Prescribed for: Common for all branches of UG

BSPH-401 PHYSICS LTPC/3104

Course Outcomes:
After successful completion of the course, the students should be able to

CO1: Be familiar with basic knowledge and terms about waves and oscillations, Quantum mechanics, Laser and fibre optics, Electronic, Dielectric, magnetic and superconducting properties of materials and their applications in various engineering problems

CO2: Know the conceptual physics and its use in solving the physical problems.

CO3: Apply the principles/laws of physics for various engineering applications.

CO4: Describe the acquired knowledge of physics in his /her words.

CO5: Identify the reasons for physical happenings.

CO/PO Mapping
(S/M/W/N indicates strength of correlation) S-Strong, M-Medium, W-Weak, N-None

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W	N	W	N	N	S	S	W	S
CO2	S	S	S	M	S	N	M	N	S	W	N	M
CO3	S	W	M	W	W	S	S	N	S	M	S	S
CO4	S	S	W	N	W	M	N	N	S	S	W	W
CO5	M	W	S	W	N	N	S	N	S	W	M	S

BSPH-401 PHYSICS LTPC/3104

UNIT-I

Waves & Oscillations: Simple harmonic motion, damped and forced simple harmonic oscillator, Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators (equation, transient and steady state behavior, phase difference between force and displacement), electrical and mechanical impedance. **8Hrs**

Quantum Mechanics: Need of quantum mechanics, de-Broglie hypothesis, wave packet; particle, group and phase velocities and their relationships, properties of wave function, Schrödinger's time independent and time dependent wave equations, energy and momentum operators, Eigen values and Eigen functions, expectation values of physical quantities (position, momentum and energy), application of time independent wave equation for a particle in a box (one dimension). **8Hrs**

Lasers & Fibre Optics: Absorption of radiation, spontaneous and stimulated emission of radiation, Einstein's coefficients, basic requirements of laser system - population inversion, optical pumping; Helium-Neon and Ruby lasers, Applications of laser, basic theory and physical structure of optical fiber, acceptance angle and numerical aperture, fiber materials, types of fibers, losses in optical fibers and basic ideas about optical sensors. **8Hrs**

UNIT-II

Electronic Materials: Free electron theory of metals (qualitative idea only) its successes and drawbacks, Bloch's theorem for particles in a periodic potential, Energy band diagrams, Kronig-penny model (to introduce origin of band gap), Energy bands in solids, E ~ k diagram, Brillouin zone and effective mass, direct and indirect band gaps, Distinction between metals, semiconductors and insulators, Hall effect. **8Hrs**

Dielectric properties of materials: Introduction of dielectric materials, polar and non-polar dielectric, basic concept of polarization, Different types of polarization, polarizability, temperature and frequency dependence of polarizability, Clausius-Mossotti relation, dielectric breakdown, dielectric loss, ferroelectric and piezoelectric materials and their applications.**6Hrs**

Magnetic materials and Superconductivity: Origin of magnetism, basic idea of diamagnetic, paramagnetic, ferromagnetic and ferrite materials, Soft and hard magnetic materials, magnetostriction, magnetic anisotropy and applications of magnetic materials. Superconductivity, Introduction, type I and type II superconductors, Meissner's effect, isotope effect, effects of magnetic field, London's equations, penetration depth, specific heat, BCS theory (qualitative idea), high temperature superconductors, applications of superconductivity. **10Hrs**

TOTAL: 48Hrs

Recommended Books:

1. The physics of vibrations and waves, H. J. Pain, Wiley, 2006
2. Engineering Physics, H K Malik and AK Singh, Tata McGraw Hill
3. Concepts of Modern Physics, A. Beiser, Tata McGraw Hill
4. Introduction to Solids, L V Azaroff, Tata McGraw Hill
5. Introduction to Solid State Physics, Charles Kittel, Wiley India Pvt. Ltd.
6. Laser theory & Applications, K Thygrajan, A K Ghatak, Mc Millan India Ltd.
7. Materials Science, M S Vijaya, G Rangarajan, Tata McGraw Hill
8. Quantum Mechanics, D. J. Griffiths, Pearson Education

BSPH-402 Physics Lab LTPC/0021

Course Outcomes:

After successful completion of the applied physics laboratory course, students should be able to:
CO1: verify the theoretical formulations/ concepts of physics experimentally
CO2: know the art of recording the observations of an experiment scientifically.
CO3: learn by doing.
CO4: handle and operate the various elements/parts of an experiment.
CO5: justify the importance of an experiment in engineering & technology.

CO/PO Mapping
(S/M/W/N indicates strength of correlation) ; S-Strong, M-Medium, W-Weak, N-None

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	N	N	M	M	N	N	N	S	S	N	S
CO2	S	S	N	S	S	N	N	S	S	S	N	S
CO3	M	M	N	S	W	N	N	N	S	S	N	S
CO4	S	N	W	W	M	N	N	M	S	N	S	S
CO5	W	N	N	M	N	S	S	N	S	S	M	S

List of Experiments

1. To determine the frequency of a tuning fork using sonometer.
2. To determine the frequency of an electrically maintained tuning fork by Melde's experiment.
3. To investigate resonance in forced oscillations and to find the spring constant.
4 To verify the inverse square law of radiation using Photoelectric effect.
5. To determine the value of Planck's constant and photoelectric work function of the material of the cathode using photoelectric cell.
6. To determine the frequency of an unknown signal by drawing the Lissajous patterns for various frequency ratios and evaluative the phase difference between two sinusoidal signals applied to X and Y inputs of cathode ray oscilloscope.
7 Determination of the value of e/m of an electron by helical method/Thomson method.
8 To determine the numerical aperture (NA) of a given multimode optical fibre by using laser beam.
9. To determine the Hall voltage, Hall coefficient and the carrier concentration of the given material.
10. To find the band gap of the semiconductor material using diode in reverse bias.
11. To determine the wavelength of He-Ne laser by diffraction method.
12. Use of Michelson-Morley interferometer for determining the wavelength of He-Ne laser.
13. To find the Curie temperature of the given ferrite material.
14. To calculate the dielectric constant of the given dielectric material.
15. To study the V-I characteristics of a photo–voltaic cell (solar cell).
16. To determine the specific rotation of sugar solution using Laurent's half-shade polarimeter

Open Elective-1 OEPH-611A Analytical Mechanics LTPC/3003

Course outcomes:

After successful completion of the course, the students should be able to

CO1: Select and use appropriate co-ordinate system to solve a given mechanics problem.

CO2: Relate symmetries to conservation laws in physical systems and apply these concepts to practical situations.

CO3: Solve dynamical problems involving classical particles by using the Lagrangian formulation.

CO4: Explain different aspects of motion of Rigid bodies, and their symmetry axes.

CO5: Use the concept of Inertial and Non-inertial frames of reference corresponding to different practical situations.

CO6: Transform physical quantities in one frame of reference to another.

CO7: Apply the basics Relativistic Mechanics to possible practical situations.

CO/PO Mapping
(S/M/W/N indicates strength of correlation) S-Strong, M-Medium, W-Weak, N-None

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	N	N	N	N	M	S	N	S
CO2	S	S	S	S	N	N	N	N	M	S	N	S
CO3	S	S	S	S	W	N	N	N	M	W	N	S
CO4	S	S	S	S	W	N	N	N	M	S	N	S
CO5	S	S	W	S	N	N	N	N	M	S	N	S
CO6	S	S	S	W	N	N	N	N	M	W	N	S
CO7	S	S	S	M	N	N	N	N	M	S	N	S

Open Elective-1 OEPH-611A Analytical Mechanics LTPC/3003

UNIT-I

Co-ordinate Systems and Conservation Laws for a System of Particles: Cartesian and spherical polar co-ordinate systems, Two- and three-dimensional coordinate systems, area, volume, displacement, and velocity in these systems, solid angle. Centre of mass, linear momentum, angular momentum, torque, potential energy and kinetic energy of a system of particles. Definition of Conservative and Non-conservative systems. Symmetries and conservations laws (qualitative idea only) **9Hrs**

Mechanics of System of Particles: Constraints of motion, generalized coordinates, D'Alembert's Principle, Lagrange's equations from DÁlembert's Principle, Lagrange's velocity-dependent forces and the dissipation function, Applications of Lagrangian formulation. **9Hrs**

UNIT-II

Rigid Body motion and Frames of Reference: Rotational motion, principal moments and Axes, Euler's equations, precession and elementary gyroscope. Inertial and Non-Inertial Frames, Transformation equations for inertial frames inclined to each other, Fictitious forces in a rotating frames of reference, Centrifugal and Coriolis forces due to rotation of earth. **9Hrs**

Relativistic Mechanics: Galilean transformations, Postulates of special theory of relativity Lorentz transformations, Kinematical consequences of Lorentz transformations– length contraction and time dilation, Twin paradox, Transformation of velocities, Simultaneity of relativity, Velocity of light in moving fluid, Relativistic Doppler effect. Variation of mass with velocity, mass-energy equivalence, relativistic momentum & energy. **9Hrs**

Total: 36Hrs

BOOKS:

1. Mechanics, H.S. Hans & S.P. Puri.
2. Mechanics, Berkeley, Vol. I, C. Kittle.
3. Classical Mechanics: H. Goldstein, C. Poole and J. Safko (Pearson Education Asia, New Delhi).
4. Mechanics & Relativity (3rd Edition), Vidwan Singh Soni (PHI Learning, New Delhi, 2013)
5. Classical Mechanics by Gupta, Kumar, Sharma (Pragati Prakashan, MEERUT)

Open Elective-1 **OEPH-611B Statistical Physics and Thermodynamics LTPC/3003**

Course Outcomes:

After successful completion of the course, the students should be able to

CO1: Understand the basic knowledge about laser and optical fibre with their applications in various fields.

CO2: Know the conceptual physics and its use in solving the physical problems.

CO3: Apply the principles of physics.

CO4: Describe the physics in his /her words.

CO5: Understand the reasons for physical happenings.

CO/PO Mapping S-strong, M-medium and W-weak indicate the strength of correlation												
COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W		W			S		W	S
CO2	S	S	S	M	S		M	W		W		M
CO3	S	W	M	W	W	S	S	S	S	M	S	S
CO4	S	S	W		W	M			M	S	W	W
CO5	M	W	S	W			S	M			M	S

Open Elective-1 OEPH-611B Statistical Physics and Thermodynamics LTPC/3003

Unit-I

Basic ideas of statistical physics, Scope of statistical physics, Basic ideas about probability, distribution of four distinguishable particles in two compartments each of equal size. Concept of macro states, microstates, thermodynamic probability, Effects of constraints on the system, Distribution of n particles in two compartments, Deviation from the state of maximum probability, equilibrium state of dynamic system, Distribution of n distinguishable particles in k compartments of unequal sizes. **10Hrs**

Phase space and its division into elementary cells, Three kinds of statistics. The basic approach in the three statistics, Maxwell Boltzmann (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of Maxwell Boltzmann law of distribution of molecular speeds, Need for quantum statistics, Derivation of Planck's law of radiation, Deduction of Wien's displacement law and Stefan's law from Planck's law, Bose-Einstein (B-E) and Fermi-Dirac (F-D) statistics, Comparison of M-B, B-E and F-D statistical dsitributions. **10Hrs**

Unit-II

Statistical definition of entropy, Change of entropy of a system, Additive nature of entropy, Law of increase of entropy, Reversible and irreversible process and their examples. Work done in a reversible process. Examples of increase of entropy in natural processes, Entropy and disorder, Brief review of terms and laws of thermodynamics, Heat death of the universe. **8hrs**

Derivation of Maxwell's thermo-dynamical relations, Cooling produced by adiabatic stretching, Adiabatic compression, Change of internal energy with volume, specific heat at constant pressure and at constant volume, Expression for Cp -Cv , Change of state and Clayperon equation, Thermo-dynamical treatment of Joule-Thomson effect, Use of Joule-Thomson effect, liquefication of helium, Production of very low temperature by adiabatic demagnetization. **8Hrs**

Total: 36hrs

Text Books:

1. Statistical Physics and Thermodynamics, V.S. Bhatia, Publisher- Shoban Lal Nagin Chand & Co., Jalandhar, 1996.
2. Statistical Physics and Thermodynamics, A.K. Sikri, Pardeep Publication, Jalandhar, 2005.
3. Statistical Mechanics, B.B. Laud (Macmillan India Ltd), 1981.
4. A Treatise on Heat, M.N. Saha & B.N. Srivastava, (The Indian Press Pvt. Ltd., Allahabad) 1965.

Open Elective-2 OEPH-612T Basic Materials Science LTPC/3003

Course Outcomes:
After successful completion of the course, the students should be able to

CO1: Understand common crystal structure and describe their symmetries.
CO2: Understand the concept of various phases of solid materials.
CO3: Understand the imperfection in solids and its effect on materials properties.
CO4: To analysis the thermal properties of materials and properties of composites.
CO5: Describe nanomaterials based on their dimensionality.

CO/PO Mapping
S-strong, M-medium and W-weak indicate the strength of correlation

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W		W			S		W	S
CO2	S	S	S	M	S		M	W		W		M
CO3	S	W	M	W	W	S	S	S	S	M	S	S
CO4	S	S	W		W	M			M	S	W	W
CO5	M	W	S	W			S	M			M	

Open Elective-2 OEPH-612T Basic Materials Science LTPC/3003

UNIT-A

Elements of crystallography: A brief Introduction to material science Material structure, Space lattices, unit cell, primitive cell, Bravais lattice, Atomic packing factor, Miller indices, directions and planes in crystal lattice (cubic & hexagonal only), Distribution of atoms in lattice planes (in cubic crystal only), Important structures (NaCl, CsCl, diamond and ZnS), Structure determination: x-ray diffraction, neuron and electron diffraction. **8Hrs**

Imperfections in crystals: Point imperfections, Frenkel and Schottky defects and their equilibrium concentration determination, Colour centres, types of colour centres, generation of colour centres, Edge and screw dislocation, Berger vector, Surface and volume defects. **4Hrs**

Equilibrium diagrams and phase transformations: Phase rule, Hume-Rothery rules for solid solutions, cooling curves for solidification of pure metals and alloys, unary system, binary system, Invariant reactions in binary system, iron-carbon equilibrium diagram, Nucleation and growth of crystal. (Homogeneous case only), application of phase diagrams. **6Hrs**

UNIT-B

Thermal properties of materials: Introduction, theory of specific heat of solids, classical theory (Dulong and Petit law), Einstein theory of specific heat, Debye's theory, The concepts of phonons, Lattice vibrations (one dimensional lattice), Thermal conductivity, thermal expansion, thermoelectric effect **6Hrs**

Composites: Introduction, general characteristics, particle-reinforced composites, Large-Particle Composites, Dispersion-Strengthened Composites, fiber-reinforced composites, Influence of Fiber Length, Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic-Matrix Composites, Carbon–Carbon Composites, Hybrid Composites, Processing of Fiber-Reinforced Composites **8Hrs**

Nano-materials: Fundamentals of nanomaterials and nanotechnology, Nano particles and Properties of nanomaterials, Synthesis, characterization & Applications of nanomaterials. **4Hrs**

Total: 36Hrs

Recommended Books:

Author	**Title**
Charles Kittel	Introduction to solid state Physics
MS Vijaya, G Rangarajan	Materials science
Raghvan	Materials science
Srinivasan and Srivastava	Materials science and Eng.
Callister JR	Materials science and Engg.: an introduction
Askeland and Phule	The science and engineering of material

Open Elective-3 OEPH-621T Plasma and its applications LTPC/3003

Course Outcomes:
After successful completion of the course, the students should be able to

CO1: Understand the basic knowledge about plasma and its applications in various fields of engineering

CO2: Know the conceptual physics and its use in solving the physical problems.

CO3: Apply the principles of physics.

CO4: Describe the physics in his /her words.

CO5: Understand the reasons for physical happenings.

CO/PO Mapping
S-strong, M-medium and W-weak indicate the strength of correlation

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W		W			S		W	S
CO2	S	S	S	M	S		M	W		W		M
CO3	S	W	M	W	W	S	S	S	S	M	S	S
CO4	S	S	W		W	M			M	S	W	W
CO5	M	W	S	W			S	M			M	

Open Elective-3 OEPH-621T Plasma and its applications LTPC/3003

UNIT-I

Introduction to Plasma: Excitation and ionization in a gas (different methods), Definition of plasma, Basic parameters of plasma, Bulk properties, Quasi-neutrality, Electrostatic Boltzman's equation, Plasma sheaths, The plasma frequency, Saha equation, Debye shielding and skin depth, Cold and hot plasma, Magnetized plasmas, Plasma confinement, Radiation plasma, Arc Plasma, Fully ionized plasma. **8Hrs**

Charged particle motion: Particle description of plasma, Motion of charged particles in electric and magnetic fields, Motion of charged particles in inhomogeneous magnetic field, Magnetic mirror confinement, Qualitative idea about motion of an electron in a time varying electric field and in a crossed radio frequency and magnetic field. **8Hrs**

Plasma oscillations: Theory of simple oscillations, Electron oscillations in a plasma, Electronic oscillation along with motion of ions, Derivation of plasma oscillations using Maxwell's equations, Ion oscillations and waves, Landau damping, Propagation of e.m. waves in plasma containing a magnetic field. **8Hrs**

UNIT-II

Plasma Diagnostic Techniques: Use of probe technique for measurement of plasma parameters, Single probe method, Double probe method, Qualitative ideas about other methods of plasma diagnostics viz., Microwave method, spectroscopic method, laser as a tool for plasma diagnostics, X-ray diagnostics and acoustic method. **6Hrs**

Plasma applications:

i) Source of power (MHD generator and Controlled thermonuclear fusion)

ii) Generation of microwaves utilizing high density plasma

iii) Concept of plasma propulsion and its applications

iv) Plasma arcs, plasma processing and fabrication (ion implantation in solids, plasma deposition and etching, paint spraying)

v) Plasma displays, plasma diode and plasma lighting devices/torches

vi) Plasma chemistry, insulating dielectrics and breakdown

vii) Pollution control (thermal, non-thermal, electrostatic precipitation, corona) **6Hrs**

Total: 36Hrs

BOOKS:

1. F.F. Chen: *Introduction to Plasma Physics and Controlled Fusion*, Vol.1, Plasma Physics. 2nd Edition, Plenum Press 1984.
2. J. R. Roth : *Industrial Plasma Engineering*, Vol.1, Principles. IOP Publishing, Ltd 1995.
3. S.N.Sen: *Plasma Physics, Plasma state of matter*, Pragati Prakashan, Meerut, second edition, 1996.
4. Brian Chapman, *Glow Discharge Processes*, John Wiley & Sons, 1980.

Open Elective-4 OEPH-622T RADIATION BIOPHYSICS LTPC/3003

Course Outcomes:

After successful completion of the course, the students should be able to

CO1: understand the basic knowledge about various kinds of radiations and aware about radiation hazards.

CO2: know the conceptual physics and its use in solving the physical problems.

CO3: apply the principles of physics.

CO4: describe the physics in his /her words.

CO5: understand the reasons for physical happenings.

CO/PO Mapping
S-strong, M-medium and W-weak indicate the strength of correlation

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W		W			S		W	S
CO2	S	S	S	M	S		M	W		W		M
CO3	S	W	M	W	W	S	S	S	S	M	S	S
CO4	S	S	W		W	M			M	S	W	W
CO5	M	W	S	W			S	M			M	

Open Elective-4 OEPH-622T RADIATION BIOPHYSICS LTPC/3003

UNIT-I

Atomic and nuclear radiations: Introduction, continuous and characteristic x-rays, Auger electrons, alpha, beta and gamma rays, internal conversion, orbital electron capture, positron decay. Radioactive decay, exponential decay, specific activity, serial radioactive decay- secular, transient and no equilibriums. **4Hrs**

Interaction of radiation with matter Introduction, interaction cross section and its units, Interactions of photons with matter -photoelectric effect, Compton effect, pair production, photonuclear reaction, attenuation and absorption coefficients. Interaction of charged particles with matter (qualitative description), range, straggling, stopping power, inelastic, elastic and radiative collisions. classification of neutrons, neutron interactions. **6Hrs**

Radiation dosimetry: Exposure, absorption of energy, relative biological effectiveness, radiation absorbed dose, dose equivalent, gray, sieverts, particle fluence, kerma. Radiation exposure from natural background and other sources. **4Hrs**

Radiation chemistry: Introduction, Stochastic energy transfer; radiation chemistry of water-radiolysis, radical chemistry, chemical stage; G-value, role of scavengers, Fricke dosimeter and model, direct and indirect actions; recombination, restitution and repair; macromolecular target in the cell, reactions with DNA; chain scission in DNA, chromatin structure, radiation damage of DNA, Repair of DNA-excision & error-prone repairs, repair of double strand breaks. **6Hrs**

UNIT-II

Theories and models for cell survival: Introduction, Clonogenic survival, Lea's target theory model, biological survival curves, target theory model-general survival equation, single hit model, multitarget-single hit survival-properties, quasi-threshold dose; molecular model for cell death- role of enzymatic repair, molecular theory of radiation action, theory of dual radiation action, Repair-Misrepair model of cell survival, Potentially lethal model. **8Hrs**

Survival curve and its significance: Introduction, technique of Clonogenic survival curve, characteristics of mammalian cell survival curve, repair of sub-lethal and potentially lethal damage, cell survival and cell age, radiation induced cell progression delay. Role of water and oxygen in modifying radiation response. **4Hrs**

Non-stochastic and stochastic effects of radiation: Non-stochastic verses stochastic effects, Non-stochastic late effects on gastrointestinal tract, skin, liver, kidneys, lung, central nervous system, eye. Stochastic effects - radiation carcinogenesis. Genetic effects - structural changes in chromosomes, gene mutations. **4Hrs**

Total: 36Hrs

Recommended Books:

1. Radiation biophysics, E.L. Alpen, Academic Press
2. An introduction to radiation protection, A. Martin and S.A. Harbison
3. Physics for radiation protection, J. E. Martin, Wiley-VCH Verlag GmbH & Co.
4. Atoms, radiation and radiation protection, J. E. Turner, Wiley-VCH Verlag GmbH & Co

Open Elective-5 OEPH-711T LASER AND ITS APPLICATIONS LTPC/3003

Course Outcomes:

After successful completion of the course, the students should be able to

CO1: employ the basic knowledge about s laser and its applications in various fields, optical fibers.

CO2: Know the conceptual physics and its use in solving the physical problems.

CO3: Apply the principles of physics.

CO4: Describe the physics in his /her words.

CO5: Understand the reasons for physical happenings.

CO/PO Mapping
(S/M/W/N indicates strength of correlation) S-Strong, M-Medium, W-Weak, N-None

COs	Programme outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W	W	W	N	W		N	S	S	W	S
CO2	S	S	S	M	S	N	M	N	S	W	N	M
CO3	S	W	M	W	W	S	S	N	S	M	S	S
CO4	S	S	W	N	W	M		N	S	S	W	W
CO5	M	W	S	W	N	N	M	N	S	W	M	S

Open Elective-5 OEPH-711T LASER AND ITS APPLICATIONS LTPC/3003

UNIT- I

LASER: Introduction, Einstein coefficient and light Applications, Laser rate equations, Optical resonators, The laser output, Q-switching, mode locking properties, Ruby, helium-neon, Solid state, carbon di-oxide, Dye and semiconductor lasers, free electron Lasers and cyclotron resonance masters. **8Hrs**

HOLOGRAPHY: Introduction, Recording and reconstruction of Holograms, Type of Holograms, Holographic recording materials, holographic storage of information and Data processing, Holographic Interferometry and its application. **8Hrs**

UNIT-II

OPTICAL FIBER COMMUNICATION: Introduction, Optical fibre Numerical Aperture, coherent bundle, fibre-optic communication system, Losses in optical fibres (Attenuation & Dispersion) Pulse dispersion in step index fibres, Graded index fibres, some general consideration: First and Second generation fibre optic communication system, Single mode fibres and the third Generation Optical communication system operation at 1.5 um wavelength, Fourth Generation optical fibres, applications fibre optic system, Advantage of fibre optic system. **10Hrs**

APPLICATIONS OF LASERS & OPTICAL FIBRES: Introduction, Material processing, Welding, Cutting, Drilling, Hardening, Micro machining, Metrology, Non-destructive testing, Pollution Detection, Laser tracking LIDAR, Precision length measurement, Velocity measurement, Recent advances, optical interconnections for integrated circuits, optical computing, Star war. **10Hrs**

Total: 36Hrs

RECOMMENDED BOOKS:

Lasers – Theory & applications K Thyagarajan & A K Ghatak MacMilllan India Ltd