Engineering Physics II
EG 1202 SH

Year: I **Total: 8 hours /week**
Semester: II **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description
This course in physics is designed to provide students with an understanding of the scientific laws of our physical world, and how physics contributes to life's activities in modern society. The course emphasizes both quantitative and qualitative aspects of physics, involving mathematical models and equations. The application of physics to social and environmental situations is well illustrated.

The practical component of this course is designed to supplement learning through the application of learned theory. The students will handle simple apparatus to do simple measurements, demonstrate simple electrical circuits, and apply their knowledge of physics to real life examples.

Course objectives
On completion of the course the student will be able to:
- Sustain interest in physics and its applications related to everyday experiences of their life
- Identify the social, economic, environmental and other implications of physics
- Describe physics as a coherent and developing framework of knowledge based on fundamental theories ofthe structures and processes of the physical world
- Demonstrate the skills of experimenting, observing, interpreting data and evaluating evidence to formulate generalizations and models
- Apply knowledge of physical principles to familiar and unfamiliar situations
- Apply facts, vocabulary and conventions to unit measurements and common measuring instruments
- Explain the definitions, laws, concepts, theories and models presented in this course.
- Describe the applications and implications of physical facts and principles.
- Explain the basic concept of Physics relevant to problems for the understanding and practicing related in engineering works.

Course Contents

Theory

Unit 1: Electrostatics, Current and Electromagnetism [20hrs]

Sub-Unit 1.1: Electrostatics and capacitors 4hrs]
- Elementary charges, charging by induction
- Faraday`s Ice-pail experiment, electric field, lines of force
- Coulomb`s law, intensity of electric field
- Electrostatic potential, equipotential surfaces, action of points
- Capacitors, types of capacitors
- Grouping of capacitors, action of dielectrics

- Simple Numerical Problems

Sub-unit 1.2: Current Electricity **[7 Hrs.]**

- D.C. current, strength of current
- Potential difference across a conductor
- Ohm' law and its verification
- Resistance and resistivity
- Connection of resistances
- Galvanometer and its conversion into ammeter and voltmeter
- Potentiometer and its use to measure emf
- Wheat stone bridge
- Kirchhoff's laws and their uses in simple circuits
- Joule's law of heating
- The rate of heating from the concept of p.d.
- See- beck effect, Peltier effect, Thomson effect
- Simple Numerical Problems

Sub- unit 1.3: Magnetic effect of current and electromagnetism **[6 Hrs.]**

- Magnetic forced and magnetic field of current
- Force experienced by a charge moving in magnetic field
- Force acting of current carrying conductor
- Statement of Biot - Savart's law
- Magnetic field due a long straight conductor and due to a circular coil
- Force acting between two current carrying parallel conductors
- Application of Ampere's law to calculate magnetic field due to a solenoid
- Faraday's laws of electromagnetic induction
- Lenz's law
- Self- induction and mutual induction in coils
- Working of transformer
- Simple Numerical Problems

Sub- unit 1.4: Alternating current **[3 Hrs.]**

- Generation of A.C. by A.C. generator
- Instantaneous and effective values of current and voltage
- Relation between voltage and current in R and L circuit
- Phase between current and voltage
- Resonance and power in A.C. circuit
- Simple Numerical Problems

Unit 2: Waves and optics **[13 Hrs.]**

Sub- unit 2.1: Wave motion **[3 Hrs.]**

- Wave motion and its type
- Characteristics of wave motion
- Wavelength, frequency and speed of waves
- Velocity of waves in different media
- Simple Numerical Problems

Sub- unit 2.2: Sound waves **[5 Hrs.]**

- Reflection, refraction, diffraction, interference
- Beats and beat frequency
- Determination of beat frequency
- Progressive waves, stationary waves and their equations

- Waves in pipes and strings
- Fundamental mode and overtones in pipes and strings
- Intensity of sound, intensity level and inverse square law
- Simple Numerical Problems

Sub- unit 2.3: Physical **[5 Hrs.]**

- Coherent sources of light and interference
- Phase difference and path difference
- Young's double slit experiment
- Diffraction and polarization of light
- Brewster's law
- Huygen's principle
- Simple Numerical Problems

Unit 3: Properties of matter **[10 Hrs.]**

Sub unit 3.1: Elasticity **[4 Hrs.]**

- Elasticity; Hooke's law
- Stress, strain, Young's modulus, Bulk modulus and shear modulus.
- Energy stored in stretched string
- Simple Numerical Problems

Sub-unit 3.2: Surface Tension **[3 Hrs.]**

- Intermolecular attraction in liquid, surface tension
- Cohesion and adhesion, angle of contact
- Surface energy, capillary action
- Simple Numerical Problems

Sub-unit 3.3: Viscosity **[3 Hrs.]**

- streamline and turbulent flows
- Idea of liquid layers, velocity gradient, coefficient of viscosity
- Viscous forces, Stoke's law, terminal velocity
- Simple Numerical Problems

Unit 4: Modern Physics **[17 Hrs.]**

Sub-unit 4.1: Atomic Physics **[9 Hrs.]**

- Motion of charged particles in electric and magnetic fields
- e/m for electrons, Millikan's oil drop experiment
- Photons, photoelectric effect, Stopping potential for photoelectrons
- Einstein's photoelectric equation
- Bohr's model for hydrogen atom
- Energy level diagram and spectral series
- X-rays; production, properties and applications
- Introduction of Laser
- Simple Numerical Problems

Sub-unit 4.2: Semiconductors **[5 Hrs.]**

- Valence electrons and Energy bands in solids
- Intrinsic and doped p-type, n-type semiconductors
- Charge carriers in semiconductors
- Acceptors, donors, p-n junction diode
- Depletion layer, forward and reverse biasing
- Rectifying properties of a diode

- Simple Numerical Problems

Sub-unit 4.3: Nuclear Physics **[3 Hrs.]**

- Laws of radioactive disintegration
- Half-life, mean-life and decay constant
- Stable and radioactive nuclei
- Binding energy, nuclear fission, critical mass and nuclear fusion
- Simple Numerical Problems

Tutorial:

The instructors should practice the numerical problems of following topics as indicated by credit hours

S. N.	Units	Sub Units	Credit hours	
1	Electricity	Electrostatics and Capacitors	4	14
		Current Electricity	5	
		Magnetic effect of current and Electromagnetism	3	
		Alternating Current	2	
2	Waves	Wave motions	2	8
		Sound waves	1	
		Physical Optics	2	
		Elasticity	3	
3	Properties of Matter	Viscosity	1	5
		Surface Tension	1	
		Semi-conductors	3	
4	Modern Physics	Nuclear Physics	3	3
Total Hours			**30**	**30**

Engineering Physics Practical II **[30 Hrs.]**

1. Determine specific resistance of a wire.
2. Determine the frequency of A.C. mains.
3. Study current voltage characteristics of a junction diode.
4. Determine speed of sound by resonance air column method.
5. Determine Young Modulus.
6. Verify Ohm's law.
7. Determine force constant of a helical spring oscillation method.
8. Compare Emfs of two cells by using potentiometer.
9. Study characteristics curves of npn transistor.
10. Determine unknown resistance by Wheatstone bridge method.

Learning materials:

1. Advanced level physics by Nelkon and Parker, 5th and later editions
2. College physics by sears, Zemansky and Young, Fourth and later editions

Textbooks for laboratory work:

1. Physics Practical book by S.K. Neupane.

Other learning materials:

1. Reference to be selected by the related lecture(s) from among the texts available in the market that meet the content needs of this subject.
2. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the questions will be as indicated as in the table below.

S. N.	Units	Sub Units	Credit hours		Total marks
1	Electricity	Electrostatics and Capacitors	7	20	12
		Current Electricity	4		
		Magnetic effect of current and Electromagnetism	6		12
		Alternating Current	3		
2	Waves	Wave motions	3	13	12
		Sound waves	5		
		Physical Optics	5		
3	Properties of Matter	Elasticity	4	10	8
		Viscosity	3		
		Surface Tension	3		
4	Modern Physics	Atomic Physics	9	17	16
		Semi-conductors	5		
		Nuclear Physics	3		
	Total credit hours		**60**	**60**	**60**