BHARATHIAR UNIVERSITY, COIMBATORE-641 046
M. Sc. PHYSICS DEGREE COURSE WITH COMPULSORY DIPLOMA
(AFFILIATED COLLEGES – CBCS PATTERN)
(For Candidates Admitted During the Academic Year 2009-2010 Batch & Onwards
SCHEME OF EXAMINATIONS

Semester	Study Components	Ins. Hrs/	Exam				Credit
			Dur. Hrs	CIA	Unit. exam	Total Mark	
I	Paper – I Classical & Statistical Mechanics	5	3	25	75	100	4
	Paper – II Mathematical Physics	5	3	25	75	100	4
	Paper – III Quantum Mechanics-I	5	3	25	75	100	4
	Paper – IV Advanced Computational Physics	5	3	25	75	100	4
	Elective/Dip. I	5	3	25	75	100	4
II	Paper – V Quantum Mechanics-II	5	3	25	75	100	4
	Paper – VI Electromagnetic Theory	5	3	25	75	100	4
	Paper –VII Electronic Devices	5	3	25	75	100	4
	Practical- I General Physics	6	4	40	60	100	4
	Practical- II Electronics	6	4	40	60	100	4
	Elective/Dip. II	5	3	25	75	100	4
III	Paper – VIII Optical Physics	5	3	25	75	100	4
	Paper – IX Nuclear & Particle Physics	5	3	25	75	100	4
	Paper – X Spectroscopy	5	3	25	75	100	4
	Paper – XI Communication Electronics	5	3	25	75	100	4
	Elective/Dip. III	5	3	25	75	100	4
IV	Paper –XII Condensed Matter Physics	5	3	25	75	100	4
	Practical- III Advanced Practicals	6	6	40	60	100	4
	Practical- IV Special Electronics	6	6	40	60	100	4
	Project	-	-	-	-	200*	10
	Elective/Dip. IV	-	-	-	-	100*	4
Total						2200	90

* Project report – 80% marks; Viva-voce – 20% marks

List of Group Elective/Diploma papers (Colleges can choose any one of the Group/Diploma papers as electives)

	GROUP A Diploma in Nano Science	GROUP B Diploma in Astrology, Astrophyscis & Cosmology
Paper I/ Sem I	Fundamentals of Nanoscale Science	Introductory Astronomy And Astrophysics
Paper II/Sem II	Nanomaterials Synthesis	Introductory Cosmology
Paper III/Sem III	Characterization and Application of Nano Materials	Astronomical Techniques
Paper IV/Sem IV	Project	Project

PAPER I – CLASSICAL & STATISTICAL MECHANICS
FIRST SEMESTER

Unit I: Lagrangian & Hamiltonian Formalism

Hamiltonian variational Principle- Lagrange's equations of motion-Application of Lagrange's equation-Linear Harmonic oscillator-Hamiltonian's equations of motion –Deduction of Hamiltonian's equation from variational principle-Application of Hamiltonian's equations of motion-Particle moving under central force-Principle of least action

Unit II – Canonical transformations

Canonical transformation-Poisson's Bracket-Definition-Equation of motion in Poisson's Bracket form-Angular momentum and Poisson's Bracket relation-H-J method- H-J partial differential equation-Solution of H-J equation-Solution of harmonic oscillator by H-J method-Action & angle variable.

Unit III: Rigid Body Dynamics & Small Oscillations

Euler's theorem-Euler's angles-Rotational K.E of a rigid body- Equations of motion for a rigid body-Motion of symmetric top under action of gravity-Stable & unstable equilibrium-Lagrange's equation for small oscillations-Properties of T,V,ω-Normal co-ordinates & Normal frequencies of vibration-Free vibration of linear triatomic molecule.

Unit IV: Classical Statistics:

Maxwell Boltzmann Distribution Law(no derivation)-Maxwell's Law of Distribution of Velocities-Most Probable, Mean, Mean Square and Root Mean Square Speeds- Principle of Equipartition of Energy-Partition Function- -Total Internal Energy of an Ideal Gas-Molar Heat Capacity of a gas at Constant Volume-Entropy-Helmholtz Free Energy-Pressure and Equation of State of an Ideal Gas.

Unit V: Quantum Statistics:

Bose-Einstein Distribution Law(no derivation)- B-E Energy Distribution for energies in the range E to E+dE-Condition for B-E Distribution to approach M-B Distribution-Bose Temperature- Bose-Einstein Condensation-Planck's Law from B-E Law- Fermi-Dirac Distribution Law(no derivation)- F-D Law for energies in the range E to E+dE-Fermi Energy-Free Electrons in a Metal- Comparison of M-B, B-E and F-D Statistics.

Books for Study & Reference:

1. Classical Mechanics- S.L.Gupta, V. Kumar & H.V.Sharma-Pragati Prakashan- Meerut.,2003
2. Classical Mechanics- H. Goldstein-Addison Wesley, London,1996
3. Elements of Statistical Mechanics-Kamal Singh & S.P. Singh- S. Chand & Company, New Delhi,1999.
4. Elements of Statistical Mechanics-Gupta & Kumar- Pragati Prakashan- Meerut
5. Classical Mechanics of Particles & Rigid Bodies-Kiran C.Gupta-Wiley Eastern Ltd.,1982
6. Classical Mechanics-S.N. Gupta
7. Fundamentals of Statistical Mechanics and Thermal Physics-E.Reif-McGraw Hill

Tutorial: Classical Mechanics (This portion is not intended for examination purpose**)**

1) Simple pendulum with rigid support, and with variable length.
2) Two connected masses with string passing over a pulley; virtual work.
3) Rolling mass inside or outside a circular ring.

PAPER II- MATHEMATICAL PHYSICS
FIRST SEMESTER

Unit I: Special Functions

Legendre's Polynomials and Functions- Differential Equations and Solutions-Generating Functions-Orthogonality-Relation between Legendre Polynomial and their Derivatives-Recurrence Relations-Bessel's Function-Differential Equation and Solution-Generating Functions-Recurrence Relations-Hermite function.

Unit II: Complex Variable Theory

Functions of a Complex Variable-Single and Multivalued Functions-Cauchy-Reimann Differential Equation-Analytical Line Integrals of Complex Function-Cauchy's Integral Theorem and Integral Formula-Derivatives of an Analytic Function-Taylor's Variables-Residue and Cauchy's Residue Theorem.

Unit III: Linear Space

Definition of Vector Space-Linear Dependence-Linear Independence-Basis-Dimension of a Vector Space-Representation of Vectors and Linear Operators with respect to Basis-Schmidt Orthogonalization Process-Inner Product.

Unit IV: Fourier Series & Laplace Transforms

Fourier Series-Dirichlet's Theorem-Change of Interval-Complex Form-Fourier Series in the Interval(0, θ)- Uses of Fourier Series.-Laplace Transform-Definition-Properties-Translation Property-Inverse Laplace Transform-Properties

Unit V: Group Theory

Definition of Groups-Groups of Transformation-Multiplication Table (C_{4V})-Subgroups and Conjugate Classes-Cyclic Groups-Symmetry Elements-Transformation & Matrix Representation-Point & Space Groups-Reducible & Irreducible Representation of a Group-Schur's Lemmas-Orthogonality Theorem-Character of a Representation & Character Table-C_{2V} & C_{3V} Groups in Molecular Physics-Application for Classification of Elementary Particles

BOOKS FOR STUDY & REFERENCE:

1. Mathematical Physics- Sathya Prakash-Sultan Chand & Sons
2. Mathematical Physics-B.D. Gupta-Vikas Publishing House, 3rd Edition, 2006
3. Mathematical Physics-B.S. Rajput- Pragati Prakashan- Meerut 17th Edition 2004
4. Elements of Group Theory for Physicists-A.W. Joshi-Wiley Eastern, 2002
5. Mathematical physics by P.K. Chattopadhayay-New Age International-New Delhi.
6. Mathematical Physics-P.P. Gupta, Yadav & Malik-Kedarnath Ramnath-Meerut
7. Numerical Methods in Science & Engineering-M.K. Venkataraman-National Publishing-Chennai,1986
8. Numerical Methods-A. Singaravelu-Meenakshi Publishing

Tutorial: Mathematical Physics (This portion is not intended for examination purpose**)**

1) Fourier Transformation (FT) of Gaussian functions.
2) Applications of FT of dirac delta function.
3) Solution of time dependent problems by FT.

PAPER III- QUANTUM MECHANICS - I
FIRST SEMESTER

Unit I: Equation of Motion & Application of Schroedinger's Equation:
State Vectors-Hilbert Space-Dirac Notation-Dynamical Variables as Operators-Change of Basis-Unitary Transformation-Equation of Motion in Schroedinger Picture, Heisenberg Picture & Dirac Picture.

Unit II: Approximate Methods:
Time Independent Perturbation Theory in Non-Degenerate Case-Ground State of Helium Atom-Degenerate Case-Stark Effect in Hydrogen-Variation Method & its Application to Hydrogen Molecule-WKB Approximation.

Unit III: Time Dependent Perturbation Theory:
Time Dependent Perturbation Theory-First and Second Order Transitions-Transition to Continuum of States-Fermi Golden Rule-Constant and Harmonic Perturbation-Transition Probabilities-Selection Rules for Dipole Radiation-Collision-Adiabatic Approximation

Unit IV: Angular Momentum
Orbital Angular Momentum-Spin Angular Momentum-Total Angular Momentum Operators-Commutation Relations of Total Angular Momentum with Components-Ladder Operators-Commutation Relation of J_z with J_+ and J_- - Eigen Values of J^2, J_z -Matrix Representation of J^2, J_z, J_+ and J_- - Addition of Angular Momenta- Clebsch Gordon Coefficients-Properties.

Unit V: Relativistic Wave Equation:
Klein Gordon Equation-Plane Wave Equation-Charge and Current Density-Application to the Study of Hydrogen Like Atom-Dirac Relativistic Equation for a Free Particle-Dirac Matrices-Dirac Equation in Electromagnetic Field-Negative Energy States.

Books for Study & Reference:
1. Quantum Mechanics-Gupta, Kumar & Sharma 23rd Edition, 2003-2004
2. Quantum Mechanics-Satyaprakash
3. Quantum Mechanics-L.I. Schiff- McGraw Hill, 3rd Edition, 1968
4. Quantum Mechanics-E. Merzbacher-Wiley and Sons, 3rd Edition, 2004
5. Quantum Mechanics-A. Devanathan-Narosa Publishing-New Delhi, 2005
6. A Text Book of Quantum Mechanics-P.M. Mathews & K. Venkatesan-Tata McGraw Hill. 29th Reprint, 2002
7. Principles of Quantum Mechanics-R.Shankar, Springer, 2005

Tutorial: Quantum Mechanics I (This portion is not intended for examination purpose**)**
1) One dimensional step, barrier, well.
2) Particle energy below and above barrier height; similarly for well.
3) Plotting of harmonic oscillator wavefunctions; problems involving matrix representations of an operator.

PAPER IV-ADVANCED COMPUTATIONAL PHYSICS
FIRST SEMESTER

Unit I: Numerical Differentiation

Finding Roots of a Polynomial-Bisection Method-Newton Raphson Method-Solution of Simultaneous Linear Equation by Guass Elimination Method-Solution of Ordinary Differential Equation by Euler, Runge-Kutta Fourth Order Methods.

Unit II: Numerical integration

Newton's cotes formula-Trapezoidal rule-Simpson's 1/3 rule- Simpson's 3/8 rule-Boole's rule-Gaussian quadrature method-(2 point and 3 point formulae)-Giraffe's root square method for solving algebraic equation.

Unit III: Matlab Fundamentals

Introduction-Matlab Features-Desktop Windows: Command, Workspace, Command History, Array Editor and Current Directory -Matlab Help and Demos- Matlab Functions, Characters, Operators and Commands.

Basic Arithmetic in Matlab-Basic Operations with Scalars, Vectors and Arrays-Matrices and Matrix Operations-Complex Numbers- Matlab Built-In Functions-Illustrative Examples

Unit IV: Matlab Programming

Control Flow Statements: ***if, else, else if, switch*** Statements-***for, while*** Loop Structures-***break*** Statement-Input/Output Commands-Function m Files-Script m Files-Controlling Output

Unit V: Matlab Graphics:

2D Plots-Planar Plots, Log Plots, Scatter Plots, Contour Plots-Multiple Figures, Graph of a Function-Titles, Labels, Text in a Graph- Line Types, Marker types, Colors-3D Graphics-Curve Plots-Mesh and Surface Plots-Illustrative Examples

Books for Study & Reference

1. Engineering and Scientific Computations Using Matlab- Sergey E. Lyshevski-JohnWiley & Sons
2. A Guide to Matlab for Beginners & Experienced Users-Brian Hunt, Ronald Lipsman, Jonathan Rosenberg-Cambridge University Press
3. Matlab Primer-Timothy A. Davis & Kermit Sigmon-Chapman & Hall CRC Press-London
4. Matlab Programming-David Kuncicky-Prentice Hall
5. Getting Started With Matlab-Rudra Pratap-Oxford University Press-New Delhi
6. An Introduction to Programming and Numerical Methods in MATLAB- S.R. Otto and J.P. Denier- Springer-Verlag-London
7. Numerical Methods Using Matlab-John Mathews & Kurtis Fink-Prentice Hall-New Jersey,2006
8. Numerical methods in Science and Engineering- M.K. Venkataraman-National Publishing Co. Madras,1996
9. Introductory Methods of Numerical Analysis- S.S. Sastry-Prentice Hall, 2005

PAPER V – QUANTUM MECHANICS - II
SECOND SEMESTER

Unit I: Scattering Theory

Scattering Amplitude-Expression in terms of Green's Function-Born Approximation and its Validity-Partial Wave Analysis-Phase Shifts-Scattering by Coulomb and Yukawa Potential

Unit II: Application to Atomic Structure

Central Field Approximation-Thomas Fermi Model-Hartree's Self Consistent Model-Hartree Fock Equation-Alkali Atoms-Doublet Separation-Intensities-Complex Atoms-Coupling Schemes

Unit III: Application to Molecular Structure

Hydrogen Molecule Ion-Hydrogen Molecule-Heitler London Method-Covalent Bond-Spin Orbit Interaction as Correction to Central Field Approximation- Hartree Fock Self Consistent Field Method for Molecules-Hybridisation.

Unit IV: Theory of Radiation (Semi Classical Treatment)

Einstein's Coefficients-Spontaneous and Induced Emission of Radiation from Semi Classical Theory-Radiation Field as an Assembly of Oscillators-Interaction with Atoms-Emission and Absorption Rates-Density Matrix and its Applications

Unit V: Quantum Field Theory

Quantization of Wave Fields- Classical Lagrangian Equation-Classical Hamiltonian Equation-Field Quantization of the Non-Relativistic Schroedinger Equation-Creation, Destruction and Number Operators-Anti Commutation Relations-Quantization of Electromagnetic Field Energy and Momentum.

Books for Study & Reference:

1. A Text Book of Quantum Mechanics-P.M. Mathews & K. Venkatesan-Tata McGraw Hill 29th Reprint 2002
2. Quantum Mechanics-Gupta, Kumar & Sharma, 23rd Edition, 2003-2004
3. Quantum Mechanics-Satyaprakash
4. Introduction to Quantum Mechanics-A.K. Chandra-Tata McGraw Hill
5. Quantum Mechanics-Merzbacher-John Wiley & Sons3rd Edition,2004
6. Quantum Mechanics-Devanathan-Narosa Publishing-New Delhi, 2005
7. Quantum Mechanics-Aruldas, 2002
8. uantum Mechanics-A.K. Ghatak and S. Loganathan-McMillan India 4th Edition, 1999
9. Quantum Mechanics-Messiah(North Holland)1970
10. Quantum Mechanics-L.I. Schiff- McGraw Hill 3rd Edition, 1968
11. Principles of Quantum Mechanics-R.Shankar, Springer, 2005

Tutorial: Quantum Mechanics II (This portion is not intended for examination purpose**)**

1) Difference in collision process between Classical and Quantum identical particles.
2) Optical theorem.
3) Partial wave analysis of scattering from standard simple potential; scattering cross-section.

PAPER VI – ELECTROMAGNETIC THEORY
SECOND SEMESTER

Unit I: Electrostatics
Coulomb's law- Gauss law-differential and integral representation- Electric field- Electric potential-energy density-Method of images-Multipole expansions.

Unit II: Electrostatics in macroscopic media
Potential and Field due to an Electric Dipole-Dielectric Polarization-External Field of a Dielectric Medium-Guass' Theorem in a Dielectric-Electric Displacement Vector **D**-Linear Dielectrics-Relations connecting Electric Susceptibility χ_e, Polarization **P**, Displacement **D** and Dielectric Constant-Boundary Conditions of Field Vectors-Molecular Field-Clausius Mosotti Relation for Non-Polar Molecules-Electrostatic Energy and Energy Density

Unit III: Magnetostatics
Biot-Savart Law- Statement-Lorentz Force Law and Definition of B-Divergence and Curl of B-Magnetic Scalar Potential (derivation of expression only)-Equivalence of Small Current Loop and Magnetic Dipole-Magnetic Vector Potential (derivation of expression only).

Unit IV: Electromagnetics
Equation of Continuity-Displacement Current-Derivation of Maxwell's Equations-Physical Significance-Poynting Vector-Momentum in EM Field-Electro Magnetic Potentials-Maxwell's Equations in terms of EM Potentials-Lorentz Gauge-Coulomb Gauge- Boundary Conditions at Interfaces-Reflection and Refraction-Fresnel's Laws-Brewster's Law & Degree of Polarization-Total Internal Reflection and Critical Angle.

Unit V: Relativistic Electrodynamics
Four Vectors-Transformation Relation for Charge and Current Densities for Electromagnetic Potentials-Covariant Form of Inhomogeneous Wave Equations-Covariance of Field Equations in terms of Four Vectors-Covariant Form of Electric and Magnetic Field Equations-Covariance of Electromagnetic Field Tensor-Covariant Form of Lorentz Force Law.

Books for Study & Reference
1. Electromagnetic Theory-Chopra & Agarwal-Nath & Co. 1984
2. Electrodynamics-Gupta, Kumar & Singh-Pragati Prakashan-Meerut 1600
3. Electromagnetic Theory & Electrodynamics-Satyaprakash-Kedarnath Ramnath & Co.-Meerut
4. Classical Electrodynamics-J.D. Jackson-Wiley Eastern 3rd Edition, 2004
5. Principles of Electrodynamics-M. Schwartz-McGraw Hill
6. Introduction to EM Fields & Waves-Carson & Lorrain

PAPER VII- ELECTRONIC DEVICES
SECOND SEMESTER

Unit I: Semiconductor Devices

FET as a Voltage Variable Resistor-Common Source Amplifier at High Frequencies-Common Drain Amplifier at High Frequencies-Silicon Controlled Rectifier (SCR)-Characteristics-SCR Power Control-Tunnel Diode

Optoelectronics: Photo Resistor-Photo Diode-Photo Transistor-LED-Photo Voltaic Effect-Solar Cells

Unit II: Operational Amplifier

Frequency Response of an Op-Amp-Parameters of an Op-Amp-Sign Changer-Scale Changer-Adder-Subtractor-Phase Shifter-Differential Amplifier-Integrator-Differentiator-Analog Computer Setup to Solve Linear Simultaneous Equation-Differential Equations in Physics-Logarithmic & Exponential Amplifiers-Active Filters.

Unit III: Digital Circuits & Devices I

Logic Families-Combinational Logic-Function of Combinational Logic-Flip Flops and other Multivibrators-Counters

Unit IV: Digital Circuits & Devices II

Shift Registers-Memories RAM, ROM, PROM, EPROM-Charge Coupled Devices (CCD)

Unit V: Signal Processing & Data Acquisition

Wave Form Generators and Wave Shaping Circuits-Sinusoidal Oscillators-Phase Shift Oscillator-Wein Bridge Oscillator-Crystal Oscillator Multivibrators Comparators-Schmitt Trigger-Square Wave & Triangular Wave Generators-Pulse Generators-IC 555 Timer and its Application-Signal and Signal Processing-Analog Multiplexer and Demultiplexer- D/A Converters-A/D Converters.

Books for Study & Reference:

1. Microelectronics-Millman & Grabel-McGraw Hill, 1982
2. Integrated Electronics-Millman & Halkias-Tata McGraw Hill 17th Reprint 2000
3. Digital Fundamentals-Floyd-UBS 1600
4. Digital Principles and Applications-Malvino- McGraw Hill 1600
5. Physics of Semiconductor Devices-Wiley Eastern

PRACTICAL I - GENERAL PHYSICS
(Examination at the end of Second Semester)

Any Twelve Experiments

1. Young's Modulus-Elliptical Fringes (Cornu's Method)
2. Young's Modulus-Hyperbolic Fringes (Cornu's Method)
3. Viscosity of a Liquid-Mayer's Oscillating Disc
4. Stefan's Constant
5. Rydberg's Constant-Solar Spectrum
6. Thickness of Wire by Air Wedge and Diffraction
7. Determination of Audio Frequencies-Bridge Method
8. Thermionic Work Function
9. Thermal Conductivity-Forbe's Method
10. Electronic Charge 'e' by Millikan's Oil Drop Method
11. Electronic Specific Charge 'e/m' by Thomson's Method
12. Thermistor-Temperature Coefficient and Band Gap Energy Determination
13. Specific Heat of a Liquid-Ferguson's Method
14. Biprism on Optical Bench-Determination of Wavelength
15. He-Ne Laser –Measurement of Wavelength using reflectance grating.
16. Babinet's Compensator
17. LG Plate-Resolving Power
18. Diffraction at a Prism Table-Determination of Wavelength
19. Fabry-Perot Interferometer-Study of Fine Structure
20. Geiger Muller Counter-Determination of Half Life of 'In'
21. Matlab Programming-Roots of a Quadratic Equation & Solution of a System of Linear Equations
22. Matlab Programming -Solution of Ordinary Differential Equations
23. Matlab Programming -Runge-Kutta Method
24. Matlab Programming -Newton-Raphson Method
25. Matlab Programming-Mean, Median & Standard Deviation
26. Matlab Programming-Curve Fitting & Interpolation
27. Matlab Programming-Matrix Summation, Subtraction and Multiplication
28. Matlab Programming-Matrix Inversion and Solution of Simultaneous Equations
29. He-Ne Laser – Measurement of refractive index of liquids.
30. He-Ne Laser – Power distribution measurement.
31. He-Ne Laser- Thickness of wire.

PRACTICAL II-ELECTRONICS

(Examination at the end of Second Semester)

Any Fifteen Experiments

1. Design of Regulated and Dual Power Supply and Construction using fixed voltage regulator and 723.
2. Basic Logic Gates-Digital IC's
3. Parameters of Op-Amp
4. Design of Wave Form Generators- using Op-Amp and Timer 555.
5. Design of Phase-Shift Oscillator- Op-Amp
6. Design of Wein's Bridge Oscillator- Op-Amp
7. Design of Active Filters- Op-Amp
8. Design of Differential Amplifier- Op-Amp
9. Sign Changer, Scale Changer, Summer and Subtractor- Op-Amp
10. Analog Computer Setup-Solving Simultaneous Equations
11. Design of UJT Relaxation Oscillator
12. CRO-Differentiating, Integrating, Clipping and Clamping Circuits, Square Wave Testing
13. Source Follower
14. SCR-Characteristics and an Application
15. A.C. Amplifier-Inverting, Non-Inverting, Voltage Follower- Op-Amp
16. Function generator using IC 8038
17. Measurement of Hall Coefficient of given Semiconductor-Estimation of Charge Carrier Concentration
18. Digital IC's- Counters, shift register(7476)
19. Schmitt Trigger using discrete components and OP-AMP/ Timer 555
20. Matlab Programming-Charging of an Capacitor in an RC Circuit with three Time Constants
21. Matlab Programming- Full Wave Rectifier-Determination of (a) Peak-to-Peak Value of Ripple Voltage,
    (b) DC Output Voltage (c) Discharge Time of the Capacitor (d) Period of Ripple Voltage
22. Matlab Programming- Plot of Voltage and Current of an RLC Circuit Under Steady State Conditions
23. Matlab Programming- NPN Transistor-Plotting Input & Output Characteristics
24. Matlab Programming-Frequency Response of a Low Pass Op-Amp Filter Circuit
25. Matlab Programming-Diode-Plot of Forward Characteristics & Load Line Plot-Estimation of Operating Point

PAPER VIII-OPTICAL PHYSICS

THIRD SEMESTER

Unit I:

Electrical Constant-Plane Harmonic Waves-Phase Velocity-Group Velocity-Doppler Effect-Relativistic Correction to the Doppler Formula-Linear Partial Polarization-Scattering & Polarization-Circular & Elliptical Polarization-Matrix Representation-Orthogonal Polarization-Eigen Vectors & Jones Matrices-Reflection and Refraction at a Plane Boundary-Amplitudes of Reflected and Refracted Waves-Brewster's Angle.

Unit II: Coherence and Interference

Theory of Partial Coherence-Coherence Time and Coherence Length-Spectral Resolution of a Finite Wave Train-Coherence and Line Width-Spatial Coherence-Extended Sources-Measurement of Stellar Diameter-Fabry Perot Interferometer.

Unit III: Lasers

Characteristics of Laser Light-Atomic Basis for Laser Action-Laser Pumping-Creating a Population Inversion-Laser Resonator-Single Mode Operation-Q Switching-Mode Locking-Helium-Neon Laser-Argon Ion Laser-Carbon dioxide Laser-Solid State Lasers-Semiconductor Laser-Applications.

Unit IV: Optical Fibres

Propagation of Light in an Optical Fibre-Acceptance Angle-Numerical Aperture-Step and Graded Index Fibres-Optical Fibre as a Cylindrical Wave Guide-Wave Guide Equations-Wave Equations in Step Index Fibres-Fibre Losses and Dispersion-Applications.

Unit V: Optical devices

Electro-optic, Magneto-optic and acousto-optic effects – Material properties related to get these effects – important Ferroelectric, Liquid crystal materials for these devices—Piezoelectric, Electrostrictive and magnetostrictive effects – important materials exhibiting these properties – and their application in sensors & actuator devices –High frequency piezoelectric devices – Principle of Surface acoustic wave devices.

Books for Study & Reference

1. Introduction to Modern Optics-G.R. Fowles, Holt, Rincharf – Winstron Inc-N.Y. 1978
2. Principles of Optics-Born and Wolf-Pergamon Press, 6th edition 1980
3. Fibre Optics technology & Applications-Stewart D. Personick-Khanna Publishers-Delhi
4. Introduction to Lasers & their Applications-D.C.O. Shea, W. Rusell Callen and W.T. Rhodes-Addison Wesley
5. Contemporary Optics-Nassbaum & Philips-Prentice Hall
6. Statistical Optics-J.W. Goodman-John Wiley
7. Optical Physics-S.G. Lipson, H. Lipson, D.S. Tannhanser-Cambridge University Press 1999
8. Modern Interferometers-Wolf-London

PAPER IX- NUCLEAR & PARTICLE PHYSICS
THIRD SEMESTER

Unit I: Nuclear Structure

Distribution of Nuclear Charge-Nuclear Mass-Mass Spectroscopy-Mass Spectrometer-Theories of Nuclear Composition (proton-electron, proton-neutron)- Bound States of Two Nucleons-Spin States-Pauli's Exclusion Principle-Tensor Force-Static Force-Exchange Force.

Unit II: Radioactivity

Alpha Decay: Properties of α Particles-Gamow's Theory of α Decay-Geiger Nuttal Law- α Ray Energies-Fine Structure of α Rays- α Disintegration Energy-Long Range α Particles.
Beta Decay: Properties of β Particles-General Features of β Ray Spectrum-Pauli's Hypothesis-Fermi's Theory of β Decay-Forms of Interactions and Selection Rules.
Gamma Decay: Absorption of γ Rays by Matter-Interaction of γ Rays with Matter-Measurement of γ Ray Energies-Internal Conversion.

Unit III: Nuclear Models

Liquid Drop Model: Bohr Wheeler Theory of Fission-Condition for Spontaneous Fission-Activation Energy-Seaborg's Expression.
Shell Model: Explanation of Magic Numbers-Prediction of Shell Model-Prediction of Nuclear Spin and Parity-Nuclear Statistics-Magnetic Moment of Nuclei-Schmidt Lines-Nuclear Isomerism.
Collective Model: Explanation of Quadrupole Moments.

Unit IV: Nuclear Reactions

Kinds of Reactions and Conservation Laws-Energy of Nuclear Reaction-Iso Spin-Continuum Theory of Nuclear Reaction-Resonance-Breit and Wigner Dispersion Formula-Stages of a Nuclear Reaction-Statistical Theory of Nuclear Reaction-Kinematics of Stripping and Pickup Reaction.

Unit V: Particle Physics

Leptons-Hadrons-Mesons-Hyperons-Pions-Meson Resonances-Strange Mesons and Baryons-Gell-Mann Okuba Mass formula for Baryons-CP Violation in Neutral Kaons (K^0) Decay- Symmetry and Conversion Laws-Quark Model-Reaction and Decays.

Books for Study & Reference:

1. Concepts of Nuclear Physics-Bernard L. Cohen-Tata McGraw Hill- New Delhi 1600,1978
2. Introductory Nuclear Physics-Kenneth S. Krane-John Wiley & Sons
3. Nuclear Physics- D.C. Sharma-K.Nath & Co-Meerut 1600
4. Nuclear and Particle Physics-Pandya and Yadav
5. Nuclear Physics-J.C. Tayal-Umesh Prakashan-Gujarat
6. Physics of Nucleus and Particles-Volume I & II-B. Nermeir & Sheldon
7. The Investigations of Physics World-G.Torld di Froncia-Cambridge University Press
8. Auto Nuclear-Evan-McGraw Hill

Tutorial: Nuclear Physics (This portion is not intended for examination purpose**)**

1) General properties of nuclear forces
2) Comparative half-Lives
3) parity violation Experiment
4) neutrino symmetry.

PAPER X-SPECTROSCOPY

THIRD SEMESTER

Unit I: Atomic & Microwave Spectroscopy

Spectra of Alkali Metal Vapours-Normal Zeeman Effect-Anomalous Zeeman Effect-Magnetic Moment of Atom and the G Factor-Lande's 'g' Formula-Paschen Back Effect-Hyperfine Structure of Spectral Lines.

Microwave Spectroscopy-Experimental Method-Theory of Microwave Spectra of Linear, Symmetric Top Molecules-Hyperfine Structure-Quadrupole Moment-Inversion Spectrum of Ammonia.

Unit II: Infrared & Raman Spectroscopy

IR Spectroscopy: Practical Aspects-Theory of IR Rotation Vibration Spectra of Gaseous Diatomic Molecules-Applications-Basic Principles of FTIR Spectroscopy.

Raman Spectroscopy: Classical and Quantum Theory of Raman Effect-Rotation Vibration Raman Spectra of Diatomic and Polyatomic Molecules-Applications-Laser Raman Spectroscopy.

Unit III: Electronic Spectra: Fluorescence & Phosphorescence Spectroscopy

Electronic Excitation of Diatomic Species-Vibrational Analysis of Band Systems of Diatomic Molecules-Deslandre's Table-Intensity Distribution-Franck Condon Principle-Rotational Structure of Electronic Bands-Resonance and Normal Fluorescence-Intensities of Transitions-Phosphorescence Population of Triplet State and Intensity-Experimental Methods-Applications of Fluorescence and Phosphorescence.

Unit IV: NMR & NQR Spectroscopy

NMR Spectroscopy: Quantum Mechanical and Classical Description-Bloch Equation-Relaxation Processes-Experimental Technique-Principle and Working of High Resolution NMR Spectrometer-Chemical Shift

NQR Spectroscopy: Fundamental Requirements-General Principle-Experimental Detection of NQR Frequencies-Interpretation and Chemical Explanation of NQR Spectroscopy

Unit V: ESR & Mossabauer Spectroscopy

ESR Spectroscopy: Basic Principles-Experiments-ESR Spectrometer-Reflection Cavity and Microwave Bridge-ESR Spectrum-Hyperfine Structure

Mossabauer Spectroscopy: Mossabauer Effect-Recoilless Emission and Absorption-Mossabauer Spectrum-Experimental Methods-Hyperfine Interaction-Chemical Isomer Shift-Magnetic Hyperfine and Electric Quadrupole Interaction

Books for Study & Reference:

1. Spectroscopy: Volumes I, II and III-B.P. Straugham & S. Walker
2. Fundamental of molecular spectroscopy – C.B.Banwell
3. Introduction to molecular spectroscopy - G.M.Barrow.
4. Atomic Physics - J.B.Rajam, S.Chand Publications.

PAPER XI- COMMUNICATION ELECTRONICS
FOURTH SEMESTER

Unit I: Antennas & Wave Propagation

Terms and Definition-Effect of Ground on Antennas-Grounded λ/4 Antenna-Ungrounded λ/2 Antenna-Antenna Arrays-Broadside and End Side Arrays-Antenna Gain-Directional High Frequency Antennas-Sky Wave Propagation-Ionosphere-Ecles & Larmor Theory-Magneto Ionic Theory-Ground Wave Propagation.

Unit II: Microwaves

Microwave Generation-Multicavity Klystron-Reflex Klystron-Magnetron-Travelling Wave Tubes (TWT) and other Microwave Tubes-MASER-Gunn Diode.

Unit III: Radar and Television

Elements of a Radar System-Radar Equation-Radar Performance Factors-Radar Transmitting Systems-Radar Antennas-Duplexers-Radar Receivers and Indicators-Pulsed Systems-Other Radar Systems-Colour TV Transmission and Reception.

Unit III: Communication Electronics

Analog and Digital Signals – Modulation – Types of Modulation- Amplitude modulation theory – Frequency spectrum of the AM wave – Representation of AM – Power relations in the AM wave – Generation of AM – Basic requirements- Description of frequency and phase modulation – Mathematical representation of FM – Frequency spectrum of the FM wave - Effects of noise on carrier.

Unit V: Internetworking Technology:

Computer Networks – Overview– Types of Networks – Network Topologies – Network Protocols – Network Architecture– ISDN,LAN,WAN, MAN- Wireless Transmission Bridges, TCP/IP Routing-Internet Work Routings-IP Addressing-Network Security- Internet Connectivity (Dial Up, Dedicated Lines, Broad Band, DSL, Radio, VSAT, etc.)-Internet Security- Technique of Data Compression

Books for Study & Reference:

1. Electronic Communication System-George Kennedy & Davis -Tata McGraw Hill 4th edition 19889
2. Principles of Communication Systems-Taub Schilling-TMH 1986
3. Communication Systems-Simon Haykin-John Wiley & Sons 2005
4. Electronics & Radio Engineering-F.E.Terman- McGraw Hill
5. Communication Systems-Carlson- McGraw Hill 3rd Edtion 1986
6. Fundamentals of Information Technology-Alexis Leon &Mathews Leon-UBS Publishers 1999
7. Digital Logic and Computer Design-S. Morrismano-Prentice Hall of India
8. Computer networks -W. Stailing- Prentice Hall of India
9. Computer networks : S. Keshav-Addison Wesley

PAPER XII-CONDENSED MATTER PHYSICS

FOURTH SEMESTER

Unit I: Crystal Structure & Diffraction
Lattice Constant and Density-Reciprocal Lattice Concept-Graphical Construction-Vector Development of Reciprocal Lattice-Properties-Reciprocal Lattice to BCC, FCC Lattices-Bragg Condition in terms of Reciprocal Lattice-Rotary Crystal Method of X-Ray Diffraction-Neutron Diffraction-Principle-Advantage-Experiment

Unit II: Crystal Defects & Dislocations
Defects: Classification-Point Defects-Schottky Defect-Frenkel Defect-Colour Centers-F Centre-Other Colour Centers-Production of Colour Centers by X-Rays and Irradiation.
Dislocations: Slip and Plastic Deformation-Shear Strength of Single Crystals-Edge Dislocation-Screw Dislocation-Stress Field around an Edge Dislocation

Unit III: Lattice Vibrations, Semiconductors & Dielectrics
Vibrations of One Dimensional Diatomic Linear Lattice-Acoustic and Optical Branches-Phonon State-Semiconductors-Conductivity of Semiconductors-Model for Intrinsic and Impurity Semiconductors-Hall Effect-Dielectrics-Ferro Electric Crystals-Ferro Electric Domains

Unit IV: Metals & Superconductors
Heat Capacity of Electron Gas-Experimental Electrical Resistivity of Metals-Superconductivity-Electron Phonon Interaction-Cooper Pairs-BCS Theory-Energy Gap and its Temperature Dependence-London Equation-Josephson Effect & Applications-High Temperature Superconductivity.

Unit V: Magnetism
Langevin Theory of Paramagnetism-Quantum Theory of Paramagnetism-Curie Law-Ferromagnetism-Weiss Molecular Field Theory-Domain Theory-Anti Ferromagnetism-Neel Theory-Ferrimagnetism-Ferrites-Spin Waves-Experimental Techniques to Study Magnetic Properties.

Books for Study & Reference:
1. Introduction to Solid State Physics-C. Kittel-Wiley Eastern-New Delhi 7th Edition 2000
2. Solid State Physics-B.S. Saxena, R.C. Gupta & P.N. Saxena-Pragati Prakashan- Meerut 8th edition 2001
3. Solid State Physics-A.J. Dekker-Macmillan India 1995
4. Solid State Physics-S.L. Kahani & C. Hemaranjani-Sultan Chand & Sons
5. Solid State Physics-H.E. Hall-John Wiley & Sons
6. An Introduction to Solid State Physics & Its Applications-R.J. Elliot & A.P. Gibson-ELBS & Macmillan
7. Principles of Solid State-H.V. Keer-Wiley Eastern
8. Physics of Solids-C.A. Wert & R.M. Thomson-McGraw Hill 1600
9. Fundamentals of Solid State Physics-J.R. Christmann- John Wiley & Sons 1600

Tutorial: Condensed matter physics (This portion is not intended for examination purpose**)**

1) Given that the primitive basis vectors of a lattice a=(a/2)(i+j),k= (a/2)(j+k) and c= (a/2) (k/j) , where I,j,and k are the usual three unit vectors along Cartesian coordinates, what is the bravais lattice?

2) the packing ratio ids defined as the fraction of the total volume of the cell that is filled by atoms. Determining the maximum values of this ratio for equal spheres located at the points of simple-cube , body-centered –cubic, and face-centered crystals.

3) determine which planes in an fcc structure have the highest density of atoms, Evaluate this density in atoms/$cm^2$for Cu.

PRACTICAL III- ADVANCED PRACTICALS

(Examination at the end of Fourth Semester)

Any Twelve Experiments

1. AlO Band
2. CN Band
3. Arc Spectra-Constant Deviation Spectrograph-Copper, Iron & Barium
4. Michelson Interferometer- λ, dλ and Thickness of Mica Sheet
5. Susceptibility-Guoy and Quincke's Method
6. Compressibility of a Liquid-Ultrasonic Method
7. Hall Effect and its application
8. e/m-Zeeman Effect
9. e/m-Magnetron Method
10. B-H Curve-Anchor Ring
11. B-H Curve-Solenoid
12. Double Slit-Wavelength Determination
13. G.M Counter-Characteristics
14. Kelvin's Double Bridge-Determination of Very Low Resistance & Temperature Coefficient of Resistance.
15. He-Ne Laser
16. Conductance of photoconductor, photovoltaic cell(solar cell)and photodiode.
17. Study of Fluorescent Spectrum of DCN Dye and Determination of Quantum Yield of Fluorescence Maxima and Full Width Maxima using Monochromator.
18. Matlab Programming-Radioactive Decay
19. Matlab Programming-Numerical Integration
20. Matlab Programming-Double Integration
21. Matlab Programming-Solution of Ordinary Differential Equations
22. Matlab Programming-Computer Simulation of Equations of Motion for a System of Particles
23. Matlab Programming-Computer Simulation of 1-D and 2-D Lattice Vibrations
24. Matlab Programming-Computer Simulation of Kronig-Penney Model
25. Matlab Programming-Numerical simulation of Wave-Functions of Simple Harmonic Oscillator
26. Matlab Programming-Simulation of Wave Functions for a Particle in Critical Box
27. Matlab Programming-Solution of Diffusion Equation

PRACTICAL IV-SPECIAL ELECTRONICS

(Examination at the end of Fourth Semester)

Any Ten Experiments

1. Op-Amp: Simultaneous Addition & Subtraction
2. Op-Amp: Instrumentation Amplifier-Temperature Measurement
3. Op-Amp: Instrumentation Amplifier-Light Intensity-Inverse Square Law
4. Op-Amp: V to I & I to V Converter
5. Op-Amp: Circuits Using Diodes-Half Wave, Full Wave, Peak Value, Clipper, Clamper
6. Op-Amp: Log and Antilog Amplifier
7. Op-Amp: Analog Computation-Second Order Differential Equation
8. Op-Amp Comparator-Zero Crossing Detector, Window Detector, Time Marker
9. IC 555 Timer Application-Monostable, Linear & Astable
10. A/D Converters-Any One Method
11. D/A Converters-Binary Weighted & Ladder Methods
12. IC Counters with Feedback
13. Microprocessor: LED Interfacing
14. Microprocessor: Stepper Motor Interfacing
15. Microprocessor: Traffic Control Simulation
16. Microprocessor: ADC Interface-Wave Form Generation
17. Microprocessor: Hex Keyboard Interfacing
18. Microprocessor: Musical Tone Generator Interface
19. Microcontroller : Blinking of LEDs either 8051 or 16F84
20. Microcontroller: Controlling LED with switch.
21. Microcontroller: DC motor control.
22. Microcontroller : triangle wave generator.

GROUP A - DIPLOMA IN NANO SCIENCE
PAPER I - FUNDAMENTALS OF NANOSCALE SCIENCE

Unit I: Basics of Nanotechnology I

Background to Nanotechnology – scientific revolutions – types of nanotechnology and nanomachines – atomic structure molecules & phases – molecular and atomic size – surfaces and dimensional space – top down and bottom up Nanoscale formation

Unit II: Forces between atoms and molecules

Strong intermolecular forces – covalent and coulomb interactions – interactions involving polar molecules and polarization – weak intermolecular forces and total intermolecular pair potentials – Van der Waals forces – repulsive forces; special interactions such as hydrogen –bonding, hydrophobic and hydrophilic interactions

Unit III: Nanostructures and their properties

Definition of nano systems – dimensionality and size dependent phenomena in Quantum dots, and Quantum wires – size dependent variation in magnetic, electronic transport properties

Unit IV: High vacuum technology

Evaporation theory – different sources for evaporation – working principles of rotary and diffusion pumps – cryogenic pumps – cryo sorption and getter pumps – vacuum materials

References:

1. Nanotechnology: basic science and emerging technologies – Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005)
2. Amorphous and Nanocrystalline Materials: Preparation, Properties, and Applications, A.Inoue, K.Hashimoto (Eds.,) (2000)
3. Understanding Nanotechnology, Scientific American, editors at Scientific American, Warner Books (2002)
4. Introduction to Nanotechnology, Charles P. Poole, Frank J. Owens, Wiley-Interscience (2003)
5. Nanotechnology: A Gentle introduction to the Next Big Idea, Mark A. Ratner, Daniel Ratner, Mark Ratne, Prentice Hall PTR; 1st edition (2002)
6. Fundamentals of Surface and Thin Film Analysis, Leonard C.Feldman and James W. Mayer
7. Hand book of thin film technology, L.I. Maissel and R. Glang (McGraw – Hill Book Company)

GROUP A - DIPLOMA IN NANO SCIENCE
PAPER II - NANOMATERIALS SYNTHESIS

Unit I: Sol-gel processing

Fundamentals of sol-gel process – sol-gel synthetic methods for oxides – other inorganics and nano composites – the Pecheni method – silica gel – Zirconia and Yttrium gel – aluminosilicate gel – polymer nano composites

Unit II: Film deposition methods

Introduction – fundamentals of film deposition – thermal evaporation – molecular beam epitaxy – pulsed laser deposition – sputter deposition – chemical vapour deposition – layer by layer growth and ultra thin films – chemical solution deposition – Langmuir Blodgelt films.

Unit III: Synthesis of nanostructures

Surface Chemistry and its role to prepare quantum dots – Polymer as quantum dot size stabilizer – One-dimensional (1D) by Spontaneous Growth – 1D structure by VLS and SLS Growth – Template Assisted Growth – Electrochemical growth of 1D structures

Unit IV: New forms of carbon

Types of nanotubes – formation of nanotubes – methods and reactants – arcing in the presence of cobalt – laser methods – ball milling – chemical vapour deposition methods – properties of nano tubes – plasma arcing – electro deposition – pyrolytic synthesis – Zeolites and templated powders layered silicates.

References:

1. Nanoelectronics and Information technology: Advanced electronic materials and novel devices (2^{nd} edition), Rainer Waser (Ed.), Wiley – VCH Verlag, Weiheim (2005)
2. Nanocomposite science and technology, Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun, Wiley – VCH Verag, Weiheim (2003)
3. Amorphous and Nanocrystalline Materials: Preparation, Properties, and Applications, A.Inoue, K.Hashimoto (Eds.,) (2000)
4. Quantum Heterostructures: Microelectronics and Optoelectronics, Vladimir Mitin
5. Theory of Modern electronic semiconductor devices, K.F. Brennan and A.S. Brown
6. Semiconductor Nanostructures for Optoelectronic applications, Todd D. Steiner
7. Smart Electronic Materials (Fundamentals and applications), Jasprit Singh
8. The Physics of Low dimensional semiconductors, John H. Davies

GROUP A - DIPLOMA IN NANO SCIENCE

PAPER III - CHARACTERIZATION AND APPLICATION OF NANO MATERIALS

Unit I: Nano characterizing tool 1

Working of Atomic Force Microscopy – Mode of operations (qualitative) and its application – X-Ray diffraction basics and its application to Size Analysis of nanomaterials – NMR Basics and application to Nanomaterials

Unit II: Nano characterizing tool 2

Scanning Electron Microscope: Theory- Instrumental setup and its application – Low KV SEM and its application – Low temperature SEM and its application – working of electron probe micro analysis and its application in elemental analysis – EDX spectra

Important material systems – optical process in semiconductors – optical process in quantum wells – semiconducting optoelectronic devices – organic optoelectronic devices (qualitative)

Unit III: Applications of nanomaterials

Quantum dot IR photo detectors- Quantum dot lasers – Synthesis of Zinc oxide nanomaterials and its application – Synthesis of group three nitride nanostructures and their applications - SK growth of germanium dots on silicon and its application.

Unit IV: Cell Biology (quantitatively)

Amino acids, Protein structure: Primary, Secondary, teritary, structure of Nucleic acids – Nucleosides and Nucleotides – physical properties of nucleosides & nucleotides – base pair – mismatch base pair – stacking – Backbone of Nucleic acids

Antibodies and their use in nano based drug delivery and imaging – Tumor targeted drum delivery.

References:

1. Nanoscale calibration and Standards and Methods Edited by C.Wilkening and Koenders
2. Fundamentals of Surface and Thin Film Analysis, Leonard C.Feldman and James W. Mayer
3. Scanning Electron Microscopy for Nanotechnology Edited by W.Zhou and Z. Lin Wang
4. Nanosystem characterizationtools in the life sciences Edited by Challa Kumar
5. Nanostructures and Nanomaterials (Synthesis, Properties and Applications), Guozhong Cao
6. Nanoelectronics and Information technology Edited by Rainer Waser
7. Cell and Molecular Biology, Gerald Karp
8. Nucleic Acids in Chemistry and Biology, G. Michael Blackburn and Michal J. Gait
9. Principles of Nucleic Acid structure, Worfram Saenger

GROUP B - DIPLOMA IN ASTROLOGY, ASTROPHYSCIS & COSMOLOGY

PAPER I - INTRODUCTORY ASTRONOMY AND ASTROPHYSICS

Unit I:

Introductory History Of Astronomy-Ptolemy's Geocentric Universe-Copernicus' Heliocentric Universe-Tycho Brahe's Observations-Galileo Galilee-Kepler's Laws Of Planetary Motion-Newtonian Concept Of Gravity-Highlights Of Einstein'S Special And General Theory Of Relativity-Curved Space-Time-Evidence Of Curved Space-Time-Bending Of Light-Time Dilation-Gravitational Redshift-Gravitational Waves

Unit II:

Stars And Galaxies-Distances-Trignometric Parallax-Inverse Square Law-Magnitude Of Stars-Apparent Magnitude-Absolute Magnitude And Luminosity-Color And Temperature- Composition Of Stars-Velocity, Mass And Sizes Of Stars-Types Of Stars-Temperature Dependance-Spectral Types-Hertzsprung-Russell (HR) Diagram-Spectroscopic Parallax

Unit III:

The Sun-Its Size And Composition-Sun's Interior Zones-Core-Convective Zone-Radiative Zone-Sun's Surface-Photosphere-Chromosphere-Corona-Sun's Power Source-Fusion Reaction Mechanism-Neutrinos And The Solar Neutrino Problem-Interior

Structure Of Stars- Origin Of Moon-Solar And Lunar Eclipses-Studies Of Lunar Surface From Various Space Missions And Their Results-Satellites Of Other Planets Of The Solar System

Unit IV:

Stellar Evolution-Mass Dependence-Giant Molecular Cloud-Protostar-T Tauri-Main Sequence Star-Subgiant, Red Giant, Supergiant-Core Fusion-Red Giant Or Supergiant-Planetary Nebula Or Supernova- Core Remnant-Stellar Nucleo Synthesis-Stellar Remnants- Degenerate Matter-White Dwarfs-Novae And Supernovae- Neutron Stars-Pulsars-Black
Holes-Detecting Black Holes

BOOKS FOR STUDY & REFERENCE:

1. Lectures On Astronomy, Astrophysics, And Cosmology-Luis A. Anchordoqu-
Lecture Notes Of Department Of Physics, University Of Wisconsin-Milwaukee
2. J.A.Ratcliffe: An Introduction To The Ionosphere And Magnetosphere.
3. Kaula. W.M.: An Intoduction To Planetary Physics.
4. Harold Zirin: Astrophysics Of The Sun.
5. W.N.Hess And G.Mead(Ed): Introduction To Space Science.
6. V.Bedmtay And Kleczek:Basic Mechanism Of Solar Activity.
7. Sagan C. Owen T. C. And Smith. H.J.: Planetary Atmospheres.
8. Kaufmann, W.J. : Exploration Of The Solar System.
9. Baugher, J.F.: The Space Age Solar System
10. K.D. Abhayankar: Astrophysics Of The Solar System.
11. www.Astronomynotes.Com

GROUP B - DIPLOMA IN ASTROLOGY, ASTROPHYSCIS & COSMOLOGY

PAPER II - INTRODUCTORY COSMOLOGY

Unit I:

Introduction to cosmology-Basic Observations and implications-Olbers' Paradox and the Dark Night Sky-Expanding Universe-Gravitational Redshift-Doppler Effect-Hubble's Law -Cosmological Principle-The Perfect Cosmological Principle-Universe with Positive, Negative and No curvature

Unit II:

Observation and interpretation of Cosmic Microwave Background Radiation (CMBR)-Matter to Energy to Matter Conversion-Cosmic Abundance of Helium and Hydrogen-Evidence Supporting the General Big Bang Theory-Salient features of Steady State Theory

Unit III:

Fate of the Universe-Dependance on Mass (Curvature of Space)-Critical density-Open Universe-Closed Universe-Homogenous and Isotropic Friedmann-Robertson-Walker Universes- Observations on Dark Matter from Orbital speeds of stars in galaxies, Faint

gas shells around ellipticals, Motion of galaxies in a cluster, Hot gas in clusters, Quasar spectra and Gravitational Lensing

Unit IV:
Deriving the Geometry of the Universe from the Background Radiation-Flatness Problem- Horizon Problem-Inflation and its effect on the universe-The Cosmological Constant

BOOKS FOR STUDY & REFERENCE:
1. Lectures On Astronomy, Astrophysics, And Cosmology-Luis A. Anchordoqu-
Lecture Notes Of Department Of Physics, University Of Wisconsin-Milwaukee
2. J.A.Ratcliffe: An Introduction To The Ionosphere And Magnetosphere.
3. Kaula. W.M.: An Intoduction To Planetary Physics.
4. Harold Zirin: Astrophysics Of The Sun.
5. W.N.Hess And G.Mead(Ed): Introduction To Space Science.
6. V.Bedmtay And Kleczek:Basic Mechanism Of Solar Activity.
7. Sagan C. Owen T. C. And Smith. H.J.: Planetary Atmospheres.
8. Kaufmann, W.J. : Exploration Of The Solar System.
9. Baugher, J.F.: The Space Age Solar System
10. K.D. Abhayankar: Astrophysics Of The Solar System.
11. www.Astronomynotes.Com

GROUP B - DIPLOMA IN ASTROLOGY, ASTROPHYSCIS & COSMOLOGY
PAPER III - ASTRONOMICAL TECHNIQUES

Unit I: Telescopes
Types Of Telescopes-Design And Construction Of A Simple Optical Telescopes-Schmidt Telescopes-Sky Charts And Their Importance-Solar Telescopes.

Unit II: Detectors
Detectors For Optical And Infrared Regions-Application Of CCD'S To Stellar Imaging, Photometry And Spectroscopy-Techniques Of Observations Of Astronomical Sources From Space In Infrared. EUV, X-Ray And Gamma-Ray Regions Of The Electromagnetic Spectrum

Unit III: Photometry And Spectroscopy
Astronomical Photometry-Simple Design Of An Astronomical Photometer-Observing Technique With A Photometer Correction For Atmospheric Extinction-Tansformation To A Standard Photometric System-Astronomical Spectroscopy-Spectral Classification-Simple Design Of Astronomical Spectrograph-Radial Velocity Measurements.

Unit IV: Radio Astronomy Techniques
Basic Parameters Of An Antenna-Various Types Of Antennas-Non-Steerable, Partially Steerable And Fully Steerable Radio Telescopes-Receiver Systems And Their

Calibration. Two-Element And Multi-Element Interferometers-LB. And VLBI Systems-Aperture Synthesis.

Books for Study & Reference:

1. C.R.Kitchin: Astrophysical Techniques.
2. Gordon Walker: Astronomical Observations -
An Optical Perspective (Cambridge University Press).
3. Henden And Kaitchuck: Astronomical Photometry.
4. Astrophysics-Stars And Galaxies By K.D.Abhyankar.
5. C.R.Miczaika And W.M.Sinton: Tools Of The Astronomers
6. W.A.Hiltner (Ed): Astronomical Techniques.
7. Carleton: Methods Of Experimental Physics. Vol.XIIA.