Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Semester - I

Subject code	Subject Name	Teaching & Evaluation Scheme								
		Theory			Practical		Th	T	P	Credit
		End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
MSPH101	**Quantum Mechanics - I**	60	20	20	0	0	3	1	0	**4**

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Quantum Mechanics – I 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 Quantum Mechanics - I. 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	
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P	Practical	

QUANTUM MECHANICS - I

UNIT I: Foundation of Quantum mechanics: Compton effect, wave nature of matter, Uncertainty principle, Wave-particle duality, wave packets, wave function, time independent Schrodinger equation, expectation values, continuity equation, Ehrenfest theorem.

UNIT II: Operators, Functions and Spaces: Linear operators, eigen functions and values, Dirac bra and ket notation and vectors, postulates of quantum mechanics, Hilbert Space, Hermitian Operators, properties of Hermitian Operators, position and momentum representation, time varying expectations, Ladder operators, the eigen values of ladder operators, the eigen functions of the orbital angular momentum operator.

UNIT III: One-dimensional problems: Free particle, potential step, rectangular barrier, tunneling, infinite square well, finite square well, periodic lattice, and linear harmonic oscillator.
Three-dimensional problems: Free particle (in Cartesian and Spherical coordinates), Three-dimensional Square well, three-dimensional linear harmonic oscillator (in Cartesian and in Spherical coordinates), rigid rotator, Hydrogen atom, and potential barrier.

UNIT IV: Time-independent perturbation theory: Introduction, Non-degenerate case (first and second order with example), Degenerate state, Stark effect, WKB approximation: Introduction, WKB solutions, connection formulae, eigen value problems, applications of WKB solutions, Alpha decay, derivation of connection formulae.

UNIT V: Harmonic oscillator I: Introduction, solution of time dependent equation, eigen functions, most general solution, coherent state, time evolution of a coherent state, propagator.

Books recommended:

1. Quantum Mechanics: Concepts and Applications, Nouredine Zettili, Jacksonville State University, Jacksonville, USA John Wiley and Sons, Ltd. 2009.
2. Quantum Mechanics: Fundamental and Applications to Technology, Jasprit Singh, University of Michigan, John Wiley and Sons, Ltd. 1997.
3. Quantum Mechanics, V. Devanathan, Narosa Publishing House, New Delhi, 2005.

4. Schaum's Outline Series: Quantum Mechanics, Y. Peleg, R. Pnini, E. Zaarur
5. Berkeley Physics Course: Quantum Physics, E. H. Wichmann.

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Semester - I

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MSPH102	**Classical Mechanics**	60	20	20	0	0	3	1	0	**4**

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Classical 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 Ourcomes	1. Student will be able to understand and solve the problems related to Classical Mechanics. 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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CLASSICAL MECHANICS

UNIT I: Mechanics of a single particle and system of particles. Generalized coordinates. Principle of least action. Galileo's relativity principle. The Lagrangian for a free particle. The Lagrangian for a system of particles.

UNIT II: Laws of conservation as derived from homogeneity and isotropy of space and homogeneity of mass. Principle of mechanical similarity. Virial theorem. Lagrangian Formulation. Constraint. Holonomic and non-holonomic constraints. D'Alembert's principle.

UNIT III: Reduced mass. Motion in a central field. Kepler's problem. Scattering in the central field. scattering cross section. Rutherford formula. Elastic and inelastic collision. Small oscillations. Forced oscillation. Normal coordinates. Frequency of molecular vibration. Damped oscillation. Parametric resonance. Motion of a rigid body. Euler's angles. Inertia tensors. Angular momentum of a rigid body. Precision Euler's equations. Symmetric and asymmetric top. Noninertial frame of reference. Rocket equation.

UNIT IV: The equations of canonical transformation; Examples, The harmonic oscillator; The symplectic approach, Poisson brackets and other canonical invariants, Equation of moiton, Infinitesimal Canonical transformations and Conservation theorems in the Poisson bracket formulation, The angular momentum Poisson bracket relations, symmetry groups of mechanical systems, Lioville's theorem, Hamilton-Jacobi equation; the harmonic oscillator, Hamilton-Jacobi equation for Hamilton's characteristics function.

UNIT V: Special theory of relativity: Basic postulates of the special theory, Lorentz transformation, velocity addition and thomos precession, vectors and matrix Tensor, I-formes and tensors, forces in special thoery; Electromagnetism, Relativistic kinematics of collisions and many particle systems, relativistic angular momentum, the langanrian formulation of relativistic mechanics.

Books Recommended:

1. Mechanics: Landau and Lifshitz (Pergamon Press)

2. Classical Mechanics: H. Goldstein (Addison and Wesley)
3. Introduction to classical Mechanics: Takwale and Puranik (Tata Mc Graw Hill)
4. Schaum's Outline Series, Theory and applications of Theoretical mechanics, M. R. Spiegel
5. Berkeley Physics Course: Mechanics, C. Kittel, W. D. Knight, and M. A. Ruderman.

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Semester - I

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		Theory			Practical		Th	T	P	Credit
		End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
MSPH103	**Applied Electronics**	60	20	20	0	0	3	1	0	**4**

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Applied 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 Applied 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).**
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P	Practical	

APPLIED ELECTRONICS

UNIT I: Semiconductor devices: diodes, junctions, transistors, field effect devices, JFET, BJT, MOS-FET and MESFET, device structure, working, I-V characteristics under different conditions.
Microwave Devices: Tunnel diode, transfer electron devices (Gunn diode), Avalanche Transit time devices, Impatt diodes, Optoelectronic devices: LED, photodiode, device structure and working.

UNIT II: Amplifiers: Negative feed back and its advantages in amplifiers, various types of couplings in amplifiers. RC coupled, CE amplifier, its frequency response curve. Differential amplifiers: Circuit configurations dual input, balanced output differential amplifier- dc analysis- ac analysis, inverting and non-inverting inputs CMRR- constant, current bias level translator.

UNIT III: Operational amplifiers: Block diagram of a typical Op-amp with negative feedback voltage series feed back effect of feedback on closed loop gain input persistence output resistance bandwidth and output offset voltage-follower. Practical op-amp input offset voltage input bias current – input off-set current, total output offset voltage, CMRR frequency response, DC and AC amplifier summing scaling and averaging amplifiers instrumentation amplifier, comparators, integrator and differentiator.

UNIT IV: Oscillators: Positive feedback and Brakhausen Criteria of Oscillators, Oscillators principle – Oscillator types – frequency stability – response – The phase shift oscillator. Wein bridge oscillator – LC tunable oscillators – Multivibrators – Astable, Monostable and Bistable – Multivibrators – square wave and Triangle wave generators.

UNIT V: Voltage regulators – Transistor series pass regulator. IC regulator -fixed regulators, adjustable voltage regulators switching regulators, Logic Gates: OR, AND, NOT, NOR, NAND Gates, NAND Gate as a universal building block, problems.

Books recommended:

1. Semiconductor Devices, Physics and Technology, S. M. Sze, Wiley (1985).
2. Introduction semiconductor devices, M. S. Tyagi, John Wiley and sons.
3. Electronic Devices And Circuits; An Introduction, Allen Mottershead.
4. Electronics Principles: A. P. Malvino McGraw Hill, International edition.

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Semester - I

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		Theory			Practical		Th	T	P	Credit
		End Sem University Exam	Two Term Exam	Teachers Assessment	End Sem University Exam	Teachers Assessment				
MSPH104	**Mathematical Physics**	60	20	20	0	0	3	1	0	**4**

Course Objectives	1. To develop the comprehensive understanding of laws of physics related to Mathematical 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 Ourcomes	1. Student will be able to understand and solve the problems related to Mathematical Physics. 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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P	Practical	

MATHEMATICAL PHYSICS

UNIT I: Special functions: Bessel functions of first and second kind, Hermite, Legendre, Associate Legendre and Laguerre polynomials, Their recursion relations, generating functions and orthognalty, Curvilinear co-ordinate system with specific cases of Cartesian, Cylindrical, and Spherical coordinate systems, Problems.

UNIT II: Integral transforms, Fourier integral, Fourier transform and inverse Fourier transforms, Fourier transform of derivatives, Convolution theorem, Elementary Laplace transforms, Laplace transform of derivatives, Application to a damped harmonic oscillator, Problems.

UNIT III: Green's functions: Non-homogenous boundary value problems, Green's function for one dimensional problems, Green's function for electrostatic boundary value problems and quantum-mechanical scattering problem.

UNIT IV: Complex variables: Analyticity of complex functions, Cauchy Riemann equations, Cauchy theorem, Cauchy integral formula, Problems.

UNIT V: Taylor's, Maclaurin, Laurent series, Residue Theorem, Simple cases of contour integration, Integrals involving multiple valued functions, Problems.

Books Recommended:

1. Mathematics of Engineers and Physicists: L. A. Pipes
2. Mathematical Methods for Physicists: G. B. Arfken
3. Mathematical Physics: H. K. Dass, R. Verma

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Semester - I

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MSPL105	**Physics Practical - I**	00	00	00	90	60	0	0	12	6

Course Objectives	1. To develop the comprehensive understanding of laws of 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 Ourcomes	1. Student will be able to understand and solve the problems related to Physics. 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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List of Experiments:

1. Assembly of Logic gates using discrete components and to verify truth table.

2. Perform mathematical operations using OPAM as Adder, Subtractor, Divider, Multiplicator.

3. Regulated Power Supply. (Transistorized)

4. R.C. coupled amplifier-frequency response.

5. Emitter follower.

6. FET characteristics and calibration of FET Input voltmeter

7. R.C. phase shifts Oscillator.

8. Measurement of Hybrid parameters of transistor.

9. Operational amplifier (OP Amp) as integrator & differentiator

10. Solving Boolean Expressions.

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MSPR106	**Presentation**	00	00	00	00	60	0	0	0	02

Note: Power point presentaion based on any topic of the theory papers of current sem syllabus.

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Semester - I

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		Theory			Practical		Th	T	P	Credit
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MSCV107	**Comprehensive Viva**	00	00	00	00	90	0	0	0	04

Note: Comprehensive Viva of the candidates in presence of subject expert and faculty members.