otherwise directed by the instructor.

6. The invigilator reserves the right to confiscate any unauthorized materials.

7. No candidate will be allowed into the examination room 20 minutes after the commencement of the examination.

8. No candidate will be permitted to leave the examination room while the examination is in progress except in cases of emergency. Such emergencies will not include bathroom visits.

9. Invigilators must ensure that absolute silence is observed in the examination room.

10. At least 5 minutes prior to the commencement of the examination invigilators will:

(i). Take a roll call using the official class list.

(ii). Send away any student whose name is not on the official class list.

(iii). Ask the candidates to surrender any unathorized material.

(iv). Draw the attention of the candidates to the consequences of cheating in an exam

(v). Draw the attention of the candidates to the instructions on the front cover of the answer books and in the question papers.

11. Once the question paper is issued an invigilator must be alert and in attendance until the scripts are collected.

12. Below are some of the cheating methods in order of popularity:-

(i). Swapping and substitution of answer sheets or booklets

(ii). Swapping question papers

(iii). 'microchips' or condensed/minimized notes smuggled using devices such as

- ball pens
- pencil pouches
- shoes
- ties
- shirt/blouse sleeves
- limbs, especially palms, arms and thighs
- chairs
- calculators (especially sliding)
- cell phones
- spectacle cases
- walls and roof
- walkman

(iv). Stealing a glance at other candidate's answers.

(v). Feigned bathroom 'emergencies'

(vi). Candidate substitution

(vii). Whispers and gestures.

13. There must be at least one invigilator for every 40 students in an examination room.

14. To thwart cheats, the invigilators should:

(i). Monitor the candidates continuously.

(ii). Never bring reading material or own work to the examination room.

(iii). Never return assignments, quizzes or term papers during the exam.

(iv). Walk around the room from time to time, inspecting pencil sets and other items that could be used to hide 'microchips'. Invigilation from the back is particularly effective in a room with many candidates and having 2 or more invigilators.

15. If an invigilator directly observes or otherwise determines (based on other evidence) that an act of cheating or misconduct has been committed or attempted s/he should take the following steps:

(i). Caution the candidate(s) involved that they are suspected of cheating.

(ii). Confiscate or take note of the **suspected** material but allow the candidate to continue with the examination.

(iii). Make a description of the suspected misconduct with specific date, time and circumstances and witnesses.

(iv). Send the report to the Dean with a recommendation as to whether the suspected misconduct is a serious violation or an infraction under USIU academic code of conduct.

II. MISSING EXAMINATIONS

In the past some students have failed to present themselves for scheduled examinations without good cause.

All students must ensure that they familiarize themselves with the examination timetable so as to report for each examination at the appointed time and place.

THERE ARE NO MAKEUPS FOR MISSED OR FAILED EXAMS.

However, in the event of serious illness, bereavement or accident the victim should report the matter to the appropriate Dean and instructor as promptly as possible. Only those cases reported immediately and supported with evidence will be considered.