Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

P.G. PROGRAM M. Sc. PHYSICS

SEM-III

Paper-I: PLASMA PHYSICS-I

SUB-JECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRAC-TICAL		Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teac hers Ass ess men t	End Sem Uni vers ity Exa m	Tea che rs Ass ess me nt				
MSPH 301	DC	PLASMA PHYSICS-I	60	20	20	0	0	3	1	0	4

Course Objectives:-

1. To develop the comprehensive understanding of laws of Plasma 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 Plasma physics.
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

MSPH 301 [PLASMA PHYSICS-I]

Unit-I: 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-II: 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-III: 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 –IV: Plasma Oscillation and waves: Representation of Waves, Group Velocity, Plasma Oscillations, Electron Plasma Waves, Sound Waves, Ion Waves, Validity of the Plasma Approximation Comparison of Ion and Electron Waves, Electrostatic Electron Oscillations Perpendicular to B, Electrostatic Ion Waves Perpendicular to B.

Unit-V: Electromagnetic waves: Electromagnetic Waves with $B_0=0$, Experimental Applications, Electromagnetic Waves Perpendicular to B_0, Cutoffs and Resonances, Electromagnetic Waves Parallel to B_0, Experimental Consequences, Hydromagnetic Waves, Magnetosonic Waves, Elementary Plasma Waves.

Text and reference books

1. J D Jackson: Classical electrodynamics (Berkley, California, 1974)
2. J A Bittencourt: Fundamentals of Plasma Physics (Springer, III Edition)
3. F F Chen: Introduction to Plasma Physics (Plenum Press, III Print)

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

P.G. PROGRAM M. Sc. PHYSICS

SEM-III

Paper-II: MATERIAL SCIENCE-I

SUB-JECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRAC-TICAL		Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teac hers Ass ess men t	End Sem Uni vers ity Exa m	Tea che rs Ass ess me nt				
MSPH 302	DC	MATERIAL SCIENCE-I	60	20	20	0	0	3	1	0	- 4

Course Objectives:-

1. To develop the comprehensive understanding of 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 Outcomes:-

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.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

MSPH302 [MATERIAL SCIENCE-I]

UNIT I: Binary alloys : Interstitial and substitutional solid solution, Factors governing solid solubility, Statistical stability of alloys, Temperature dependence of solubility, phase diagrams, Super lattices, Equilibrium between two phases. Two component systems containing two phases, The phase rule.

UNIT II:. Binary phase diagrams: Isomorphous alloy systems, The Lever rule, Eutectic systems, The equilibrium microstructure of eutectic systems, applications, Peritectic transformation, Iron Carbon phase diagram, Austenite, pearlite, Bainite and Martensite phases, TTT diagram, Heat treatments, Intermatallic compounds, Hume-Rothery electron compounds

UNIT III:. Thin films and their need, deposition processes, growth of thin films, kinetics of nucleation, mechanism of growth, epitaxy, 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, magneto optical effects.

UNIT V: Synthesis Technique of Materials:• Solid State Reactions : steps involved in method and examples,• Sol-gel method : Introduction to Sol-Gel, Advantages of Sol-Gel Technique, Limitations of Sol-Gel Technique, Hydrothermal Process ,Co-Precipitation Process, Polyol Process, Combustion Process .

Books Recommended:

1. Thin film phenomena Kasturi L Chopra, Robert E Krigger publishing company, Huntington, New York 1979.
2. An introduction to the thin film state: Preparation, structure and basic characteristic of thin films B Damodar Das, Aparna publication, Ashoka road, Mysore 1992
3. Preparation of thin film, Joy George, Marcel Dekker, Inc. 1992
4. Vacuum technology, A. Roth, North Holland Company, (1989).
5. Vacuum technology, Andrew Guthrie, Robert E. Krieger Publishing Company. Malabar, Florida, 1990

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

P.G. PROGRAM M. Sc. PHYSICS

SEM-III

Paper-III: LASER PHYSICS-I

SUB-JECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRAC-TICAL		Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teac hers Ass ess men t	End Sem Uni vers ity Exa m	Tea che rs Ass ess me nt				
MSPH 303	DC	**LASER PHYSICS-I**	60	20	20	0	0	3	1	0	4

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to LASER Technology 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 LASER Physics.
2. Student will be able to determine physical parameter experimentally with optimal usage of resources and complete the assignments in time.

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Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

MSPH303 [LASER PHYSICS-I]

Unit I: Spontaneous and Stimulated Emission, Einstein Coefficients, Population Inversion, Pumping, Resonator, Properties of Laser: Intensity, Brightness, Monochromaticity, Coherence (temporal and Spatial), Directionality, General Applications of Laser.

Unit II: Light Amplification, The Threshold Condition, Critical Fluorescence Power, Line Broadening Mechanisms: Homogeneous and inhomogeneous Broadening, Natural Broadening, Collision Broadening, Crystal Field Broadening, Doppler Field Broadening.

Unit III: Classification of Lasers, 2, 3 and 4- Level Pumping Scheme, Pumping Techniques: Optical Pumping, Electrical Discharge Pumping, Chemical Pumping, Gas Dynamic Pumping, Injection Pumping.

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

Unit V: Various Laser Systems: He-Ne Laser, Co_2 Laser, Excimer Laser, Nd:YAG Laser, Nd:Glass Laser, Dye Laser, Semiconductor Laser.

Text and Reference Books

1. Introduction to Atomic and Molecular Spectroscopy by V. K.Jain
2. Optical Electronics, M. Yariv.
3. Laser Spectroscopy, Demtroder:
4. Non-Linear Spectroscopy, Letekhov :
5. Principles of Lasers, Svelto
6. Lasers and Non-linear Optics, B.B. Laud.

ST

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

P.G. PROGRAM M. Sc. PHYSICS

SEM-III

Paper-IV: INSTRUMENTATION, MEASUREMENT AND ANALYSIS-I

SUB-JECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRAC-TICAL		Th	T	P	CREDITS
			End Sem Universi ty Exam	Two Term Exam	Teac hers Ass ess men t	End Sem Uni vers ity Exa m	Tea che rs Ass ess me nt				
MSPH 304	DC	INSTRUMENTA TION, MEASUREMEN T AND ANALYSIS-I	60	20	20	0	0	3	1	0	4

Course Objectives:-

1. To develop the comprehensive understanding of laws of physics related to Instrumentation, Measurement & Analysis 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 Instrumentation, Measurement & Analysis.
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

MSPH 304 [INSTRUMENTATION, MEASUREMENT AND ANALYSIS-I]

Unit I: a. Introduction of IR & UV (Infra Red & Ultra Violet) Spectroscopy.

b. Principle & Measurement Technique of IR.

c. Principle & Measurement Technique of UV.

d. Analysis of IR & UV Spectra.

Unit II: a. Introduction of XRD Technique (X-ray Diffraction)

b. Principle & Measurement Techniques of XRD

c. Analysis of XRD.

Unit III: a. Introduction of XAS (X-ray Absorption Spectroscopy).

b. Principle & Measurement Techniques of XANES

c. Principle & Measurement Techniques of EXAFS

d. Analysis of XANES, EXAFS.

Unit IV: Unit II: a. Introduction of XPS (X-ray Photoelectron Spectroscopy).

b. Principle & Measurement Techniques of XPS

c. Analysis of XPS.

Unit V: Unit II: a. Introduction of RAMAN Spectroscopy.

b. Measurement of given sample by RAMAN Spectroscopy.

c. Analysis of RAMAN Spectra.

Text and References Books:

1. X-ray Diffraction Crystallography, Kozo Shinodo.
2. XAFS for everyone, Scott Calvin.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

P.G. PROGRAM M. Sc. PHYSICS

SEM-III

Paper-V: DIGITAL ELECTRONICS-I

SUB-JECT CODE	Catego-ry	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				
MSPH 305	DC	DIGITAL ELECTRONICS-I	60	20	20	0	0	3	1	0	4

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.

Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

MSPH305 [DIGITAL ELECTRONICS-I]

Unit-I: MOSFET, MESFET, HEMT and HBT: Structure, working, derivations of equations for I-V characteristics under different conditions, High frequency limits. Scaling of MOS devices and short channel FET.

Unit-II: Introduction to Logic families: TTL circuits: 7400 devices, TTL characteristics, TTL overview, Encoders and Decoders, DTL, RTL, MOS, CMOS, Classification of IC circuits: SSI, MSI. LSI, VLSI, ULSI.

Unit-III: Registers and counters: Buffer registers, Shift register, Ripple counters, Synchronous counters, Ring counters, other counters and Bus-organized computer. Flip-Flops: RS-latches, Level clocking, D-latches and flip-flops, JK master slave flip-flops.

Unit-IV: Oscillators: The phase shift oscillator, Wein bridge oscillator, LC-tunable oscillators, Multivibrator, Monostable and Astable. Simple-as-possible computer (**SAP-1**): Architecture, Instruction set, Programming, Fetch cycle, Execution cycle, Schematic diagram, Micro Programming.

Unit-V: Simple-as-possible computer-II (**SAP-2**): Bidirectional resistors, Architectures, Memory reference instructions, Registers instruction, Jump and call instructions, Logic instructions. Simple-as-possible computers (**SAP-3**): Programming model, Arithmetic instructions, Increments, decrements and multiples Logic instructions.

Text and reference books

1. S M Sze: Semiconductor devices, (John Wiley & Sons)
2. M S Tyagi: Introduction to semiconductor materials and devices, (John Wiley & Sons)
3. M Sayer and A Mansingh: Measurement, instrumentation and experimental design in physics and engineering, (Prentice Hall of India, New Delhi)
4. Ajoy Ghatak and K Thyagarajan: Optical electronics, (Cambridge University Press)
5. J Millmann and C C Halkias: Integrated electronic: Analog and digital circuits and systems, (Tata Mcgraw-Hill Education, New Delhi)
6. G K Mithal: Electronic devices and circuits, (Khanna Publishers)

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P.G. PROGRAM M. Sc. PHYSICS

SEM –III

Paper-V: PHYSICS PRATICAL

SUB-JECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRAC-TICAL		Vi-va/P re-sen-ta-tion	Th	T	P	CREDITS
			End Sem Univ ersity Exam	Two Term Exam	Teac hers Asse ssme nt	End Sem Univ ersit y Exam	Teac hers Ass ess men t					
MSPL 307	DC	PROJECT PHASE-I & PRESENTATION	00	00	00	00	00	200	0	0	16	8

NOTE: The student perusing their project under the supervision of at least one of the faculty member of the institute on the topic of the syllabus.