Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

B. Sc. Physics Hons

V Sem

Subject Code	Category	Subject Name	Teaching and Evaluation Scheme								
			Theory			Practical		Th	T	P	CREDITS
			End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
BSPHPH 506	DC	Digital Electronics	60	20	20	0	0	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Digital Electronics and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Digital Electronics. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		**Teacher Assessment (Theory) shall be based on following components: Quiz / Assignment/ Project / Participation in class (Given that no component shall be exceed 10 Marks).**
Th	Theory	
T	Tutorial	**Teacher Assessment (Practical) shall be based on following components: Viva / File / Participation in Lab work (Given that no component shall be exceed 50% of Marks).**
P	Practical	

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BSPHPH 506: Digital Electronics

UNIT I: Number system: Decimal, Binary, Octal and Hexadecimal number system and base conversion, Binary arithmatic operations: Addition, subtraction, Multiplication and division, 1's and 2's complement representation and there arithmetic and ASCII code.

UNIT II: Boolean algebra and logic gates: Logic gates: AND,OR, NOT,XOR,XNOR,NOR,NAND (Definition, Symbols& Truth table) Basic laws of Boolean algebra, Duality Principal , De Morgan's Law, Simplification of Boolean Identities , Standard SOP & POS Forms and Simplification using K-map, DTL, TTL, CMOS, MOS.

UNIT III: Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator,Encoder, decoder and BCD to seven segment decoders; Multiplexer and demultiplexer.

UNIT IV: Sequential Logic Circuits: Basic sequential circuit; Types of sequential circuits; Synchronous and asynchronous; Flip-flops: Edge triggered RS flip-flops, Edge triggered JK flip-flops, D flip-flops and Master slave flip-flops.

UNIT V: Types of Registers, Serial In-serial Out, Serial In-parallel Out, Parallel In-serial Out, Parallel In-parallel Out, Universal Shift Register, Aynchronous counter and Binary counters.

References

1. Digital Principle and Applications by A.P. Malvino and D.D. Leach (Tata McGraw Hill, New Delhi)
2. Digital Electronics : Practice using Integrated Circuits by R.P. Jain and MMS Prasad (Tata McGraw Hill, New Delhi)
3. Digital Computer Electronics by A.P. Malvino (Tata McGraw Hill, New Delhi)
4. Modern Digital Electronics by R.P. Jain (Tata McGraw Hill, New Delhi)

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BSPHPH 502	DC	Material Science	60	20	20	0	0	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Material Science and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Material Science. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		Teacher Assessment (Theory) shall be based on following components: Quiz / Assignment/ Project / Participation in class (Given that no component shall be exceed 10 Marks).
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BSPHPH 502: Material Science

UNIT I: Crystalline and amorphous solid state material, Electrical, Electronic Optical, Thermal and Mechanical properties of Materials, concept of 3D, 2D, 1D Materials.Plastic deformation, tensile properties, compressive and shear deformation, hardness, creep, fracture and fatigue.

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

UNIT IV: 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 V: 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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			End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
BSPHPH 503	DC	Kinetic Theory and Thermodynamics	60	20	20	0	0	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Kinetic Theory and Thermodynamics and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Kinetic Theory and Thermodynamics. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		**Teacher Assessment (Theory) shall be based on following components: Quiz / Assignment/ Project / Participation in class (Given that no component shall be exceed 10 Marks).**
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BSPHPH 503: Kinetic Theory and Thermodynamics

UNIT I Introduction to Thermodynamics Zeroth and First Law of Thermodynamics: Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Concept of Temperature, Concept of Work & Heat, State Functions, Internal Energy, and Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient.

UNIT II Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work.Heat Engines.Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.

UNIT III Etropy: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy.Entropy of a perfect gas.Principle of Increase of Entropy, Entropy Changes in Reversible and Irreversible processes with examples, Entropy of the Universe.Entropy Changes in Reversible and Irreversible Processes.Principle of Increase of Entropy, Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics, Unattainability of Absolute Zero

UNIT IV Thermodynamic Potentials: relation between thermodynamical potential, Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.

UNIT V Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv, (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.

References:

1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
2. A Treatise on Heat, MeghnadSaha, and B.N.Srivastava, 1958, Indian Press
3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill
4. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer.

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			End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
BSPHPH 504	DC	Nanoscience and Applications	60	20	20	0	0	4	1	0	5

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Nanoscience and ability to apply them for laying the foundation for research and development. 2. To work ethically as member as well as leader in a diverse team.
Course Ourcomes	1. Student will be able to understand and solve the problems related to Nanoscience and Applications. 2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Abbreviation		
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BSPHPH 504: Nanoscience and Applications

UNIT I Nanoscale Systems

Introduction toNano, Nanostructures: 1D, 2D and 0D, nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and densityof states of materials at nanoscale, Size Effects in nano systems, Quantum confinement:quantum confinement of carriers in 3D, 2D, 1D, 0D nanostructures and its consequences and Carbon Nanotubes (CNT).

UNIT II Electron Transport and Optical Properties in Nanomaterials

Coulomb interaction in nanostructures, Concept of dielectric constant for nanostructures and charging of nanostructure. Radiative processes: General formalization-absorption, emission and luminescence and Optical Properties of nanostructures.

UNIT III Synthesis of Nanostructure Materials

Top down and Bottom up approach, Photolithography. Ball milling, Gas phase condensation, Vacuum deposition,Introduction to Physical vapor deposition (PVD): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition, Chemical vapor deposition (CVD), Sol-Gel. Electro deposition.

UNIT IV Introduction to characterization techniques

X-Ray Diffraction., Optical Microscopy, Scanning Electron Microscopy (SEM),Transmission Electron Microscopy (TEM),Atomic Force Microscopy (AFM) and Scanning Tunneling Microscopy (STM).

UNIT V Applications of Nanoscience

Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Nanomaterial Devices: Quantum dots heterostructure lasers, optical switching and optical data storage.

REFERENCES

1. C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.).
2. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publishing Company)
3. T. Pradeep, Nano: Understanding Nanoscience and Nanotechnology, McGraw-Hill Education

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4. K.K. Chattopadhyay and A. N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited).
5. Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons).
6. M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier).
7. Bharat Bhushan, Springer Handbook of Nanotechnology (Springer-Verlag, Berlin).

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