SUBJECT TITLE : APPLIED SCIENCE –II.
(Common for All Engineering / Technology Programmes)
SUBJECT CODE :
PERIODS/WEEK : 6 (Physics 3 + Chemistry 3)
PERIODS/SEMESTER : 108 (54+54)
CREDITS : 6

RATIONALE:-

Knowledge of Applied Science is essential to develop scientific temper, basic understanding of concepts and principles of science so as to give a good foundation for further study of engineering courses and also to help in developing continued learning skills. The course is intended to achieve the same.

PARTS – A: ENGINEERING PHYSICS

TIME SCHEDULE

Module	Topic	Periods
I	1.1.0 Statics	10
	1.2.0 Fluid Flow	4
	1.3.0 Viscosity	3
	1.4.0 Surface Tension	3
	1.5.0 Simple Harmonic Motion	6
	Test I	1
II	2.1.0 Optics	5
	2.2.0 Electricity	12
	2.3.0 Gates	2
	2.4.0 Laser	4
	2.5.0 Photoelectric Effect	3
	Test II	1
	Total	**54**

OBJECTIVES

On Completion of the module, the student will be able to

MODULE-I

1.1.0 Statics

1.1.1 Understand the principles of statics and its applications
1.1.2 Add Vectors using triangle method.
1.1.3 Define Resultant and Equilibrant of vectors.
1.1.4 State Parallelogram law of forces.
1.1.5 Derive expression for resultant using Parallelogram law.
1.1.6 State the law of triangle of forces.
1.1.7 State Lami's theorem.
1.1.8 Explain moment of a force.
1.1.9 State the conditions of equilibrium of a rigid body acted upon by a large number of coplanar parallel forces.
1.1.10 Derive expression for work done by a couple.

1.2.0 Fluid Flow

1.2.1 Understand the principle of fluid flow
1.2.2 Distinguish between Streamline and Turbulent flow.
1.2.3 Explain Pressure energy, Kinetic energy and Potential energy of a liquid.
1.2.4 Mention equation of continuity.
1.2.5 State Bernouille's theorem.
1.2.6 Explain the working of airfoil and atomizer.

1.3.0 Viscosity

1.3.1 Apply the principle of viscosity in solving problems.
1.3.2 Define coefficient of viscosity.
1.3.3 Give the Poiseusille's formula.
1.3.4 Explain terminal velocity.
1.3.5 Mention Stoke's formula.
1.3.6 Explain the effect of temperature on viscosity
1.3.7 Solve problems using Poiseuille's formula.

1.4.0 Surface Tension

1.4.1 Comprehend the phenomenon of surface tension and its applications.
1.4.2 Define surface tension.
1.4.3 Explain angle of contact and cappilarity.
1.4.3 Define surface energy.
1.4.4 Derive the relation between surface tension and surface energy.
1.4.5 Mention the expression for the excess of pressure issued a spherical drop and bubble.
1.4.6 Solve problems related to surface tension.

1.5.0 Simple Harmonic Motion

1.5.1 Comprehend the concept of wave motion
1.5.2 Define Simple Harmonic motion.
1.5.3 Derive equation for simple harmonic motion.
1.5.5 Explain period, frequency, amplitude .
1.5.6 Distinguish between transverse and longitudinal waves.
1.5.7 Define wavelength.
1.5.8 Derive the relation $V = f\lambda$
1.5.9 Explain resonance.
1.5.10 Explain ultrasonic waves.
1.5.11 Mention applications of ultrasonic.

MODULE-II

2.1.0 Optics

2.1.1 Understand the concept of optical phenomena.
2.1.2 State Snell's law of refraction.
2.1.3 Explain critical angle and total internal reflection.
2.1.4 Explain the propagation of light through optic fibre.
2.1.5 Convex and concave lens.
2.1.7 Mention the formula $1/u + 1/v = 1/f$ (No derivation)
2.1.7 Mention the formula $1/f = (n-1)(1/R1 - 1/R2)$(No derivation)
2.1.8 Explain Simple microscope.
2.1.9 Explain blue colour of sky using scattering.

2.1.10 2.2.0 Electricity

2.2.1 Understand the fundamentals of electricity and its magnetic effect
2.2.2 State Kirchoff's laws.
2.2.3 Derive expression for balancing condition of wheat Stone's Bridge.
2.2.4 State Biots and Savart's law.
2.2.5 Mention the expression for magnetic field due to current through a circular coil.
2.2.6 State Fleming's left hand rule.
2.2.7 Describe the principle and construction of a moving coil galvanometer.
2.2.8 Explain the conversion of galvanometer into ammeter and voltmeter
2.2.9 Solves problems based on the above laws.

2.3.0 Gates

2.3.1 Understand the concept of logic gates.
2.3.2 Represent Logic gates symbolically.
2.3.3 Explain with the help of truth table.

2.4.0 Laser

2.4.1 Understand laser action and its application
2.4.2 Explain population inversion, spontaneous emission, stimulated emission and optical pumping.
2.4.2 Write down the characteristics of Laser.
2.4.3 Describe various applications of Laser.
2.4.4 Explain the working of Ruby Laser.

2.5.0 Photoelectric Effect

2.5.1 Comprehend the theories of photoelectric effect
2.5.2 Describe Max plank's quantum theory.
2.5.3 Explain Photoelectric effect and application(photoelectric cell)
2.5.4 State Laws of Photoelectric emission.
2.5.5 Derive Einstein's photoelectric equation.
2.5.6 Solve problems using the above equation.

CONTENT DETAILS

MODULE -I

Statics

Vectors and Scalars – Triangle Method of vector addition – Concurrent forces – Resultant and equilibrant – Parallelogram law – Derivation of the resultant in Magnitude and direction – Law of triangle of forces – Lami's theorem – Resolution of forces – Parallel forces – Like and unlike Parallel forces – moment of force- Conditions of equilibrium of body under the action of a number of coplanar parallel forces- Couple – Moment of a couple – work done by a couple – Numerical problems.

Fluid flow

Stream line and turbulent flow – Pressure energy, Potential energy and kinetic energy of a liquid – Equation of continuity – Bernoulli's theorem – Applications – Air foil and Atomizer.

Viscosity

Viscous force – Coefficient of viscosity - Poiseuille's formula, Stoke's formula and experiments- Variation of viscosity with temperature - Numerical problems.

Surface tension

Surface tension- Formation of drops and bubbles – Angle of contact- capillarity and Eepression for cappilary rise (no derivation).Surface energy – Relation between surface tension and Surface energy (Proof) – Expression for excess pressure inside a spherical drop and bubble (no derivation) - factors affecting surface tension . Problems.

Simple Harmonic Motin

Periodic and oscillatory motion-Definition of Simple Harmonic Motion – Examples - Equation of SHM – Period, frequency, amplitude – Transverse and longitudinal waves- Definition of wavelength ,wave velocity and frequency – Derivation of relation $v = f\lambda$ - free vibration – forced vibration – Resonance – Ultrasonic waves and applications. Numerical problems.

MODULE-II

Optics

Snell's law of refraction – Critical angle – Total internal reflection – Optical fibre – Convex and concave lens- lens formula -lens maker's formula (no derivation) Simple microscope –Scattering and its explanation -blue colour of sky .Numerical problems.

Electricity

Kirchoff's Laws – Wheatstone's bridge - Condition for balancing – Magnetic effect of Electricity, Biot- Savart's Law – Right hand palm rule – Magnetic field due to current carrying circular coil at a point on the axial line and at the centre (no derivation) Fleming's Left hand rule – Force on a current carrying conductor placed in a magnetic field – Moving coil galvanometer – theory and construction – Conversion of a galvanometer into ammeter and voltmeter – Numerical problems.

Gates

AND, OR, NOT, NAND, NOR and XOR gates (symbol and truth table)

Laser

Population inversion- Spontaneous emission- stimulated emission- optical pumping – characteristics and applications -Ruby laser-construction and its working

Photoelectric Effect

Quantum theory – Photoelectric effect- photoelectric cell and its applications – Laws of photoelectric effect – Einstein's photoelectric equation – Numerical problems.

REFERENCE BOOKS:-

1. Physics - Resnick and Halliday
2. Mechanics – D.S.Mathur
3. Mechanics – Narayana Kurup
4. Modern Physics - Murukesan
5. Digital and Computer Principle -Malvino
6. Engineering Physics – A.Marikani

PART – B: CHEMISTRY

TIME SCHEDULE

Module	Topic	Periods
I	1.1 Surface Chemistry	4
	1.2 Electro-chemistry	12
	1.3 Chemistry of Corrosion	10
	Test I	1
II	2.1 Introduction to Organic Chemistry	4
	2.2 Polymers & Composites	9
	2.3 Fuels	7
	2.4 Impact of Environmental Pollution and Green Chemistry	6
	Test II	1
Total		**54**

OBJECTIVES

MODULE 1:-

1.1.0 Surface chemistry:

1.1.1 Understand the difference between absorption and adsorption with examples
1.1.2 Understand adsorption as a surface phenomenon
1.1.3 Illustrate different types of adsorption
1.1.4 Mention the factors influencing adsorption
1.1.5 List the important applications of adsorption (Elementary idea only)

1.2.0 Electrochemistry:

1.2.1 Distinguish between a) conductors & insulators b) metallic & electrolytic conduction c) strong & weak electrolytes
1.2.2 Illustrate electrolysis taking molten NaCl as example, anode reaction & cathode reaction as oxidisation & reduction.
1.2.3 Explain the applications of electrolysis(electroplating & anodizing)
1.2.4 Distinguish between electrolytic cell & galvanic cell,
1.2.5 Outline the schematic representation of galvanic cell
1.2.6 Explain the classification of galvanic cells as primary & secondary
1.2.7 Illustrate primary cell with Daniel cell as examples
1.2.8 Illustrate secondary cell with Nickel-Cadmium cell as example
1.2.9 Explain the electrode reactions while charging & discharging of Ni-Cd cell
1.2.10 Explain the term electrode potential & emf of a cell
1.2.11 Understand electrochemical series and its applications
1.2.12 Explain the concept of fuel cells (elementary idea only)
1.2.13 Explain hydrogen-oxygen fuel cell with figure and electrode reactions
1.2.14 Mention the advantages and uses of fuel cells **1.3.0 Chemistry of Corrosion:**
1.3.1 Understand the concept of corrosion & identify it as an electrochemical process
1.3.2 Define corrosion
1.3.3 Explain the rusting of iron-mention the conditions for rusting
1.3.4 Explain the electrochemical theory of corrosion
1.3.5 Understand galvanic corrosion & differential aeration/oxygen concentration cell corrosion
1.3.6 Describe the methods of prevention of corrosion,{ (Barrier protection and Cathodic protection(sacrificial anode method only)}

MODULE II

2.1.0 Introduction to organic chemistry:

2.1.1 Understand the fundamental ideas of organic chemistry
2.1.2 List the differences between organic & inorganic compounds
2.1.3 Describe the uniqueness of carbon atom
2.1.4 Define 'catenation'
2.1.5 Distinguish between saturated & unsaturated compounds
2.1.6 Illustrate general classification & that based on functional groups
2.1.7 Define isomerism – explain with simple examples only

2.2.0 Polymers & Composites:

2.2.1 Understand the terms polymers , polymerization , Homopolymers,Co-polymers (examples)
2.2.2 Distinguish between addition & condensation polymerisation with examples
2.2.3 Differentiate between thermoplastics & thermosetting plastics
2.2.4 Distinguish natural rubber and synthetic rubber
2.2.5 Explain vulcanization & its merits
2.2.6 Define "fibre" and its classification & examples
2.2.7 Understand the monomers and uses of some industrially important polymers (Polyethene, PVC, Orlon, Polystyrene, Teflon, Bakelite, Nylon 6, Nylon 6.6, Buna, Buna-S, Buna-N, Neoprene, Thiokol, Silicon Rubber)
2.2.8 Understand the term composite
2.2.9 Mention the characteristics of composite
2.2.10 Understand the constituents of composite
2.2.11 Mention the different types of composite (Metal matrix composite, ceramic matrix composite and polymer matrix composite)

2.3.0 Fuels:

2.3.1 Understand the term "fuel"
2.3.2 Define calorific value
2.3.3 Explain their classification into solid, liquid & gaseous with examples
2.3.4 Explain briefly the liquid fuels petrol, diesel, kerosene
2.3.5 Explain cracking with an example
2.3.6 Mention the constituents of gaseous fuels(natural gas (CNG), producer gas, water gas, LPG & Gobar gas)
2.3.7 Compare solid, liquid and gaseous fuels
2.3.8 List the qualities of a good fuel.
2.3.9 Mention nuclear fuels with examples
2.3.10 Understand the idea of Rocket fuels- Propellants, Types giving one example each.

2.4.0 Impact of Environmental pollution and Green Chemistry

2.4.1 Recollect the terms pollution& pollutants
2.4.2 Understand the different types of pollution
2.4.3 Investigate the impact of pollution on the environment
2.4.4 Understand the terms ozone depletion, Green house effect, Acid Rain, Photochemical smog (basic Idea only)
2.4.5 Understand the relevance of Green Chemistry, principles and scope in the present scenario.

CONTENT DETAILS

MODULE 1 - PHYSICAL CHEMISTRY

Surface Chemistry

Differences between Absorption and Adsorption, Adsorption as a surface phenomenon, Types of Adsorption and their differences, Mention the factors influencing adsorption, List the important applications of adsorption.

Electrochemistry

Conductors & Insulators, Metallic & electrolyte conductors, strong & weak electrolytes – Mechanism of electrolysis – Molten NaCl as an example. Application of electrolysis – Electroplating & Anodizing. Galvanic cell — Primary cell (eg: - Daniel cell - Anode reaction, athode reaction & Net cell reaction) Secondary cells eg. Nickel- Cadmium Cell – charging & discharging) Electrode potential and e.m.f of a cell. Electrochemical series& its applications. Fuel cells – Introduction, Hydrogen – Oxygen fuel cell (figure and cell reaction), Advantages & applications.

Chemistry of corrosion

Definition – Rusting of Fe , condition for Rusting of Fe, Electrochemical theory of corrosion, Galvanic corrosion and differerential aeration corrosion. Prevention of corrosion i) Barrier protection iii) Cathodic protection (sacrificial anode method).

MODULE II - ORGANIC CHEMISTRY

Introduction to Organic Chemistry

Differences between organic and inorganic compounds – uniqueness of carbon – catenation, saturated and unsaturated – general classification of organic compound – classification based on functional groups ,isomerism(definition with an example).

Polymers &Composites

Define polymers , polymerisation, types of polymers (Homo and Co-polymers with examples) . Illustrate with examples Addition and condensation polymerization . Plastics -definition, Thermoplastics, Thermosetting plastic, with examples Rubber – Natural and synthetic rubber (example), vulcanization. and its advantages Fibre – Natural fibres, synthetic fibres, semi synthetic fibres, examples. Mention the monomers and uses of the following polymers- polythene, PVC, Orlon, Polystyrene, Teflon, Bakelite, Nylon 6, Nylon 6.6, Buna, Buna-S, Buna-N, Neoprene, Thiokol, Silicon Rubber.

Define the term composite . Mention the characteristics of composite .List the constituents of composite. Mention the different types of composite (Metal matrix composite, ceramic matrix composite and polymer matrix composite)

Fuels

Define fuel, calorific value, classification into solid, liquid & gaseous with examples ,liquid fuels- petrol, diesel, kerosene Define cracking with an example, Mention the constituents of gaseous fuels (natural gas (CNG), producer gas, water gas, LPG & Gobar gas) , Nuclear fuels with examples ,Comparison of Solid, liquid and gaseous fuels. Qualities of a good fuel.

Impact of Environmental pollution & Green Chemistry

Define the the terms pollution& pollutants , different types of pollution ,the impact of pollution on the environment, ozone depletion, Green house effect, Acid Rain, Photochemical smog (basic Idea only) Relevance, principles and scope of green chemistry in the present scenario

REFERENCES:-

1. B.S.Bahl A Text book of Organic Chemistry S.Chand & Co., New Delhi
2. Puri & Sharma A Text book of Organic Chemistry S.Chand & Co., New Delhi
3. Soni. P.L. A Textbook of physical Chemistry Sultan Chand & Sons, New
4. A.J. Lee Physical Chemistry William Heinemann Ltd.,
5. N. Krishna murthy, P. Vallinayagam, D. Madhavan Engg. Chemistry PHI Learning Ltd
6. Rashmi Sanghi, M.M. Srivastava Green Chemistry Narosa Publishing House