SYLLABUS

BSHPH 601: MATERIAL SCIENCE-I

Unit-1:

Electrical, Electronic Optical, Thermal and Mechanical properties of Materials. 3D, 2D, 1D Materials.Plastic deformation, tensile properties, compressive and shear deformation, hardness, creep, fracture and fatigue.

Unit-2:

Binary phase diagrams: Isomorphs alloy systems, The Lever rule, Eutectic systems, The equilibrium microstructure of eutectic systems, applications, Peritectic transformation, Iron Carbon phase diagram, Austenite, pearlite, TTT diagram, Heat treatments and Intermetallic compounds.

Unit-3:

Thin films and their need, deposition processes, growth of thin films, kinetics of nucleation, mechanism of growth, epitaxy and molecular beam epitaxy.

Unit-4:

Defects in thin films, electron transport in thin films, size effect, galvanometric effects, optical properties of thin film, thin film filters, laser mirrors, magnetic properties and magneto optical effects.

Unit-5:

Corrosion: Mechanism Of Localized corrosion,oxidation resistance,aquous corrosion,Anodic corrosion,corrosion prevention and development of eco-friendly protective coating system.

REFERENCES

1. Thin film phenomena Kasturi L Chopra, Robert E Krigger publishing company, Huntington, New York.
2. An introduction to the thin film state: Preparation, structure and basic characteristic of thin films B Damodar Das, Aparna publication, Ashoka road, Mysore.
3. Preparation of thin film, Joy George, Marcel Dekker, Inc.
4. Vacuum technology, A. Roth, North Holland Company.
5. Vacuum technology, Andrew Guthrie, Robert E. Krieger Publishing Company, Malabar, Florida.

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BSHPH 602: PLASMA PHYSICS

Unit-1:

Introduction of Plasma: Occurrence of Plasmas in Nature, Definition of Plasma, Concept of Temperature, The Saha Equation, Quasineutrality, Debye Shielding, The Plasma Parameters, Three condition for Plasmas.

Unit-2:

Single Particle: single particle motion, Uniform E and B Fields, Nonuniform B Field, Nonuniform E Field, Time varying E Field, Time-Varying B Field, Center Drifts, Adiabatic Invariants.

Unit-3:

Plasma as Fluid: Plasma as a fluid, Relation of Plasma Physics to Ordinary Electromagnetics, Fluid Equation of Motion, Fluid Drifts Perpendicular to B, Fluid Drifts Parallel to B, Plasma Approximation.

Unit-4:

Application of Plasma: Material processing, Bio-medical applications: Concept of Plasma Niddle, working and recent development, plasma sterilization, plasma surface modification of polymer, corona plasma: air and water disinfection, plasma based nanofabrication, dielectric barrier discharge (DBD), plasma etching.

Unit-5:

Diagnostics of Plasma: Single Probe Technique: Measurement of Electron Temperature and Electron Temperature of Plasma, Double Probe Technique: Measurement of Electron Temperature and Density of Plasma. Spectroscopy diagnostics.

REFERENCES

1. J D Jackson: Classical electrodynamics (Berkley, California)
2. J A Bittencourt: Fundamentals of Plasma Physics (Springer)
3. F F Chen: Introduction to Plasma Physics (Plenum Press)

BSHPH 603: LASER AND OPTICAL FIBRE

Unit-1:

Spontaneous and Stimulated Emission, Einstein Coefficients, Population Inversion,Pumping. Resonator. Properties of Laser: Intensity, Brightness, Monochromaticity, Coherence (Temporal and Spatial), Directionality, Ultra short duration Pulses, Polarisability. Applications of Laser based on above properties.

Unit-2:

Classification of Lasers, 2, 3 and 4- Level Pumping Scheme, Pumping Techniques: Optical Pumping, Electrical Discharge Pumping, Chemical Pumping, Gas Dynamic Pumping, Injection Pumping. Various Laser Systems: Ruby Laser, He-Ne Laser, Co_2 Laser, Nd: YAG Laser Diode laser.

Unit-3:

Functions of Resonator, Modes of Resonator, Types of resonator: Stable and Unstable resonator, Mode fillingand stability in various types of resonators (Plane–Plane, Plano–Concave, Concave–Concave, Plano–Convex, Convex–Convex Resonators), Ring resonator.

Unit-4:

Applications of Lasers: Lasers Cutting, Lasers Welding, Lasers Drilling, Lasers Surface treatments: Medical applications of laser, Laser in Communication, Doppler velocitymetery, Pollution detection & Remote Sensing, Holography: Principal, Construction of Master Hologram and Reconstruction of Holograms.

Unit-5:

Introduction to Optical fibre, Acceptance Angle and Cone, Fractional refractive index change, Numerical Aperture, Modes of Propagation, Types of Optical fibre (SMF & MMF), V- Number, Pulse dispersion: Its types and effect on information carrying capacity, Graded Index Optical fibre, Attenuation and Losses in fibre and Applications of Optical fibre.

REFERENCES

1. Introduction to Atomic and Molecular Spectroscopy, V.K.Jain, Alpha Science International Limited.
2. Introduction to optical electronics, Ammon Yariv, Holt, Rinehart and Winston.
3. Springer Handbook of Lasers and Optics, edited by Frank Träger, Springer.
4. Principles of Lasers, Orazio Svelto and D. C. Hanna, Springer.
5. Lasers and Non-linear Optics, B.B. Laud, Wiley.

BSHPH 604: INTRODUCTION TO OPTOELECTRONICS

Unit-1:

Introduction to Optical sources and their properties. Optical emission from semiconductors: P-N junction diode, Heterojunction, Semiconductor materialSemiconductor injection Lasers. Efficiency and Stripe geometry.

Unit-2:

Light emitting diode (LED) structures: Planar LED, Dome LED, Surface emitter,Edge emitter, Superluminescent LED, LED Characteristics: Optical output power, output spectrum, reliability.

Unit -3:

Single mode operation, Semiconductor laser structures: Gain guided and index guided lasers, Semiconductor laser characteristic: Threshold temperature dependence, Dynamic response, Frequency chirp, noise and reliability.

Unit-4:

Introduction to optical detectors, principle and types of optical detectors, Absorption: Absorption coefficient, direct and indirect absorption in Silicon (Si) and Germanium (Ge). Quantum efficiency, responsively and cutoff wavelength of optical detectors.

Unit-5:

Semiconductors photodiode without internal gain: p-n photo diode, p-i-n photodiode, speed of response, Basic idea of noise in optical detectors. Semiconductors photodiodes with internal gains: Avalanche photodiodes. Benefits and drawbacks of Avalanche photodiodes and Multiplication factor.

REFERENCES

1. Optical Fiber Communications: Principles and practices, John M. Senior, Prentice Hall of India, Pvt. Ltd.
2. Fundamental of optics, F. A. Jenkins & H. E. White, Tata McGraw hill.
3. LASERS: Fundamentals & applications, K. Thyagrajan &A. K. Ghatak, Tata McGraw Hill.
4. Fibre optics through experiments, M. R. Shenoy, S. K. Khijwania, et.al., Viva Books.
5. Nonlinear Optics, Robert W. Boyd, (Chapter-I). Elsevier.
6. Optics, Karl Dieter Moller, Learning by computing with model examples, Springer.
7. Optical Systems and Processes, Joseph Shamir, PHI Learning Pvt. Ltd.
8. Optoelectronic Devices and Systems, S.C. Gupta, PHI Learning Pvt. Ltd.
9. Optical Physics, A. Lipson, S. G. Lipson, H. Lipson, Cambridge University Press.

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U.G. PROGRAM B.Sc. Physics (Hons.)

Sem-VI, Paper-V

SUBJECT CODE	Cat-egory	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRAC-TICAL		Th	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
BSHPH605	DC	Project–II	00	00	00	90	60	0	0	12	6

Project–II evaluation will be based on internal and external presentation/viva .

Total Marks: 150

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Sem-VI, Paper-VI

SUB-JECT CODE	Cate-gory	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRAC-TICAL		Vi-va/ Pres en-ta-tion	Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teach ers Asses sment	End Sem Univ ersit y Exam	Teac hers Ass ess men t					
BSHPH 606	DC	Presentation	00	00	00	00	0	60	0	0	0	2

Total Marks: 60

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Sem-VI, Paper-VII

SUB-JECT CODE	Cate-gory	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRAC-TICAL		Vi-va/ Pres en-ta-tion	Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teach ers Asses sment	End Sem Univ ersit y Exam	Teac hers Ass ess men t					
BSHPH 607	DC	Comprehen sive Viva	00	00	00	00	0	90	0	0	0	4

Total Marks: 90