Semester wise AC & ELC Subject Combination of PHYSICS

Semester	Course Category	Code	Papers	Credits
Semester I / II	Associated Core (PHYSICS)	AC-1/2	MECHANICS	4
Semester III / IV	Elective Course (PHYSICS) - 1	ELC-1	ELECTRICITY AND MAGNETISM	4
Semester V / VI	Elective Course (PHYSICS) - 2	ELC-2	THERMODYNAMICS AND STATISTICAL PHYSICS	4
Semester VII / VIII	Elective Course (PHYSICS) - 3	ELC-3	WAVES AND OPTICS	4

INSTRUCTIONS FOR QUESTION SETTER

1. **Semester Internal Examination Question Pattern** (15 Marks)

The **Semester Internal Examination (SIE)** will carry a total of **15 marks**, which includes **10 marks for the internal test** and **5 marks for class attendance**. The question paper will have **two groups**.

Group A will have: **Question 1:** Five very short answer questions (1 mark each, total 5 marks)

Group B will have: Two descriptive-type questions of 5 marks each, out of which students must answer **any one** (total 5 marks)

The remaining **5 marks** will be based on **class attendance**, as per the following:

➢ Up to 45% attendance: 1 mark
➢ 46% to 54%: 2 marks
➢ 55% to 64%: 3 marks
➢ 65% to 74%: 4 marks
➢ 75% and above: 5 marks

2. **End Semester University External Examination Question Pattern** (60 Marks)

The **End Semester Examination (ESE)** will be of **60 marks** and will also have **two groups**.

Group A (Compulsory) will include: **Question 1:** Five very short answer questions (1 mark each, total 5 marks)

Questions 2 and 3: Two short answer questions (5 marks each, total 10 marks) **Group B** will contain **five descriptive-type questions** of **15 marks each**, out of which students must answer **any three** (total 45 marks)

Note: Questions may have sub-parts if needed in the theory examination.

3. **End Semester University Practical Examination Question Pattern** (25 Marks)

The **End Semester Practical Examination (ESE)** will be of **6 hours duration**. The total marks and evaluation should be done as per the following guidelines:

• **Experiment/Activity performed during the exam** – 15 marks
• **Practical record notebook** – 5 marks
• **Viva-voce (oral questions)** – 5 marks

Students must score **at least 10 marks** to pass the practical examination.

Internal Semester Examination: 10 Marks

F.M.=10	Subject/Code Time= 1 Hrs.	Exam Year
i. **Group A** carries very short answer type **compulsory** questions. ii. **Answer 1 out of 2** subjective/ descriptive questions given in **Group B**. iii. Answer in your own words as far as practicable. iv. Answer all sub parts of a question at one place. v. Numbers in right indicate full marks of the question.		

<center>**Group A**</center> [5x1=5]

1.
    i.   ....
    ii.   ....
    iii.   ....
    iv.   ....
    v.   ....

<center>**Group B**</center>

2. ....   [5]
3. ....   [5]

Note: There may be subdivisions in each question asked in Theory Examination.

End Semester Examination: 60 Marks

F.M.=60	Subject/Code Time= 3 Hrs.	Exam Year
i. **Group A** carries very short answer type **compulsory** questions. ii. **Answer 3 out of 5** subjective/ descriptive questions given in **Group B**. iii. Answer in your own words as far as practicable. iv. Answer all sub parts of a question at one place. v. Numbers in right indicate full marks of the question.		

<center>**Group A**</center> [5x1=5]

1.
    i.   ....
    ii.   ....
    iii.   ....
    iv.   ....
    v.   ....

2. ....   [5]
3. ....   [5]

<center>**Group B**</center>

4. ....   [15]
5. ....   [15]
6. ....   [15]
7. ....   [15]
8. ....   [15]

Note: There may be subdivisions in each question asked in Theory Examination.

PROMOTION CRITERIA

- All students will be promoted in odd Semesters (I, III, V & VII).
- To get a promotion from Semester II to Semester III, from Semester IV to Semester V, and from Semester VI to Semester VII a student has to procure a minimum of 4 CGPA.
- However, it will be necessary to obtain a minimum credit (4) to pass in each of the subjects individually before completion of the course.

CALCULATION OF MARKS FOR THE PURPOSE OF RESULT

The passing in a subject will be based on the combined marks obtained in both the internal and external examinations of the semester. However, the student must pass theory and practical examinations separately.

COURSE: ASSOCIATED CORE (PHYSICS) **TOTAL CREDITS:** THEORY-03, PRACTICAL-01
PAPER NAME: MECHANICS **TEACHING HOURS:** THEORY-45, PRACTICAL-30

EVALUATION			
	External Exam	**Internal Exam**	**Practical**
Full Marks	60	15 (10 Written + 5 Attendance/Overall Class Performance)	25
Duration of Exam	3 Hours	1 Hour	6 Hours
Pass Marks	30 Marks		10 marks

Course Objectives:

This course aims to enable the students to acquire the mathematical knowledge about the vector algebra and ordinary differential equation with their role in applied physics. Key concepts of the general properties of matter, the motion of a particle under central force field, oscillations and non-inertial systems.

Learning Outcomes:

● Understanding about vector algebra and ODEs will be developed.

● Learn about the behaviour of physical bodies around us in daily life.

● Understand the dynamics of planetary motion.

● Build a foundation of various applied field in science and technology.

● Develop the analytical thinking on Mechanics in order to understand the response of the classical systems to external forces.

PART A

THEORY COURSE CONTENTS:

UNIT I:

Introductory Mathematics (10 Lectures): Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

UNIT II:

General Properties of Matter (15 Lectures): Hooke's law. Stress-strain diagram. Elastic moduli. Poisson's Ratio-expression for Poisson's ratio in terms of elastic constants. Relation between Elastic constants. Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder. Kinematics of Moving Fluids: Viscous fluid, Poiseuille's Equation for Flow of a Liquid through a Capillary Tube with correction, Flow of compressible fluid through a capillary tube. Effect of temperature and pressure on viscosity. Surface tension and surface energy. Angle of contact. Expression for excess pressure. Effect of temperature and pressure on surface tension.

UNIT III:

Work, Energy and Motions (20 Lectures): Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work and Potential energy. Work done by nonconservative forces. Law of conservation of Energy. Motion of a particle under a central force field. Two bodies problem. Conservation of angular momentum. Kepler's Laws of planetary motion and their derivation. Satellite in circular orbit and applications. Weightlessness. Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations. Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

SUGGESTED READINGS:

1.   An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
2.   Mechanics, D. S. Mathur.
3.   Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4.   Feynman Lectures, Vol. I, R.P. Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education.
5.   Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
6.   University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

PRACTICAL COURSE CONTENTS:

List of Practical:

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study errors: Truncation and round off errors, Absolute and relative errors.
3. To determine the elastic Constants of a wire by Searle's method.
4. To determine the value of g using Bar Pendulum.
5. To determine the value of g using Kater's Pendulum.
6. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

SUGGESTED READINGS:

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
2. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.
5. Numerical Methods, E Balagurusamy, McGraw Hill Education.

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