Govt. (Auto) Girls P.G. College of Excellence, 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 m.m. 40

Unit -I

Differential equations: Recursion relation, generating functions and orthogonality of Bessel functions of first and second kind, Hermite, Legendre, Associate Legendre 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 functions(Branch points).

29/8/20 28/8/20 28.8.20

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. Bhatak, Goyal & Guha Mathematical Physics
6. M.R Spiegel (Schaum Series) Complex variable & Laplace Transform

13/4/15 17.4.15

7/9/13 12/10 Dr. Ashish Verma 7/9/13

Dr. P. L. Jain 7/8/13

Dr. N.S. 13/10/19

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

SEMESTER - I **PAPER - II**

CLASSICAL MECHANICS

m.m.40

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 onebody problem; the equation of motion and first integrals, the differential equation for the orbit.

Unit - II

The equat ions of canonical transformation and generating functions; The Hamilton-Jacobi Action and Angel variables. Poisson.s bruckets; 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.

Unit - III

Theory of small oscillations, 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. Coriolis force and its terrestrial astronomical applications, Elementary treatment of Eulerian coordinates and transformation matrices. Angular momentum inertia tensor. Eular equations 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 fourdimensional formulation, 4 -Vectors and 4 - scalers. Relativistic generalization of Newton's laws, 4 –momentum and 4 - force, variance under Lometz 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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CLASS - M.Sc. **SUBJECT - PHYSICS**
SEMESTER - I **PAPER - III**

mm. 40

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 unitarytransformation (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 L2 and Lz 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 Messinh Quantum Mechanics
5. J. J. Sakurai Modern Quantum Mechanics
6. Mathews and Venkatesan Quantum Mechanics

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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 related to get these effect,important ferro electric, l iquid 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 delaylines, 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 and technology
2. MS tyagi Introduction to semiconductors devices
3. M Sayer and A Manisingh Measurement instrumentation and experimental design in physics and engineering
4. Ajoy Ghatak and Thyagajam Optical Electronics

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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

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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. Tandon Statistical Physics

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Dr. Ashish Verma

Dr. P. L. Jain 7/8/13 17/4/15

7/8/13

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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. Langregian and Hamiltonian for a relativistic charged particle jn External EM field; motion of charged particles in electromagnetic fields, uniform and nonuniform 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 : Magnetohydrodynamic 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. Bittenecerort 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

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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 photoacousticspectroscopy 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 Stinghem Spectroscopy vol. I, II and III
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.Bernath Spectra of atoms and molecules
9. J.M. Hallan Modern Spectroscopy

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Session 2014-2015

Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Title of subject Group	:	Condensed Matter Physics-I
Paper No.	:	I
Compulsory/Optional	:	Compulsory
Max. Marks	:	40

	Particulars
Unit-I	**Central Structure :** Bravis 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 defection. 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 lines lattic Lattice vibrational spectrum. The concept of Phonons momentum of phono Inelastic scattering of photons by phonons. Inelastic scattering of neutrons 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, grunneisen 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 Shrivastava : Crystallography for Solid State Physics.
2. Azaroff : Elementary to Solids.
3. Omar : Introduction solids states physics.
4. Kittle : Solids state physics
5. Huong : Theoretical Solids State physics.
6. Weertman and weertman : Elementary Dislocation theory.
7. Burger, Crystal structure physics.
8. Made Lung : Introdution to solid state physics.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Title of subject Group	:	Nuclear and Particle
Paper No.	:	II
Compulsory/Optional	:	Compulsory
Max. Marks	:	42 40

	Particulars
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 (Synchrocyclotron) magnetic induction accelerator (Betatron), Electron Synchrotron and linear accelerator (Linac)
Unit-3	**Nuclear Models :** Liquid drop model, Bohar –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, multiple 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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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Title of subject Group	:	Digital Electronics.
Paper No.	:	III
Compulsory/Optional	:	Compulsory
Max. Marks	:	42 40

Particulars

Unit-I	**Number system :** (Binary, Octal, Decimal, hexadecimal) and conversion between them. Boolean arithmetic, signed and unsigned binary numbers. 1'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 ad sub tractor 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 register (left and right shift)
Unit-4	**Counters –** asynchronous (ripple) counter, synchrononous (parallel) counter, MOD-5 counter and MOD-10 counter, BCD counter, up down counter. Shift Registrar 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 of counter method, single slope, equal slope, successive approximation ADC)

Suggested Readings :

1. "Digital principles and applications" by A.P. Malvino and Donlad P. Leach, Tata Megraw- Hill company, New Delhi,1993.
2. "Microprocessor Architecture, 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.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Title of subject Group	:	Atomic and Molecular.
Paper No.	:	IV
Compulsory/Optional	:	Compulsory
Max. Marks	:	40

Particulars	
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:** Frank condon principles, dissociation and pre-dissociation and pre-dissociation dissociation energy. Born-Oppenheimer-approximation, vibrational course structure of electronic spectra (bands progression and sequence)
Unit-3	**Raman Spectra :** Raman Effect quantum theory of Raman effect, Molecular Polarisability in Raman effect, Vibrational Raman Spectra of diatomic molecular, 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, splitting 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.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Title of subject Group	:	Condensed Matter Physics -II
Paper No.	:	I
Compulsory/Optional	:	Compulsory
Max. Marks	:	40

Particulars

Unit-I	**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 super conductivity. AC and DC Josephson effects Josephson Tunneling.
Unit-2	**Magnetism :** Weiss theory of ferromagnetic Heiscobery model and molecular field theory. Domain and Bloch wall energy. Spin waves and mangnons, curie weiss law for susceptibility, Ferri and anti ferromagnetic.
Unit-3	**Imperfection in crystals :** Imperfection in atomic packing, point defects, interstitial schotky and frenkel defectsIonice vacancies colour 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 dissolution.
Unit-4	**Thin Film :** Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and thickness (Fizeu fringe) 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 properties. Physics Reference

Suggested Readings :

1. Kittel : Solid State Physics.
2. Huang : Theoretical solid state Physics.
3. Weetman and weertman : Elementary dislocation theory.
4. Thomas : Multiple Electron microscopy.
5. Tolansky : Multiple beam Interferometer.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Title of subject Group	:	Laser Physics - II
Paper No.	:	II
Compulsory/Optional	:	Compulsory
Max. Marks	:	= 40

Particulars	
Unit-I	**Basic Principle of Laser :** Introduction to laser, spontaneous and stimulated emission. Einstein coefficients. Idea of light amplification. Population inversion, 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 liquid laser, Dye laser and chemical laser i.e. HCl and HF lasers.
Unit-4	**Application of Lasers :** Holography and its principle, theory of holograms, reconstruction of image, characteristics of Holographs. Applications of lasers in chemistry and optics laser in industry i.e. laser welding, 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 Selio
2. Optical electronics- Yarive
3. Laser spectroscopy-demtroder.
4. Laser spectroscopy and instrumentation demotrouler.
5. Molecular spectroscopy-king.
6. Non linear optics by B.B. Laud.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Title of subject Group	:	Computer Programming and Informatics
Paper No.	:	III
Compulsory/Optional	:	Optional
Max. Marks	:	40

Particulars	
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 opearators. Evaluation of expression and operator precedence.
Unit-2	Input and output statement, control statement (if, if-else, if nested if-else statements, switch, while Do...While and for statement) Simple C programs like search of prime number between given range of numbers, finding the smallest and largest of three numbers, sum 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 arryns String handling functions like s print f( ), strcpy ( ), strlen ()| Strcmp () etc. Simple programs using user define functions arrays and string functions
Unit-4	**Network :** Terminals-Dumb Terminals, smart terminals, intelligent terminals. Types of Network : According to range : LAN, MAN, WAN Client Server. According to topologies : Bus, Ring, Star, Mesh Network. Internet History of Internet Service provider (ISP) Introduction to type of internet account shell/Ac. TCP I/P A/c Types of connectivity-Dialup, Leased lines. 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 Explorar, Netscape Navigator Station and Dynamic Web page introduction to 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

Suggested Readings :

1. Let us C — Yaswat Kanetkar
2. Programming with C — Balaguruswami
3. Internet and web page page design 'O' level module M 1.2 — Dr. P.D. Murarka
4. Internet and web page design 'O' level module M 1.2 — Pearl Software.
6. C # 2008 in simple step dreamtech press
7. C # 2008 programming black book dreamtech press

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
Session 2014-2015

Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Title of subject Group	:	Communication Electronics
Paper No.	:	IV-D
Compulsory/Optional	:	Optional
Max. Marks	:	40

Particulars	
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	**Propogation of waves :** Ground waves , sky waves, 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:** Advantage and disadvantages microwave transmission loss in free-space, propagation of microwaves, atmospheric effects on propagation, fresnel zone problem used in microwave communication system.
Unit-4	**Digital Communications :** Pulse- Modulation system, sampling theorem, Low pass and Band pass signals, PAM, Channel BW for a PAM signal, Natural Sampling, Flt 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	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Title of subject Group	:	Material Science
Paper No.	:	IV-B
Compulsory/Optional	:	Compulsory
Max. Marks	:	40

Particulars	
Unit-I	Classification of Materials : Types of Materials : Crystalline, polycrystalline, Amorphous (introduction and their structure) Elementary idea of polymers (structure and properties methods of polymerization. Glasses : Structure and properties. Types of Glasses, fractions in glasses : Composite Materials : Introduction their types and properties, different type of bonding medalung energy for ionic crystal
Unit-2	Phase Transitions : Thermodynamics of Phase transformation, Free-energy calculation, I and II order transformation, Hume Rother rule; solid solid solution and types of solid solutions, phase rule, One, Two component systems, Eutectic and Paratactic phase diagrams, Lever rule, phase diagrams of Mg-Al, Fe-C kinetics of transformations, Homogeneous and heterogeneous nucleation Growth Kinetics.
Unit-3	Diffusion in Materials : Mechanism of diffusion, energy of formation and motion, long distance motion, Rate theory of diffusion, Einstein relation (relation between diffusivity and mobility) Fick's laws of diffusion and solution of Fick's second law, kirkendal effect, diffusion of vacancies in ionic crystals, Experimental determination of Diffusion coefficient.
Unit-4	Elastic and Anelastic Behaviour : Atomic models for elastic behaviour, Elastic deformation in singal crystals, Elastic anisotropy, Elastic constant and elasticity, anelastic behavior Therno-elastic effect and relaxation process, Idea of visco elastic behaviour (Spring-Dashpot model), Determination of elastic constant of cubic crystaly by ultrasonic wave propogation.
Unit-5	Transport properties of solids : Electrical conductivity of metals and alloys, extrinsic, intrinsic, semiconductors and amorphous semiconductors, scattering of electrons by phonons, impurity, etc. Relaxation time, Carrier mobility and its temperature dependence, mathiessin's rule for resistivity, temperature dependence of metallic resistively.

Book Suggested :

1.	Introduction to solids	: L.V. Azaroff.
2.	Introduction to Solid State Physics	: C Kittle
3.	Materials and Engineering	: Raghavan
4.	Diffussion Kinetics for Atoms in crystals	: Manning
5.	Theoretical Solid State Physics	: Huang