M.Sc. Physics
List of papers with Subject Code

S. No.	Part	Title of the Paper	Subject Code	Credits
Semester I				
1	**A**	Classical Mechanics and Relativity	1PH01a	5
2		Statistical Mechanics	1PH02	5
3		Mathematical Physics I	1PH03	5
4		Quantum Mechanics I	1PH04a	5
5		Electronics I	1PH05a	5
6	**B**	Analytical Reasoning I	SAR1	2
Semester II				
7	**A**	Electromagnetic Theory and Plasma Physics	2PH06a	5
8		Mathematical Physics II	2PH07a	5
9		Quantum Mechanics II	2PH08	5
10		Material Science	2PH09a	5
11		Electronics II	2PH10a	5
12		Practical I – General Experiments	2PHP1	5
13		Practical II – Electronics Experiments	2PHP2	5
14	**B**	Analytical Reasoning II	SAR2	2
Semester III				
15	**A**	Nuclear and Particle Physics	3PH11a	5
16		Solid State Physics I	3PH12a	5
17		Molecular Physics and Spectroscopy I	3PH13	5
18		Reactor and Radiation Physics	3PH14a	5
19		Electronics III	3PH15a	5
20	**B**	Analytical Reasoning III	SAR3	2
Semester IV				
21	**A**	Advanced Quantum Mechanics	4PH16	5
22		Solid state Physics II	4PH17	5
23		Molecular Physics and	4PH18	5

		Spectroscopy II		
24		Computational methods and C programming	4PH19a	5
25		Electronics IV	4PH20a	5
26		Practical III – Advanced Experiments	4PHP3a	5
27		Project Work	4PHPR	5
28		Project Viva voce	4PHPV	5
29	**B**	Quality Control Circles (Theory)	OQCC	1
30		Quality Control Circles (Presentation)	OQCCP	1
Semester I				
31	**MCA**	Digital Electronics Laboratory	1CAP2a	

SEMESTER I

PAPER I - CLASSICAL MECHANICS AND RELATIVITY - 1PH01a

UNIT I : LAGRANGIAN AND HAMILTONIAN FORMULATION

Newton's equations and conservation laws for systems of particles - D'Alembert's principle and Lagrange's equations of motion – Hamilton's equations of motion - Two- body central force problem – Scattering by a central potential – Two - particle scattering- Cross-section in lab frame- Kepler's laws.

UNIT II : MECHANICS OF RIGID BODIES

Angular momentum and kinetic energy - Moment of inertia tensor – Euler's angles – Euler's equations of motion – Torque - free motion – Rigid body motion – Kinematics – Dynamics – Symmetrical top.

UNIT III : CANONICAL TRANSFORMATION

Hamilton's principle of least action – Lagrange's and Hamilton's equations of motion – Poisson brackets – Canonical transformations and their generators – Simple examples – Hamilton-Jacobi theory – Application to harmonic oscillator problem.

UNIT IV : SMALL OSCILLATIONS

Formulation of the problem - Transformation to normal coordinates - Frequencies of normal modes - Linear triatomic molecule.

UNIT V: RELATIVITY

Lorentz transformations - Four vectors - Lorentz invariance of the four product of two four vectors - Invariance of Maxwell's equations - Relativistic Lagrangian and Hamiltonian for a free particle.

BOOKS FOR STUDY:

1. H. Goldstein, 2002, Classical Mechanics. 3rd Ed., C. Poole and J. Safko, Person Education Asia, New Delhi,
2. T.W.B. Kibble, Classical Mechanics.
3. R. Resnick, Introduction to special theory of relativity.

BOOKS FOR REFERENCE:

1. L. D. Landan and L.M. Lifshitz, Mechanics.
2. J.L. Synge and B. A. Griffith, Principles of Classical Mechanics.

SEMESTER I

PAPER II - STATISTICAL MECHANICS - 1 PH02

UNIT : 1 PHASE TRANSITIONS

Phase transitions of first and second kind- Bragg-Williams approximation - Liquid gas - transition - Magnetic transition - Landau theory - Correlation of fluctuations and correlation length - Scaling hypothesis.

UNIT : 2

Phase space - Density of states - Liouville's theorem - Relation between statistical and thermo dynamical quantities - Entropy of mixing - Gibbs paradox - Sackur Tetrode equation - Ensemble - Different types of Ensemble - Uses - Limit of applicability of three distribution law.

UNIT : 3

MB ideal gas - Maxwell law of distribution of velocities - Equi-partition law of energy - Doppler Broadening of spectral lines - Classical real gas - Cluster expansion - Viral equation of state - Partition function - Relation between partition function and thermo dynamical quantities - Different types of partition function.

UNIT 4 : B.E. AND F.D. STATISTICS

Ideal B.E. gas - Gas degeneracy - B.E. condensation - λ transition in He^4 - Theory of super fluidity (London, Tisza, and Landau) - Photon gas - Plank's law of radiation - Phonon gas - Einstein and Debye's model for specific heat of solids - Ideal FD gas - Gas degeneracy - Electron gas - Thermionic emission - Pauli's theory of Paramagnetism.

UNIT 5

Boltzmann Transport equation - Boltzmann Transport equation for electrical conductivity, thermal conductivity, magneto resistance - viscosity.

Correlation of space-time dependent fluctuations - fluctuations and transport phenomena - Brownian motion - Langevin theory - fluctuation - dissipation theorem - The Fokker - Plank equation.

BOOKS FOR STUDY

1. Gupta Kumar, 2004, Statistical Mechanics, Pragati, Prakasham, 25th edition, Meerut.
2. Basakhi Ram and V.P. Gupta, 2000, Statistical Mechanics, Goel Publishing House, 1st Edition, Meerut.
3. E.S.R. Gopal, 2001, Statistical Mechanics and Properties of matter. Macmillan Co. of India Ltd.
4. B.K. Agarwal and Malvin Einster, 2002, Statistical Mechanics, New Age International Publisher's, New Delhi.
5. Kerson Huang, 1986, Statistical Mechanics, Wiley Eastern Ltd., New Delhi.
6. B.B. Laud, 2002, Fundamentals of Statistical Mechanics, New Age International Publisher's, New Delhi.
7. Sathya Prakash and J.P. Agarwal, 1998, Statistical Mechanics, Kedarnath Company, 7th edn., Meerut.

BOOKS FOR REFERENCES

1. A.B. Gupta and H. Roy, 2002, Thermal Physics, Books and Allied, Kolkata.
2. Kalidas, M.V.Sangaranarayanan, 2003, Non Equilibrium Thermodynamics, Macmillan India, New Delhi.

3. M. Glazer and J.Wark, 2001, Statistical Mechanics, Oxford University Press.
4. L.D. Kandanolf, 2001, Statistical Physics - Statics, Dynamics and Renormalization, World Scientific, Singapore.
5. F.W. Sears and G.L. Salinger, 1998, Thermodynamics, Kinetic Theory and Statistical Thermodynamics, 3rd edition, Narosa, New Delhi.
6. R.K. Gupta, 2001, Physics of Particles, Nuclei and Materials - Recent Trends, New Horizons of Physics Series, Narosa, New Delhi.
7. R.P. Feynmann, R.B. Leighton and M.Sands, 1998, The Feynmann Lectures of Physics, Vols. 1, 2 & 3, Narosa, New Delhi.

PAPER III - MATHEMATICAL PHYSICS I - 1PH03

UNIT I : VECTOR ANALYSIS

Curl, Divergence and Laplacian - Orthogonal curvilinear coordinate system - spherical, cylindrical and parabolic coordinates - Expression for gradient, curl divergence and Laplacian - Poisson equation with its solution - Equation of continuity - Application to hydrodynamics, equation of heat flow.

UNIT II : COMPLEX VARIABLES

Functions of a complex variable analytic functions - Kinds of singularities - Line integrals - Cauchy's theorem, Cauchy's integral formula - Taylor and Laurent expansions - Residue theorem and its application to evaluation of definite integrals.

UNIT III : DIFFERENTIAL EQUATIONS AND THEIR SOLUTIONS

Second order differential equation - Solutions for Bessel, Legendre, Lagurre and Hermite differential equation - Properties - Generating functions - Rodrigue's formula - Orthogonal properties - Recurrence relations - Integral representation of special functions.

UNIT IV : SPECIAL FUNCTIONS

GREEN'S FUNCTION : Inhomogeneous differential equations - Green's function - Eigen function - Expansion of the Green's function - Stern Liouville type equations in 1-D and their Green's functions.

BETA, GAMMA AND ERROR FUNCTIONS

Definition, symmetry property of Beta function, evaluation and transformation of Beta function - Evaluation and Transformation of Gamma function - Relation between Beta and Gamma function, Evaluation of some integrals - Evaluation of Error Functions.

UNIT V : PROBABILITY

Probability, sample space, mutually exclusive events - The theorem of total probability, compound events and theorem of compound probability -

Binomial theorem of probability, standard deviation as the sum of distributions, mathematical expectation - Theoretical distributions - Binomial distributions, Poisson distribution and Normal distribution.

BOOKS FOR STUDY

1. Satya Prakash, 2004, Mathematical Physics, Sultan Chand & Sons,New Delhi.
2. B.D. Gupta, 2000, Mathematical Physics, Vikas Publishing House, U.P.
3. M.R. Spiegel, 1981, Schaum's series, Complex Variables Mc-Graw Hill, New York.
4. M.R. Spiegel, 1981, Schaum's series, Vector Analysis, Mc-Graw Hill, New York.

BOOKS FOR REFERENCE

1. L.A. Pipes and Harwell, 1971, Applied Mathematics for Engineers and Physicists, Mc Graw Hill, New York, 3rd Edition.
2. E. Butkov, 1968, Mathematical Physics, Addison - Wesley Reading, Massachusetts

PAPER IV - QUANTUM MECHANICS I - 1PH04a

UNIT I : FORMALISM OF QUANTUM MECHANICS

Postulates of quantum mechanics - Time dependent Schrodinger equation - statistical interpretation and conditions on wave function - Probability current density - Equation of continuity - Expectation values of dynamical variables - Ehrenfest theorem - Operator formalism - Linear operators - Self adjoint operators - Eigen values and Eigen functions of X, P_x,- Orthonormality - Observable - Expansion postulate - Interpretation of Eigen function - Simultaneous measurability - Commutability and compatibility - Uncertainty relation.

UNIT II : REPRESENTATION THEORY

Hilbert space - Dirac rotation - Coordinate and momentum representations - Time evolution - Schrodinger, Heisenberg and interaction pictures - Symmetries and conservation laws - Unitary transformations associated with translations and rotations - parity and time reversal.

Dirac Delta function in 1-D : Properties of the Dirac Delta Function - Representation of the Dirac delta function as a limit of a sequence of ordinary functions.

UNIT III

Simple Applications of Schrodinger Equation: Step potential - Particle in a box - Square well potential - Square potential barrier.

UNIT IV : IDENTICAL PARTICLES

System of identical particles - Symmetric and anti symmetric wave functions - Bosons and Fermions - The Exclusion Principle - Ensembles of identical systems - The density matrix.

The Simple harmonic oscillator: Schrodinger equation for 1-D - Linear harmonic oscillator (Cartesian coordinates) - Energy eigen values and energy eigen functions abstract operator method).

UNIT V : 3-D Problems

Orbital Angular Momentum and spherical harmonics - Particle in a central potential - Rigid rotator - 3D harmonic oscillator - Hydrogen atom

BOOKS FOR STUDY

1. E. Merzbacher, 1990, Quantum Mechanics, 3rd edition, , John Wiley Publications.
2. Leonard I.Schiff, Quantum Mechnics, 3rd edition, McGraw Hill Publications.
3. P.M.Mathews and S.K. Venkatesan, 1976, A text books of Quantum Mechanics, McGraw Hill Publications.

BOOKS FOR REFERENCE

1. A. Ghatak, 2002, Basic Quantum Mechanics, Macmillan India, New Delhi.
2. G. Aruldhas, 2002, Quantum Mechanics, Prentice - Hall of India, New Delhi.
3. R.P. Feynman, R.B. Leighton, and M. Sands, 1998, The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi.
4. Pauling and Wilson, 1935, Introduction to Quantum Mechanics, McGraw Hill Kogakusha, Ltd. -
5. J.J. Sakurai, 2004, Modern Quantum Mechanics.

PAPER V - ELECTRONICS I - 1PH05a

UNIT 1

Operational amplifier principles - OP-amp characteristics - Inverting and non-inverting configuration - OP-amp parameters - Input offset voltage - Input offset current - Output offset voltage - Open loop gain, CMRR, slew rate, power / bandwidth - Frequency response - Minimization of OP-amp errors.

UNIT 2

OP-amp applications - Precision rectifier - Peak detector - Positive clipper - Positive clamper - Voltage to current, current to voltage converters instrumentation amplifier - ac amplifier - Monolithic power amplifier using LM 380 - Differentiator - Integrator circuit - Solution to simultaneous and differential equations.

UNIT 3

Active filters - Butter worth filters - Low pass, high pass, band pass, band rejection filter delay equaliser or all pass filter network - Logarithmic amplifiers - Antilogarithmic amplifier - Multiplier - Divider - Waveform generator - Square wave, triangular wave, pulse generator - Schmitt trigger sine wave generator (Wiens & Phase shift).

UNIT 4

Analog to digital conversion - the weighted resistor D/A converter - the R-2R ladder D/A converter - S/H circuit - A/D converter - flash A/D converter - counter types A/D converter - successive approximation A/D converter - the dual slope converter - a comparison of A/D converters - converter using voltage to frequency conversion - a converter using voltage to time conversion.

UNIT 5

Phase - locked loop and timer IC's - Basic functional block diagram of PLL - applications of PLL - Frequency multiplier - Frequency translator - AM detection FM detection - Working of 555 timer - astable - FSK generator, PPM voltage controlled oscillator - Monostable multivibrator - Missing pulse detector, frequency divider, pulse width modulation - Ramp generator - Schmitt trigger.

BOOKS FOR STUDY AND REFERENCE

1. Roy Chaudhary and Shail Jain, 1991, Linear integrated circuits, New Age International (P) Ltd.
2. R.A. Gaekwad, 1994, OP.amp & Linear Integrated Circuits EEE - New Age International (P) Ltd.
3. Coughlin R.F. and F.F. Driscol, 1996, OP.amp and linear integrated circuit, Prentice Hall of India, New Delhi.
4. J. Millman & Halkias, 1990, Integrated Electronics, McGraw Hill, 10th edition, New Delhi.
5. V.Vijayendran, 2005, Introduction to Integrated Electronics - Digital & Analog, S.Viswanathan, Printers & Publishers Pvt. Ltd., Chennai.

SEMESTER II

PAPER VI - ELECTROMAGNETIC THEORY AND PLASMA PHYSICS - 2PH06a

UNIT I: ELECTROSTATICS

Gauss's law – Poisson and Laplace's equation – Solution to Laplace equation in spherical polar co ordinates – Electrostatic potential energy – Electric dipole and quadrupole – Multipole expansion of potential – Dilectrics - Polarization and displacement vectors - Boundary conditions - Dielectric sphere in a uniform field - Electrostatic energy in the presence of dielectric .

UNIT II : MAGNETOSTATICS

Biot - Savart's Law - Ampere's law - Magnetic vector potential - Magnetic field of a localized current distribution - Magnetic moment, force and torque on a current distribution in an external field - Magnetostatic energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetized sphere.

UNIT III : MAXWELL EQUATIONS

Faraday's laws of induction - Maxwell's displacement current - Maxwell's equations - Vector and scalar potentials - Gauge invariance - Wave equation and plane wave solution - Coulomb and Lorentz gauge - Energy and momentum of the field - Poynting's theorem - Lorentz force - Conservation laws for a system of charges and electromagnetic fields.

UNIT IV : WAVE PROPAGATION

Plane waves in free space – Plane waves in non-conducting media - Waves in a conducting medium - Reflection and refraction at a plane interface - Propagation of waves in a rectangular wave guide.

Inhomogeneous wave equation and retarded potentials - Radiation from a localized source - Oscillating electric dipole

UNIT V : ELEMENTARY PLASMA PHYSICS

Boltzmann Equation - Simplified magneto - hydrodynamic equations - Electron Plasma oscillations - Debye shielding problem - Plasma confinement in a magnetic field - Magneto-hydrodynamic waves - Alfven waves and magnetosonic waves.

BOOKS FOR STUDY

1. J.D. Jackson, 1975, Classical Electrodynamics, Wiley Eastern Ltd., New Delhi.

2. J.A. Bittencourt, 1989, Fundamentals of Plasma Physics, Pergamom Press, Oxford.

3. D.J. Griffiths, 2002, Introduction to Electrodynamics, 3rd edn., Prentice - Hall of India, New Delhi.

4. J.R.Reitz, F.J.Milford and R.W.Christy, 1986, Foundations of Electromagnetic Theory, 3rd edn., Narosa Publication, New Delhi.

5. Paul Lorrain and Dale Corson, 1986, Electromagnetic fields and waves, 2nd edn., CBS Publishers and Distributors, New Delhi.

BOOKS FOR REFERENCE

1. W. Panofsky and M.Phillips, 1962, Classical Electricity and Magnetism, Addison Wesley, London.

2. J.D. Kraus and D.A. Fleisch, 1999, Electromagnetic Theory with Applications, 5th Ed. WCB, McGraw Hill, New York.

3. B. Chakraborty, 2002, Principles of Electrodynamics, Books and Allied, Kolkatta.

4. R.P. Feynmann, R.B. Leighton and M. Sands, 1998, The Feymann Lectures of Physics, Vols. 1, 2 and 3, Narosa Publishing House, New Delhi.

PAPER VII - MATHEMATICAL PHYSICS II - 2PH07a

UNIT I: LINEAR VECTOR SPACES

Vectors in N-dimensions- Linear independence - Basis - Representation of vectors and linear operators with respect to a basis - Transformation under change of basis - Schmidt orthogonalisation process - Schwartz inequality - Unitary transformation

TENSOR ANALYSIS: Definition of scalars, contra variant vectors - Covariant vectors - Einstein's summation convention - Definition of tensor - Kronecker delta symbol - Properties of Kronecker delta - Second rank Cartesian tensors as operators - Symmetric and anti-symmetric tensors - Tensors of rank higher than two.

UNIT II: GROUP THEORY

Definitions of groups, subgroups and conjugate classes - Symmetry elements, transformation, matrix representation - Representation of a group - Reducible and irreducible representations - Schur's Lemma theorem - Orthogonality theorem - Character of a representation - Character table - Application to molecular physics - Normal modes of vibration - Symmetry co-ordinates.

UNIT III : FOURIER SERIES

Fourier series - Expansion of periodic functions - Odd and even functions - Half-range series - Complex form of Fourier series - Pointwise convergence of Fourier series.

UNIT IV: FOURIER TRANSFORM

Properties of Fourier Transform - Fourier Integral theorem - Fourier sine and cosine transform - Application of Fourier Transform - 1D wave equation- Stretched string - heat conducting equation.

UNIT V: LAPLACE TRANSFORM AND ITS APPLICATIONS:

Laplace integral - basis properties of Laplace transform - convolution theorem - additional properties of Laplace transform - Application of Laplace transform - Boundary value problems - inverse Laplace transform, Boundary value problems.

BOOKS FOR STUDY

1. Satya Prakash, 2004, Mathematical Physics, Sultan Chand & Sons, New Delhi.

2. P.K.Chattopadhyay, 1990, Mathematical Physics, Wiley Eastern, Madras.

3. A.W. Joshi, 1997, Elements of Group Theory for Physicists, 4th Edition, New Age International, New Delhi.

4. E. Kreyszig, 1999, Advanced Engineering Mathematics, 8th Edition, Wiley, New York.

BOOK FOR REFERENCE

1. A.W. Joshi, 1995, Matrices and Tensors in Physics, 3rd Edition, Wiley Eastern, Madras.

2. E. Butkov, 1968, Mathematical Physics Addison - Wesley Reading, Massachusetts.

3. L.A. Pipes and L.R. Harvell, 1971, Applied Mathematical for engineers and physicists, 3rd edn, McGraw Hill, New York.

4. B.D. Gupta, 2000, Mathematical Physics, Vikas Publishing House, U.P.

PAPER VIII - QUANTUM MECHANICS II - 2PH08

UNIT I : TIME - INDEPENDENT PERTURBATION THEORY

Perturbation theory in non-degenerate cases - First and second order perturbation - Application to anharmonic oscillator and helium atom- Degenerate case - Stark effect in hydrogen atom.

UNIT II : VARIATIONAL METHOD

Application to ground state of hydrogen and helium atoms - WKB approximation: 1-D case - Application to bound states - Application to barrier penetration - Alpha decay.

UNIT III : ANGULAR MOMENTUM

Eigen - value spectrum for angular momentum algebra - Matrix representation - Spin angular momentum and spin wave function - Addition of angular momentum - Clebsh Gordan coefficients - Spin wave functions for a system of two spin half particles.

UNIT IV : TIME-DEPENDENT PERTURBATION THEORY

First and second order transitions under constant perturbation - Conservation energy Application to potential scattering - Transformation from centre of mass to laboratory frame - Harmonic perturbation - Adiabatic and sudden approximations

UNIT V : SCATTERING THEORY

Differential and total cross - section - Scattering amplitude - Green's function - Born approximation and its validity - Scattering by Yukawa potential - Coulomb potential - Partial wave analysis - Phase shifts - Optical theorem - Shift and potential - Low energy scattering - Scattering by square well and hard sphere - Relation between centre of mass and lab frame.

BOOKS FOR STUDY

1. P.M.Mathews and S.K. Venkatesan, 1976, A text books of Quantum Mechanics, McGraw Hill Publications.

2. E. Merzbacher, 1990, Quantum Mechanics, 3rd edition, , John Wiley Publications.

3. Leonard I.Schiff, Quantum Mechnics, 3rd edition, McGraw Hill Publications.

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1. A. Ghatak, 2002, Basic Quantum Mechanics, Macmillan India, New Delhi.

2. G. Aruldhas, 2002, Quantum Mechanics, Prentice - Hall of India, New Delhi.

3. R.P. Feynman, R.B. Leighton, and M. Sands, 1998, The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi.

4. Pauling and Wilson, 1935, Introduction to Quantum Mechanics, McGraw Hill Kogakusha, Ltd. -

5. J.J. Sakurai, 2004, Modern Quantum Mechanics.

SEMESTER II

PAPER IX - MATERIAL SCIENCE - 2PH09a

UNIT I: CRYSTAL PHYSICS

Crystal symmetry, simple crystal structure, polymorphism and allotropy, crystal imperfection, X-ray diffraction methods for structure determination.

UNIT II : MAGNETIC MATERIALS & DIELECTRIC MATERIALS

Ferrites - Magnetic recording - Metallic glasses, various polarisation process - Dielectric loss, Internal field (Lorentz method), Clausius - Mossootti relation - Dielectric breakdown - Active dielectrics - Piezo electricity, Ferro electricity, Pyroelectricity

UNIT III : OPTICAL MATERIALS

Luminescence - CRO - Injection luminescence, liquid crystal displays - Action of LCD display device, Photo detector, Thermography, optical fibers, laser materials and principle.

UNIT IV: MODERN ENGINEERING MATERIALS

Metallic glasses as Transformer core materials, Fiber Reinforced Plastics (FRP) and Fibre Reinforced Metals (FRM) - Biomaterials - advanced ceramics - High temperature materials - Thermoelectric materials - Nuclear engineering materials, polymers.

UNIT V: NANOMATERIALS AND APPLICATIONS OF NANOTECHNOLOGY

Synthesis and Characteristic classification of Nanomaterials- structural and mechanical materials - colorants and pigments - carbon nanotubes- applications - Electronics and magnetic applications

BOOKS FOR STUDY

1. P.K. Palanisamy, 2004, Material Science, Switch Publications (India) Pvt. Ltd., Chennai - 17.
2. M. Arumugam, 2004, Material Science, Anuradha Agencies

BOOK FOR REFERENCE

1. A.J.Dekker, 1977, Electrical Engineering Materials, Prentice Hall, New Delhi.

2. A.Van Hipper, 1954, Dielectric Materials Applications, John Wiley and Sons, New York.

3. G.I. Epifanov, 1979, Solid State Physics, MIR Publishers, Moscow.

4. Kenneth J. Klabumde, 2000, Nanoscale materials in Chemistry, John Wiley and Sons.

SEMESTER II

PAPER X ELECTRONICS – II 2PH10a

UNIT 1

Microprocessor Architecture and microcomputer systems :

Microprocessor as CPU - Architecture of 8085 - Functional block diagram and pin configuration - register array - microprocessor initiated operations - 8085 bus organization - address bus, bi-directional data bus and control bus - control & status signals.

Instruction set of 8085 - Data transfer, arithmetic and logic instructions, branching operations, machine control & I / O operations, stacks & subroutines - instruction format - addressing modes - simple assembly language programs.

UNIT 2

Interrupts of 8085 microprocessor - interrupt vector locations - restart instructions - 8085 timing of interrupt acknowledge machine cycle and execution of RST instruction - Hardware and software interrupts - RIM and SIM instruction - simple, polled and interrupt I/O.

UNIT 3

8085 instruction timings - instruction and machine cycle - T-states - Timing diagram for memory / I / O read, write cycles, time delay calculations. Memory and I/O interface - interfacing memory to 8085 - 2K x 8, 4K x 8 ROM interface, 2K x 8, 4K x 8 RAM interface, design of output port using I/O mapped I/O technique only - difference between I/O mapped and memory mapped I/O - Handshake signals.

UNIT 4

Study of programmable peripheral interface (PPI) : 8155 and 8255 chips for interfacing - keyboard interface - seven segment display interface - stepper

motor interface - interfacing digital to analog converters (DAC) - analog to digital converter - 8279 programmable keyboard / display interface

UNIT 5

Functions of 8253 programmable interval timer - basic concepts in serial I/O lines - SID and SOD hardware controlled serial I/O using programmable chips 8251 (USART).

BOOKS FOR STUDY AND REFERENCE :

1. R.S.Gaonkar, 1997, Microprocessor architecture, programming and applications with 8085. 3rd Edition, Penram International Publishing, Mumbai.
2. V. Vijayendran, 2005, Fundamentals of microprocessor 8085 - Architecture, programming and interfacing, S. Viswanathan Printers & Publishers Pvt. Ltd.
3. B.Ram, 2000, Fundamentals of Microprocessor & Microcomputers, Dhanpat Rai Publications, New Delhi.
4. Aditya P. Mathur, 2000, Introduction to Microprocessors, Tata McGraw Hill Pvt. Ltd.
5. R.P. Jain, 1996, Digital Electronics, Practise using integrated circuits, Tata McGraw Hill.

SEMESTER II

PRACTICAL I - GENERAL EXPERIMENTS - 2PHP1

1. Youngs Modulus - Elliptical fringes.
2. Youngs Modulus - Hyperbolic fringes.
3. Thickness of the enamel coating on a wire - by diffraction.
4. Co-efficient of linear expansion - Airwedge method.
5. Hydrogen spectrum - Rydberg's constant
6. Stefan's constant
7. B-H loop using Anchor ring.
8. Band gap of thermistor.
9. Meyer's disc. method for co-efficient of viscosity of water
10. Four probe method.
11. Geiger - Muller counter - Characteristics.
12. Geiger - Muller counter - Dead time.
13. Geiger - Muller counter - Absorption co-efficient.
14. G.M. counter - Inverse square law.
15. Feather's analysis - Range of Beta particles.
16. Michelson interferometer - Wavelength and separation of wavelength.
17. Michelson interferometer - Thickness of a mica sheet.
18. Susceptibility - Quincke's method.
19. Susceptibility - Guoy balance
20. Hall effect.

SEMESTER II

PRACTICAL II - ELECTRONICS EXPERIMENTS - 2PHP2

1. Number conversion - 8 bit & 16 bit BCD to binary, binary to BCD, Hex to ASCII using 8085.
2. Square and square root of BCD and Hex Nos.
3. Sum of a simple series.
4. Time delay subroutine and a clock diagram.
5. OpAmp - 8 bit DAC.
6. Microprocessor – 12 hour clock, 24 hour clock
7. OP amp. – astable multivibrator
8. OP amp.– Monostable multivibrator-frequency divider,
9. OP amp.– Schmitt Trigger.
10. OP amp. – Solving differential equation.
11. Filters – Low Pass and High Pass filters.
12. Wien's Birdge Oscillator
13. Phase shift Oscillator
14. 555 Timer – astable multivibrator & VCO
15. 555 Timer – monostable multivibrator
16. 555 Timer – Schmitt trigger.
17. ADC successive approximation.

SEMESTER III
PAPER XI - NUCLEAR AND PARTICLE PHYSICS - 3PH11a

UNIT - I : NUCLEAR INTERACTIONS

Nucleon - nucleon interaction - Tensor forces - Meson theory of nuclear forces - Yukawa potential - Nucleon - Nucleon scattering - Effective range theory - Spin dependence of nuclear forces - Charge independence and charge symmetry of nuclear forces - Isospin formalism.

UNIT - II : NUCLEAR REACTIONS

Types of reactions and conservation laws - Energetic of nuclear reactions - Reaction dynamics - Q - Value equation - Scattering and reaction cross sections - Compound nucleus reactions - Direct reactions - Resonance scattering - Breit - Wigner one level formula.

UNIT - III : NUCLEAR MODELS

Nuclear structure and Nuclear radius, charge distribution and magnet moment - BE, semi empirical mass formula - Liquid drop model - Bohr - wheeler theory of fission - Experimental evidence for shell effects - Shell model - Spin - Orbit coupling - magic numbers - Angular momenta and parities of nuclear ground states - Qualitative discussion and estimates of transition rates - magnetic moments and Schmidt lines - Collective model of Bohr and Mottelson - Nuclear statistics - ICS mass parabola.

UNIT - IV : RADIOACTIVE DECAY

Alpha decay, Gamow theory, Geigelnuttal law - beta decay - Fermi theory of beta decay Shape of the beta spectrum - total decay rate mass of the neutrino - angular momentum and parity selection rules - Allowed and forbidden decay's Comparative half - lives - Neutrino physics - Non - conservation of parity - Gamma decay - Multipole transitions in nuclei - angular momentum and parity selection rule - Internal conversion - Nuclear isomerism.

UNIT - V : ELEMENTARY PARTICLE PHYSICS

High energy particle accelerators - Synchrotron, linear accelerator, storage rings - Types of interaction between elementary particles - Hadron and leptons - Symmetry and conservation laws - Elementary ideas of CP and CPT invariance - Classification of hadrons - Lie algebra, SU (2) - SU (3) multiples Quark model - Gell - Mann - Okubo mass formula for octet and decuplet hadrons - Charm, bottom and top quarks.

BOOKS FOR STUDY:

1. K.S. Krane, 1987, Introductory Nuclear Physics, Wiley, New York.
2. D. Griffiths, 1987, Introduction to Elementary Particles Harper and Row, New York,
3. R.R. Roy and B.P. Nigam, 1983, Nuclear Physics, Wiley - Eastern
4. R.C. Sharma, 1992 - 93, Nuclear Physics, K. Nath & Co Mearut
5. D.C. Tayal, 1995 Nuclear Physics, Himalaya Publishing house Bombay.

BOOK FOR REFERENCE:

1 H.A. Enge, 1975, Introduction to Nuclear Physics, Addison - Wesley.

2. M.K.Pal, 1982, Theory of Nuclear Structure, Affiliated East - West, Madras.
3. J.M. Longo, 1971, Elementary Particles, Mc Graw Hill, New York.
4. R.D. Evans, 1955, Atomic Nucleus, Mc Graw Hill, New York.
5. I. Kaplan, 1989, Nuclear Physics, 2nd edn., Narosa, New Delhi.
6. B.L. Cohen, 1971, Concepts of Nuclear Physics, Tata Mc Graw Hill,

   New Delhi.

SEMESTER III

PAPER XII - SOLID STATE PHYSICS I - 3PH12a

UNIT I

Crystal Structure and diffraction: Fundamental types of lattice, simple crystal structures, Reciprocal lattice, crystal diffraction, Brillouin Zones, experimental diffraction methods.

UNIT II

Classification of solids: ionic crystal, covalent crystals, metal crystals, hydrogen bonded crystals, crystals of inert gases, Vanderwaals interaction, London interaction, repulsive interaction, cohesive energy, compressibility and bulk modulus.

UNIT III

Free electron Fermigas: Energy levels, density of states, effect of temperature on Fermi - Dirac distribution, free electron gas in 3-dimension - heat capacity, electrical conductivity, Hall effect, motion in magnetic fields.

UNIV IV

Energy bands - nearly free electron models, origin and magnitude of the energy gaps - Block functions, Kronig - Penney model, wave equation of an electron in a periodic potential, crystal momentum of electron, solution of central equation, empty lattice approximation, number of orbitals in a bond semi conductors , metals and insulators

UNIT V

Fermi surfaces: Reduced Zone scheme, periodic zone scheme construction of Fermi surfaces, electron orbits, hole orbits and open orbits, experimental methods in Fermi surface studies - De Haas Van Alphen Effect.

BOOKS FOR STUDY

1. Singhal R.L., 1989, Solid state physics, VII Ed., Kedar Nath Ram nath & Co., Meerut.

2. C.M. Kachhava , 1993, Solid state physics, Tata Mc Graw-Hill Publishing company Ltd., New Delhi.

3. B.S. Saxena, R.C. Gupta and P.N. Saxena, 1990, Fundamentals of solid state physics X Ed., Pragati Prakashan, Meerut.

BOOKS FOR REFERENCE

1. Kittel, 1997, Introduction to Solid State Physics, V Ed., Wiley Eastern Ltd.

2. S.O. Pillai, 1997, Introduction to Solid State Physics, revised and Enlarged Edition, New Age International Private Ltd, Chennai.

SEMESTER III

PAPER XIII - MOLECULAR PHYSICS AND SPECTROSCOPY I - 3PH13

UNIT - I

Microwave Spectroscopy: Theory of Microwave Spectroscopy-Rotation spectra of rigid diatomic molecules - isotopic effect in rotational spectra spectrum - non rigid rotator- vibrational rotational effect – Linear poly atomic molecules - symmetric top molecules - hyperfine structure and quadrupole coupling constant and quadrupole hyperfine interaction.

UNIT - II

Infrared spectroscopy - energy of diatomic molecules - selection rules for an harmonic oscillator - the diatomic vibrating - rotator - Break down of Born Oppenheimer approximation - the interaction of rotations and vibration - fundamental vibration and the symmetry of simple poly atomic molecules - overtone & combination - Fermi Resonance - Hydrogen bonding - Influence of rotation in the spectra of polyatomic molecules - influence of nuclear spin - analysis by IR techniques of simple polyatomic molecule.

UNIT - III

Experimental techniques and Applications of microwave and infra red spectroscopy. Stark effect - Techniques and instrumentation - block diagram and description of microwave spectrometer; single and double beam infrared spectra photometer applications of infrared spectroscopy (Qualitative analysis) - FTIR Spectroscopy - Biological applications.

UNIT - IV

NMR techniques: concepts of NMR spectroscopy - Basic Principles of interaction of spin and applied magnetic field Quantum Mechanical Description - Bloch equations - steady state solution of Bloch equation - theory of chemical

shifts - spin coupling between two or more nuclei - chemical and magnetic equivalence. AMX spectra First order and second order spectra - Double resonance and spin tickling (qualitative) - experimental methods - single and double coil method - pulse method - high resolution method - Application of NMR to quantitative measurement

UNIT - V

Interferometry and Lasers: Michelson interferometer - standardization of meter scale - Fabry Perot interferometer - etalon - LG plate.

Laser: Principle of Laser, Einstein coefficient - Threshold for 3 and 4 level laser system - Ammonia laser - Ruby laser, He-Ne laser, CO_2 laser, Diode laser , ND : YAG laser, Excimer laser - Laser applications.

BOOKS FOR STUDY

1. G. Aruldhas, 2001, Molecular Structure and Spectroscopy, Prentice Hall of India, New Delhi
2. C.N. Banwell, 1989, Fundamentals of Molecular spectroscopy, Tata McGraw Hill.
3. S.L. Gupta, V. Kumar & K.C. Sharma, 1977, Elements of spectroscopy, Pragathi Prakashan, Meerut.
4. K. Thyagarajan & A.K. Ghatak, 1997, Lasers, MacMillan India

BOOK FOR REFERENCE

1. Walker & Straughan, 1971, Spectroscopy, Vol. I, II, III, Chapman & Hall, John Wiley & Sons, New York
2. D.N. Sathyanarayana, 2004, Vibrational spectroscopy, New Age International Publication, New Delhi
3. R. Chang, 1971, Basic Principles of spectroscopy, McGraw Hill, Kogakusha, Japan.

SEMESTER III

PAPER IV - REACTOR PHYSICS AND RADIATION PHYSICS - 3PH14a

UNIT - I

Fundamentals: The Phenomenon of Nuclear fission, fission fuels, fission cross section, products of fission, energy release from fission reactor, reactor power, fuel Burn up and fuel consumption. Neutron chain reaction, neutron balance and conditions for criticality - Fermi's Four Factor Formula - Multiplication Factor - conversion and breading - different types of reactors

UNIT - II

Thermal reactors - neutron diffusion - The return transport equation - the one - speed transport equation - Fick's law diffusion equation - boundary conditions - plane - spherical and cylindrical geometries - Measurement of diffusion parameters - neutron moderation - energy loss in elastic collisions - collision and slowing down densities - moderators - Moderation (without absorption) in nuclei - lethargy - space dependent slowing down - Fermi's age theory. Moderation with absorption Temperature effects on resonance absorption.

UNIT - III

Interaction of charged particle with matter - Bethe - Bloch equation for energy loss - range energy relation - Interaction of electrons and photons with matter - photo electric effect - pair production - Compton effect - neutron irradiation and radiation damage. Radiation hazards - evaluation and control - radiation doses from natural and man - made sources and their effects - radiation protection and regulation.

UNIT - IV

Inorganic scintillation NaI (T1) Crystals - BGO Crystals - Theory of inorganic scintillator detector - organic scintillator - theory of organic scintillators - plastic phosphors - delay times - wave length shifters, quenchers -

photomultipliers - Interaction of electromagnetic radiation and electrons with Si and Ge - Electron hole pairs - Physics of semi conductor detector - Reversed biased detector - partially and totally depleted detectors-Charge collection and pulse shape Ge (Li) and Si (Li)detector - High purity Si and Ge detector- surface barrier detectors - Ion implanted detectors - PSD - semiconductor detector applications - charged particle spectroscopy - X-ray, Gamma ray and electron spectroscopy - Neutron detectors - Activation foils and BF_3 counters.

UNIT - V

Radiation dosimetry - Principles of dosimetry- thermo luminescence dosimetry - chemical dosimeters. Film dosimeters - Track edge detectors

BOOK FOR STUDY

1. J. Lamarsh, Introduction to nuclear reactor theory, Addison - Wesley publishing company, Inc.

2. W.R. Leo, III Rev. Ed., Techniques for Nuclear and particle physics experiments - A how to approach, Narosa publishing house, Chennai.

3. Kapoor and Ramamurthy, Nuclear Radiation detectors, Wiley Eastern Ltd.,

BOOKS FOR REFERENCE

1. S. Glasstone and A. Sesonske, 1998, Nuclear reactor engineering - reactor design basics, IV Ed., Vol I, CBS publishers & distributors, New Delhi
2. S. Glasstone and A. Sesonske, 1998, Nuclear reactor engineering - reactor systems engineering, IV Edn., Vol II, CBS publishers & distributors, New Delhi.
3. Glenn F. Knoll, 2000, Radiation detection and measurement, III Edn., John Wiley and sons.
4. Mahesh & Vij, Principles of Dosimetry

PAPER XV - ELECTRONICS III - 3PH15a

UNIT 1 : MICROPROCESSORS AND ARCHITECTURE

8086/8088, 80386, 80486 internal microprocessor architecture, real mode and protected modes of memory addressing, memory paging - addressing modes - data addressing modes, program memory addressing modes, stack memory addressing modes.

UNIT II

Instruction set - data movement instructions, arithmetic and logic instructions, program control instructions - Assembler macros - Assembler directives - Assembly language programming.

UNIT III

Hardware specification : pin out and the pin functions, clock - generator (8284A), Bus buffering and latching, bus timing, ready and wait state, minimum mode versus maximum mode.

UNIT IV

Memory Interface : Memory devices, 8088 (8-bit)

Memory Interface, 8086, 80386 and 80486 (16-bit)

Memory Interface, 80386 DX and 80486 (32-bit)

Memory Interface, Dynamic RAM

Basic I/O Interface : Introduction to I/O interface, I/O port address decoding, 8255, 8279, 8254, ADC and DAC.

UNIT V

Interrupts : Basic interrupt processing, hardware interrupts. Expanding the interrupts Expanding the interrupt structure, 8259A PIC Direct Memory Access : Basic DMA operation, 8237 DMA Controller, Shared Bus Operation, Disk memory systems, video displays

BOOKS FOR STUDY AND REFERENCE

1. Barry B. Brey, 1999, The intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium processor architecture, programming and interfacing, 4th edition, Prantice Hall.

2. Douglas V. Hall, 1992, Microprocessors and Interfacing, Programming and Hardware, 2nd edition, McGraw Hill International.

3. Yu - Cheng live and Glenn A. Gibson, 1995, Microcomputer System : The 8086/8088 Family architecture, programming and Design, 2nd Edition, PHI.

4. Mohamed Rafiquzzaman, 1997 Microprocessor and Microcomputer based System Design, Universal Book Stall, New Delhi.

5. S. Vijayendran, 2006, Fundamentals of Microprocessor - 8086 - Architecture, Programming (MASM) and Interfacing, S. Viswanathan Printers & Publishers Pvt. Ltd., Chennai.

SEMESTER IV

PAPER XVI - ADVANCED QUANTUM MECHANICS - 4PH16

UNIT - I

Semi classical theory of radiation: Application of the time dependent perturbation theory of semi-classical theory of radiation - Einstein's coefficient - absorption - induced emission - spontaneous emission - Einstein's transition probability - dipole transition - selection rules - forbidden transition.

UNIT - II

Quantum theory of Atomic and molecular structure: approximations in atomic structure - central field approximation - Thomas fermi statistical model - Hartree Fock equation - the method of self consistent field - Residual electrostatic and spin orbit interaction - alkali atoms - doublet seperation - intensities - Hydrogen molecule - covalent bond.

UNIT - III

Relativistic Quantum Mechanics : Klein - Gordon equation, charge - current four vector non-relativistic limits - Dirac equation - Dirac matrices - Free particle solution - spin angular momentum - significance of negative energy, electron in a magnetic field - spin magnetic moment - spin orbit energy covariant form of the Dirac equation - gamma matrices and their properties.

UNIT - IV

Quantisation of the field: Electromagnetic wave as harmonic oscillators - quantisation - classical electromagnetic wave - quantisation of field oscillators - photons - number operator - creator - creation and annihilation operators of photons.

UNIT - V

Elements of Quantum Field Theory: classical field theory - Lagrangian or canonical field theory - Quantisation of the field - Non relativistic (Schroedinger) Field - Relativistic field - Dirac field - Quantisation of electro magnetic field - Interacting fields - Feynman Diagram.

BOOKS FOR STUDY:

1. P.M.Mathews and S.K. Venkatesan, 1976, A text books of Quantum Mechanics, McGraw Hill Publications.

2. E. Merzbacher, 1970, Quantum Mechanics, 3rd edition, John Wiley & Sons, New York.

3. Leonard I.Schiff, 1968, Quantum Mechanics, 3rd edition, Tata McGraw Hill, New Delhi.

4. V.K. Thankappan, 1985, Quantum Mechanics, 2nd edition, Wiley Eastern Ltd., New Delhi.

5. V. Devanathan, 2005, Quantum Mechanics, Narosa Publishing House, New Delhi.

BOOKS FOR REFERENCE

1. G. Aruldhas, 2002, Quantum Mechanics, Prentice - Hall of India, New Delhi.

2. R.P. Feynman, R.B. Leighton, and M. Sands, 1998, The Feynman Lectures on Physics, Vols. 1, 2 and 3, Narosa, New Delhi.

3. Pauling and Wilson, 1935, Introduction to Quantum Mechanics, McGraw Hill Kogakusha, Ltd. -

4. J.J. Sakurai, 2004, Advanced Quantum Mechanics, New Age International.

PAPER XVII - SOLID STATE PHYSICS II - 4PH17

UNIT - I

Lattice Vibration: Vibrations of one - dimensional Monoatomic Lattice - Group velocity and phase velocity - Brilliouin zones - Derivation of Force constant - Normal modes of vibration in one dimensional atomic lattice of finite length - lattice with two atoms per primitive cell-optical branch - Acoustic branch - Important facts about diatomic lattice - Phonons-Momentum of phonons - inelastic scattering of photons by phonons.

UNIT - II

Diamagnetism - Langevin's theory of a diamagnetism - Paramagnetism - Langevin's theory of Paramagnetism - quantum theory of Paramagnetism - Iron group ions Quenching of orbital angular momentum Van Vleck paramagentism - Pauli paramgenetism - Nuclear Paramagnetism

UNIT - III

Ferromagnetism - Weiss theory of Ferromagnetism - Quantum theory of ferromagnetism- Heisenberg interpretation of Weiss field - Relation between exchange integral, Weiss constant and Ferro magnetic curie temperature - Ferromagnetic spin waves - Magnon Dispersion relation - quantisation of spin waves - Ferromagnetic domains - Domain wall - Anti ferromagentism - sub lattice theory of Anti Ferromagnetism - Neel temperature - Ferrimagnetisms Curie temperature and susceptibility of Ferromagnetic - Ferri magnetic materials.

UNIT - IV

Super conductivity - Meissner effect - critical field and critical temperature - Type I and Type II super conductors - thermodynamic properties - Entropy - Specific heat - isotope effect - Thermal conductivity - Energy gap - Flux quantization - Thermo dynamics of the super conductivity transition- BCS theory (qualitative approach).

UNIT - V

London's equation I and II - penetration depth - super conductivity at high frequency - Quantum tunneling - Josephson tunneling a.c and d.c - squid - introduction to high temperature super conductors.

BOOKS FOR STUDY:

1. B.S Saxena R. G. Gupta and P.N. Saxeena 1990, Fundamentals of solid state physics, X Ed., Pragatic prakasham, Meerut

2. Singhal R.L. 1989, solid state Physics, VII Ed., Kedar Nath Ram Nath & Co., Meerut.

3. R.K. Puri and V.K. Babbar 1997 solid state physics first ed., S. Chand & Co New Delhi

4. S.O Pillai, solid state Physics, revised and enlarged edition, New Age International (P) Ltd., Chennai.

BOOK FOR REFERENCE

1. C.M Kachhava, 1993, solid state Physics, Tata MC graw-Hill Publishing Company Ltd., New Delhi.

2. Kittel C., 1997, Introduction to solid state Physics, V Ed., wiley Eastern Ltd., New Delhi.

3. H.C. Gupta 1995 solid state Physics Vikas Publishing House Pvt Ltd., New Delhi.

4. J.P. Srivastava 2001 elements of solid state Physics prentice Hall of India New Delhi.

PAPER XVII - MOLECULAR PHYSICS AND SPECTROSCOPY II - 4PH18

UNIT - I

Raman Spectroscopy : Mechanism of Raman effect - classical and quantum theory of Raman effect - Polarizability ellipsoid - Difference between Raman and infrared spectra - Pure rotational Raman spectra of linear molecules - vibrational Raman spectra - Raman activity of vibrations - rule of mutual exclusion - polarization of light and Raman effect.

UNIT - II

Experimental techniques and Applications of Raman Spectroscopy : Structural determination of correlation of Raman and infrared spectroscopy of simple molecules like water and carbon dioxide - block diagram and description of Raman spectrometer with advantages of using Laser source, Raman effect in relation organic, inorganic and physical chemistry.

UNIT - III

Normal co-ordinate analysis - selection rules for Raman and Infra-red Vibrational normal modes - normal modes for Raman and IR activity C_2V and C_3V point groups - representation of molecular vibrations in symmetry co-ordinates - secular equation - potential energy matrix - kinetic energy matrix for XY_2 bent symmetrical molecule - Wilson's G Matrix for bent XY_2 molecule - general valence force field for bent XY_2 molecule.

UNIT - IV

ESR spectroscopy : Origin of electron spin resonance and resonance condition - quantum mechanical theory of ESR - design of ESR - spectrometer - Hyperfine structure study - ESR study of anisotropic systems - Triplet states study of

ESR - application of ESR to solid state physics (crystal defects and biological studies).

UNIT - V

NQR and Mossbauer spectroscopy : General principles of NQR - energy levels of quadrupole transition for axial & non-axial symmetry design of NQR spectrometer - Application of NQR - principles of Mossbauer - effect - Mossbauer - spectrometer - Isomer shift - Quadrupole interaction - magnetic hyper fine interactions applications of Moss bauer spectroscopy to molecular and electronic structure.

BOOKS FOR STUDY & REFERENCE

1. G. Aruldhas, 2001, Molecular Structure and Spectroscopy, Prentice Hall of India, New Delhi.

2. C.N. Banwell, 1989, Fundamentals of Molecular spectroscopy, Tata McGraw Hill.

3. S.L. Gupta, V. Kumar & K.C. Sharma, 1977, Elements of spectroscopy, Pragathi Prakashan, Meerut.

4. P.S. Sindhu, 1991, Molecular Spectroscopy, Tata McGraw Hill.

BOOK FOR REFERENCE

1. Walker & Straughan, 1971, Spectroscopy, Vol. I, II, III, Chapman & Hall, John Wiley & Sons, New York.

2. D.N. Sathyanarayana, 2004, Vibrational spectroscopy, New Age International Publication, New Delhi.

3. R. Chang, 1971, Basic Principles of spectroscopy, McGraw Hill, Kogakusha, Japan.

PAPER IXX - COMPUTATIONAL METHODS AND PROGRAMMING -4PH19a

UNIT - I : SOLUTIONS OF EQUATIONS

Determination of zeros of polynomials - Roots of non-linear algebraic equations and transcendental equations - Bisection – Iteration – Regula Falsi - Newton - Raphson methods - Convergence of solutions

UNIT - II : LINEAR SYSTEMS

Solutions of simultaneous linear equations - Gaussian elimination – Gauss Jordan – Iteration methods - Gauss Seidal – Gauss Jacobi methods - Matrix inversion - Eigen values and Eigen vectors of matrices - Power and Jacobi Methods.

UNIT - III : INTERPOLATION AND CURVE FITTING

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) - Curve fitting – Least squares- Fitting a straight line – Parabola – Power curve – Exponential Curve.

UNIT - IV : DIFFERENTIATION, INTEGRATION AND SOLUTION OF DIFFERENTIAL EQUATIONS

Numerical differentiation - Numerical integration - Trapezoidal rule - Simpson's rule - Error estimates - Gauss-Laguerre, Gauss-Laugerre, Gauss-Hermite and Gauss-Chebyshev quadratures - Numerical solution of ordinary differential equations - Euler and Runge Kutta methods.

UNIT - V : PROGRAMMING WITH C

Constants – Variables – Data types – Operators and expression – Managing input and output operators – Decision making and Branching – Loops – Arrays – User defined functions - Programs for the following computational methods : 1. Zeros of polynomial equations by Newton-Raphson method 2. Lagrange

Interpolation 3. Trapezoidal and Simpson's 1/3 Rule, 4. Solution of first order differential equations by Euler and Runge kutta method 5. Curve fitting – Straight line.

BOOKS FOR STUDY

1. S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall India Ltd., New Delhi.

2. V. Rajaraman, 1993, Computer Oriented Numerical Methods, 3rd edn., Prentice Hall India Ltd., New Delhi.

3. M.K. Jain, S.R.Iyengar and R.K.Jain, 1995, Numerical Methods for Scientific and Engineering Computation, 3rd edn., New Age International, New Delhi.

4. F. Scheid, 1998, Numerical Analysis, 2nd edn., Schaum's Series McGraw Hill, New York

5.E.Balaguruswamy, Introduction to ANSI C , Tata McGraw Hill Publishing Company Ltd.

BOOKS FOR REFERENCE

1. S.D. Conte and C. De Boor, 1981, Elementary Numerical Analysis, An Algorithmic Approach, 3rd edn., International Ed. McGraw Hill.

2. W.H.Press, S.A.Teukdsky, W.T.Vetterling and B.P.Flannery, 1993, Numerical Recipes in C, 2nd edn., Cambridge University Press,.

3. B.F. Gerald and P.O.Wheatley, 1994, Applied Numerical Analysis, 5th edn., Addison Wesley.

4. S.S.Kuo, 1996, Numerical Methods and Computers, Addison-Wesley, London.

5. A. Singaravelu, Numerical methods, Meena

PAPER XX - ELECTRONICS IV - 4PH20a

UNIT I

Generation of microwaves : Magnetrons, Klystrons and Travelling wave tube - solid state microwave devices - GUNN diode, IMPATT, TRAPATT diodes - micro wave bipolar transistor - MOSFET - Parametric amplifier - Hybrid MICS - Microwave measurements, crystal detector - standing wave indicator - VSWR - impedance, frequency and dielectric measurements.

UNIT II

Colour Television : Television Camera - Plumbicon - Solid state image scanner - design of transistor video amplifier with high frequency, low frequency compensation network - Principles of PAL colour television system - discussion of colour television transmitter, receiver under PAL system with suitable block diagrams. Microwave antennae.

UNIT III

Radar System - brief study of CW Doppler, Frequency modulated CW Doppler - navigation MTI, conical scan tracking - monopulse tracking radar system - radar transmitter - receiver, receiver noise figure - radar display - duplexer.

UNIT IV

Digital communication systems : pulse code modulation (PCM, differential pulse code modulation (DPCM) digital modulate scheme, amplitude, phase and frequency shift keying scheme (ASK, PSK, FSK) Fibre optic transmission theory - Different types of fibers - Transmission characteristics of optical fibers - dispersion, attenuation, absorption, scattering losses - fiber materials - sensors - intensity and phase modulated sensors - displacement, temperature, pressure, flow, magnetic and electric field sensors.

UNIT V

Micro controller 8051 : Architecture of 8051 - Key features of 8051 - memory organisation - data memory and program memory - internal RAM organisation - special function registers - control registers - I/O ports - counters and timers - interrupt structure - instruction set of 8051 - simple programs. (Sum of numbers, biggest and smallest in an array) - software time delay.

BOOKS FOR STUDY AND REFERENCE

1. John Kennedy, Electronic communication System 3rd Edition, Tata Mc-Graw Hill.

2. Gulati, 1988, Monochrome & Colour Television, Wiley Eastern Publ.

3. Terman, Electronic & Radio Engineering. 4th Edition Tata Mc-Graw Hill.

4. Kanneth J. Ayala, 1996, The 8051 microcontroller, 3rd Edition Penram International, India.

5. Christian Hentshel, 1984, Fiber Optics Handbook, Hewlett-Packard.

6. Allen H. Cherin, McGraw - Hill, 1983, An introduction to optical fibers, New York.

7. Siman Haykin, 1994, Communication System, Third Edition, John Wiley & Sons.

SEMESTER IV

Practical III - Advanced Experiments - 4PHP3a

1. 8086 µP and 8051 µC experiments
    a. Addition and subtraction
    b. Multiplication and division
    c. Ascending and descending order

2. Interfacing experiments using 8086 µP and 8051 µC
    a. 0809 ADC
    b. DAC – Waveform generator
    c. DC stepper motor – clockwise, anticlockwise, full stepping and half stepping
    d. Seven segment display – alpha numerical character
    e. Key board Interface
    f. 8253 Timer interface
3. Microwave test bench : standing wave measurements, determination of operating frequency and impedance measurement
4. Microwave test bench : radiation pattern of pyramidal antenna and law of inverse square
5. Microwave test bench : dielectric measurement – solid / liquid
6. Ultrasonic Interferometer – compressibility of the liquid
7. Laser based experiments
8. Fiber optics experiments
9. C programming for the following computational methods
    a. Zeros of the polynomial by Newton Raphson method.
    b. Lagrange interpolation.
    c. Trapezoidal and Simpson 1/3 rule.
    d. Solution of first order differential equation by Euler and Runge Kutta methods.
    e. Curve fit – Fitting of straight line.

MCA - 1CAP2a - Practical II: Digital Electronics Laboratory

#	Course Content	L	P	T
1	**Basic logic gates:** 1. Basic logic gates using ICs 2. Half adder and Full adder using XOR and AND gates 3. Half subtractor and Full subtractor using fundamental gates 4. NAND and NOR as universal building blocks.	-	18	-
2	**Combinational circuits:** 5. Multiplexer and De-multiplexer 6. Encoders and Decoders 7. One-bit Comparator	-	18	-
3	**Registers and Counters:** 8. Flip-Flops 9. Shift registers 10. Ring Counter 11. Johnson's Ring Counter 12. Ripple Up and Down Counter 13. Synchronous Up and Down Counter	-	24	-
4	**Adder and Subtractor:** 14. Binary adder and subtractor using IC 7483 15. Basic BCD Adder using IC 7483	-	15	-
Total		**-**	**75**	**-**