Faculty of Humanities & Science

DEPARTMENT OF PHYSICS
2018 Regulation

M.Sc (Physics) Curriculum& Syllabus

SEMESTER – I					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
THEORY					
HMPH1901	Mathematical Physics	5	0	0	4
HMPH1902	Classical Mechanics & Relativity	5	0	0	4
HMPH1903	Analog and Digital Electronics	5	0	0	4
HMPH19EC	1.1 Laser and Modern Physics 1.2 Non Linear Dynamics 1.3 Electrodynamics Any one	4	0	0	3
PRACTICAL					
HMPH19L01	Practical-I General and Electronics	0	0	5	3
				Total Credits	**18**
SEMESTER – II					
THEORY					
HMPH1904	Quantum Mechanics	5	0	0	4
HMPH1905	Solid State Physics	5	0	0	4
HMPH1906	Microprocessor 8085 & 8086	5	0	0	4
HMPH19EC	2.1 Nano Science 2.2 Energy Physics 2.3 Advanced Spectroscopy	4	0	0	3
PRACTICAL					
HBPH19L02	Practical -II Microprocessor	0	0	5	2
				Total Credits	**18**
SEMESTER – III					
THEORY					
HMPH1907	Electromagnetic Theory	5	0	0	4
HMPH1908	Statistical Mechanics and Low Temperature physics	5	0	0	4
HMPH1909	Integrated Electronics	5	0	0	4
HMPH19EC	3.1 Communication Electronics	4	0	0	3

C. B. Palaniveli
REGISTRAR
Dr. M.G.R.
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Periyar E.V.R. High Road,
Maduravoyal, Chennai 600 095

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	3.2 Instrumentation Technique 3.3 Crystal Growth Technique Any one				
PRACTICAL					
HMPH19L03	Practical-III Integrated Electronics Lab	0	0	5	3
				Total Credits	**18**
SEMESTER – IV					
THEORY					
HMPH1910	Nuclear & Particle Physics	5	0	0	4
HMPH1911	Computation Methods and C Programming	5	0	0	4
PROJECT					
HMPH19P01	Project Work	0	0	15	13
				Total Credits	**21**

TOTAL CREDITS 75

SEMESTER - I

HMPH1901 MATHEMATICAL PHYSICS **L T P C**

50 0 4

Objective:

Understanding mathematical principles and its applications in physics

UNIT-I : VECTOR ANALYSIS **12**

Scalar and vector field- Gradient, Divergence and Curl- Physical Interpretation- Line Integral- Surface Integral- Volume Integral- Greens theorem, Stroke's theorem.

UNIT-II :MATRIX AND SPECIAL FUNCTIONS **12**

Characteristic eqution of a matrix- Eigen values and Eigen vectors- Cayley Hamilton's theorem- Hermition and Unitary matrices- Diagnolisation of matrix.

Special functions- Gamma and Beta functions- Legender, Bessel, Laguerre and Hermite differential Equation.

UNIT-III :COMPLEX VARIABLES **12**

Functions of a Complex variable- Continuity and differentiability- Single and multi valued functions- Analytic Function- Cauchy Riemann conditions- Cauchy Integral theorem and Integral formula

UNIT-IV :LAPLACE AND FOURIER TRANSFORM **12**

Laplace transform- Definition, properties(Linearity, Shifting, Derivatives of Laplace transform property)- Inverse Laplace transform-Fourier series- Fourier Integral- Fourier transform(infinite)- Fourier sine and cosine transform- Properties of Fourier series.

UNIT-V :GROUP THEORY AND TENSORS **12**

Group theory: Basic definitions- Multiplication table- Sub groups- Class- Coset- Lagrange's theorem- Homomorphism and isomorphism- Occurrence of tensors in physics- Notations and conventions- algebra of tensors- equality and Null tensors- addition & subtraction- Contraction of tensors

Total no.of hours :60

Books for study and Reference:

1. Mathematical physics by B.S.Rajput, PragathiPrakashan publishers.
2. Mathematical physics by B.D.Gupta, Vikas Publishing House pvt ltd, New Delhi.
3. Mathematical physics by Sathya Prakash, Sultan chand Publisher H.K.Dass
4. Mathematical physics by H.K.Dass and Dr.RamaVarma, S.Chand publishers.

HMPH1902 CLASSICAL MECHANICS AND RELATIVITY L T P C

5 0 0 4

Objective:

Learn about mechanics of a particle, system of particle and its conservation using Newtonian Mechanics and study of relativistic theory.

UNIT -I:LANGRANGIAN MECHANICS 12

Newton`s law of motion – mechanics of a particle- mechanics of a system of particles – centre of mass – conservation of linear momentum and angular momentum – Kinetics energy of a system of particles – energy conservation of a system of particles – generalized coordinates – principle of virtual work – D`Alembert`s principle – Langrangian equation – generalized momentum – conservation law and cyclic coordinates.

UNIT – II: HAMILTONIAN MECHANICS 12

Hamiltonian of a system – Hamiltonian`s equation of motion – Hamiltonian equation from variational principle – integrals of Hamiltonian`s equation – canonical transformations – poisson brackets and integrals of motion- Jacobi equation – Harmonic oscillator in H-J method.

UNIT – III:MECHANICS OF RIGID BODY 12

Angular momentum and kinetic energy - moment of inertia tensor – principle axes – Euler`s equations of motion – force free motion of a symmetrical top – heavy symmetric top with one point fixed.

UNIT-IV :THEORY OF SMALL OSCILLATIONS 12

Equilibrium and potential energy – theory of small oscillations- normal modes – resonant frequencies and normal modes of two coupled pendula – normal frequencies, normal modes and normal coordinates of longitudinal vibration of CO_2 molecule.

UNIT - V :SPECIAL THEORY OF RELATIVITY 12

Postulates of special theory of relativity – Lorentz transformation equations – Einstein`s law of addition of velocity – length contraction – time dilation – mass energy relation – invariance of Maxwell`s equation.

Total no.of hours :60

Books for study and Reference:

1. Classical Mechanics, N. C. Rana and P. S. Joag (Tata McGraw-Hill India)
2. Introduction to Classical Mechanics, Takwale and Puranik (Tata McGraw-Hill).
3. Classical Mechanics, H. Goldstein (Narosa Publishing House)
4. Classical Mechanics, Mondal (Prentice-Hall India)
5. Classical Mechanics: A Modern Perspective, Barger & Olsson (McGraw Hill International)
6. Classical Mechanics, Aruldhas G, Prentice Hall of India pvt., New Delhi/2008
7. Modern Physics, Murugesan R, S. Chand & Co., 2005

HMPH1903 ANALOG AND DIGITAL ELECTRONICS L T P C

500 4

Objectives:

Study of semiconductors, FET, MOSFET, SCR and its characteristics.

Learn about Logic Gates, SOP, POS, Karnaugh Map and its relevant circuits

UNIT – I:SPECIAL SEMICONDUCTOR DEVICES 12

Field Effect Transistors: Junction Field Effect Transistors, MOSFETs, Differences between JFETs and MOSFETs, Biasing MOSFETs, FET Applications, SCR characteristics- SCR as rectifier- construction and characteristics of UJT.

UNIT – II:THE BASIC GATES AND CIRCUITS 12

Review of Basic Logic gates, Positive and Negative Logic,Combinational Logic Circuits: Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method.

UNIT – III:DATA PROCESSING CIRCUITS 12

Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD to Decimal Decoders, Seven Segment Decoders, Encoders, Exclusive-OR Gates, Parity Generators and Checkers, Programmable Array Logic, Programmable Logic Arrays, HDL Implementation of Data Processing Circuits. Arithmetic Building Blocks, Arithmetic Logic Unit.

UNIT – IV:FLIP FLOPS AND REGISTERS 12

Flip- Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS FLIP-FLOP, Edge-triggered D FLIP-FLOPs, Edge-triggered JK FLIP-FLOPs. FLIP-FLOP Timing, JK Master-slave FLIP-FLOP.Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers, and Register implementation in HDL.

UNIT -V :COUNTERS 12

Decade Counters, Presettable Counters, Counter Design as a Synthesis problem, A Digital Clock, Counter Design using HDL. D/A Conversion and A/D Conversion: Variable, Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, A/D Converter-Simultaneous Conversion, A/D Converter-Counter Method, Continuous A/D Conversion, A/D Techniques, Dual-slope A/D Conversion, A/D Accuracy and Resolution.

Total no.of hours :60

Books for study and Reference:

1. B. Razavi, Design of Analog Integrated Circuits, McGraw Hill Education, 2000.
2. Gray, Hurst, Lewis, Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009.
3. P. E. Allen, D. R. Holberg, CMOS Analog Circuit Design, 3rd Edition, Oxford University Press, 2013.
4. Stephen Brown, ZvonkoVranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.
5. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
6. M Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson, 2008.

HMPH19E01 LASER AND MODERN PHYSICS L T P C
400 3

Objectives:

Study about the fundamentals of Laser, Laser systems and its applications

Learn about wave properties of matter and nuclear model.

UNIT-I:FUNDAMENTALSOF LASERS AND PUMPING PROCESSES (9)

Spontaneous and stimulated emission - population inversion - temporal coherence and spatial coherence - optical and electrical pumping methods and its pumping efficiencies - three and four level lasers- methods of Q switching : electro optical shutter, mechanical shutter – multi photon photoelectric effects.

UNIT-II : LASER SYSTEMS (9)

Gas Laser : CO_2 Laser, Tunable Solid state laser – fiber laser – Argon ion laser – N_2 laser – free electron and X-ray Lasers – homo and hetero junction semiconductor lasers - Quantum well laser.

UNIT-III : LASER APPLICATIONS (9)

Laser range finder – underwater laser – laser guided anti-tank missile – Laser Radar (LIDAR) – ring laser gyroscope – anti missile defense system (star wars) – metrology and data storage – holography – medical applications.

UNIT-IV : QUANTUM MECHANICS AND NULCEAR STRUCTURE (9)

Wave properties of particles – wave equation – Schrodinger equation – expectation values – particle in a box – finite potential well – Tunnel effect – harmonic oscillator – Quantum theory of hydrogen atom.

Nuclear composition - nuclear properties – stable nuclei – liquid drop model – shell model – Meson theory of nuclear forces.

UNIT-V : LATTICE DYNAMICS (9)

Crystal Lattice - Primitive and Unit cell - Lattice with two atoms per primitive cell – First Brillouin zone – group and phase velocities - quantization of lattice vibration – phonon momentum – inelastic scattering by phonons – Debye's theory of lattice heat capacity.

Total no.of hours :45

Books for Study:

1. Introduction to Laser theory and applications by M.N. Avadhanalu
2. Laser principles, types and applications by K.R. Nambiar
3. Introduction to Solid State Physics by Kittel, Wiley and Sons, 7th Edition.

Books for Reference:

1. Laser Fundamentals by William .T. Silfvast
2. Material Science and Engineering by V.Raghavan, PHI
3. Modern Physics by R.Murugasen.

HMPH19E02 NON-LINEAR DYNAMICS L T P C
40 0 3

Objectives:

Study Of Non Linear, Linear Oscillators,Chaos In Conservative Systems And Also Complex Analytic Integrability Of Non Linear System

UNIT-I : INTRODUCTION TO NONLINEAR DYNAMICS (9)

Linear and nonlinear forces – mathematical implication of nonlinearity – working definitions of nonlinearity.Linear and Nonlinear oscillators : Linear oscillators and predictability – damped and driven nonlinear oscillators – nonlinear oscillators and bifurcations.

UNIT-II : QUALITATIVE FEATURES (9)

Autonomous and non autonomous systems : Dynamical system as coupled first order differential equations – equilibrium points – phase – space/phase plane and phase trajectories.

Classification of equilibrium points: Two dimensional case with examples – Limit cycle motion – periodic attracters – Poincare – Bendixsons theorem – Higher dimensional system-Lorentz equations.

UNIT-III : CHAOS IN CONSERVATIVE SYSTEMS (9)

Poincare cross – section – possible orbits in conservative systems – Henon – Heiles system – Characterization of regular and chaotic motions :Lyapnuov exponents – Numerical computation – power spectrum – auto correlation – dimension.

UNIT-IV :FINITE DIMENSIONAL INTEGRABLE NONLINEAR DYNAMICAL SYSTEMS (9)

The notion of integrability complete integrability – complex analytic integrability – How to detect integrability :Painleve analysis.

UNIT-V :Soliton and Complete integrability (9)

Nonlinear dispersive systems – cnoidal and solidary waves – The Scott Russel phenomenon and K-dV equation – Fermi – Pasta – Ulam numerical experiment – K-dV equation – numerical experiment of Zabusky and Kruskal – Birth of solitons – Miura transformation and linearization of K-dV equation: The Lax pair – Inverse scattering transform method – Explicit soliton solutions – Hirota'sbilinearisation method.

Total no.of hours :45

Book for study :

1. M.Lakshmanan and S.Rajasekar, Non-linear dynamics :Integrability chaos and patterns – Springer – Verlog, Berlin, 2003.

Books for reference :

1. M.J.Ablowiz and P.A.Clarkson, Solitons, Nonlinear evoluation equations inverse scattering-Cambridge University press, Cambridge, 1991.
2. I.Percival and D.Richards : Introduction to dynamics, Cambridge Univ. Press 1st Edn (1983).
3. E.A.Jackson : Perspectives of nonlinear dynamics I & II, Cambridge Univ. Press, Revised Edn. (1992)
4. R.L.Devaney : An Introduction to chaotic dynamical systems, Westview Press, (2003) HaoBailin – Chaos, World Scientific Publishing Co. Pvt. Ltd, Singapore.

HMPH19E03 **ELECTRODYNAMICS** **L T P C**

40 0 3

Objectives:

Understanding about electrodynamics, electromagnetic radiation andMagneto Hydrodynamics

UNIT-I : ELECTRIC AND MAGNETIC POTENTIAL (9)

Divergence and curl of E-Electric scalar potential – poinson's and Laplace's equations – uniqueness theorems – potential of a localised charge distribution – electric potential energy of a continuous charge distribution – multi pole expansion : approximate potentials at large distances – monopole and dipole terms – electric dipole moment – electric field of a dipole.

Divergence and curl of B – Energy in the magnetic fields due to current carrying elements – Magnetic vector potential – magnetic potential at any point due to current carrying elements – multi pole expansion of the vector potential – magnetic dipole moment – magnetic field of a dipole.

UNIT-II : ELECTRODYNAMICS (9)

Maxwell's equation in free space and in matter, displacement current, boundary conditions, Gauge transformations – Coulomp and Lorentz gauge – momentum – Poynting's theorem, - Polarisation – monochromatic plane waves – energy and momentum in electromagnetic waves.

Propagation in linear media – reflection and transmission at (i) normal incidence (ii) oblique incidence – laws of geometrical optics – Fresnel's equation – Brewster's angle – boundary conditions – absorption and dispersion in conductors – skin depth – reflection at a conducting surface – dispersion and anomalous dispersion – Cauchy's formula.

UNIT-III : RELATIVISTIC ELECTRODYNAMICS (9)

Four vectors – tensor algebra, Lorentz transformation – invariance of Maxwell's equations under Lorentz transformation – transformation of electromagnetic field intensities – electromagnetic field tensor – electromagnetic field invariants – covariant form of Maxwell's equations Relativistic Lagrangian for a free particle – energy momentum of a free particle – Lagrangian and Hamiltoninan for a charged particle in an electromagnetic field.

UNIT-IV : ELECTROMAGNETIC RADIATION (9)

Retarded scalar and vector potentials – Lienard – Wiechert potentials for a moving point charge – electric and magnetic fields of a moving point charge, velocity and acceleration fields. Electric dipole radiation – magnetic dipole radiation – radiation from an arbitrary source – power radiated by a point charge – Larmor formula – Lienard's generalization of the Larmor formula – radiation reaction Abraham Lorentz formula.

UNIT-V : GUIDED WAVES AND MAGNETO HYDRODYNAMICS (MHD) (9)

Essential conditions for guided waves – TEM waves in coaxial cables – TE waves – rectangular wave guide – electric and magnetic fields on the surface and inside rectangular wave guide – TE and TM waves in rectangular wave guide – cut – off frequency and wavelength – circular waveguides – energy flow and MHD Definitions – magneto hydrodynamic equations – magnetic diffusion – viscosity and pressure.

Total no.of hours :45

Books for study :

1. Introduction to electrodynamics by David Jeffery Griffiths, 3rd edition, Prentice Hass (1999)
2. Classical electrodynamics by John David Jackson, 3rd edition, Wiley Eastern Ltd.(1999)
3. Electrodynamics by Gupta SI, Kumar V, Singh Sp, 2nd edition, PragatiPrakashan (2001)
4. Introduction to Electrodynamics by Anton Z.Capri, P.V.PanatNarosa publishing house, New Delhi (200)
5. Electromagnetic fields and waves by V.V.Sarwate, Reprint 2006, New Age International (P) Publishers (formerly Wiley Eastern Limited) (1993)

HMPH19L01 GENERAL AND ELECTRONICS LAB L T P C

0 0 5 3

Objectives:

Understanding of hysteresis, laser beam parameters and dielectric measurement by doing relevant experiments.
To gain the knowledge of characteristic of FET,SCR,MOSFET and UJT

GENERAL:

1. Determination of Stefan's constant
2. Thickness of Insulation of wire by interference Method (Air Wedge)
3. Biprism –spectrometer
4. Hysteresis-BH curve
5. Laser-study of Laser Beam parameter
6. Dielectric measurement in Microwave test bench

ELECTRONICS:

1. Regulated power supply 5 volt for digital
2. Characteristics of SCR
3. Characteristics of UJT
4. OP-Amp Inverting, Non-Inverting , Voltage follower
5. OP-Amp Summing, difference, differentiator and integrator
6. Study of RS and D flip-flop using Nand or Nor gates
7. Study of JK , D flip-flop using 7476/7373

SEMESTER-II

HMPH1904 QUANTUM MECHANICS

L T P C

Objective: 500 4

Understanding of basic quantum mechanics, angular momentum and Relativistic Quantum Mechanics

UNIT-I: BASICS & GENERAL FORMALISM 12

Wave function- postulates of quantum mechanics- Schrodinger equation- Applications of Schrodinger Equation- Ehrenfest's theorem- Eigen Values and Eigen functions- Uncertainty principle- Operator Formalism- Central forces- Reduction of two body problems- Conservation and Symmetric laws- Parity and time reversal

UNIT-II: APPROXIMATION METHODS 12

Time independent perturbation theory for Non degenerate level and degenerate level- Anharmonic Oscillatorand ground state Helium atom- Stark effect- Normal Zeeman effect- WKB Approximation- Tunneling through a Barrier- Application to simple harmonic Oscillator.

UNIT-III: ANGULAR MOMENTUM AND IDENTICAL PARTICLES 12

Eigen values and Eigen functions of angular momentum- Commutational Rules for angular momentum Operators- Matrix Representation- Pauli's Spin matrices- Clebsch Gorden coefficient.

Identical particles: System of identical particles- Symmetric and Anti symmetric functions- Bosons and fermions- Equations of motions.

UNIT-IV: RELATIVISTIC QUANTUM MECHANICS 12

Glein Gordan Equations- Dirac Equation- Plane wave solutions- Interpretation of Negative energy states- antiparticles- Spin of electron- magnetic moment of electron due to spin. Creation and Annihilation operators- Covariant from Dirac Equations- Properties of Gamma matrices.

UNIT-V: SCATTERING THEORY 12

Scattering process- differential and total cross section- Scattering Amplitude- Center of mass frame- Laboratory frame- Reduced mass- Transformation from CM frame to Laboratory frame- Reduction of two body problem into one body problem.

Total no.of hours :60

Books for study and Reference:

1. Quantum Mechanics by P.M. Mathews&Venkatesan, Tata McGraw Hill Publishers
2. Quantum mechanics by G.Aruldhass, Prentice Hall of India, New Delhi

3. Quantum mechanics by V.K.Thangappan, New Age publisher.

HMPH1905 SOLID STATE PHYSICS L T P C

50 0 4

Objective:

To study the Crystal Physics, Lattice Vibrations and Einstein's and Debye's theory of Specific heat.

UNIT –I: CRYSTAL PHYSICS 12

Concept and construction of reciprocal lattice– properties - relation between a,b,c and a*,b* c* - application to SC,BCC, FCC lattices – Brillouin zones for BCC, FCC lattices – atomic scattering factor – geometrical structure factor – interpretation of Bragg's equation – construction of Ewald's sphere.

UNIT –II :LATTICE VIBRATIONS 12

Vibrations in one dimensional mono atomic lattice, diatomic lattice – phonons – momentum of phonons – properties of phonons – phonon phonon interaction – specific heat – classical theory of lattice heat capacity – Einstein's theory – Debye's model of lattice heat – Einstein's theory capacity – density of modes – Debye's approximation – limitations – normal and umklapp process

12

UNIT –III :FREE ELECTRON THEORY

Drude – Lorentz classical theory – sommerfeld classical theory – free electron gas in one dimension box & three dimension box – density of states – FD Statistics (Qualitative) – effect of temperature on Fermi distribution function – application of free electron gas model – electronic specific heat – electrical and thermal conductivities – Hall effect

UNIT–IV :BAND THEORY 12

Bloch theorem – Kronig Penny model – Brillouin zones construction – symmetry properties of energy function – extended , reduced and periodic zone schemes – velocity and effective mass – tight bonding approximation – Fermi surface construction & characteristics –effect of electric & magnetic field on Fermi surface - Experimental study of Fermi surface – anomalous skin effect – cyclotron resonance – de Hass Van Alphen effect

UNIT – V :SUPERCONDUCTIVITY 12

Critical field and temperature – Meissner's effect – properties of superconductivity – thermodynamics of superconducting transition – entropy and specific heat – origin of band gap – isotope effect – London equation – penetration depth – coherence length – BCS theory – flux quantization – tunneling and Josephson effect – applications of superconductors.

Total no.of hours :60

Books for study and Reference:

1. Charles Kittel " Introduction to Solid State Physics", J.Wiley& Sons
2. Solid State Physics by J.Dekker, MacMillan India
3. N.W.Ashcroft& D.M. Mermin, "Solid State Physics", Brooks & Cole
4. J.Singleton, "Band Theory & Electronic Properties of Solids", O.U.P
5. Concepts of Modern Physics by Beiser, Tata Mc.Graw Hill, 5 th Edition,1997

HMPH1906 MICROPROCESSOR 8085/8086 L T P C

50 0 4

Objectives:

Learn about programming in 8085 and 8086 ARCHITECTURE

UNIT-I :8085 PROGRAMMING 12

Architecture of 8085-addressing modes-instruction sets-programming technique-assembly language programs-memory mapping.

UNIT-II :8085 INTERFACING 12

2k*8 and 4k*8 ROM interface-2k*8 and 4k*8 RAM interface-Timing diagram for memory READ and memory WRITE cycles-Memory mapping-I/O schemes-memory mapped I/O and I/O mapped I/O schemes-comparison between them.

UNIT-III :INTERFACING PERIPERAL AND I/O SYSTEMS 12

Programmable peripheral interface 8255: Architecture of 8255-control signals of 8255-operation modes-interfacing of key board –interfacing multiplexed 7 segment display-stepper motor interface.

UNIT –IV :8086 ARCHITECTURE 12

8086 Architecture-Min.Mode-Max.Mode-Segmentation of address-Pipe line processing-Interrupts in 8086.

UNIT-V :8086 PROGRAMMING 12

Addressing modes-Instruction set-Instruction Templates for MOV Instruction-Data Transfer Instruction-Arithmetic, Logic, shift, rotation instruction-Flag control instructions-Compare, Jump instructions-Loop and string instructions-code conversion: Binary to BCD, BCD to Binary.

Total no.of hours :60

Books for study and Reference:

1. Douglas. V. Hall/Microprocessor and interfacing programming and Hardware/Tata McGraw Hill (unit-IV)
2. W.A.Triebel and Avatar Singh, The 8086/8088 Microprocessors-Programming,software,Hardware and Application,Prentice Hall of India,New Delhi
3. The 8085 Microprocessor –k.udaya kumar.
4. Microprocessor and Micro Computer – John uffenbeck.

HMPH19E04NANO SCIENCE **L T P C**

Objective: **4 0 0 3**

Understanding of Nanostructure, Synthesis and its Physical Properties and its applications

UNIT-I :BASICS OF NANOSCIENCE AND NANOSTRUCTURE (9)

Emergence of nanoscience –Classification of micro-metric, sub-metric,meso-metric and nano metric and deep nano –metric scales-Carbon age-Electronic structure of nanoparticles-kinetics in nanostructure-zero, one and two dimensional nanostructures.

UNIT-II :SYNTHESIS AND PHYSICAL APPROACH (9)

Synthesis of bulk nano-structured materials-sol gel processing-Mechanical milling-Inert gas condensation technique-vapour deposition and epitaxial growth technique-pulsed laser deposition, magnetron sputtering-Photolithography

UNIT-III : NANO MATERIALS-PROPERTIES (9)

Carbon nanotube-Metal oxides (Tio2, Zno)-Semiconductors (CdS, ZnSe)-Ceramics and composites-Biological system (DNA, RNA)-Electronic, chemical, optical and mechanical properties

UNIT-IV :NANO TECHNOLOGY (9)

Introduction-Nanomaterials-Quantum Wells, Wires and Dots-carbon nano structure-Thin film technology-silicon laser technology-Integrated optics-components and integrated optic systems.

UNIT-V : NANO MATERIALS APPLICATIONS (9)

Applications of Molecular electronics and Nano electronics-Quantum electronic devices-nanostructure as single electron transistor-Principle and design-biological application.

Total no.of hours :45

Books for study and Reference:

1. Nano structural Materials and Nanotechnology, HariSingh Nalwa
2. K.W.Kolinski,"Surface science: Foundation of Catalysis and nanoscience",Wiley,2002
3. A.S.Edelstein and R.C.Cammarata.''Nanomaterials:Synthesis,Properties and Applications:, Institute of physics Pub.,1998.
4. Joel I Gerstein, 'The physics and chemistry of materials' 'Wiley 2001

HMPH19E05 **ENERGY PHYSICS** **L T P C**

4 0 0 3

Objectives:

Gaining knowledge of energy extraction from ocean, wind,biomass and solar radiation.

UNIT-I : INTRODUCTION TO ENERGY SOURCES (9)

Energy sources and their availability – prospects of renewable energy sources - Energy from other sources - chemical energy – Nuclear energy – Energy storage and distribution.

UNIT-II : ENERGY FROM THE OCEANS (9)

Energy utilization – Energy from tides – Basic principle of tidal power – utilization of tidal energy.

UNIT-III :BASIC PRINCIPLES OF WIND ENERGY CONVERSION (9)

power in the wind – forces in the Blades – Wind energy conversion – Advantages and disadvantages of wind energy conversion systems (WECS) Energy storage – Applications of wind energy.

UNIT- IV : ENERGY FROM BIOMASS(9)

Biomass conversion Technologies – wet and dry process – Photosynthesis.

Biogas Generation: Introduction – basic process and energetic – Advantages of anaerobic digestion – factors affecting bio digestion and generation of gas - biogas from waste fuel – properties of biogas- utilization of biogas.

UNIT-V : SOLAR RADIATION AND ITS MEASUREMENTS: (9)

Solar, cells : Solar cells for direct conversion of solar energy to electric powers – solar cell parameter – solar cell electrical characteristics – Efficiency – solar water Heater – solar distillation – solar cooking – solar green house.

Total no.of hours :45

BOOKS FOR REFERENCE:

1. Non-conventional sources of energy by G.D. Rai, 4th edition, Khanna Publishers, New Delhi (1996)
2. Energy Technology by S. Rao and Dr. Parulekar.
3. John Twidell and Tony weir, Renewable energy resources, Taylor and Francis group, London andNewyork.
4. M.P. Agarwal, Solar energy, S. Chand and Co.,
5. A.B. Meinel and A.P. Meinal, Applied solar energy.
6. Solar energy, principles of thermal collection and storage by S.P. Sukhatme, 2nd edition,
7. Tata McGraw-Hill publishing co. Ltd., New Delhi (1997).

HMPH19E06 ADVANCED SPECTROSCOPY L T P C

4003

Objectives:

Understanding of Atomic and Molecular Spectroscopy, NMR Techniques and Quantum treatment of ESR of molecules

UNIT-I :ATOMIC AND MOLECULAR SPECTROSCOPY (9)

Infrared Spectroscopy – vibrations f diatomic and simple polyatomic molecules – Anharmonicity – Fermi Resonance – Hydrogen bonding – IR Spectrophotometer – FTIR spectroscopy – Principle and instrumentation – applications of IR Spectroscopy Classical theory of Raman scattering – Mutual exclusion principle – Raman spectrometer – Application of IR and Raman spectroscopy in molecular structure determination for molecules of Type XY_2.

UNIT-II : NMR TECHNIQUES (9)

NMR – Theory of NMR method – Bloch equations – chemical shift – NMR spectrometer – single and double coil methods – Pulse method – Applications of NMR

UNIT-III :NQR TECHNIQUES (9)

Quadrapole nucleus – principle of nuclear quadrapole resonance spectroscopy – Nuclear quadrapole energy levels for axial and non-axial symmetry – experimental techniques – Applications of NQR method.

UNIT-IV :ESR TECHNIQUES (9)

Quantum treatment of ESR – Total Hamiltonian – nuclear interaction and hyperfine structure – relaxation effects - ESR spectra of free radicals in solution – instrumentation – applications of ESR method.

Principles of Mossbauer spectroscopy – experimental methods – isomer shift – quadrapole interaction – applications

UNIT – V : SERS (9)

Surface Enhanced Raman spectroscopy – Enhancement mechanisms – SERS study in biomolecules and medicine. Photo acoustic spectroscopy – principle – photo acoustic generation – experimental set up – simple applications – photoelectron spectroscopy – principle – instrumentation – applications

Total no.of hours :45

Books for study

1. Molecular structure and spectroscopy by G.Aruldhas
2. Foundations of Molecular spectroscopy by CN Banwell

Books for reference

1. Atomic and Molecular spectroscopy by M.C. Gupta
2. High resolution nuclear magnetic resonance by J.A. Pople, W.G. Schneider and H.J. Bernstein

HMPH19L02 **MICROPROCESSOR LAB** **LTPC 0053**

Objective:
Learn about programming in 8085 and 8086**ARCHITECTURE**

1. Micro processor 8086-Addition and subtraction
2. Microprocessor 8086-Multiplication and Division
3. Microprocessor 8086-Multibyte addition and Subtraction
4. Microprocessor8086-Sorting in Ascending and descending order.
5. Generation of Fibonacci series
6. Microprocessor 8085-Addition and subtraction of 8bit number
7. Microprocessor 8085-Addition and subtraction of 16 bit number
8. Multiplication of 8 bit and 16 bit number
9. Division of 8 bit number.
10. Sum of set of N data (8 bit numbers)
11. 8085 microprocessor-stepper motor interface
12. 8085 Microprocessor-Traffic signal controller/simulator

SEMESTER – III

HMPH1907 ELECTROMAGNETICTHEORY L T P C

Objective:50 0 4

To learn about Electrostatics, Magnetostatics, Faradays laws and electromagnetic waves

UNIT –I :ELECTROSTATICS 12

Boundary value problems and Laplace equations – Boundary conditions and uniqueness theorem – Laplace equations in three dimensions – solution in Cartesian and spherical polar coordinates with examples. Polarization and displacement vectors – Boundary conditions – Dielectric sphere in a uniform field – Polarizability and electric susceptibility – Electrostatic energy in the presence of dielectrics.

UNIT–II :MAGNETOSTATICS 12

Biot Savart law – Ampere's law – Magnetic vector potential and magnetic field of a localized current distribution – magnetic moment, force and torque on a current distribution in an external field – magnetic static energy – magnetic field in macroscopic media and boundary conditions – uniformly magnetized sphere

UNIT–III :FARADAY's LAWS 12

EMF – Electromagnetic induction – Faraday's laws – interpretation of Faraday's EMF – Self inductance – induction of long solenoid – coaxial cylinders – parallel cylinders – Mutual inductance- transformer action – magnetic energy density – simple problems

UNIT–IV :ELECTROMAGNETIC WAVES 12

Maxwell's displacement current – vector and scalar potential – gauge invariance – wave equation and plane wave solution coulomb and Lorentz gauge – energy and momentum of the field – pointing theorem – Lorentz force – laws of conservation for a system of charges.

UNIT–V : PROPAGATION OF WAVES 12

Plane wave in anon conducting media – linear and circular polarization – reflection and refraction at a plane interface – waves in a conducting medium – propagation of waves in a rectangular wave guide. Inhomogeneous wave equation and retardation potential – radiation from a localized source – oscillating dipole

Total no.of hours :60

Books for study and Reference:

1. William H. Hayt& John A.Buck ,"Engineering Electromagnetics",Tata Mc-Graw- Hill 7th Edition 2005

2. John D Kraus, “Electromagnetics”, Tata McGraw Hill Book Co., New York, Third Edition, 1989.

3. Mathew N. O. SADIKU, “Elements of Electromagnetics” Oxford University PressInc. First India edition, 2007
4. Joseph A Edminister, “Theory and Problems of Electro Magnetics”, Schaums Outline Series Tata McGraw
5. Hill book company New York, 1986.

HMPH1908 STATISTICAL MECHANICS AND LOW TEMPERATURE PHYSICS

L T P C

Objectives:50 0 4

To understand classical Statistics,Partition Function, Quantum Statistics, Semiconductor Statistics and Fluctuation and also Low Temperature Physics

UNIT-I : CLASSICAL STATISTICS **12**

Phase space – ensembles – Liouvilles's theorem – M.B.distribution – Maxwell's distribution of velocity – Doppler broadening of spectral lines – equipartition theorem – entropy and probability

UNIT-II : PARTITION FUNCTION **12**

Partition function – calculation of thermo dynamic quantities in terms of partion function- rotational, vibrational and translational partition function – Diatomic ideal gas.

UNIT-III : QUANTUM STATISTICS **12**

BE and FD distribution– Application of BE statistics – Photon gas – Debye's theory of specific heats of solids – Application of FD statistics – Electron gas – Richardson and Dushman's Equation - Comparison between classical and quantum statistics – Pauli's spin paramagnetism.

UNIT-IV : SEMICONDUCTOR STATISTICS AND FLUCTUATION **12**

Degenerate and non degenerate semiconductor – Random walk problem – Brownian motion – Einstein's theory of translational Brownian motion – Experimental verification - Theory of fluctuation

UNIT-V :LOW TEMPERATURE PHYSICS **12**

Production of low temperature – Methods - Freezing mixture – Evaporation liquid under reduced pressure - Adiabatic demagnetisation – approach to absolute zero by adiabatic Demagnetization – Helium I & Helium II – Fountain and Mechano Caloric effect – properties of Helium II – Theory of Helium II – Landau's Theory – London's Theory-Super conductivity

Total no.of hours :60

Books for study :

1. Agarwal, B.K. and Melvin Eisner, Statistical Mechanics , 2nd edition New Age International Pvt. Limited Publishers New Delhi, 1989.
2. Sinha, S.K., Statistical Mechanics Theory and Application, TMH Publishing Co., 1990.

Books For Reference:

1. 1.Laud, B.B. Fundamentals of Statistical Mechanics, New Age International Pvt. Limited Publishers New Delhi, 1989.
2. FederickReif, Fundamentals of Statistical and Thermal Physics, 20th printing, McGraw Hill Publishing Co., New York, 1988.

HMPH1909 INTEGRATEDELECTRONICS L T P C

Objectives:500 4

Study of Operational amplifier using ICs

Know about Boolean Algebra and Karnaugh Map and also digital system.

Unit – 1: Semiconductor Devices 12

FET, MOSFET, UJT, SCR, TRIAC - Structure, Working, Characteristics - Fet Amplifier - Ujt Relaxation Oscillator -Scr / Triac For Power Control Memory Devices: Rom, Eprom, Eeprom – Static And Dynamic Ram - Cmos And Nmos, Non-Volatile -Nmos, Magnetic, Optical And Ferroelectric Memories, Charge Coupled Devices (Ccd).

Unit - 2: Microwave Devices 12

Tunnel Diode - Transfer Electron Devices (Gunn Diode) - Avalanche Transit Time Devices AndImpatt Diodes. Photonic Devices: Radioactive And Non-Radioactive Transitions - Bulk And Thin Film Photoconductive Devices (Ldr), Diode Photo Detectors, Solar Cells (Open Circuit Voltage
And Short Circuit Current, Fill Factor) - Led (High Frequency Limit, Effect Of Surface And Indirect Recombination Of Current, Operation Of Led) - Diode Lasers (Conditions For Population Inversion In Active Region, Light Confinement Factor).

Unit - 3: Digital Electronics 12

Counters And Registers - Synchronous Counter – Design Of Synchronous Of Different Modulus - Shift Registers And Their Applications.

Unit - 4: Applications For Op-Amps 12

Op-Amp Basics - Instrumentation Amplifier – Phase -Locked Loop - Peak Detector - Zero Crossing Detector - Analog Integration And Differentiation - Solutions To Simultaneous And Differential Equations Using Op-Amps- Op-Amp Active Filters - Sample And Hold Circuit - Log
And Anti-Log Amplifiers - Sine And Square Wave Generators

.

Unit - 5: D/A And A/D Converters 12

Binary Weighted Resistor D/A Converter - R-2r Ladder -D/A Converter - Flash, Counter Type, Successive Approximation And 'Dual Slope A/D Converters – Resolution And Accuracy.
Timer 555: Internal Architecture And Working – Timer 555 As Schmidt Trigger, Astable And Monostable.

Total no.of hours :60

Books For Study And Reference:

1. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, 2nd Ed, Prentice-Hall, 1996.
2. R. L. Boylestad, Louis Nashelsky, Electronic Device And Circuit Theory Pearson Education
3. R.F. Coughlin and F.F. Driscol, Op Amp And Linear Integrated Circuits.
4. A. Ghatak and K. Thyagarajan, Optical Electronics (Cambridge Univ. Press).
5. M.S. Tyagi, Introduction To Semiconductor Devices (Wiley, Ny).

6. M. Sayer and A. Mansingh, Measurement, Instrumentation And Experimental Design In Physics And Engineering (Prentice-Hall India, New Delhi, 2000).
7. Millman and Halkias, Integrated Electronics.

HMPH19E07COMMUNICATION ELECTRONICS L T P C
40 0 3

Objectives:

Study of Operational amplifier using ICs

Know about Boolean Algebra and Karnaugh Map and also digital system.

To study about the Signal analysis, Pulse Modulation, Broad Band an Satellite Communication

UNIT - I :SIGNAL ANALYSIS (9)

Fourier transform of gate functions, delta functions at the origin – Two delta function and periodic delta function – properties of Fourier transform – Frequency shifting – Time shifting – Convolution theorem – Frequency convolution theorem – Sampling theorem.

UNIT –II : PULSE MODULATION (9)

Pulse amplitude modulation – Natural sampling - Instantaneous sampling Transmission of PAM signals – Pulse width modulation – Time division multiplexing and frequency division multiplexing – Band width requirements for PAM signals – Pulse code modulation – Principles of PCU – Quantizing noise – Generation and demodulation of PCM – Effects of noise – Advantages and application of PCM – Differential PCM (DPCM) – Delta modulation.

UNIT – III : BROAD BAND COMMUNICATION (9)

Coaxial cable circuit - Parallel wire line circuit – Computer communication – Digital data communication – Modems – Microwave communication links – LOS links – Tropospheric scatter microwave links – Integrated Service Digital Network (ISDN) – Architecture – Broadband ISDN – Local Area Network (LAN) – La-AN topologies – Private Branch Exchange (PBX).

UNIT – IV : SATELLITE COMMUNICATION (9)

Introduction – Communication satellite systems – Transmitting and receiving earth station – Satellite orbits – Satellite frequency bands – Satellite multiple access formats – FDMA – CDMA – Satellite channel, Power flow – Polarization antenna gain – Parabolic dish antenna – Power loss – Rainfall effect – Receiver noise – Carrier to noise ratio – Satellite link analysis – Up link – Down link – Cross link – Direct Home TV broadcasting – Satellite transponders.

UNIT– V: RADAR AND NAVIGATION(9)

Introduction, Basic Radar systems, Radar systems – Radar range – Pulsed radar system – A -Scope – Plan Position Indicator (PPI) – Search Radar – Tracking Radar – Moving Target Indicator (MTI) – Doppler Effect – MTI principle – Digital MTI – Radar Beacons – CW Doppler radar – Frequency modulated radar – Loop Antenna – Errors in loop direction finding – VHF Omni- directional range (VOR)- LORAN – Distance measuring equipment (DME) – Instrument Landing System (ILS) –Ground Controlled Approach System (GCA). 35

Total no of hrs:45

Books for Reference:

Analog Communication by K.Shashidhar

Digital Communication by V.K.Khanna ,S.Chand

Communication System Engg.Handbook by Donald.H.Hamsher

HMPH19E08INSTRUMENTATION TECHNIQUES L T P C

Objectives:40 0 3

To understand Basic Knowledge of Electrical, Electronic,Analyticaland

Bio Medical Instrumentation and also Sensor Instruments

UNIT -1: ELECTRICAL INSTRUMENTATION (9)

AC bridges-measurement of Inductance by Maxwell's Inductance bridge-Measurement of Capacitance by De saulty's bridge-Measurement of Mutual Inductance by carry Foster bridge-ac differential voltmeter-dc differential voltmeter-Antilog multimeter.

UNIT -2: ELECTRONIC INSTRUMENTATION (9)

Analog to Digital Converters-Dual slope ADC and Successive approximation ADC-Digital Counter (four bit)-Digital Voltmeter-Digital Frequency meter-Digital Frequency meter-Digital multimeter- Digital Thermometer.

UNIT-3: ANALYTICAL INSTRUMENTATION (9)

CRO- Measurement of Time period and Frequency-Distortion Analyzer-Wave analyzer- Spectrum Analyzer-IR spectrometer-UV spectrometer-Fast Fourier Transform Analyzer- Ultra sound scanner.

UNIT-4: SENSOR INSTRUMENTS (9)

Strain gauge and measurement of strain-measurement of pressure using electrical transducer-measurement of seismic vibration using seismic transducer- Piezo electric accelerometer-measurement of temperature using semiconductor device-Radiation measurement by GM counter

UNIT-5: BIO MEDICAL INSTRUMENTATION (9)

Bioelectric potentials-resting and action potential –Half cell potential-surface needle and micro electrodes-principle, description, function and recording of ECG, EMG and EEG-artificial pace maker-simulators-heart lung machine-kidney machine-PH meter-Laser blood flow meter.

Total no of hrs:45

BOOK FOR STUDY AND REFERENCE

1. Albert D. Helfrich and William D. cooper , modern electronic Instrumentation and measurement techniques , 5th Edition ,Prentice hall of India
2. Milman and Halkias –Integrated Electronics
3. Malvino Leech-Digital principles
4. Gaonkar ,R.S Microprocessor Architecture, Programming and Applications with 8085,3rd Edition Penram international Publishing ,Mumbai, 1997
5. Arumugam. M, Biomedical Instrumentation , Anuradha publications ,Kumbakonam,2011

HMPH19E09 CRYSTAL GROWTH TECHNIQUES L T P C

Objectives:4 0 0 3

To learn about the basic ideas of crystal growth at low temperature, from flux, from melt and from vapour

UNIT I :FUNDAMENTALS OF CRYSTAL GROWTH (9)

The crystalline stat – the birth of crystal growth – historical review – importance of crystal growth – classification of crystal growth methods – generation of reactants – importance of crystal growth – classification of crystal growth methods – generation of reactants – transport of reactants to the growth surface – theories of nucleation homogenous and heterogeneous nucleation – growth surface.

UNIT II :GROWTH FROM LOW TEMPERATURES SOLUTIONS (9)

Solution – selection of solvents – solubility and super solubility – saturation and super saturation – Meir`s solubility diagram - metastable zone width – measurement and its enhancement – growth by restricted evaporation of solvent, slow cooling of solution and temperature gradient methods.

UNIT III :GROWTH FROM FLUX (9)

Flux growth – principle –choice of flux – growth kinetics – phase equilibrium and phase diagram – growth techniques - solvent evaporation technique, slow cooling technique and transport in temperature gradient technique.

UNIT IV:GROWTH FROM MELT (9)

Basis of melt growth – heat transfer – growth techniques – conservative processes – Bridgman – Stockbarger method – pulling from the melt – Czochralski method - zone refining – vertical, horizontal float zone methods – skull melting process.

UNIT V:GROWTH FROM VAPOUR (9)

Basic principle – physical vapour deposition – evaporation – and sublimation processes - sputtering – chemical vapour deposition – advantages and disadvantages – chemical vapour transport - fundamentals – growth by chemical vapour transport reaction – transport materials and transporting agents.

Total no of hrs:45

Book for study

1. Crystal growth processes, Bose, J.C.
2. Crystal growth processes, Sandhana Raghavan and Ramasamy
3. Nucleation, Zettlemeyer
4. Crystallization, Mullin, J.W.

HMPH19L03 **INTEGRATED ELECTRONICS** **L T P C**

0 05 3

Objective:

To develop and understanding of practical knowledge in Integrated circuits

1. IC 741-Schmitt Trigger and Monostable multivibrator
2. IC 741-Multiplexer and Demultiplexer
3. IC 741-Square wave , Triangular wave, saw tooth wave generator.
4. IC 741-Half wave Rectifier
5. IC 741-Precision full wave Rectifier
6. IC555-A stable Multivibrator
7. IC555-Monostable Multivibrator
8. IC 555-Schmitt Trigger
9. Shift registers
10. BCD Counter
11. Arithmetic Operation Using 7483/7486

HMPH1910NUCLEAR AND PARTICLE PHYSICS L T P C

Objectives:500 4

To study about size of nucleus, nuclear reaction, nuclear model, nuclear radioactivity

And basic ideas about elementary particles

UNIT-I :GENERAL PROPERTIES OF NUCLEI 12

Nuclear size-Nuclear radius determination-Electron scattering-mirror nuclei-Muonic atoms-Nuclear electric and magnetic moments-binding energy-Weizacker mass formula-Applications-nuclear spin, isospin and parity.

UNIT-II :NUCLEAR REACTIONS 12

Types of reactions and conservation laws-Energetics of nuclear reactions-Dynamics of nuclear reactions-Q-value equation-scattering and reaction cross sections-compound nucleus reactions-Direct reactions-Resonance scattering.

UNIT-III :NUCLEAR MODELS 12

Liquid drop model-Nuclear fission-Bohr and Wheeler theory of nuclear fission-Nuclear shell model-spin orbit coupling-spin and parity of nucleus-Magnetic moments-Schmidt lines.

UNIT-IV :RADIOACTIVITY –BETA AND GAMMA DECAYS 12

Beta decay-Energy spectrum-Fermi's theory-F-K plot-Selection rules-Fermi and Gammow-Teller rules-Non-conservation of parity-Gamma emission-Multipole radiation and selection rules-Nuclear isomerism.

UNIT-V :ELEMENTARY PARTICLE PHYSICS 12

Types of interaction between elementary particles-Hardons and leptons-symmetries and conservation laws-Elementary ideas of CP and CPT invariance-Classification of hardons-SU(2) andSU(3) multiplets-Quark model-Gell-Mann-okubo mass formula for octet and decuplethardons-charm,bottom and top quarks.

Total no of hrs:60

Books for study and Reference:

1. Nuclear physics,Roy and Nigam,S.Chand&co.,New Delhi
2. Physics of nuclei and Particles (Vol l&II),Mermier and Sheldon,AcademicPress,New York
3. Elementary Particles,Alladi Ramakrishnan
4. Krane,K.S.Introductory Nuclear physics,wiley,New York,1987

HMPH1911 COMPUTATIONAL METHODS AND C PROGRAMMING **L T P C**

Objective: **500 4**

To gain knowledge and understanding of computational methods and C Programming.

UNIT –I :SOLUTIONS OF EQUATIONS **12**

Determination of zeros of polynomials – Root of nonlinear algebraic equations and transcendental equations – bisection and Newton-Raphson methods – Convergence of solutions.

UNIT-II :LINEAR SYSTEMS **12**

Eigen values and Eigen vectors of a matrix - Inverse of a matrix, Determinant - Solution of linear systems of equations by Gauss Elimination method - Pivotal condensation method - Numerical Problems based on Eigen values & Eigen vectors of matrix & Gauss elimination method - power and Jacobi method

UNIT-III :INTERPOLATION AND CURVE FITTING **12**

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) – curve fitting – Polynomial least – square fitting.

UNIT-IV :INTEGRATION AND DIFFERENTIATION **12**

Numerical Differentiation – Numerical Integration - Trapezoidal Rule - Simpson Rule (one – third) Solution of Ordinary Differential Equations by Euler Method - RungeKutta method - Numerical Problems based on Trapezoidal rule, Simpson rule, Euler &RungeKutta method

UNIT-V :PROGRAMMING WITH C **12**

Flow-carts- integer and floating point arithmetic expressions – built-in functions – executable and non-executable statements – subroutines and functions – programs for the following computational methods: (a) Zeros of polynomials by the bisection method (b) Zeros of polynomials/non-linear equations by the Newton –Raphson method (c) Lagrange Interpolation (d) Trapezoidal and Simpson's Rules

Total no of hrs:60

Books for study and Reference:

1. Computer oriented Numerical methods by V. Rajaraman
2. Numerical Analysis by Scheid. F (Schaum's series)
3. Programming in ANSI C by E Balagurusamy
4. Introductory methods of Numerical Analysis by S.S.Sastry