Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

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

Sem-V, Paper-I

SUB-JECT CODE	Category	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				
BSHPH 501	DC	Solid State Physics	60	20	20	0	0	3	1	0	**4**

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A- Quiz/Assignment/Attendance, MST MidSem Test
*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to Solid State Physics 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 Outcomes:-

1. Student will be able to understand and solve the problems related to Solid State Physics.

2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

BSHPH 501: SOLID STATE PHYSICS

Unit-1:
Amorphous and Crystalline Solids; Elements of Symmetry, Seven Systems, Cubic Lattices, Crystal Planes, Miller Indices, Bonding In Solids, Madelung Constant. X-ray diffraction: Bragg formulation.

Unit-2
Specific Heat of solids-classical theory (Dulong-Petit's law); Einstein and Debye's theory, vibrational modes of one dimensional mono atomic lattice dispersion relation, Brillouin zones.

Unit-3:
Free electron model of a metal, solution of one dimensional Schrodinger equation in a constant potential, density of states, Fermi energy, energy bands in a solid, Kronig-Penney model without mathematical details, Metals, Insulators, semiconductors and Hall effect.

Unit-4:
Dia, para and ferro-magnetism, Langevin's theory of dia and para magnetism, Curie-Weiss law, Qualitative description of ferro-magnetism, B-H Curve and hysteresis loss.

Unit-5:
Periodic potential and Bloch's theorem, Proof of Bloch theorem, Superconductivity: type-I and type-II superconductors, Meisner Effect, Josephson junctions and Bose-Einstein Condensation.

REFERENCES

1. Solid State Physics: N. W. Ashcroft and N. D. Mermin. *Publisher*: New York : Holt, Rinehart and Winston.
2. Solid State Physics: C. Kittel, *Publisher*: Wiley.
3. Solid State Physics: S. O. Pillai.
4. Intermediate Solid State Physics: A. E. Animalu, The Benjamin-Cummings *Publishing* Co.
5. Principle of Condensed matter Physics: Chaikin and Lubensky, *Publisher*: Cambridge University Press.
6. Solid State Physics, J. D. Patterson, B. C. Bailey, Springer Berlin Heidelberg New.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

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

Sem-V, Paper-II

SUB-JECT CODE	Category	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				
BSHPH 502	DC	Digital Electronics	60	20	20	0	0	3	1	0	**4**

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A- Quiz/Assignment/Attendance, MST MidSem Test
*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

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 Outcomes:-

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.

BSHPH 502: DIGITAL ELECTRONICS

Unit-1:
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-2:
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.

Unit-3:
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-4:
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-5:
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)

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

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

Sem-V, Paper-III

SUB-JECT CODE	Category	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				
BSHPH 503	DC	Statistical Mechanics	60	20	20	0	0	3	1	0	**4**

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A- Quiz/Assignment/Attendance, MST MidSem Test
*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to Statistical Mechanics 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 Outcomes:-

1. Student will be able to understand and solve the problems related to Statistical Mechanics.

2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

BSHPH 503: STATISTICAL MECHANICS

Unit-1:

System, Ensemble, Canonical ensemble, Micro-canonical ensemble, Macro state, Microstate, Thermodynamic Probability, Constraints, Accessible and Non-accessible Microstates, Concept of Phase-Space, μ-Space and γ-Space, Negative Temperature, Fundamental Postulates of Statistical Mechanics, Determination of β parameter thermodynamically, Entropy, Partition function, Statistical Interpretation of Entropy and Boltzmann's Entropy-Probability Relation $S = k \log W$.

Unit-2:

Maxwell Boltzmann's Canonical Distribution Law, Gibb's paradox. Maxwell-Boltzmann's Law of Distribution of Velocities, Discussion of the velocity distribution function, Maxwell-Boltzmann's Law of Distribution of Speed (Most probable speed, Number of molecules corresponding to maximum probable speed, Mean speed, Root mean square speed and their relations) and Droppler's Broadening of Spectral Lines.

Unit-3:

Radiation, Emissivity, Spectral Distribution of Black Body Radiation, Prevost's Theory of Exchange, Kirchoff's Law and its significance, Wien's Distribution Law, Wien's Displacement Law. Rayleigh-Jean's Law. Stefan-Boltzmann Law, Ultraviolet Catastrophe and Planck's Quantum Postulates. Experimental verification of (1) Wien's Distribution Law (2) Wien's Displacement Law, (3) Rayleigh-Jean's Law and (4) Stefan-Boltzmann Law.

Unit-4:

B-E distribution law. Thermodynamic functions of a Completely Degenerate Bose Gas.
Bose-Einstein condensation, properties of liquid He (qualitative description). Radiation as photon gas. Bose's derivation of Planck's law.

Unit-5:

Fermi-Dirac Distribution Law. 'h' as a Natural Constant Thermodynamic functions of an ideal Completely Degenerate, Fermi Gas. Fermi Energy. Electron gas in a Metal, Specific Heat of Metals. White Dwarf Stars. Chandrasekhar Mass Limit and In distinguishability of Particles and its Consequences.

REFERENCES

1. Statistical Physics : Berkeley Physics Course Volume 5 by F Reif (Tata McGraw-Hill Company Ltd).
2. Statistical and Thermal Physics: an introduction by S.Lokanathan and R.S.Gambhir. (P.H.I.).
3. Statistical Mechanics by R. K. Patharia.(Oxford: Butterworth).
4. Statistical Mechanics by K. Huang (Wiley)
5. Statistical Mechanics by eyringeyringeyring
6. Unified Physics by R. P. Goyal.
7. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears and
8. G.L. Salinger, Narosa University Physics, Ronald Lane Reese, Thomson Brooks/Cole.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

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

Sem-V, Paper-IV

SUB-JECT CODE	Category	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				
BSHPH 504	DC	Nanoscience And Applications	60	20	20	0	0	3	1	0	**4**

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A-Quiz/Assignment/Attendance, MST MidSem Test
*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to Nanoscience and Applications 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 Outcomes:-

1. Student will be able to understand and solve the problems related Nanoscience and Applications.

2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

BSHPH 504: NANOSCIENCE AND APPLICATIONS

Unit-1:

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, 0D nanostructures and its consequences and Carbon Nanotubes (CNT).

Unit-2:

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-3:

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-4:

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-5:

Introduction to 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
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).

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

Sem-V, Paper-V

SUB-JECT CODE	Cate-gory	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				
BSHPH505	DC	Physics Lab	00	00	00	90	60	0	0	12	6

Total Marks: 150

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

Sem-V, Paper-VI

SUB-JECT CODE	Cate-gory	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTI-CAL		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 506	DC	Presentation	00	00	00	00	0	60	0	0	0	2

Total Marks: 60

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

Sem-V, Paper-VII

SUB-JECT CODE	Cate-gory	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTI-CAL		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 507	DC	Comprehen sive Viva	00	00	00	00	0	90	0	0	0	4

Comprehensive Viva will be based on the all subjects of the V sem.

Total Marks: 90