STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

SYLLABUS

L-SCHEME

(Implements from the Academic year 2011-2012 onwards)

Course Name : **All branches of Diploma in Engineering and Technology and Special Programmes except DMOP, HMCT and Film & TV**

Semester : **II Semester**

Subject Title : **Engineering Physics - II**

Subject Code : **2005**

Teaching and Scheme of Examination: **No of weeks per semester : 16 weeks**

Subject	Instructions		Examination			
	Hours/Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Engineering Physics-II	**4 Hrs**	**64 Hrs**	**25**	**75**	**100**	**3 Hrs**

Topics and Allocation of Hours:

Sl.No.	Topic	Time(Hrs)
1.	HEAT	12
2.	HEAT AND NON-CONVENTIONAL ENERGY	13
3.	LIGHT AND REMOTE SENSING	13
4.	ELECTRICITY	13
5.	ELECTRONICS AND NANO TECHNOLOGY	13
Total		64

RATIONALE:

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Science such as Physics.

The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the foundation by enlightening the **Fundamental facts, Principles, Laws and Correct sequence of events** to develop the Engineering and Technology field for the prosperity of human beings.

OBJECTIVES :

At the end of the study of II Semester the student will be able to :

- Identify good conductors and insulators of heat.
- Analyse the relation between pressure, volume and temperature of gas and to interpret the results.
- Understand the process of Isothermal and Adiabatic changes of gas and basic laws of thermodynamics.
- Acquire knowledge about liquefaction process of gases.
- Realise the inevitable need for tapping Alternate energy to address the looming energy crisis.
- Identify the characteristics and properties of LASER, Photo Electric effect and Optical fibre cable and their engineering applications.
- Acquire broader ideas about the process of remote sensing in tapping the earth resources for human benefits.
- Acquire knowledge about heating, chemical and magnetic effects of electric current.
- Understand the effect of self induction and mutual induction.
- Gain broader ideas of capacitors, diodes, transistors, integrated circuits, logic gates and nano materials.
- Identify, analyse and solve Engineering field related problems involving expressions derived in all the above topics.

II SEMESTER

2005 ENGINEERING PHYSICS –II

Contents: Theory

Unit	Name of the Topic	Hours	Marks
I	**HEAT** **1.1TRANSFER OF HEAT** Concept of Heat and Temperature – Centigrade, Fahrenheit and Kelvin scales of temperature measurement and their inter conversions – Conduction, convection and radiation – Definitions and explanations – Coefficient of thermal conductivity – Definition and SI unit – Selection of good and poor thermal conductors – Properties of thermal radiation. **1.2 KINETIC THEORY OF GASES** Postulates – Mean square velocity and Root Mean Square (RMS) velocity of molecules – Definitions and expressions – Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases- Relation between pressure, kinetic energy and absolute temperature of the gas – Mean kinetic energy per molecule of the gas – Boyle's law and Charles' laws – Deduction from the expression for the pressure of a gas. Simple problems based on the expression for the pressure of a gas **1.3 SPECIFIC HEAT CAPACITY** Specific heat capacity of a substance (solids and liquids) – Definition – Specific heat capacity of a gas at constant volume – Specific heat capacity of a gas at constant pressure – Ratio of specific heat capacities – Explanation for C_p greater than C_v – Derivation of Meyer's relation – calculation of Universal gas constant R from the gas equation PV = RT. Simple problems based on Meyer's relation.	**3 Hrs** **5Hrs** **4 Hrs**	**15**

II	**HEAT AND NON-CONVENTIONAL ENERGY** **2.1 ISOTHERMAL AND ADIABATIC CHANGES** Isothermal and Adiabatic changes - Explanation – Equations for isothermal and adiabatic changes (No derivation)Simple problems based on equations $P_1V_1 = P_2V_2$ and $P_1V_1^{\gamma} = P_2V_2^{\gamma}$ **2.2 LAWS OF THERMODYNAMICS** Zeroth law and first law of thermodynamics – Explanation - Second law of thermodynamics – Clausius statement and Kelvin's statement – Concept of heat engines and efficiency. **2.3 LIQUEFACTION OF GASES** Liquefaction, critical temperature, critical pressure and critical volume – Definitions – Principle used in cascade process – Cascade process of liquefaction of oxygen – Disadvantages of cascade process - Joule Thomson effect – Temperature of inversion – Liquefaction of air by Linde's process. **2.4 NON – CONVENTIONAL ENERGY** Introduction – Non-renewable and Renewable (Alternate) energy sources – Examples – Solar energy, wind energy, tidal energy, geothermal energy, Hot Dry Rocks (HDR) and bio-mass – Advantages and disadvantages of renewable energy.	**2 Hrs** **2 Hrs** **4 Hrs** **5 Hrs**	**15**

III	**LIGHT AND REMOTE SENSING** **3.1 REFRACTION OF LIGHT** Refraction – Laws of refraction – Refractive index of a medium / material – Definition – Refraction through prism – explanation – Angle of minimum deviation – Definition – Expression for refractive index of the material of the prism using it at minimum deviation position. **3.2 OPTICAL FIBRE CABLE** Fibre optics – Introduction – Phenomenon of total internal reflection – Application of total internal reflection in Optical Fibre Cable (OFC) as a wave guide – Advantages of O.F.C. **3.3 LASER** LASER – Characteristics of LASER – principle of LASER – Spontaneous emission – Stimulated emission – population inversion – Types of LASER – Production of LASER using semiconductor (GaAs) diode source – Uses of LASER. **3.4 PHOTO ELECTRIC EFFECT** Photo electric effect – Introduction – Hallwachs experimental arrangement – Einstein's photoelectric equation – Laws of photoelectric emission – Photo emissive cells – Photo voltaic cells – Solar cell – Applications. **3.5 REMOTE SENSING** Remote sensing – Introduction – Active and passive remote sensing – Explanation and examples – Components of remote sensing – Data acquisition, data analysis and reference data – Components of electro magnetic spectrum used in remote sensing – Microwave remote sensing – RADAR – principle and working with block diagram – Earth resources satellites (E.R.S).	**2 Hrs** **2 Hrs** **3 Hrs** **2 Hrs** **4 Hrs**	**15**
IV	**ELECTRICITY** **4.1 ELECTRICAL CIRCUITS** Ohm's law – Laws of resistances – Resistivity and Conductivity – Definitions – Elementary ideas about superconductivity and applications of super conductors –	**3 Hrs**	**15**

	Kirchoff's laws – Illustration by simple circuits – Condition for balancing the Wheatstone's network – Metre bridge – Experimental determination of resistivity of the material of a wire using metre bridge. Simple problems based on expression for resistivity. **4.2 HEATING AND CHEMICAL EFFECTS OF CURRENT** Joule's law of heating – Experimental determination of specific heat capacity of a liquid using Joule's calorimeter – Thermo electric effect – Seebeck effect – Peltier effect – Peltier coefficient – Faraday's laws of electrolysis – Electro chemical equivalent (e.c.e) of an element – Definition – Experimental determination of e.c.e. of copper. Simple problems based on expression for e.c.e. **4.3 MEASURING INSTRUMENTS** Motion of a charged particle inside a uniform magnetic field – Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field – Fleming's Left Hand rule – Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field – Working of a moving coil galvanometer and its merits – Conversion of galvanometer into an Ammeter and Voltmeter – Working of a multimeter Simple problems based on conversion of galvanometer into ammeter and voltmeter. **4.4 ELECTRO MAGNETIC INDUCTION** Faraday's laws of electro magnetic induction – Lenz's law – Fleming's Right Hand Rule – Self induction and mutual induction – Working of a transformer.	**3 Hrs** **4 Hrs** **3 Hrs**	
V	**ELECTRONICS AND NANO TECHNOLOGY** **5.1 CAPACITORS** Capacitance of a capacitor – Definition – ' farad '– Definition – Energy stored in a capacitor – Expressions for effective capacitance when capacitors are connected in series and parallel – Uses of dielectric materials in capacitors – Applications of capacitors. Simple problems based on expressions for effective	**3 Hrs**	**15**

	capacitance for series and parallel connections of capacitors. **5.2 SEMI CONDUCTORS** Semi conductors – Energy bands in solids – Energy band diagram of good conductors, insulators and semi conductors – Fermi Level – Intrinsic semiconductors - Concept of positive holes - Doping – Extrinsic semiconductors – P type and N type semiconductors. **5.3 DIODES AND TRANSISTORS** P-N junction diode – Forward bias and reverse bias – Rectification action of diode – Working of full wave rectifier using P N junction diodes in bridge type configuration - Action of diode as a varactor – Zener diode – Light Emitting Diode (L.E.D) – Liquid Crystal display (L.C.D) – Light dependent resistor (L.D.R) PNP and NPN transistors – Three different configurations – Advantages of common emitter configuration-Experimental method to draw input and output characteristics of an NPN transistor in common emitter configuration – Action of NPN transistor as a switch. **5.4 DIGITAL ELECTRONICS** Digital electronics – Introduction – Logic levels – Basic logic gates: OR, AND and NOT gates – Universal logic gates: NAND and NOR gates – Special logic gates: XOR and XNOR gates – Symbolic representation, Boolean expression and Truth table for all above logic gates – Integrated circuits – Fabrication - Levels of integration – SSI, MSI, LSI and VLSI. **5.5 NANO TECHNOLOGY** Nano materials – Introduction – Nano materials synthesis using chemical vapour deposition and Sol gels method – Properties and uses of nano materials.	**2 Hrs** **3 Hrs** **3 Hrs** **2 Hrs**	

Text Book : 1) Physics – Higher secondary – First year – Volume I & II – Tamil Nadu text book Corporation
2) Intermediate physics – Volume I & II – Anwar Kamal – Foundation books private Ltd.

Reference Book : 1) Fundamentals of physics – Brijlal and Subramaniam.
2) Simplified transistors circuits – M.L. Gupta – Dhanpat rai and sons.
3) Fundamentals of Electricity – D.N. Vasudeva – S. Chand & co

II SEMESTER

2005 ENGINEERING PHYSICS – II
MODEL QUESTION PAPER

Time : 3 Hrs Max Marks : 75

PART- A

Marks 15 x 1 = 15

Note : Answer any 15 Questions.

1. Define convection.
2. Define co-efficient of thermal conductivity.
3. Write the expression for root mean square velocity of molecules.
4. Define specific heat capacity of a substance.
5. Define isothermal change.
6. Write First Law of thermodynamics.
7. Define temperature of inversion.
8. Write any two advantages of renewable energy.
9. Define angle of minimum deviation.
10. Define population inversion.
11. Write any two applications of photoelectric cells.
12. What is remote sensing?
13. Define resistivity.
14. What is Seebeck effect?
15. Write Fleming's Left Hand Rule.
16. Define mutual induction.
17. Define ' farad '.
18. What is a ' hole ' ?
19. Write the three possible configurations in which a transistor can be connected.
20. Write any two uses of nano materials.

PART- B

Marks 5 x 12 = 60

Note : i) Answer all Questions choosing any two sub divisions from each question.
ii) All sub divisions carry equal marks.

I a) List the properties of thermal radiation.

b) Derive an expression for the pressure of a gas on the basis of postulates of kinetic theory of gases.

c) The ratio of specific heat capacities of a gas is 1.66. Assuming the value of universal gas constant R as 8.12 JK^{-1} mol^{-1}, find the values of specific heat capacity at constant pressure and specific heat capacity at constant volume of the gas.

II a) Explain the cascade process of liquefaction of oxygen.
b) Explain solar energy, wind energy and tidal energy.
c) 10 litres of gas at 5 atmospheric pressure is suddenly compressed to half of its initial volume. Find the resulting pressure, assuming $\gamma = 1.667$.

III a) Derive an expression for the refractive index of the material of a prism using it in minimum deviation position.
b) Explain the application of total internal reflection in optical fibre cable as a waveguide.
c) Explain the production of LASER using a Semiconductor diode source.

IV a) Derive the condition for balancing Wheatstone's network.
b) Derive an expression for the torque acting on a rectangular current carrying coil placed in a uniform magnetic field.
c) A Galvanometer of resistance 75Ω shows full scale deflection for a current of 100mA. How will you convert it into i) an ammeter to read a maximum of 5A and ii) a voltmeter to read a maximum of 10V ?

V a) Explain the working of a Full Wave rectifier with a neat circuit diagram using P-N junction diodes in bridge type Configuration.
b) Explain the synthesis of nano materials using chemical vapour deposition process.
c) Three capacitors of values 10μF, 20μF and 30μF are used in a circuit. Find the effective capacitance when they are connected i) in series and ii) in parallel.

* * *