Karnataka CET (KCET) Physics Syllabus, 2013

1. WAVES AND SOUND

· Waves: formation of waves, types of waves, wave amplitude, frequency, wave length and velocity - relation n =f l - equation for progressive wave, intensity, super position of waves. Problems

· Sound: Properties, velocity in gases, Newton - Laplace formula, factors affecting velocity - intensity and loudness, units, Noise and Music beats as an example of superposition of waves, Doppler effect, formula for general case, discussion for individual cases. Problems

· Stationary waves: Modes of vibration in pipes, laws of vibration of stretched strings, sonometer, Problems.

· Ultrasonics: Production (mention of methods), properties and applications

· Acoustics of buildings: reverberation, Sabine's formula (mention), requisites for good acoustics and methods of achieving them.

2. PHYSICAL OPTICS

· Introduction to theories of light

· Interference of light: Coherent sources, Young's double slit experiment, expression for path difference, conditions for constructive and destructive interference, width of interference fringes. Problems

· Diffraction of light: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction through a single slit (qualitative explanation), limit of resolution, Rayleigh's criterion, resolving powers of telescopes and microscope. Problems

· Polarisation of light: transverse nature of light waves, methods of producing plane polarised light, Brewster's law, double refraction, dichroism, polariods and their applications, optical activity and specific rotation. Problems.

3. ELECTROSTATICS

· Electric charge: Coulomb's law, dielectric constant, SI unit of charge, electric intensity and potential, relation connecting them, derivation of expression for potential at a point due to an isolated charge. Gauss theorem and applications, intensity at a point (a) due to a charged spherical conductor (b) near the surface of a charged conductor, Problems

· Capacitors: parallel plate, spherical, cylindrical, expressions for the capacitances, principle of a capacitor, effect of dielectric, energy stored in a capacitor, combination of capacitors, uses, Problems

4. CURRENT ELECTRICITY

· Different effects of electric current: potential difference, resistance, colour code, Ohm's law and its limitations, variation of resistance of a conductor with length- area of cross section and temperature, resistivity, superconductivity, thermistor and its applications, combination of resistors, EMF of a cell, current in a circuit, branch currents, grouping of cells, expression for different cases, potentiometer, problems

· Kirchhoff's laws: Condition for balance of a Wheatstone's bridge, metre bridge, Problems

· Magetic effect of current: direction of field, right hand clasp rule and magnitude - Laplace's law, force on a charged particle moving across a magnetic field (qualitative), magnetic field strength, flux density, magnetic flux density at a point on the axis of (a) a circular coil carrying current (derivation), (b) a solenoid carrying current (without derivation), tangent law, tangent galvanometer (with theory), Problems

· Force on a current carrying conductor in a magnetic field: Fleming's left hand rule, force between two parallel conductors carrying current, definition of ampere, suspended coil galvanometer (with theory), conversion of galvanometer into ammeter and voltmeter, Problems

· Magnetic materials: Intensity of Magnetising field (H), intensity of magnetisation (I) and magnetic induction (B) - relation connecting them, permeability and susceptibility, properties of dia, para and ferromagnetic substances, hysteresis cycle and its significance, retentivity and coercivity, uses of magnetic materials.

· Electromagnetic induction: Laws, self and mutual induction, induction coil (principle), principle and working of a generator, expression for sinusoidal emf, peak, mean and rms values, impedance, current in R, L & C and RLC circuits, power factor, choke and transformer (principle), principles of a ac meters (moving iron and hot wire types) Problems.

5. MODERN PHYSICS

· Introduction to modern physics: types of spectra, E. M. spectrum, types of electron emission.

· Quantum theory of radiation: Explanation and applications of photoelectric effect, atom models, Bohr's theory of hydrogen atom, derivation of expressions for orbital radius, orbital velocity, energy of electron and wave number, spectral series, energy level diagram, de Broglie matter waves, Problems.

· Nuclear Physics: Nuclear size, charge, mass and density, constituents, amu in terms of electron volts, magnetic moment and nuclear forces, mass defect and binding energy, nuclear fission, chain reaction, critical size, nuclear reactor, nuclear fusion, stellar energy, radiation hazards, Problems.

· Radioactivity: Properties of radioactive radiations, decay law, decay constant, Soddy's group displacement law, half life and mean life, expression for half life, radio isotopes and their uses, Problems.

· Solid state electronics: Band theory of solids (qualitative), classification into conductors, insulators and semi conductors, p-type and n-type semi conductors, characteristics of p-n junction, rectifying action of diode, half wave and full wave rectifiers. Transistors, pnp and npn, characteristics, relation between alph and beta transistors as an amplifier (qualitative -npn in CE mode)

Syllabus from PUC-I / XI Std. or equiv.

1. INTRODUCTION

Introduction to Physics SI units - dimensions - dimensional formulae - dimensional analysis - limitations Scalars and vectors - unit vector - vector addition - resolution of a vector - scalar and vector products

2. DYNAMICS

Motion of a particle in one dimension - derivations of equations of motion velocity - time curve. - Problems

Newton's laws of motion, f=ma derivation - conservation of momentum (statement and to arrive at) - illustrations - problems

Motion in two dimensions - equation for the trajectory of a projectile - range, height and time of flight - uniform circular motion - centripetal acceleration (derivation of expression) - centripetal and centrifugal forces with illustrations - problems

Work, energy and power - work done - F.S. - expressions for potential and kinetic energy - conservation of energy (statement with illustrations - problems)

Gravitation - Law of gravitation - variation of g with altitude, depth and lattitude - motion of planets and satellites - statement of Kepler's laws, orbital velocity - escape velocity - weightlessness - problems

Rotational motion of rigid body - angular displacement, velocity, acceleration and momentum, torque - equations for angular motion - moment of inertia - radius of gyration, comparison of linear and rotational motions - problems

Elasticity - stress and strain - Hooke's law - moduli of elasticity - expression for Young's modulus in the case of stretching Simple harmonic motion - characteristics - examples and equation for SHM ($y = a \sin wt$)

3. STATICS

Coplanar concurrent forces - resultant of two forces - magnitude and direction (derivation) equilibrium of three forces - law of triangle of forces - Lami's theorem - problems

Moment of a force - law of moment (statement) - application to find the resultant of two parallel forces - couple - statement of conditions of equilibrium of parallel forces - problems

4. HYDROSTATICS AND HYDRODYNAMICS

Hydrostatics - fluid thrust and pressure - atmospheric pressure (units) pressure at a point due to a liquid - Archimedes' principle (statement) - problems

Hydrodynamics - streamline and turbulent flow - Bernoulli's theorem - explanation with examples Surface tension - cohesion and adhesion - surface tension and angle of contact - capillary rise (without derivation) Viscosity - velocity gradient - co-efficient of viscosity - Poiseuille's formula for the flow of a liquid through a capillary tube and Stoke's law (without derivation)

5. HEAT

Heat and temperature - measurement of temperature - Mention of different thermometers - effect of heat like expansion and change of state Gas laws - absolute scale of temperature - perfect gas equation - isothermal and adiabatic changes - mention of equations of state - problems

Absorption of heat - specific heat - thermal capacity - principle of calorimetry - latent heat - specific heat - specific heats of gases - (C_p - C_v) and their relation (C_p - C_v = R) - degrees of freedom - equipartition of energy - importance of g Conduction of heat - steady state - temperature gradient - thermal conductivity - problems

Radiation - emissive and absorptive powers - Stefan's law - Prevost's theory of exchanges - Kirchhoff's law - Wien's displacement law - Plank's law - solar constant - temperature of the sun (qualitative treatment of the topics without derivation) - problems

Thermodynamics - relation between heat and work (first law) - heat engine - efficiency - reversible and irreversible process - Carnot's cycle - pV diagram - efficiency of a Carnot engine (without derivation) (Second Law) - problems

6. GEOMETRICAL OPTICS

Introduction to light - optical medium - rectilinear propagation of light Reflection of light - laws of reflection - reflection at curved surfaces - image formation in the case of spherical mirrors - mirror formula (without derivation) - sign convention - problems

Refraction at a plane surface - laws of refraction - absolute and relative refractive indices (Symbol n to be used for RI) - refraction through multiple refracting media - lateral shift and normal shift (expressions without derivation) - total internal relection - conditions for total internal relection - relation between critical angle and refractive index (n) - applications of optical fibres and total reflecting prisms - problems

Refraction through a prism - derivation of the expression for the refractive index (n) of the material of a prism in terms of A and D - dispersion through a prism - deviation produced by a thin prism - dispersive power - prism combination for dispersion without deviation - problems

Refraction at spherical surfaces - derivation of the relation connecting n,u,v and r for refraction at a spherical surface (concave towards point object in denser medium) - refraction through a lens - lens maker's formula - power of a lens - Image formation in the case of thin lenses, linear magnification - lenses in contact - problems

Spherical and chromatic aberrations - qualitative discussion - achromatic combination of lenses Optical instruments - microscopes, telescopes, prism binoculars, direct vision spectroscope and spectrometer (qualitative) Photometry - basic concepts - units - principle of photmetry - problems