Swami Vivekanand University, Sagar (M.P.)

As per model syllabus of U.G.C. New Delhi, drafted by Central Board of Studies and Approved by Higher Education and the Governor of M.P.

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Faculty of Science

Syllabus & Prescribed Books

Subject- Physics

M.Sc. Semester Examination

2016-18

I to IV Semester

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Swami Vivekanand University, Sagar (M.P.)

COURSEWISE SCHEME
I st SEMESTER

1. Course Code	: MSCPHY	5. Total Practical	: 2
2. Course Name	: M.Sc. Physics	6. Total Practical Marks	: 100
3. Total Theory Subject	: 4	7. Total Marks	: 300
4. Total Theory Marks	: 200	8. Minimum Passing Percentage	: 36

Sub. Code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks					
		1st	2nd	3rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Compulsory														
MSCPHY 101	Mathematical Physics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 102	Classical Mechanics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 103	Quantum Mechanics-I	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 104	Electronics Devices	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 105	**Practical-I** Gen. Physics Based Practical	0	0	0	0	0	0	0	0	0	50	18	50	18
MSCPHY 106	**Practical-II** Electronics Based	0	0	0	0	0	0	0	0	0	50	18	50	18

Swami Vivekanand University, Sagar (M.P.)

Department Of Higher Education, Govt. of M.P.
Semester Wise Syllabus For Post Graduate classes
As recommended by Central Board of Studies and
Approved by HE the Governor of M.P.

CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - I **PAPER - I**

MATHEMATICAL PHYSICS

Unit -I

Differential equations: Recursion relation, generating functions and orthogonality of Bessel functions of first and second kind, Hermite, Legendre, Associate Legcndre and Laguerre Polynomials.Curvilinear co-ordinate system with specific cases of Cartesian, Cylindrical, and Spherical coordinate systems.

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.

Unit -III

Green's functions: Non-homogenous boundary value problems, Green's function for one dimensional problems, eigen function expansion of Green's function, Fourier transform.method of constructing Green's function, 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. Taylors, Maclaurin, Laurent series & mapping. Theorem of residues. Simple cases of contour integration. Jordan's lemma Integrals involving multiple valued unctions(Branch points).

Unit –V

This unit will have a short *note* question covering all the four units. The students will have to answer any two questions out of the four.

Books Recommended :

1. L. A. Pipes — Mathematics of Engineers and Physicists
2. Arfken — Mathematical Methods for Physicists
3. P.K. Chattopadhyay — Mathematical Physics
4. H.K.Dass — Mathematical Physics
5. Ghatak, Goyal & Guha — Mathematical Physics
6. M.R Spiegel (Schaum Series) — Complex variable & Laplace Transform

Swami Vivekanand University, Sagar (M.P.)

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Semester Wise Syllabus For Post Graduate classes
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CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - I **PAPER - II**

CLASSICAL MECHANICS

Unit - I

Newtonin mechanics of one and many particles systems: Conservation laws, Constrains their classification, Principle of virtual work; D'Almbert's principle in generalized coordinates, The Lagrange's equation from D'Almbert's principle. Configuration space, Hamilton's principle deduction from D'Almberts principle, Generalized momenta and Lagrangian formulation of the conservation theorems, Reduction to the equivalent one body problem; the equation of motion and first integrals, the differential equation for the orbit.

Unit - II

The equations of canonical transformation and generating functions; The Hamilton-Jacobi Action and Angel variables. Poisson's brackets; simple algebraic properties of Poisson's brackets. The equation of motion in Poisson's Brackets notation. Poisson theorem; principle of least action. The Kepler problem, Inverse central force field, Rutherford scattering.

Uni t - III

Theory of small oscil lati ons, Equations of motion, Eigen frequencies and general motion, normal modes and coordinates, Applications to coupled pendulum and linear bistable molecule. Rotating coordinate systems. Acceleration in rotating frames. Cori ol is force and its terrestrial astronomical applications, Elementary treatment of Eulerian co-ordinates and transformation matrices. Angular momentum inertia tensor. Eular equa tions of motion for a rigid body. Torque free motion for a rigid body.

Unit - IV

Symmetries of space and time. Invariance under galilion transformation, Covariant four-dimensional formulation, 4 -Vectors and 4 - scalers. Relativistic generalization of Newton's laws, 4 - momentum and 4 - force, variance under Lornetz transformation relativistic mechanics. Covariant Lagrangian, covariant Hamiltonian,
Examples.

Unit -V

This unit will have a short note question covering all the tour units. The students will have to answer any two questions out of the four.

Books Recommended

1. H.Goldstein (Addison Wesley) Classical Mechanics
2. N.C.Rana & P.S.Jog Classical Mechanics
3. Landu & Lifshitz (Pergamann Press) Classical Mechanics
4. A. Sommarfield (Academic Press) Classical Mechanics
5. R.G.Takwale & P.S. Puranik Introduction to Classical Mechanics

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Department Of Higher Education, Govt. of M.P.
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CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - I **PAPER - III**

QUANTUM MECHANICS- I

Unit – I

Basic Postulates of quantum Mechanics, equation of continuity, Normality, orthogonality and closure properties of eigen functions, expectation values and Ethrentest theorems, solution of Schrodinger equation for one dimensional (a) potential well (b) potential step and (c) Potential barrier.

Unit – II

Linear vector space, concept of Hibert space, bra and ket notation for state vector, representation of state vectors and dynamical variables by matrices and unitary transformation (Translation and rotation), creation and annihilation operators, matrices for x and p. Heisenberg uncertainty relation through operators (Schwartz inequality).

Unit -III

Solution of Schrodinger equation for (a) linear harmonic oscillator (b) hydrogen - like atom (c) square well potential and their respective application to atomic spectra, molecular spectra and low energy nuclear states (deutron).

Unit - IV

Angular momentum in quantum mechanics, Eigen values and Eigen function of L^2 and L_z in term of spherical harmonics, commutation relation. Time independent perturbation theory. Non-degenerate and degenerate cases.

Unit -V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Text Books and reference-book:

1. L I Schiff, Quantum Mechanics
2. S Gasiorovvicz, Quantum Physics
3. B Craseman and J D Powell Quantum Mechanics
4. A P Messiah Quantum Mechanics
5. J. J. Sakurai Modern Quantum Mechanics
6. Mathews and Venkatesan Quantum Mechanics

Swami Vivekanand University, Sagar (M.P.)

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CLASS - M.Sc. **SUBJECT - PHYSICS**
SEMESTER - I **PAPER - IV**

ELECTRONIC DEVICES

Unit – I

Transistors: JFET, BJT, MOSFET and MESFET, structure derivations of the equations for I-V characteristics under different condition, microwave devices, tunnel diode, transfer electron devices (Gunn diode), avalanche transits time devices, Impatt diodes and parametric devices.

Unit - II

Photonic devices: radiative and non-radiative transitions, optical absorption, bulk and. thin film photo conductive devices (LDR), diode Photo detectors, Solar cell (open circuit voltage and short circuit current, fill factor), LED (high frequency limit, effect of surface and indirect recombination current, operation of LED), semi-conductors; diode lasers (conditions for population inversion in active region, light confinement factor, optical gain and threshold current for lasing.

Unit - III

Memory Devices: Read Only Memory (ROM) and Random Access Memory (RAM). Types of ROM: PROM, EPROM, EEPROM and EAPROM, Static and dynamic RAMs (SRAM & DRAM), characteristics of SRAM and DRAM.Hybrid Memories :CMOS and NMOS memories, Nonvolatile RAM, ferro-electric memories,charge coupled devices (CCD), storage devices: Geometry and organization of magnetic (FDD & HDD) and Optical **(CD-ROM, CD-R, CD-R/W,** DVD) Storage devices.

Unit - IV

Electro-optics, Magneto-optic and Acousto-optic effects, materials properties relate to get these effect,important ferro electric, liquid crystal and polymeric materials for these devices, piezoelectric, electrostrictive and magnetostrictive effects. Important materials for these properties and their applications in sensors and actuator devices, acoustic delay l ines, piezoelectric resonators and filters, high frequency piezoelectric devices-surface, acoustic wave devices,

Unit - V

This unit will have a short note question covering all the four units. 'The students will have to answer any two questions out of the four.

Text books and reference books:

1. SM Sze Willey (1985) Semiconductors devices - physics technology
2. M S tyagi Introduction to semiconductors devices
3. M Sayer and A Manisingh Measurement instrumentation and experimental design in physics and engineering
4. Ajoy Ghatak and Thyagrajam Optical Electronics

Swami Vivekanand University, Sagar(M.P.)

COURSEWISE SCHEME
II[nd] SEMESTER

1. Course Code	: MSCPHY	5. Total Practical	: 2
2. Course Name	:M.Sc. Physics	6. Total Practical Marks	: 100
3. Total Theory Subject	: 4	7. Total Marks	: 300
4. Total Theory Marks	: 200	8. Minimum Passing Percentage	: 36

Sub. Code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks					
		1st	2nd	3rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Compulsory														
MSCPHY 201	Quantum Mechanics-II	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 202	Statistical Mechanics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 203	Electronics Dynamics and	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 204	Atomic and Molecules Physics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 205	**Practical-I** General Physics Based	0	0	0	0	0	0	0	0	0	50	18	50	18
MSCPHY 206	**Practical-II** Electronics Based	0	0	0	0	0	0	0	0	0	50	18	50	18

Swami Vivekanand University, Sagar(M.P.)

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CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - II **PAPER - I**

QUANTUM MECHANICS –II

Unit - I

Approxmination method for bound states : Rayleigh- Schrodinger Perturbation theory of non-degenrate and degenrate levels and their application to perturbation of an oscillator, normal helium atom and first order stark effect in hydrogen. Variation method and its application to ground state helium, W K B Approximation method, connection formulae, ideas on potential barrier with applications to theory of alpha decay.

Unit - II

Time dependant perturbation theory: Methods of variation of constants and transition probability, adiabatic and sudden approximation, wave equation for a system of charged particles under the influence of external electromagnetic field, absorption and induced emission, Einstein's A and B coefficients and transition probability.

Unit- III

Theory of Scattering, Physical concepts, scattering amplitude, scattering cross section. Born Approximation and partial waves, scattering by perfectly rigid sphere, complex potential and absorption, scattering by spherically symmetric potential, identical particles with spin, Pauli's spin matrices.

Unit- IV

Schrödinger's relativistic equation (Klein-Gordon equation), Probability and current density, Klein - Gordon equation in presence of electromagnetic field, hydrogen atom, short comings of Klein-Gordon equation, Dirac's relativistic equation for free electron, Dirac's Matrices. Dirac's relativistic equation in electromagnetic field, negative energy states and their interpretation hydrogen atom, hyperfine splitting.

Unit - V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Text Books and reference book:

1. LI Schiff — Quantum Mechanics
2. S Gasiorowicz — Quantum Physics
3. B Craseman and J J Powell — Quantum Mechanics (Addison Wessley)
4. A .Messiah — Quantum Mechanics
5. J.J. Sakurai — Modern Quantum Mechanics
6. Mathews and Venkatessan — Quantum Mechanics
7. A .K.Ghatak and Loknathan — Quantum Mechanics

Swami Vivekanand University, Sagar(M.P.)

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CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - II **PAPER - II**

STATISTICAL MECHANICS

Unit - I

Foundation of statistical mechanics, specification of states of a system contact between statistics and thermodynamics, classical ideal gas entropy of mixing and Gibb's paradox.Microcanonical ensemble, phase space, trajectories and density of states, Liouville theorem, canonical and grand canonical ensembles, partition function, calculation of statistical quantities, energy and density fluctuations.

Unit-II

Statistics of ensembles, statistics of indistinguishable particles, density matrix, Maxwell -- Boltzmann, Fermi Dirac and Bose- Einstein statistics, properties of ideal Bose gases, Bose — Einstein condensation, properties of ideal Fermi gas, electron gas in metals, Boltzman transport equation.

Unit-III

Cluster expansion for a classical gas, virial equation of state, mean field theory of Ising model in 3,2 and 1 dimension. Exact solution in one-dimension.

Unit-IV

Thermodynamics fluctuation spatial correlation Brownian motion, Langevin theory, fluctuation dissipation theorem, the Fokker-Planck equation, Onsager reciprocity relations.

Unit V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Text Books and reference book:

1. F Reif — Statistical and thermal Physics
2. K Huang — Statistical Mechanics
3. R K Pathria — Statistical Mechanics
4. R Kubo — Statistical Mechanics
5. Tandan — Statistical Physics

Swami Vivekanand University, Sagar (M.P.)

Department Of Higher Education, Govt. of M.P.
Semester Wise Syllabus For Post Graduate classes
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CLASS - M.Sc. **SUBJECT - PHYSICS**
SEMESTER - II **PAPER - III**

ELECTRODYNAMICS AND PLASMA PHYSICS

Unit – I

Review of Basics *of* electrostatics and magnetostatics (electric field, Gauss's law, Laplaces and Poisson equations, method of images, Biot-Sawart law, Ampere law, Maxwell's equations, scalar and vector potentials, gauge transformation, Lorentz gauge, Coulomb Gauge, Solution of Maxwell equations in conducting media radiations by moving charges, retarded potentials, Lienard Wiechrt potentials, fields of charged particles in uniform motion, fields of arbitrarily moving charge particle.

Unit-II

Fields of an accelerated charged particles at low velocity and high velocity, angular distribution of power radiated, Review of four vector and Lorentz transformation in 4-dimensional spaces, Invariance of electric charge, relativistic transformation properties of E and H fields. Electromagnetic fields tensor in 4-dimensional Maxwell equation, Four Vector current and potential and their invariance under Lorentz transformation, covariance of electrodynamics.
Langragian and Hamiltonian for a relativistic charged particle jn External EM field; motion of charged particles in electromagnetic fields, uniform and non-uniform E and B fields.

Unit -III

Elementary concept of occurrence of plasma. Gaseous and solid state plasma. Production of gaseous and solid state plasma. Plasma parameters. Plasma confinement pinch effect instability in a pinched- plasma column. Electrical neutrality in a plasma. Debye screening distance. Plasma oscillations: Transverse oscillations and longitudinal oscillations.

Unit – IV

Domain of Magnetohydrodynamics and plasma Physics : Magneto-hydrodynamic equations, magnetic hydro-static pressure hydrodynamic waves: Magneto-sonic and Alfven waves, particle orbits and drift motion in a plasmas, Experimental study of Plasma, the theory of single and double probes.

Unit - V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Text Books and reference book:

1. Bitteneerort — Plasma Physics
2. Chen — Plasma Physics
3. Gupta, Kumar, Singh — Electrodynamics ;
4. Sen — Plasma state and matter
5. Jackson — Classical electrodynamics
6. Pamolsky & Philips — Classical electricity and Magnetism

Swami Vivekanand University, Sagar (M.P.)

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Semester Wise Syllabus For Post Graduate classes
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CLASS - M.Sc. **SUBJECT - PHYSICS**

SEMESTER - II **PAPER - IV**

ATOMIC AND MOLECULAR PHYSICS

UNIT -I

Quantum states of one electron atom. Atomic orbitals. Hydrogen spectrum, Paulis principle, Spectra of alkali elements, Spin orbit interaction and line structure of alkali Spectra . Methods of molecular quantum mechanics, Thomas Fermi statistical model, Hartree and Hartree fock method, Two electron system. Interaction energy in L-S and J-J coupling, hyperfine structure (qualitative), line broadening mechanisms(general ideas).

UNIT - II

Types of molecules. Diatomic linear. Symmetric top, asymmetric top and spherical top molecules. Rotational spectra of diatomic molecules as a rigid rotator, Energy level and Spectra of non-rigid rotator, intensity of rotational lines,

UNIT- III

Vibrational energy of diatomic molecule, diatomic molecule as a simple harmonic oscillator, Energy levels and spectrum, Morse potential energy curve, Molecules as vibrating rotator, Vibration spectrum of diatomic molecule PQR branches, IR spectrometer(qualitative)

UNIT-IV

Introduction to ultraviolet, visible and infra-red spectroscopy, Raman spectroscopy: Introduction, pure rotational and vibrational spectra, Techniques and instrumentation, Photo electron spectroscopy, elementary idea about photoacoustic spectroscopy and Mossbauer spectroscopy(principle).

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Text **and** reference Books:

1. H.E. White — Introduction to atomic spectra
2. C.B. Banwell — Fundamental of molecular spectroscopy
3. Walker and Strnghem — Spectroscopy vol. I, II and 111
4. G.M.Barrow — Introduction to molecular spectroscopy
5. Herzberg — Spectra of diatomic molecules
6. Jeanne L and McHale — Molecular Spectroscopy
7. J.M.Brown — Molecular Spectroscopy
8. P.F.Bemath — Spectra of atoms and molecules
9. J.M. Halian — Modern Spectroscopy '

Swami Vivekanand University, Sagar (M.P.)

COURSEWISE SCHEME
III[rd] SEMESTER

1. Course Code	: MSCPHY	5. Total Practical	: 2
2. Course Name	: M.Sc. Physics	6. Total Practical Marks	: 100
3. Total Theory Subject	: 4	7. Total Marks	: 300
4. Total Theory Marks	: 200	8. Minimum Passing Percentage	: 36

Sub. Code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks					
		1st	2nd	3rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Compulsory														
MSCPHY 301	Condensed matter physics-I	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 302	Nuclear and particle physics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 303	Digital electronics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 304	Atomic and molecular physics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 305	**Practical-I**	0	0	0	0	0	0	0	0	0	50	18	50	18
MSCPHY 306	**Practical-II**	0	0	0	0	0	0	0	0	0	50	18	50	18

Swami Vivekanand University, Sagar (M.P.)

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
उच्च शिक्षा विभाग, म.प्र. शासन
स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Class / कक्षा : **M.Sc.**
Semester / सेमेस्टर : **III**
Subject / विषय : **Physics**
Title of Subject Group : **Condensed Matter Physics-I**
विषय समूह का शीर्षक :
Paper No. / प्रश्नपत्र क्रमांक : **I**
Compulsory / अनिवार्य या
Optional / वैकल्पिक अनिवार्य : **Compulsory**

Particulars / विवरण

Unit-1	**Crystal structure:** Bravais lattice in two and three dimension. Simple crystal structures: Hexagonal close packed structure, Diamond structure, zinc blende structure, sodium chloride structure, cesium chloride structure.
Unit-2	**Crystal diffraction by X-Ray:** Reciprocal lattice, Reciprocal lattice of bcc and fcc lattice. Relation between crystal lattice axes and crystal reciprocal lattice axes. Bragg diffraction. Condition in term of reciprocal lattice vector. Brillouin zones.
Unit-3	**Elastic properties of solids:** Stress and strain components, elastic compliance and stiffness constants, elastic energy density, reduction of number of elastic constants, elastic stiffness constants for isotropic body, elastic constant for cubic isotropic bodies, elastic waves, waves in (100) direction, experimental determination of elastic constants.
Unit-4	**Lattice vibration and phonons:** Lattice dynamic of a diatomic linear lattice. Lattice vibrational spectrum. The concept of phonons momentum of phonons. Inelastic scattering of photons by phonons. Inelastic scattering of neutrons by phonons. Inelastic scattering of X-Ray.
Unit-5	**Thermal properties and band theory of solids:** Anharmonicity, thermal expansion, thermal conductivity, equation of state of solids, gruneisen constant. Band theory, classification of solids, concepts of effective mass. Fermi surfaces, anomalous skin effect, De Hass van alphen effect, cyclotron resonance, magneto resistance.

Suggested Readings :

1. Verma and Srivastava: Crystallography for solid State physics.
2. Azaroff: Elementary to Solids.
3. Omar: Introduction Solids state physics.
4. Kittle: Solids state physics
5. Huong: theoretical solids state physics
6. Weertman and weertman: Elementary dislocation theory
7. Buerger: Crystal structure physics.
8. Made lung: introduction to solids state physics.

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Class / कक्षा	: **M.Sc.**
Semester / सेमेस्टर	: **III**
Subject / विषय	: **Physics**
Title of Subject Group	: **Nuclear and Particle Physics**
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र कमांक	: **II**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: **Compulsory**

Particulars / विवरण

Unit-1	**Nuclear Interaction and Nuclear reaction:** Nuclear forces, exchange and tensor forces, meson theory of nuclear forces, Low-energy n-p scattering and spin dependence of n-p forces. Direct and compound nuclear reaction mechanism, reciprocity theorem.
Unit-2	**Accelerators of charged particles:** Study of cyclotron, phase stability, frequency modulated cyclotron (synchorocyclotron) magnetic induction accelerator (Betatron), Electron synchrotron and linear accelerator (Linac)
Unit-3	**Nuclear models:** Liquid drop model, Bohr-wheeler's theory of nuclear fission, shell model, spin orbit interaction, magic number, spin and angular momenta of nuclear ground state, nuclear quadrupole moment.
Unit-4	**Nuclear decay and elementary particles:** β Decay, general features of β ray spectrum, Fermi theory of β decay, selection rules, parity in β decay, multipole radiation, internal conversion, nuclear isomerism.
Unit-5	**Elementary particles:** Classification of elementary particles, fundamental interaction, parameters of elementary particles. Symmetry and conservation laws, symmetry schemes of elementary particles SU(3)

Suggested Readings :

1. Introduction to Nuclear physics : H.A. Enge
2. Nuclear radiation detectors : S.S. Kapoor and V.S.Ramamurthy
3. Atomic and Nuclear physics : S.N. Ghoshal
4. Nuclear and Particle physics : D.C. Tayal
5. Nuclear Physics : R.C. Sharma
6. Introduction to Nuclear physics : KRANE
7. Nuclear physics Principles & Application :Lilley

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केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Class / कक्षा	: **M.Sc.**
Semester / सेमेस्टर	: **III**
Subject / विषय	: **Physics**
Title of Subject Group	: **Digital Electronics**
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: **III**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: **Compulsory**

Particulars / विवरण

Unit-1	Number system (Binary, Octal, Decimal, hexadecimal) and conversion between them. Boolean arithmetic, signed and unsigned binary numbers, I's complement, 2's complement,
Unit-2	Codes: BCD, Gray, ASCII, EBCDIC, Demorgans theorem, Gates: OR, AND, NOT, NOR, OR, NAND, XOR, XNOR, Boolean algebra, karnaugh map, adder and subtractor circuit design.
Unit-3	Multiplexer, demultiplexer, encoder, decoder, parity checker and generator, Flip-Flops: R-S,D, J-k, J-k Master slave flip flop, race around condition registers, shift registers (left and right shift)
Unit-4	Counters-asynchronous (ripple) counter, synchronous (parallel) counter, MOD-5 counter and MOD-10 counter, BCD counter, Up-Down counter, Shift Register counter (Ring counter)
Unit-5	Digital to analog conversion (Binary weighted register method, R-2R ladder network method, complete DAC structure. Analog to digital converters (Stair case or counter method, single slope, equal slope, successive approximation ADC)

Suggested Readings :

1. "Digital principles and applications" by A.P.Malvino and Donald P.Leach, Tata Megraw-Hill company, New Delhi, 1993.
2. "Microprocessor Architecutre, Programming and Applications with 8085/8086 by Rames S. Gaonkar, Wiley-eastern Ltd. 1987 (for unit V)"
3. Digital electronics –S.N. Ali
4. Digital electronics –Morries Mano
5. Microprocessor and Microcomputers-B.Ram-Dhanpat Rai publications V edition.

Swami Vivekanand University, Sagar (M.P.)

Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
उच्च शिक्षा विभाग, म.प्र. शासन
स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Class / कक्षा	: **M.Sc.**
Semester / सेमेस्टर	: **III**
Subject / विषय	: **Physics**
Title of Subject Group	: **Atomic and Molecular Physics**
विषय समूह का शीर्षक	:
Paper No. / प्रश्नपत्र क्रमांक	: **IV**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	: **Compulsory**

Particulars / विवरण

Unit-1	Nuclear Magnetic Resonance Spectroscopy: Concept of Nuclear Magnetic resonance spectroscopy, Interaction between nuclear spin and magnetic field, population of energy level, relaxation processes, spin-spin interaction and spin-spin coupling between two and more nuclei (Qualitative)
Unit-2	Electronic spectra of Diatomic Molecules: Franck Condon principles, dissociation and pre-dissociation, dissociation energy. Born-Oppenheimer-approximation, vibrational coarse structure of electronic spectra (bands progression and sequence).
Unit-3	Raman Spectra Raman effect, quantum theory of Raman effect, Molecular polarisibility in Raman effect, Vibrational Raman spectra, vibration-rotation Raman Spectra of diatomic molecules, application of Raman and infrared spectroscopy in the structure determination.
Unit-4	Mossbauer Spectroscopy: Mossbauer effect, principles of Mossbauer spectroscopy, recoil less emission of gamma emission, line width and resonance absorption, application of mossbauer spectroscopy (Isomer shift, Quadra pole splitting magnetic field effect).
Unit-5	Electron Spin Resonance spectroscopy: Elementary Idea about ESR, Principle of ESR, ESR spectrometer, splinting of electron energy levels by a magnetic field, G-Values, simple experimental setup of ESR. ESR spectra of free radicals in solution, An Isotropic system.

Suggested Readings :

1. Fundamentals of Molecular Spectroscopy-C.B. Banwell.
2. Spectra of Diatomic Molecules-Herzberg.
3. Mossbauer Spectroscopy-M.R.Bhide
4. NMR and Chemistry-J.W.Akitt
5. Modern Spectroscopy-J.M.Hollons

Swami Vivekanand University, Sagar (M.P.)

COURSEWISE SCHEME
IVth SEMESTER

1. Course Code	: MSCPHY	6. Total Practical Marks	: 100
2. Course Name	: M.Sc. Physics	7. Project Marks	: 50
3. Total Theory Subject	: 4	8. Total Marks	: 350
4. Total Theory Marks	: 200	9. Minimum Passing Percentage	: 36
5. Total Practical	: 2		

Sub. Code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks					
		1st	2nd	3rd	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Compulsory														
MSCPHY 401	Condensed matter physics-II	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 402	Laser Physics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 403	Computer Programming & Informatics	42	0	0	42	15	8	3	50	18	0	0	50	18
Optional														
MSCPHY 404-A	Communication electronics	42	0	0	42	15	8	3	50	18	0	0	50	18
MSCPHY 404-B	Digital electronics	42	0	0	42	15	8	3	50	18	0	0	50	18
Compulsory														
MSCPHY 405	**Practical-I**	0	0	0	0	0	0	0	0	0	50	18	50	18
MSCPHY 406	**Practical-II**	0	0	0	0	0	0	0	0	0	50	18	50	18
MSCPHY 407	Project Work	0	0	0	0	0	0	0	50	18	0	0	50	18

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Class / कक्षा : **M.Sc.**
Semester / सेमेस्टर : **IV**
Subject / विषय : **Physics**
Title of Subject Group : **Condensed Matter Physics-II**
विषय समूह का शीर्षक :
Paper No. / प्रश्नपत्र कमांक : **I**
Compulsory / अनिवार्य या
Optional / वैकल्पिक अनिवार्य : **Compulsory**

Particulars / विवरण

Unit-1	Super Conductivity: Concept of super conducting state, persistent current, critical temperature, meissner effect, thermodynamics of the super conducting transitions, London equation and penetration depth, coherence length, Type I and Type II superconductors, B.C.S. theory of superconductivity. AC and DC Josephson effects, Josephson Tunneling.
Unit-2	Magnetism: Weiss theory of ferromagnetic Heisenberg model and molecular field theory, Domain and Bloch wall energy, Spin waves and mangnons, curie weiss law for susceptibility, Ferri and anti ferrimagnetic.
Unit-3	Imperfection in crystals: Imperfection in atomic packing, point defects, interstitial Schottky and frenkel defects, lattice vacancies colour centres, F centres, F' centres, coagulation of F centres, production of colour centres and V centres, explanation of experimental facts, line defects, edge and screw dislocation, mechanism of plastic deformation in solids, stress and strain fields of screw and edge dislocation, elastic energy of dislocation, slip and plastic deformation, shear strength of single crystal, burgers vector stress fields around dislocation.

Unit-4	Thin film: Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and film thickness (Fizeau frings) Electrical conductivity of thin films, expression for electrical conductivity of thin films, Hall-coefficient quantum size effect in thin film.
Unit-5	Nano structure: Definition and properties of nano structured material, different method of preparation of nano materials, plasma enchanted chemical vapour deposition, electro deposition. Structure of single wall carbon nano tubes (classification, chiral vector Cn, Translational vector T, Symmetry vector R, Unit Cell, Brillouin Zone) Electronic, mechanical, thermal and phonon properties.

Suggested Readings :

1. Kittel: Solid State Physics
2. Huang: Theoretical Solid State Physics
3. Weertmon and Weertman: Elementary Dislocation theory
4. Thomes: Multiple Electron microscopy
5. Tolansky: Multiple Beam Interferometer
6. Heavens: Thin films
7. Chopra: Physics of thin films.

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Class / कक्षा	**: M.Sc.**
Semester / सेमेस्टर	**: IV**
Subject / विषय	**: Physics**
Title of Subject Group	**: Laser Physics**
विषय समूह का शीर्षक	**:**
Paper No. / प्रश्नपत्र कमांक	**: II**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	**: Compulsory**

Particulars / विवरण

Unit-1	Basic principles of laser: Introduction to laser, spontaneous and stimulated emission. Einstein coefficients. Idea of light amplification. Population invertion, laser pumping schemes for two and three level system with threshold condition for laser oscillation.
Unit-2	Properties of Laser Beams and Resonators: Properties of Laser-Temporal coherence, spatial coherence, directionality and monochromatic of laser beam, resonators, vibrational mode of resonators, laser amplification, open resonator.
Unit-3	Types of lasers: Solid state lasers i.e. Ruby Laser, Nd-Yag Laser, Semiconductor laser, Gas laser i.e. Carbon dioxide Laser, He-Ne Laser, Basic idea about liquid laser, Dye laser and chemical laser i.e. HCI and HF lasers.
Unit-4	Application of Lasers Holography and its principle, theory of holograms, reconstruction of image, characteristics of Holographs, Application of lasers in chemistry and optics laser in Industry i.e. laser belding, Hole drilling, laser cutting, application of lasers in medicine.

Unit-5	Basic idea about non-linear optics Harmonic generation, second and third harmonic generation, phase matching, optical mixing, parametric generation of light, self-focusing of light.

Suggested Readings :

1. Laser-syelto
2. Optical electronics-Yarive
3. Laser spectra scopy-demtroder
4. laser spectroscopy and instrumentation demotroder
5. Molecular spectra scopy-King
6. Non linear optics by B.B. Loud

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Class / कक्षा : **M.Sc.**
Semester / सेमेस्टर : **IV**
Subject / विषय : **Physics**
Title of Subject Group : **Computer Programming and Informatics**
विषय समूह का शीर्षक :
Paper No. / प्रश्नपत्र कमांक : **III**
Compulsory / अनिवार्य या
Optional / वैकल्पिक अनिवार्य :**Compulsory**

Particulars / विवरण

Unit-1	Conceptual framework of computer languages (Algorithm, Flowcharts) Need of structured programming, Top-down, bottom-up and modular programming design. Introduction to C languages- basic structure of C program. Character set, keyword and identifiers, C data types, variable and data type declaration. Various operators like arithmetic, relational, logical, assignment, conditional, increment and decrement operators. Evaluation of expression and operator precedence.
Unit-2	Input and output statement, control statement (If, If-else, lf nested if-else statements, switch, while, Do…while and for statements) Simple C programs like search of prime number between given range of numbers, finding the smallest and largest of three numbers, sume of algebraic series, factorial of given number, roots of a quadratic equation, binary to decimal and decimal to binary conversion etc.
Unit-3	Functions: need of functions, calling the function by value and by reference, category of functions: no argument no return, argument but not return, argument with return. Recursion. One and two dimensional arrays. String and string handling functions like sprintf (), strcpy (), sscanf(), strlen(), sizeorf(), strcmp() etc. Simple programs using user define functions, arrays and string functions.
Unit-4	Network: Terminals-Dumb terminals, smart terminals, intelligent tgerminals. Types of network: • According to range: LAN, MAN, WAN, Client server. • According to topologies: BUS, RING, STAR, Mesh Netwrork. Internet: History of Internet Service Provider (ISP), introduction to type of internet account –shell/Ac, TCP/IP A/c. types of connectivity-Dialup, Leased lines, Satellite. IP Address-Class A, Class B, Class C Domain Name address. URL-absolute and

	relative
Unit-5	Web enabled technology (Email and HTML): Web Browser: Internet Explorer, Netscape Navigator, Station and Dynamic web page Introduction to HTML. HTML tags: • <HTML>, <TITLE>, <HEAD>, <BODY> • <P>, , <ALIGN>, <I>, <B>, <DIV>, <PRE>, and their attributes. • <IMG>, <a> and their attributes. • Ordered and Unordered list tages • Tabes and associated tags and its properties. Creation of simple forms using text. Password, text area, radio, submit, Reset and Hidden. Brief idea about HTTP. Search engine, its working, types of search engines: sub directories meta search engines, search function-AND and OR. Population search engines.

SUGGESTED READINGS :

1. Let us C : Yashwat Kanetkar
2. Programming with C : Balaguruswami
3. Internet and Web Page : V.K.Jain
   'O' level module M1.2
4. Internet and Web Page design : Dr. P.D. Murarka
   'O' level module M1.2
5. Internet and web page design : Pearl Software
   'O' level module M1.2
6. C# 2008 in simple step
   Dreamtech press
7. C# 2008 programming block book
   Dreamtech press

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Class / कक्षा	:	M.Sc.
Semester / सेमेस्टर	:	**IV**
Subject / विषय	:	**Physics**
Title of Subject Group	:	**Communication Electronics**
विषय समूह का शीर्षक	:	
Paper No. / प्रश्नपत्र कमांक	:	**IV- A**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	:	**Optional**

Particulars / विवरण

Unit-1	**Communication Electronics:** Amplitude modulation – generation of AM waves demodulation of AM waves, DSBSC modulation, Generation of DSBSC waves, coherent detection of DSBSC waves, SSB modulation, generation and detection of SSB waves, vestigial sideband modulation.
Unit-2	**Propagation of Waves:** Ground Waves, sky wave, space wave, propagation, maximum usable frequency, skip distance, virtual height, fading of signals, Satellite communication: orbital satellite, geostationary satellites, orbital pattern, look angles, orbital spacing, satellite system, link modules.
Unit-3	**Microwave:** Advantages and disadvantages of microwave transmission loss in free-space, propagation of microwaves, atmospheric effects on propagation, Fresnel Zone problem used in microwave communication systems.
Unit-4	**Digital Communications:** Pulse-Modulation system, sampling theorem, Low pass and Band pass signals, PAM, channel BW for a PAM signal, Natural Sampling, Flat top sampling, signals Recovery through Holding, Quantization of signals, Quantization, Differential PCM Delta Modulation, Adaptive Delta Modulation, CVSD.

Unit-5	**Data Transmission:** Base-band signal receiver, probability of error, optimum filter, white noise, matched filter and probability of error, coherent reception correlation, PSK, FSK, non coherent detection of FSK, differential PSK, QPSK, calculation of error probability for BPSK, BFSK, and QPSK .

Book Suggested

1. Digital Communications : W. Tomasi
2. Microwave : K. C. Gupta
3. Microwave Devices & Circuits : S.Y. Lio

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Class / कक्षा	:	M.Sc.
Semester / सेमेस्टर	:	**IV**
Subject / विषय	:	**Physics**
Title of Subject Group	:	**Digital Electronics**
विषय समूह का शीर्षक	:	
Paper No. / प्रश्नपत्र कमांक	:	**IV- B**
Compulsory / अनिवार्य या Optional / वैकल्पिक अनिवार्य	:	**Optional**

Particulars / विवरण

Unit-1	**OP-AMP:-** Differential amplifier circuit configurations: dual input balanced output dual input, single input unbalanced output (ac analysis) only, block diagram of a typical op amp analysis, schematic symbol of an op- amp.
Unit-2	**OP-AMP Parameters:-** Ideal op-amp., Op-amp parameters; input offset voltage, input offset current, input bias current, CMRR, SVRR, large signal voltage gain, Slew rate, Gain band width product, output resistance, supply currents power consumption, inverting and non-inverting inputs.
Unit-3	**Application of OP-AMP:** Inverting and non-inverting amplifier, summing, scaling and averaging amplifier, integrator and differentiator. Oscillator Principles: oscillator types, frequency, stability response, the phase shift oscillator, Wein-bridge oscillator, L-C tunable oscillator, square wave generator.
Unit-4	**Microprocessors and Micro Computers:** Microprocessor and Architecture: Intel 8086, Microprocessor architecture modes of memory addressing, 8086/8088 Hardware specification: Pin-outs and pin functions, clock generator (8284A) Bus buffering and latching, Bus timing, Ready and wait state, Minimum mode versus maximum mode.

Unit-5	**Programming the Microprocessors:** Addressing modes: Data addressing modes, program memory addressing modes, stack memory-addressing modes. Instruction set: data movement Instructions, Arithmetic and login instructions, program control instructions. Programming example: Simple assembly language programs table handling direct table addressing, searching a table sorting a table using pseudo ops.

BOOK SUGGESTED

1. Digital Principles and Application : A. P. Melvino & D. P. Leech
2. Op-Amps & Linear Integrated circuits : R. A. Gayakwad
3. Electronics : D. S. Mathur
4. Digital Principles & Applications : Malvino & Leech
5. Microprocessor Architecture, Programming & Applications with 8085/8086 : R.S. Gaonker
6. Microprocessor & Digital Systems : D.V. Hall
7. Fundamentals of Electronics : Borker