THIRUVALLUVAR UNIVERSITY

MASTER OF SCIENCE

DEGREE COURSE

M.Sc. PHYSICS

UNDER CBCS

(with effect from 2008-2009)

The Course of Study and the Scheme of Examinations

Year / Semester	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam hrs	Max.Marks		
							IA	Uni. Exam.	Total
I Year I Semester	Core	Paper I	Mathematical Physics	5	4	3	25	75	100
	Core	Paper II	Classical Mechanics and Statistical Mechanics	5	4	3	25	75	100
	Core	Paper III	Quantum Mechanics I	5	4	3	25	75	100
	Core Practical		General Experiments	6	-	-	-	-	-
	Core Practical		Electronics Experiments	6	-	-	-	-	-
	Elective I	Paper I	Electronic Devices and Applications	3	4	3	25	75	100
I Year II Semester	Core	Paper IV	Electromagnetic Theory	5	4	3	25	75	100
	Core	Paper V	Spectroscopy	5	4	3	25	75	100
	Core	Paper VI	Quantum Mechanics II	5	4	3	25	75	100
	Core Practical	Practical I	General Experiments	5	6	4	40	60	100
	Core Practical	Practical II	Electronics Experiments	5	6	4	40	60	100
			Human Rights	2	2	3	25	75	100
	Elective II	Paper II	Electronic Instrumentation	3	4	3	25	75	100
II Year III Semester	Core	Paper VII	Solid State Physics	5	4	3	25	75	100
	Core	Paper VIII	Nuclear and Particle Physics	5	4	3	25	75	100
	Core Practical		General Experiments	6	-	-	-	-	-
	Core Practical		Electronics Experiments	6	-	-	-	-	-

Year / Semester	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam hrs	Max.Marks		
							IA	Uni. Exam.	Total
	Elective III	Paper III	Microprocessor I	4	4	3	25	75	100
	Elective IV (Non-Major Subject)	Paper IV	Nano Science	4	4	3	25	75	100
II Year IV Semester	Core	Paper IX	Materials Science and Laser Physics	5	4	3	25	75	100
	Core	Paper X	Research Methodology	5	4	3	25	75	100
	Core Practical	Practical III	General Experiments	6	6	6	40	60	100
	Core Practical	Practical IV	Microprocessor Experiments	6	6	6	40	60	100
	Elective V	Paper V	Microprocessor II	4	4	3	25	75	100
	Core	Paper XI	Project with *viva voce*	4	4	Project	150 +Viva 50		200
			Total	**120**	**90**				**2200**

THIRUVALLUVAR UNIVERSITY

M.Sc. PHYSICS

SYLLABUS

UNDER CBCS

(with effect from 2008-2009)

I SEMESTER

PAPER I

MATHEMATICAL PHYSICS

UNIT-I : Complex Variables

Analytic function - kinds of singularity - Line integrals and Cauchy's theorem - Taylor and Laurent expansions - Residue theorem - Application to evaluation of definite integrals - conformal mapping and invariance of Laplacian in two dimensions - Representation of functions by contour integral.

UNIT-II : Linear Differential equations and Green's function

Second order linear differential equations - Sturm - Liouville's Theorm - Orthogonality of eigenfunctions - Illustration with Legendre, Laguerre, Hermite and Chebyshev differential equations - Location of Zeros of these polynomials - Wronskian, ordinary and singular points - Green's function- Eigenfunction expansion of Green's function - Reciprocity therem - Sturm - Liouville type equations in one dimension and their Green's function.

UNIT-III : Laplace and Fourier transforms

Laplace transforms - Solution of linear differential equations with constant Coefficients - Fourier integral - Fourier transforms, Fourier sine and consine transforms - Convolution theorems - Applications.

UNIT-IV : Tensor Analysis

Definition of scalars - contravariant Vectors and Covariant Vectors - Einstein's summation convention - Definition of tensors - Second rank cartesian tensor as operator - Symmetric and antisymmetric tensors - tensors of rank higher than two - Specific Tensors - Covariant derivatives.

UNIT-V : Group Theory

Definition of groups, subgroups and conjugate classes - Symmetry elements, Transformation, Matrix representation - Point groups - representation of a group - Reducible and irreducible representations - Orthogonality theorem - character of a representation - character Table C_{2v} and C_{3v} - Application to Infrared and Raman active vibrations of XY_3 type molecules - Projection operators applied to an equilateral triangle - Rotation group and angular momenta.

Books for Study

1. E. Kreyszig., 1999, Advanced Engineering Mathematics, 8th Ed. Wiley, New York .
2. M.D. Greenberg, 1998, Advanced Engineering Mathematics, 2nd Edition, International Ed., Prentice - Hall International, New Jersey.
3. P.K. Chattopadhyay, 1990, Mathematical Physics Wiley Esatern, Madras.
4. F.A. Cotton, Chemical Application of Group Theory 3rd Edition, John Wiley and Sons, New York.
5. S. Lipschutz, 1987, Linear Algebra, Schaum's Series, McGraw - Hill, New York.
6. A.W. Joshi, 1997, Elements of group Theory for Physicists, 4th Edition, New Age International, New Delhi.
7. G. Arfken and H.J. Weber, 2001, Mathematical Methods for Physicists, 5th Edition, Harcourt (India), New Delhi.

Books for Reference

1. P.R Halmos, 1965, Finite dimensional Vector Spaces, 2nd Edition. Affiliated East - West, New Delhi.
2. M. Hamermesh, 1962, Group Theory and Its application to Physical Problems Addison Wesley, London.
3. C.R. Wylie and LC. Barrett, 1995, Advanced Engineering Mathematics, 6th Edition., International Edition. McGraw Hill, New York.
4. P.K. Chakrabarti and S.N. Kundu, 1996, A Text Book of Mathematical Physics, New Central Book Agency, Kolkata.
5. A.K. Ghatak, I.C. Goyal and S.H. Chua, 2002, Mathematical Physics Macmillan India, New Delhi.

PAPER II

CLASSICAL MECHANICS AND STATISTICAL MECHANICS

PART A : CLASSICAL MECHANICS

UNIT-I : Rigid body dynamics

Angular momentum, rotational kinetic energy and moment of inertia of a rigid body - Euler's angles - Euler's equations of motion - Torque - free motion of a rigid body - Motion of a symmetrical top under the action of gravity.

UNIT-II : Lagrangian and Hamiltonian formulations and Canonical Transformations

Lagrange's equations of motion - Hamiltonian - Variational Principle and Lagrange's equation - non-holonomic and non-conservative systems.

Hamilton's equations - Cyclic variables - Principle of least action - Equations of canonical transformations - Examples of canonical transformation - Lagrange and Poisson Bracket notation - Infinitesimal contact transformation - Constants of motion and symmetry properties.

UNIT-III : Hamilton - Jacobi Theory and Theory of Small Ocillations

Hamilton - Jacobi equations - Linear Harmonic Oscillator problem by Hamilton - Jacobi method - Action Angle variables - Application to Kepler's problem.

Oscillatory motion - Theory of small oscillation - Linear Triatomic Molecule - Stability of Oscillatory motion - Forced Harmonic Oscillator - non- linear Oscillation in a symmetric potential.

PART B : STATISTICAL MACHANICS

UNIT-IV : Classical Statistics

Microstates and Macrostates - Phase space - Liouville's theorem and it's significance - ensembles - Definition of Micro Canonical, Canonical and Grand Canonical ensembles - Partition function - Translational partition functions- Entropy - Gibb's Paradox - Sackur - Tetrode equation.

UNIT-V : Quantum Statistics

Quantum Statistics of ideal gas - Ideas of B-E and F-D Particles - Degeneracy of gases - Bose-Einstein condensation of gases - Photon gas - Planck's law of radiation and its limitation - Thermionic emission - Pauli's theory of Paramagnetism.

Books for Study

1. H. Goldstein, 2002, Classical Mechanics. 3rd Edition., C. Poole and J.Safko, Pearson Education, Asia, New Delhi.
2. S.N. Biswas, 1998, Classical Mechanics, Books and Allied Ltd., Kolkata.
3. K. Huang, 1975, Statistical Mechanics, Wiley Eastern Ltd., New Delhi.
4. B.K. Agarwal and M. Eisner, 1998, Statistical Mechanics, 2nd Edition, New Age International, New Delhi.
5. J.K. Bhattacharjee, 1996, Statistical Mechanics: An Introductory Text, Allied Publication, New Delhi.

Books for Reference

1. L.D. Landau and E.M. Lifshitz, 1969, Mechanics, Pergomon Press, Oxford.
2. K.R. Symon, 1971, Mechanics, Addison Wesley, London.
3. J.L. Synge and B.A Griffith, 1949, Principles of Classical Mechanics, Mc. Graw-Hill, New York.
4. C.R.Mondal, Classical Mechanics, Prentice - Hall of India, New Delhi.
5. L.P. Kadanoff, 2001, Statistical Physics - Statics, Dynamics and Renormalization, World Scientific, Singapore.
6. M. Glazer and J. Wark, 2001, Statistical Mechanics, Oxford University Press, Oxford.

PAPER III

QUANTUM MECHANICS I

UNIT-I : Basic formalism

Wave functions for a free particle - Interpretation and conditions on the wave function - Postulates of quantum Mechanics and the Schroedinger equation - Ehrenfest's theorem - Operator formalism - Linear operators - Self adjoint operators - Expectation Value - Stationary States - Hermitian Operators for dynamical variables - Eigen values and eigen function - Orthonormality - Uncertainty Principle.

UNIT-II : Applications

Ladder operators and simple harmonic oscillator - Rigid rotator - Step Potential - Particle in a central potential - Particle in a periodic potential - Orbital angular momentum and spherical harmonics - Central forces and reduction of two body problem - Particle in a Spherical well - Hydrogen atom.

UNIT-III : General formalism:

Hilbert's space - Dirac notation - Representation theory - Co-ordinate and momentum representations - Time evolution - Schroedinger, Heisenberg and Interaction pictures - Symmetries and conservation laws - Unitary transformations associated with translations and rotations.

UNIT-IV : Approximation methods

Time-independent perturbation theory for non- degenerate and degenerate levels - Application to ground state of anharmonic oscillator and Stark effect in Hydrogen - Variation method - Application to ground state of Helium atom - WKB approximation - WKB quantization rule - Application to simple Harmonic Oscillator.

UNIT-V : Angular momentum and identical particles

Commutation rules for angular momentum operators - Eigen value spectrum from angular momentum algebra - Matrix representation - Spin angular momentum - Non-relativistic Hamiltonian including spin - Addition of two angular momenta - Clebsch - Gordan coefficients - Symmetry and anti symmetry of wave functions - Pauli's spin matrices.

Books for Study

1. P.M. Mathews and K. Venkatesan, 1976, A Text book of Quantum Mechanics, Tata McGraw-Hill, New Delhi.
2. L.I. Schiff, 1968, Quantum Mechanics, 3rd Edition, International Student Edition, McGraw-Hill Kogakusha, Tokyo.
3. V. Devanathan, 2005, Quantum Mechanics, Narosa Publishing House, New Delhi.

Books for Reference

1. E. Merzbacher, 1970, Quantum Mechanics 2nd Edition, John Wiley and Sons, New York.
2. V.K. Thankappan, 1985, Quantum Mechanics, 2nd Edition, Wiley Eastern Ltd, New Delhi.
3. P.A.M. Dirac, 1973, The Principles of Quantum Mechanics, Oxford University Press, London.
4. L.D. Landau and E.M. Lifshitz, 1976, Quantum Mechanics, Pergomon Press, Oxford.

ELECTIVE

PAPER I

ELECTRONIC DEVICES AND APPLICATIONS

UNIT-I : Fabrication of IC and logic families

Fabrication of IC - Monolithic integrated circuit fabrication - IC pressure transducers - Monolithic RMS - Voltage measuring device - Monolithic voltage regulators - Integrated circuit multipliers - Intergrated circuit logic - Schottky TTL - ECL - I^2L - P and NMOS Logic - CMOS Logic - Tristate logic circuits.

UNIT-II : Opto electronic devices

Light sources and Displays - Light emitting diodes - Surface emitting LED - Edge Emitting LED - Seven segment display - LDR - Diode lasers - Photo detectors - Basic parameters - Photo diodes - p-i-n Photo diode - Solar cells - Photo transistors - IR and UV detectors.

UNIT-III : 555 Timer and applications

555 Timer - Description - Monostable operation - Frequency divider - Astable operation - Schimitt trigger - Phase Locked Loops - Basic principles - Analog phase detector - Voltage Controlled Oscillator - Voltage to Frequency conversion - PLL IC 565 - Description - Lock-in range - Capture range - Application - Frequency multiplication.

UNIT-IV : Op-amp applications

Instrumentation amplifier - V to I and I to V converter - Op-amp circuits using diodes - Sample and Hold circuits - Log and Antilog amplifiers - Multiplier and Divider - Electronic analog Computation - Schimitt Trigger - Astable, Monostable Multivibrator - Triangular wave generators - Sine wave generators - Rc Active filters.

UNIT-V : Pulse and digital Communication

Pulse communications - Introduction - Types - Pulse-Amplitude Modulation (PAM) - Pulse Time Modulation - Pulse Width Modulation (PWM) - Pulse Position Modulation (PPM) - Pulse Code Modulation (PCM) - Principles of PCM - Quantizing noise - Generation and Demodulation of PCM - Effects of Noise - Advantages and applications of PCM - Pulse systems - Telegraphy - Frequency-Shift keying - Telemetry - Digital communication - Modem classification - Modes of modem operation - Modem interconnection - Modem interfacing.

Books for Study

1. S.M. Sze, 1985, Semiconductor Devices - Physics and Technology, Wiley, New York.
2. Millman and Halkias, Integrated Electronics, McGraw-Hill, New Delhi.
3. R.A. Gaekwad, 1994, Op-Amps and intergrated circuits EEE.
4. Taub and Shilling, 1983, Digital Integrated Electronics, McGraw-Hill, New Delhi.
5. J. Millman, 1979, Digital and Analog Circuits and Systems, McGraw-Hill, London.
6. George Kenndy, 1987, Electronic communication systems 3rd Edition, McGraw-Hill, London.

Books for Reference

1. R.F. Coughlin and F.F, Driscol, 1996, Op-Amp and linear integrated circuits, Prentice Hall of India, New Delhi.
2. M.S.Tyagi, Introduction to Semiconductor Devices, Wiley, New York.
3. P. Bhattacharya, 2002, Semiconductor Optoelectronic Devices, 2nd Edition, Prentice-Hall of India, New Delhi.
4. Deboo/ Burrous, 1985, Integrated circuits and semiconductor Devices - Theory and application, McGraw-Hill, New Delhi.
5. D. Roy Choudhury, 1991, Linear integrated circuits, Wiley Eastern, New Delhi.
6. Ramakant Gaekwad, 1981, Operational amplifiers, Wiley Eastern, New Delhi.

II SEMESTER

PAPER IV

ELECTROMAGNETIC THEORY

UNIT-I : Electrostatics

Electrostatic potential - Poisson's equation - Laplace's equation - Solution of Laplace's equation - Zonal harmonics - Addition theorem for spherical harmonics - Conducting sphere in a uniform field - Polarization vector - Field at external and internal points - displacement vector - Polar molecules - Forces on dielectrics - Dielectric sphere in a uniform field.

UNIT-II : Magnetostatics

Magnetic field of steady current - Magnetic vector potential - Application to a long current carrying wire - ampere's law - Lorentz force - Line integral of a vector potential over a closed curve - Equation of continuity - Lorentz condition - Magnetic scalar potential - Application to a circular coil - Magnetic shielding - Energy in a magnetic field.

UNIT-III : Maxwell's equations

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

UNIT-IV : Application of Maxwell's equations

Fields and radiation of localised sources - Oscillating electric dipole - Radiation from an oscillating electric dipole - Poynting vector and radiated power - Radiation resistance - Radiation from a linear antenna - Antenna arrays - Radiation pressure and electromagnetic momentum - Electromagnetic oscillators.

UNIT-V : Wave propagation

Propagation of electromagnetic waves in isotropic and anisotropic dielectrics - Propagation in conducting media - Linear and circular polarization - Reflection and refraction at a plane interface - Propagation of waves in a rectangular wave guide - Cavity resonator - Faraday and Kerr effects.

Books for Study

1. J.D. Jackson, 1975, Classical Electrodynamics, Wiley Eastern Ltd., New Delhi.
2. D.J. Griffiths, 2002, Introduction to Electrodynamics, 3rd Edition, Prentice - Hall of India, New Delhi.
3. J.R. Reitz, F.J. Milford and R.W. Christy, 1986, Foundations of Electromagnetic Theory, 3rd Edition, Narosa Publication, 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 with Applications, 5th Edition WCB McGraw-Hill, New York.
3. B. Chakraborty, 2002, Principles of Electrodynamics, Books and Allied, Kolkata.

PAPER V

SPECTROSCOPY

UNIT-I : Microwave spectroscopy

Pure rotational spectra of diatomic molecules - Polyatomic molecules - Study of linear molecules and symmetric top molecules - Hyperfine structure and quadruple moment of linear molecules - Experimental techniques - Molecular structure determination - Stark effect - inversion spectrum of ammonia - Applications to chemical analysis.

UNIT-II : Infrared spectroscopy

Vibrational spectroscopy of diatomic and simple ployatomic molecules - Harmonic Oscillator - Anharmonic Oscillator - Rotational vibrators - Normal modes of vibration of Polyatomic molecules - Experimental techniques - Applications of infrared spectroscopy - H_2O and N_2O molecules - Reflectance spectroscopy.

UNIT-III : Raman Spectroscopy

Classical theory of Raman Scattering - Raman effect and molecular structure - Raman effect and crystal structure - Raman effect in relation to inorganic, organic and physical chemistry - Experimental techniques - Coherent anti-Stokes Raman Spectroscopy - Applications of infrared and Raman spectroscopy in molecular structural confirmation of water and CO_2 molecules.

UNIT-IV : NMR and NQR Techniques

Theory of NMR - Bloch equations - Steady state solution of Bloch equations - Theory of chemical shifts - Experimental methods - Single Coil and double coil methods - Pulse Method - High resolution method - Applications of NMR to quantitative measurements.

Quadruple Hamiltonian of NQR - Nuclear quadruple energy levels for axial and non-axial symmetry - Experimental techniques and applications.

UNIT-V : ESR and Mossbauer Spectroscopy

Quantum mechanical treatment of ESR - Nuclear interaction and hyperfine structure - Relaxation effects - Basic principles of spectrographs - Applications of ESR method.

Mossbauer effect - Recoilless emission and absorption - Mossbauer spectrum - Experimental methods - Massbauer spectrometer - Hyperfine interactions - Chemical Isomer shift - Magnetic hyperfine interactions - Electric quadruple interactions - Simple biological applications.

Books for Study

1. C.N. Banwell and E.M. McCash, 1994, Fundamentals of Molecular Spectroscopy, 4th Edition, Tata McGraw-Hill Publications, New Delhi.
2. G. Aruldas, 2001, Molecular Structure and Spectorscopy, Prentice - Hall of India Pvt.Ltd., New Delhi.
3. D.N. Satyanarayana, 2004, Vibrational Spectroscopy and Applications, New Age International Publications, New Delhi.

Books for Reference

1. Atta Ur Rahman, 1986, Nuclear Magnetic Resonance, Spinger Verlag, New York.
2. Towne and Schawlow, 1995, Micorwave Spectroscopy, McGraw-Hill,
3. Raymond Chang, 1980, Basic Principles of Spectroscopy, Mc Graw-Hill, Kogakusha, Tokyo.
4. D.A. Lang, Raman Spectroscopy, Mc Graw-Hill International, N.Y.

PAPER VI

QUANTUM MECHANICS II

UNIT-I : Scattering Theory

The scattering problem - formulation - Scattering amplitude - cross sections - Transformation from centre of mass to laboratory frame- Partial wave analysis - optical theorem - Phase shifts - Scattering length and effective range - Low energy scattering - Born approximation and its validity.

UNIT-II : Perturbation Theory

Time dependent perturbation theory - Constant and harmonic perturbations - Transition probabilities - Fermi's-Golden rule - Selection rules for dipole radiation - Adiabatic approximation - Sudden approximation - The density matrix - spin density matrix and magnetic resonance - Semi classical treatment of an atom with electromagnetic radiation.

UNIT-III : Relativistic Quantum Mechanism

Klein-Gordon equation - Failures - Dirac equation - Plane - wave solutions - Interpretation of negative energy states - Antiparticles - Spin of electron - Magnetic moment of an electron due to spin - Energy values in a coulomb potential.

UNIT-IV : Dirac equation

Covariant form of Dirac equation - properties of gamma matrices - Traces - Separation of the equation and the Hydrogen atom problem - Invariance of Dirac equation under Lorentz transformation - T-Transformation for the Dirac equation in presence of electro magnetic field.

UNIT-V : Quantisation of Fields

Relativistic Lagrangian and Hamiltonian of a charged particle in an electromagnetic field - The Lagrangian and Hamiltonian formulations of field - Second quantization of Kelin-Gordon field - creation and annihilation operators - Commutation relations - Quantization of electromagenetic field - Quantization of Schroedinger's field - Quantization of Dirac field.

Books for Study

1. P.M. Mathews and K. Venkatesan, 1976, A Text book of Quantum Mechanics, Tata Mc Graw-Hill, New Delhi.
2. L.I. Schiff, 1968, Quantum Mechanics, 3rd Edition, International Student Edition, McGraw-Hill, Kogakusha, Tokyo.
3. E. Merzbacher, 1970, Quantum Mechanics, 2nd Edition, John Wiley and Sons, New York.
4. J.D. Bjorken and S.D. Drell, 1964, Relativistic Quantum Mechanics, McGraw-Hill, New York.
5. V. Devanathan, 2005, Quantum Mechanics, Narosa Publishing House, New Delhi.
6. P.A. M. Dirac, 1973, The Principles of Quantum Mechanics, Oxford University Press, London.
7. B.K. Agarwal, 1976, Quantum Mechanics and Field Theory, Lokbharti Publications, India.
8. Amitabha Lahiri and B.G. Pal, 2005, A First Book of Quantum Field Theory, Narosa Publications, New Delhi.

Books for Reference

1. V.K. Thankappan, 1985, Quantum Mechanics, 2nd Edition, Wiley Eastern Ltd, New Delhi.
2. V. Devanathan, 1999, Angular Momentum Techniques in Quantum Machanics, Kluwer Academic Publishers, Dordrecht.
3. L.D. Landau and E.M. Lifshitz, 1958 Quantum Mechanics, Pergomon Press, London.
4. J.S. Bell, Gottfried and M. Veltman, 2001, The Foundations of Quantum Mechanics, World Scientific.
5. G. Aruldhas, 2002, Quantum Mechanics, Prentice-Hall of India, New Delhi.
6. Claude Itzykson and Isau Bernard Zuber, 1987, Quantum Field Theory, McGraw-Hill International Edition.
7. Leslie E. Vallentine, 1998, Quantum Mechanics - A Modern Development, World Scientific Publications Pvt. Ltd, Singapore.

CORE PRACTICAL I

GENERAL EXPERIMENTS

(Any 15 out of the given 25)

1. Cornu's method - Young's modulus by elliptical fringes.
2. Cornu's method - Young's modulus by hyperbolic fringes.
3. Determination of Stefan's constant.
4. Band gap energy - Thermister.
5. Hydrogen spectrum - Rydberg's constant.
6. Co-efficient of linear expansion - Air wedge method.
7. Permittivity of a liquid using RFO.
8. Viscosity of liquid - Meyer's disc.
9. Solar spectrum - Hartmann's Interpolation formula
10. F.P. Etalon using spectrometer.
11. Iron / Copper arc spectrum.
12. Brass / Alloy arc spectrum.
13. B-H loop using Anchor ring.
14. Specific charge of an electron -Thomson's method / Magnetron method.
15. Electrical resistance of a metal / alloy by four probe method.
16. Edser and Butler fringes - Thickness of air film.
17. Spectrometer - Polarisability of liquids.
18. Spectrometer - Charge of an electron.
19. Determination of strain harding co-efficient.
20. Thickness of the enamel coasting on a wire - by diffraction.
21. Lasers: Study of laser beam parameters.
22. Measurement of Numerical aperture (NA) of a telecommunication graded optic fibre.
23. Fibre attenuation of given optical fibre.
24. Determination of solar constant.
25. Biprism - Wavelength of monochromatic source - Refractive Index of a liquid.

CORE PRACTICAL II

ELECTRONICS EXPERIMENTS

(Any 20 out of the given 25)

1. Characteristics of SCR and Triac.
2. SCR and Triac - Switching and power control.
3. Op-amp - Inverting, Non-inverting amplifier - Voltage follower - summing, difference, average amplifier - differentiator and integrator.
4. Op-amp - Study of the attenuation characteristics and design of the phase-shift Oscillator.
5. Op-amp - Study of the attenuation characteristics and design of the Wien Bridge Oscillator.
6. Op-amp - Solving simultaneous equations
7. Op-amp - Design of square wave, sawtooth wave, and Triangular wave generators.
8. Op-amp - Design of schmitt Trigger and construction of Monostable multivibrator.
9. Op-amp - Design of active filters - second order - low pass, high pass, band pass and band rejecter.
10. Op-amp - D.A. converter - Binary weighted method - R/2R ladder method.
11. IC 7400 - Half adder, Half subtractor, Full adder, Full subtractor.
12. IC 7490 - modulus counters
13. IC 7447 - display
14. Up-down counters - Design of modulus counters.
15. 4 bit Shift Registers - Ring counter - Twisted Ring counter.
16. IC 7483 - Arithmetic operations.
17. IC 555 - Astable multivitorator and Voltage Controlled Oscillator.
18. IC 555 - Monostable multivibrator, Frequency Divider.
19. IC 555 - Schmitt Trigger and Hysterisis.
20. IC 7400 & IC 7413 - Clock generators.
21. Temperture co-efficient using 555 timer.
22. Instrumentation Amplifier - using four IC 741.
23. Pulse width modulator using IC 741.
24. A/D converter using comparator LM 336.
25. Phase Locked Loop.

HUMAN RIGHTS

COMPULSORY PAPER

UNIT-I

Definition of Human Rights - Nature, Content, Legitimacy and Priority - Theories on Human Rights - Historical Development of Human Rights.

UNIT-II

International Human Rights - Prescription and Enforcement upto World War II - Human Rights and the U .N .O. - Universal Declaration of Human Rights - International Covenant on Civil and Political Rights - International Convenant on Economic, Social and Cultural Rights and Optional Protocol.

UNIT-III

Human Rights Declarations - U.N. Human Rights Declarations - U.N. Human Commissioner.

UNIT-IV

Amnesty International - Human Rights and Helsinki Process - Regional Developments - European Human Rights System - African Human Rights System - International Human Rights in Domestic courts.

UNIT-V

Contemporary Issues on Human Rights: Children's Rights - Women's Rights - Dalit's Rights - Bonded Labour and Wages - Refugees - Capital Punishment.

Fundamental Rights in the Indian Constitution - Directive Principles of State Policy - Fundamental Duties - National Human Rights Commission.

Books for Reference:

1. International Bill of Human Rights, Amnesty International Publication, 1988.
2. Human Rights, Questions and Answers, UNESCO, 1982

3. Mausice Cranston - What is Human Rights
4. Desai, A.R. - Violation of Democratic Rights in India
5. Pandey - Constitutional Law.
6. Timm. R.W. - Working for Justice and Human Rights.
7. Human Rights, A Selected Bibliography, USIS.
8. J.C.Johari - Human Rights and New World Order.
9. G.S. Bajwa - Human Rights in India.
10. Amnesty International, Human Rights in India.
11. P.C.Sinha & K. Cheous (Ed) - International Encyclopedia of Peace, Security Social Justice and Human Rights (Vols 1-7).
12. Devasia, V.V. - Human Rights and Victimology.

Magazines:

1. The Lawyer, Bombay
2. Human Rights Today, Columbia University
3. International Instruments of Human Rights, UN Publication
4. Human Rights Quarterly, John Hopkins University, U.S.A.

ELECTIVE

PAPER II

ELECTRONIC INSTRUMENTATION

UNIT-I : Transducers

Classification of Transducers - Principle, construction and working of Thermistor, LVDT, Electrical strain gauges and capacitive transducers.

Measurement of non-electrical quantities - Strain, Displacement, temperature, Pressure and Force.

UNIT-II : Digital Instrumentation

Principle, block diagram and working of Digital frequency counter, digital multimeter, digital pH meter, digital conductivity meter and digital storage oscilloscope.

UNIT-III : Analytical Instrumentation

Principle, block diagram, description, working and applications of UV-VIS spectrometer, IR spectrometer, Flame emission spectrometer and ICP - AES spectrometer - Basic concepts of Gas and Liquid Chromatography.

UNIT-IV : Bio-Medical Instrumentation

Physiological transducers to measure blood pressure, body temperature.

Sources of Bio-electric potentials - resting potential, action potential, bio-potential electrodes.

Principle, block diagram and operation of ECG and EEG - recorders.

UNIT-V : Computer Peripherals

Printers - Printer mechanism - Classification. Dot matrix, Ink jet and laser printers. Basic concepts of key board and mouse.

Mass data storage - floppy disk -Hard Disk - Optical disk (CD).

Books for Study

1. Dr. Rajendra Prasad, Electronic Measurements and Instrumentation, Khanna Publications.
2. S. Ramambhadran, Electronic Measurements and Instrumentation Khanna Publications.

Books for Reference

1. S.M. Dhir, Electronics and Instrumentation, Khanna Publishers. Khandpur,

III SEMESTER

PAPER VII

SOLID STATE PHYSICS

UNIT-I : Crystal Physics

Types of lattices - Miller indices - simple crystal structures - Crystal diffraction - Bragg's law - Reciprocal lattice (sc, bcc, fcc) - Laue equations - Structure factor - Atomic form factor - Types of crystal binding - Cohesive energy of ionic crystals - Madelung constant - Inert gas crystals - Vander Waal - Landon equation - Metal crystals - Hydrogen bonded crystals.

UNIT-II : Lattice dynamics

Monoatomic lattices - Lattice with two atoms per primitive cell - First Brillouin zone - Group and phase velocities - Quantization of lattice vibrations - Phonon momentum - Inelastic scattering by phonons - Debye's theory of lattice heat capacity - Einstein's model and Debye's model of specific heat - thermal expansion - Thermal conductivity - Umklapp processes.

UNIT-III : Theory of metals and semiconductors

Free electrons gas in three dimensions - Electronic heat capacity - Wiedmann-Franz law - Hall effect - Band theory of metals and semiconductors - Bloch theorem - Kronig-Penny model - Semiconductors - Intrinsic carrier concentration - Mobility - Impurity conductivity - Fermi surfaces and construction - Experimental methods in Fermi surface studies - de Haas Van Alphen effect.

UNIT-IV : Magnetism

Elementary ideas of dia, para and ferro magnetism - quantum theory of paramagnetism - Rare earth ion - Hund's rule - Quenching of orbital angular momentum - Adiabatic demagnetization - Quantum theory of ferromagnetism - Curie point - Exchange integral - Heisenberg's interpretation of Weiss field - ferromagnetic domains - Bloch Wall - Spin waves - Quantization - Magnons - thermal excitation of magnons - Curie temperature and susceptibility of ferrimagnets - Theory of antiferromagnetism - Neel temperature.

UNIT-V : Super conductivity

Experimental facts-occurrence - Effect of magnetic fields - Meissner effect - Entropy and heat capacity - Energy gap - Microwave and infrared properties - Type I and II superconductors - theoretical explanation - thermodynamics of super conducting transition - London equation - Coherence length - BCS Theory - single particle Tunneling - Josephson tunneling - DC and AC Josephson effects - High temperature super conductors - SQUIDS.

Books for Study

1. C. Kittel, 1996, Introduction to Solid State Physics, 7th Edition, Wiley, New York.
2. M. Ali Omar, 1974, Elementary Solid State Physics-Principles and Applications, Addison-Wesley, London.
3. H.P. Myers, 1998, Introductory Solid State Physics, 2nd Edition, Viva Book, New Delhi.
4. S.O. Pillai, 1997, Solid State Physics, New Age International, New Delhi.

Books for Reference

1. N.W. Aschroft and N.D. Mermin, Solid State Physics, Rhinehart and Winton, New York.
2. J.S. Blakemore, 1974, Solid State Physics, 2nd Edition, W.B. Saunder, Philadelphia.
3. A.J. Dekker, Solid State Physics, Macmillan India, New Delhi.
4. H.M. Rosenburg, 1993, The Solid State, 3rd Edition, Oxford University Press, Oxford.
5. S.O. Pillai, 1994, Problems and Solutions in Solid State Physics, New Age International, New Delhi.
6. S.L. Altmann, Band Theory of Metals, Pergamon, Oxford.
7. M.A. Wahab, 1999, Solid State Physics, Structure and Properties of Materials, Narosa, New Delhi.
8. J.M. Ziman, 1971, Principles of the Theory of Solids, Cambridge University Press, London.

PAPER VIII

NUCLEAR AND PARTICLE PHYSICS

UNIT-I : Nuclear Structure And Models

Magnetic dipole moment - Experimental determination - Electric quadruple moment - Liquid drop model - Semi-empirical mass formula of Weizsacker - Nuclear stability - Mass parabolas - Bohr-Wheeler theory of fission - Shell model - Spin-orbit coupling - Magic numbers - Angular momenta and parities of nuclear ground state - qualitative discussion and estimates of transition rates - Magnetic moments and Schmidt lines - Collective model of Bohr and Mottelson - Nilsson Model - oblate and prolate deformations of Nucleus.

UNIT-II : Nuclear Interactions

Nuclear forces - Two body problem - Ground state of deuteron - Magnetic moment - Quadruple moment - Tensor forces - Meson theory of nuclear forces - Yukawa potential - Nucleon-nucleon scattering - Low energy n-p scattering - Effective range theory - Spin dependence, charge independence and charge symmetry of nuclear forces - Isospin formalism.

UNIT-III : Nuclear reactions

Types of reactions and conservation laws - Energetics of nuclear reactions - Reaction dynamics - Q-value equation - Scattering and reaction cross sections - compound nucleus - Scattering matrix - Reciprocity theorem - Breit-Wigner one level formula - Resonance Scattering - Continuum theory - Optical model - Absorption cross section at high energies.

UNIT-IV : Nuclear decay

Beta decay - Fermi's theory - Fermi-Kurie Plot - Fermi and Gamow - Teller selection rules - Allowed and forbidden decays - Decay rates - Theory of Neutrino - Helicity of neutrino - Helicity measurement - Theory of electron capture - Non-conservation of parity - Gamma decay - Internal conversion - Multipole transitions in nuclei - Nuclear isomerism - Angular correlation in successive gamma emissions.

UNIT-V : Particle Physics

Types of interactions between elementary particles - Hadrons and Leptons - Symmetry and conservation laws. Elementary ideas of CP and CPT invariance - Classification of Hadrons - Lie algebra - SU (2) - SU (3) multiplets - Quark model - Gell-mann-Okubo mass formula for octet and decaplet Hadrons - Weak interactions.

Books for Study

1. K.S. Krane, 1987, Introductory Nuclear Physics, Wiley, New York.
2. D. Griffiths, 1987, Introduction to Elementary Particle Physics, Harper and Row, New York.
3. R.R. Roy and B.P. Nigam, 1983, Nuclear Physics, New Age International, New Delhi.
4. I. Kaplan, 1989, Nuclear Physics, 2nd Edition, Narosa, New Delhi.
5. H.A. Enge, 1975, Introduction to Nuclear Physics, Addison Wesle, London.

Books for Reference

1. Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.
2. Ghoshal, Atomic and Nuclear Physics, Volume 2.
3. J.M. Longo, 1971, Elementary Particles, McGraw-Hill, New York.
4. R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.
5. B.L. Cohen, 1971, Concepts of Nuclear Physics, TMH, New Delhi.
6. M.K. Pal, 1982, Theory of Nuclear Structure, Affl. East-West, Chennai.
7. W.E. Burcham and M. Jobes, 1995, Nuclear and Particle Physics, Addison-Wesley, Tokyo.

ELECTIVE

PAPER III

MICROPROCESSOR I

UNIT-I : Architecture and Programming

Intel 8085A Microprocessor Architecture - Programmer's model - Registers - ALU - Control units - Stacks - Complete instruction set of Intel 8085 - State transition and timing diagrams - T States - Machine cycles - Instruction cycles - Fetch, Execute, overlap in instruction cycles - Addressing modes - Assembly language programs - use of arithmetic, logical, Data transfer, stack and I/O instructions in programming - Subroutines.

UNIT-II : Interfacing memory to 8085A

Static and Dynamic RAM - Interfacing memory chips - 2K X 8, 4K X 8 ROM interface - 2K X 8, 4K X 8 RAM interface - Timing diagram for memory read and memory write cycles - time delay subroutines and delay calculations - I/O mapped I/O - Memory mapped I/O - Address decoding for 8085A system.

UNIT-III : Interfacing I/O to 8085A

Simple, polled and interrupt I/O - Interfacing keyboard - Seven segment display interface - stepper motor interface - DAC and ADC interfaces - Programmable keyboard / display interface 8279 - Programmable interval timer 8253 - Programmable peripheral device 8255.

UNIT-IV : Serial I/O and Data communication

Basic concepts - software controlled Asynchronous serial I/O - SID and SOD lines - Hardware controlled serial I/O using programmable chips - Programmable communication interface 8251A (USART). Data Communication methods and standard GPIB – IEEE-488, RS-232c, 20MA current loop.

UNIT-V : Applications of 8085A Microprocessor

Desirable features of 8085A Microprocessor for industrial applications - wave form generation square and Triangular waves - Temperature controller - Digital Clock - DMA controller interface.

Books for Study

1. R.S. Gaonkar, 1997, Microprocessor Architecture, programming and Application with the 8085, 3rd Edition, Penram International Publishing, Mumbai.
2. V. Vijayendran, 2002, Fundamentals of Microprocessor – 8085 - Architecture, Programming and interfacing, Viswanathan Publication, Chennai.

Books for Reference

1. B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai publications, New Delhi.
2. R. Theagarajan, S. Dhanasekaran and S. Dhanapal, Microprocessor and its applications, New Age International, New Delhi.

ELECTIVE

PAPER IV

(NON-MAJOR SUBJECT)

NANO SCIENCE

UNIT-I: Introduction to Nanoparticles

Introduction - Historical perspective of nanoparticle - Classification of nanomaterials - Nanorods - Nanoparticle - Nanomaterial preparation - Plasma arching - Chemical vapour deposition - Solgel electrodeposition - Ball milling technique.

UNIT-II: Nanocrystals

Synthesis of metal nanoparticles and structures - Background on quantum semiconductors - Background on reverse Miceller solution - Synthesis of semiconductors - Cadmium telluroid nano crystals - Cadmium sulfide nano crystals - Silver sulfide nano crystals - Nano manipulator - Nano tweezes - Nanodots.

UNIT-III: Characteristics of Nanomaterials

Magnetism in particle of reduced size dimension - Variation of magnetism with size - Magnetic behavior of small particle - Diluted magnetic semiconductor (DMS) - Fe DME and its applications. Nanoparticle as chemical reagents - Specific heat of nanoparticle crystals - Melting point of Nanoparticle material - Nanolithography - Estimation of nanoparticle size using AFM.

UNIT-IV: Nano Tubes

New form of carbon - Types of nanotubes - Formation of nanotubes - Various techniques - Preparation and properties of nanotubes - Uses of nanotubes and applications - Nano material processing for nanotube - Light and Nano technology - Nanoholes and photons - Quantum electronic devices - Quantum electronic devices - Quantum information and Quantum Computers.

UNIT-V: Applications

Micromechanical systems - Robots - Ageless materials - Nanomechanics - Nano electronics - Optoelectronic devices - LED - Applications - Colourants and pigments - Nano biotechnology - DNA chips - DNA array devices - Drag delivery systems.

IV SEMESTER

PAPER IX

MATERIALS SCIENCE AND LASER PHYSICS

UNIT-I : Phase Diagram:

Phase Diagram - Basic principle - Simple binary systems - Solid solutions - Eutectic systems - Application.

Solid Solution - Interstitial and substitutional solid solutions - Hume -Rothery electron compounds - Long range order theory of Bragg and Williams - Super lattices - Intermediate and interstitial phases - Intermetallic compounds. Elementary ideas of corrosion - Oxidation - Creep and fracture.

UNIT-II : Defects

Point defects - Schottky and Frenkel defects - number of defects as a function of temperature - Diffusion in metals - Diffusion and ionic conductivity in inonic crystals.

Dislocations - Edge and screw dislocations - Burgers vector - Plastic deformation - Slip - Motion of dislocations under uniform shear stress - Stress fields around dislocations - Density - Work hardening - Effect of grain size on dislocation motion - Effect of solute atoms on dislocation motion.

UNIT-III : Optical Properties, Dielectric Properties and Ferro Electrics

Color centers - Photo conductivity - electronic transitions in photo conductors - Trap, Capture, recombination centers - General mechanism - Luminescence - Excitation and emission - Decay mechanisms - Thallium activate - Alkali halides - Sulfide phosphorous.

Internal electric field in a dielectric - Clausius - Mossotti and Lorentz - Lorenz equations - Dielectric dispersion and loss.

Ferroelectrics - Ferro electricity - General properties - Dipole theory - Ionic displacements and the behaviors of $BaTiO_3$ - Spontaneous polarization of $BaTiO_3$ - Thermodynamics of Ferro electric transitions.

UNIT-IV : Elastic Behaviour, Polymer and Ceramics

Anelastic and visco elastic behaviour - Atomic model of elastic behaviour - rubber like elasticity - An elastic deformation - Relaxation process - Model for visco elastic behaviour.

Polymers - Polymerization mechanism - Polymer structures - Deformation of polymers - Behaviour of polymers.

Ceramics - Ceramic phases - Structure - classes - Effect of structure on the behaviour of ceramic phases - composites.

UNIT-V : Laser Physics

Introduction - Einstein co-efficient - Possibility of amplification - Population inversion - Laser pumping Rate equations - Three level and four level system - Optical resonator - Types and modes of resonator - Oscillation - Threshold condition.

Simple theory of Fabry - Perot optical resonant cavity system - Its limitations - the confocal resonant cavity - generalized confocal resonator theory - Spot size and beam divergence - quality factor Q of an optical cavity - Interaction of radiation - with matter - Spontaneous and stimulated emission - Conditions for oscillation to occur - Frequency of oscillation of the system - Hole Burning - Band width of laser radiation.

Books for Study

1. G.K. Narula, K.S. Narula, and V.K. Gupta, 1995, Material Science, TMH, New Delhi.
2. A.J. Dekker, 1981, Solid State Physics, McMillan Co.
3. V. Ragavan, 2003, Material Science and Engineering, 4th Edition, Prentice Hall of India, New Delhi.
4. M. Arumugam, 2002, Materials Science, 3rd Edition, Anuradha Agencies.
5. Allen and Jones, 1967, Principles of Gas lasers, Butterworths, London.
6. K.R. Nambiar, 2004, Laser Principles, types and Application, New Age International.
7. K. Thyagarajan, and A.K. Ghatak, 1997, Laser Theory and Applications, Macmillan India Ltd.

Books for Reference

1. Lawrence H. Vlack, 1998, Elements of Materials Science and Engineering, 6th Edition, Second ISE reprint, Addison-Wesley.
2. H. Iabch and H. Luth, 2001, Solid State Physics, An introduction to principles of Material Science, 2nd Edition, Springer.
3. B.B. Laud, 1991, Lasers and Non linear optics, Wiley Eastern Ltd.
4. Verdayan J.J. 1993, Laser Electronics, Prentice-Hall India, New Delhi.

PAPER X

RESEARCH METHODOLOGY

UNIT-I : Principles of Scientific Research

Identification of the problem - Literature survey - Reference collection - Familiarity with ideas and concept of investigation - Internet Browsing - Drawing Inferences from data - Qualitative and Quantitative analysis - Results - Seminar - Synopsis writing - Art of writing a Research paper and Thesis - Power point presentation - OHP Presentation.

UNIT-II : Numerical methods

Solutions of equations - Simple iterative methods - Newton - Raphson method - Numerical Integration - Simpson's 3/8 rule - Runge Kutta method II order - Solution of Simultaneous equation - Differentiation - Numerical differentiation with interpolation polynomials.

UNIT-III : Programming in C

Introduction - Basic structure of C Programming - Character set - constants - Keywords - Identifiers - Variables - declaration of variables - Assigning values to variables - defining symbolic constants - Operators - Arithmatic, relational, logical, assignment, increment, decrement conditional and special type conversion in Expressions.

UNIT-IV : Operators, Arrays and Strings

Arrays - one, two and multi dimensional arrays - Initializing two dimensional arrays - Declaring and Initialising string variables - Reading and Writing Strings on the screen - Arithmetic operations on strings.

UNIT-V : Simple Programmes

User defined functions - their needs - Multiplication programme - Return values and their types - Calling Functions - Categories of functions - Matrix multiplication - Diagonalisation and inversion - Solution to simultaneous equations - intergration and differential equations.

Books for Study

1. J. Andersson B.H. Burston and M. Poole, 1977, Thesis and Assignment writing, Wiley Eastern, London.
2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
3. E. Balagurusamy, Numerical methods, Tata McGraw-Hill
4. V. Rajaraman, 1993,Computer oriented Numerical Methods, 3rd Edition, PHI, New Delhi.
5. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi
6. V. Rajaraman, Programming in C, PHI, New Delhi.

Books for Reference

1. S.D. Conte and C.de Boor, 1981, Elementary Numerical analysis-an algorithmic approach, 3rd Edition, McGraw Hill.
2. B.F. Gerald, and P.O. Wheatley, 1994, Applied Numerical analysis, 5th Edition, Addison-Wesley, M.A.
3. B. Carnagan, H.A. Luther and J.O. Wilkes, 1969, Applied Numerical Methods, Wiley, New York.
4. S.S. Kuo, 1996, Numerical Methods, and Computer, Addison-Wesley.
5. W.H. Press, 1992, Numerical Recipes in C, 2nd Edition, Cambridge University Press.

CORE PRACTICAL III

GENERAL EXPERIMENTS

(Any 15 out of the given 20)

1. G.M. Counter - characteristics, Inverse square law.
2. G.M. Counter - Absorption co-efficient.
3. Michelson Interferometer -Wavelength and separation of wavelengths.
4. Michelson Interferometer - Thickness of mica sheet.
5. F.P. Etalon - using Michelson set up.
6. Hall effect.
7. Molecular Spectra - AlO Band.
8. Molecular Spectra - CN Band.
9. Susceptibility of a liquid by Quincke's method.
10. Susceptibility of a liquid by Guoy's method.
11. Ultrasonic Diffraction - Velocity and Compressibility of a liquid.
12. Ultrasonic Interferometer - Velocity and Compressibility of a liquid.
13. B-H curve using CRO.
14. Spectral analysis of a salt.
15. Absorption Spectra.
16. Laser beam - Interference Experiments.
    (a) Interference using on optically plane glass plate and a Laser.
    (b) Interference of Laser beams - Lloyd's single mirror method.]
17. Laser beam – Diffraction Experiments.
    (a) Diffraction at straight edge.
    (b) Laser diffraction at a straight wire.
    (c) Laser diffraction at a circular aperature.
18. Microwave experiment.
19. Determination of Planck's constant.
20. Spectrophotometer - Beer's law verification and absorption co-efficient.

CORE PRACTICAL IV

MICROPROCESSOR EXPERIMENTS

(Any 20 out of the given 25)

1. Number conversion - 8 bit and 16 bit: BCD to Binary, Binary to BCD, Hex to ASCII using 8085.
2. Square and square root of BCD and HEX numbers 8 bit and 16 bit using 8085.
3. Addition and subtraction using 8086.
4. Multiplication and division using 8086.
5. Sum of a simple series.
6. Time delay subroutine and a clock programme.
7. Double and Triple precision addition and subtraction subroutine using 8085 / 8086.
8. Interfacing a HEX keyboard to the MPU system through I/O ports.
9. Switching an array of LEDs by programming.
10. Op-amp 8 bit DAC.
11. ADC and interfacing 0809 with MPU.
12. Interfacing and programming 0800 with MPU.
13. Analog to digital conversion using a DAC Comparator and MPU system.
14. Wave form generation - Assymmetrical square wave and a ramp.
15. Interfacing a DC stepper motor to the MPU system - clockwise and anticlockwise - full stepping and half stepping.
16. Ascending order / Descending order using µp 8085.
17. Temperature control of a bath using a MPU system.
18. Parallel communication between two microprocessor systems.
19. Serial communication between two microprocessor systems.
20. Newton's and Lagrange's interpolation with algorithm, flowchart FORTRAN / C Programme and output.
21. Numerical integration by Trapezoidal / simpson's rule with algorithm, flowchart FORTRAN / C Programme and output.

22. Solution of a polynomial equation and determination of roots by Newton Raphson method with algorithm, flowchart FORTRAN / C Programme and output.
23. Numerical solution of ordinary first order differential equation -Euler's method with algorithm, flowchart FORTRAN / C Programme and output.
24. Curve fitting - Least square fitting with algorithm, flowchart FORTRAN / C Programme and output.
25. Matrix manipulation - Multiplication Transpose and Inverse with algorithm, Flow chart - Fortran / C programme and output.

Book for Reference

1. D. Chattopadhyay, P.C. Rakshit, and B. Saha, An Advanced Course in Paractical Physics, 6th Ed. (Books and Allied, Kolkata, 2002).

ELECTIVE

PAPER V

MICROPROCESSOR II

UNIT-I : Architecture and Programming

Introduction - Architecture - Pin configuration - Minimum mode and Maximum mode system - Internal architecture of 8086 - Internal registers - System clock - Bus cycle - instruction execution sequence - Programming - Software model of 8086 / 8088 - Addressing modes - Instruction set - Subroutines - Loop and string instructions - Procedures - Assembler Macros - Assembler directives - Assembly language Programming.

UNIT-II : Memory interface of 8086 / 8088 Microprocessor

Memory interface - block diagram - Hardware organization of the memory address space - Memory control signals - The stack - Stack segment register and stack pointer - Demultiplexing the address and data bus - Interfacing 4K word /8K word - RAM interface - Dynamic RAM - interfacing and refreshing.

UNIT-III : Interrupt interface of 8086 /8088 Microprocessor

Introduction - Types of interrupts - Interrupt and address pointer table - Interrupt instructions - Masking of interrupts - External hardware interrupt interface - Interrupt sequence - 8259 Programmable interrupt controller (PIC) - Software interrupt - Non-Maskable interrupt - Reset interrupt - Internal interrupt functions.

UNIT-IV : Input / Output interface of 8086/8088

Introduction - I/O address space and data transfers - I/O instructions - I/O Bus cycle - Output ports - Centronix parallel interface of printers - Printer concepts - Interfacing ASCII keyboard - Concepts of secondary storage device like floppy disk and Hard disk.

UNIT-V : Advanced microprocessors and operating systems

Introduction to Intel 80386, Intel 80486 microprocessors - Multitasking concepts - Difference between 8086 and 80386 / 80486 - Operating system concepts and terms - DISK operating system (DOS) - Multitasking and multiprogramming operating system (UNIX)

Books for Study

2. W.A. Triebel and Avatar Singh, The 8086 / 8088 Microprocessors- Programming, Software, Hardware and application, Prentice Hall of India, New Delhi.
3. V.Vijayendran, 2002, Fundamentals of Microprocessor - 8086- Architecture, Programming (MASM) and interfacing, Viswanathan Publishers, Chennai.
4. B. Brey, 1995, Intel Microprocessors 8086 / 8088, 80186, 80286, 80386, 80486, Architecture, programming and Interfacing, EEE.
5. A.K. Ray and K.M. Bhurchandi, 2000, Advanced Microprocessor and peripherals, Tata McGraw-Hill, New Delhi.

Books for Reference

1. Douglas V. Hall, Microprocessors - Interfacing, Programming and Hardware, Tata McGraw-Hill, New Delhi.
2. Yu-Cheng and Glenn A. Gibson, The 8086 / 8088 family- Architecture, Programming and design, Prentice -Hall of India, New Delhi.
3. J. Uffenbeck, The 8086 / 8088 Family-Design, Programming and Interfacing- Prentice-Hall of India, New Delhi.
4. B. Ram, 2000, Advanced Microprocessor and Interfacing Tata McGraw-Hill, New Delhi.

PROJECT

PAPER XI

PROJECT WITH *VIVA VOCE*

For students to enter into preliminary research field both in theory and experiment the concept of Project has been introduced in the final Semester. In the Project the student will explore new developments from the books and journals, collecting literature / data and write a Dissertation based on his / her work and studies. The Project Work can also be based on experimental work.

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