Govt.College for Women (Autonomous)

Kumbakonam – 612 001

P.G. – Revised Course Structure Under CBCS

(For the Candidates admitted from the Academic year 2015 -16 Onwards)

Semester	Course	Course Title	Ins Hrs / Week	Credit	Exam Hrs	Marks Int	Marks Ext	Total
I	Core Course-I (cc)	Classical Dynamics And Relativity	6	5	3	25	75	100
	Core Course-II (cc)	Mathematical physics	6	5	3	25	75	100
	Core Course-III (cc)	Statistical Mechanics	6	5	3	25	75	100
	Core Course-IV(Ec)	General Experiments	6	4	6	40	60	100
	Elective Course-I(Ec)	Electronics	6	4	3	25	75	100
	Total		**30**	**23**	**3**			
II	Core Course-V(cc)	Numerical methods	6	5	3	25	75	100
	Core Course-VI(cc)	Quantum Mechanics	6	5	3	25	75	100
	Core Course-VII(cc)	Electronics Experiments	6	5	6	40	60	100
	Core Course-VIII(cc)	Programming in C++	6	5	3	25	75	100
	Elective Course II(Ec)	Experimental Techniques & Instrumentation	6	4	3	25	75	100
	Total		**30**	**24**				
III	Core Course-IX(cc)	Atomic and Molecular Physics	6	5	3	25	75	100
	Core Course-X(cc)	Electromagnetic Theory	6	5	3	25	75	100
	Core Course-XI(cc)	Nuclear and Particle Physics	6	5	3	25	75	100
	Core Course-XII(cc)	Advanced Electronics-I	6	4	6	40	60	100
	Elective Course-III(Ec)	Communication Electronics	6	4	3	25	75	100
	Total		**30**	**23**				
IV	Core Course-XIII(cc)	Solid State Physics	6	5	3	25	75	100
	Core Course-XIV(cc)	Advanced Electronics II	6	5	6	40	60	100
	Core Course-XV(cc)	Project	12	6				100
	Elective Course-IV(Ec)	Advanced Physics	6	4	3	25	75	100
	Total		**30**	**20**				
			120	**90**				**1900**

Core Course   :14

Elective Course:4

Project Paper :

CORE COURSE-I -CLASSICAL DYNAMICS AND RELATIVITY

CODE:

CREDIT:

UNIT-I:

Fundamental Principles and Lagrangian Formulation:

Mechanics of a particle and system of particles- Conservation laws-Constraints-Generalised coordinates-D'Alembert's principle and Lagrange's equation-Hamiltonian Application-Atwood's Machine.

UNIT II:

Lagrangian formulation:Applications

a)Rigid body dynamics

Euler angles- Moments and products of inertia-Euler's equations-Symmetrical top.

b)Oscillatory Motion

Theory of small oscillations-Normal modes and frequencies- Two coupled harmonic oscillators-Linear triatomic molecule.

Wave motion-Wave equation-Phase velocity-group velocity-Dispersion.

UNIT III:

Hamilton's Formulation

Hamilton's canonical equations of motion-Hamiltonian Principle -Hamilton's equations from variational principle-Principle of Least action-Canonical transformations -Poisson brackets-Hamilton-Jacobi method.

UNIT IV:

Nonlinear Dynamics

Dynamical systems-Mathematical implications of nonlinearity-Definition and defects of non linearity-regular and chaotic motion-linear and nonlinear oscillators, Phase trajectories-fixed points and limit cycles-Period doubling bifurcation and onset of chaos in logistics map.

Solitons-experiments of Kruskal and Zabusky on Kdv equation -block diagram of IST and description.

UNIT V:

Relativity

Review of basic of special theory of relativity-energy momentum four vector-Minkowski's four dimensional space-Lorent's transformation as rotation-Minkowski's space Lagrangian formulation in relativistic mechanics-Invariance of Maxwell's equations under Lorentz transformation.

BOOKS FOR STUDY:

1.Classical Dynamics-Gupta Kumar

2.Classical Dynamics-Sathya Prakash

3.Non linear Dynmics-M.Lakshmanan.

BOOKS FOR REFERENCE:

1.H.Goldstein,Classical mechanics,Narosa Book distributors,New Delhi(1980)

2.N.C.Rana and P.S.Joag.,Classical mechanics,Tata Mc Graw Hill,New Delhi

CORE COURSE-II-MATHEMATICAL PHYSICS

Unit 1: Vector analysis

Concept of vector and scalar fields – Gradient, divergence, curl and Laplacian – Vector identities – Line integral, surface integral and volume integral – Gauss theorem, Green's Theorem, Stoke's theorem and applications – Orthogonal curvilinear coordinates – Expression for gradient, divergence, curl and Laplacian in cylindrical and spherical co-ordinates - Definitions – Linear independence of vectors – Schmidt's orthogonalisation process – Schwartz inequality.

Unit 2: Tensors and Matrix Theory

Transformation of coordinates – Summation convention – Contravariant, covariant and mixed tensors – Rank of a tensor – Symmetric and antisymmetric tensors – contraction of tensor – Characteristic equation of a matrix – Eigen values and eigenvectors – Cayley – Hamilton theorem-Reduction of a matrix to diagonal form – Jacobi method – Sylvester's theorem.

Unit 3: Complex Analysis

Functions of complex variables – Differentiabilility -- Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities - Cauchy's residue theorem – Evaluation of definite integrals.

Unit 4: Special Functions

Gamma and Beta functions – Sturm-Liouville problem – Legendre, Associated Legendre, Bessel, Laugerre and Hermite differential equations : series solution – Rodriguez formula – Generating functions – Orthogonality relations – Important recurrence relations.

Unit 5: Group Theory

Basic definitions – Multiplication table – Subgroups, Cosets and Classes – Direct Product groups – Point groups -- Space groups – Representation theory – Homomorphism and isomorphism– Reducible and irreducible representations – Schur's lemma – The great Orthogonality theorem – Character table -- C3v and D3h as examples – Elementary ideas of rotation groups.

Books for Study and Reference

Relevant chapters in

1. A.W. Joshi, Matrices and Tensors in Physics, Wiley Eastern Ltd., New Delhi (1975)

2. Eugene Butkov, Mathematical Physics, Addison Wesley, London (1973)

3. L.A.Pipes and L.R. Harvill, Applied Matematics for Engineers and Physcists,

   McGraw Hill Company, Signgapore (1967)

4. P.K.Chattopadhyay, Mathematical Physics, Wiley Eastern Ltd., New Delhi (1990)

5. A.K. Ghattak, T.C.Goyal and S.J. Chua, Mathematical Physics, Macmillan, New Delhi (1995)

6. G.Arfken and H.J.Mathemattical Methods for Physicists, 4thed. Physicists (Prism Books, Banagalore, 1995).

7. M.D.Greenberg, Advanced Engineering Mathematics, 2nd

 ed. International ed., Prentice – Hall

   International, NJ, (1998)

8. E.Kreyszig, Advanced Engineering Mathematics, 8th

 ed. Wiley, NY (1999)

9. W.W.Bell, Special Functions for Scientists and Engineers (Van Nostrand, New York, 1968) .

10. A.W. Joshi, Elements of Group Theory for Physicists (Wiley Eastern, New Delhi, 1971).

11. F.A. Cotton, Chemical Applications of Group Theory (Wiley Eastern, New Delhi, 1987).

CORE COURSE-III-STATISTICAL MECHANICS

CODE:

CREDIT:

UNIT I:Thermodynamics

Energy and First law of thermodynamics -heat content and heat capacity-Specific heat-entropy and the second law of thermodynamics-thermodynamic potential and the reciprocity relation-thermodynamic equilibrium -Nernst heat theorem.

UNIT II:Kinetic theory

Distribution function and its evolution-Boltzmann transport equation and its validity-Boltzmann's theorem-Maxwell-Boltzmann's distribution-Transport phenomena-Mean free path.

UNIT III:Classical Statistical Mechanics

Introduction-Phase space and ensembles-Density function-Liouville's theorem-Maxwell-Boltzmann distribution law-Micro canonical ensemble-Ideal gas-Entropy-Partition function-Principle of equipartition of energy-Canonical and grand canonical ensemble.

UNIT IV:Quantum Statistical Mechanics

Basic concepts-Bose-Einstein and Fermi-Dirac Statistics-Distribution laws-Equations of state-Bose-Einstein condensation.

UNIT V:Application of Q.S.M

Ideal Bose gas :Photons-Black body and planck gas Properties-Degeneracy-Electron gas-Pauli paramagnetism.

BOOKS FOR STUDY:

1.Statistical Mechanics-Gupta kumar & Sharma

2.Statistical Mechanics-Sathya prakash & Agarwal

3.Statistical Mechanics(Wiley Eastern Limited,New Delhi,1994)-B.K.Agarwal and M.Eisner

4.Thermal and Statistical physics(New Age International(P) limited,New Delhi,2010)-R.B.Singh

5.Statistical Physics,Thermodynamics & Kinetic theory.(Vishal Publicating Co., Jalandhar,2010)Bhatia.

6.Fundamentals of Statistical Mechanics(New Age International(p) Limited,New Delhi,2009)-Laud.

7.Introduction to Statistical Mechanics(Narosa Publishing House New Delhi,2011)-Sinha.

8.Statistical Mechanics on Introduction (Nrosa Pubicating House New Delhi,2009)-Evelyn Guha.

CORE COURSE-IV-GENERAL EXPERIMENTS

CODE:

CREDIT:

ANY 12 EXPERIMENTS

1. Determination of **q,η ,σ** - Elliptical Fringes.

2. Determination of **q,η , σ** - Hyperbolic Fringes.

3. Determination of Stefan's Constant.

4. 'g' factor Determination-ESR Spectrometer.

5. e/m – Magnetron method.

6. e/m – Thomson method.

7. Plank's constant – Photoelectric effect.

8. Biprism – Wavelength determination – scale and Telescope method.

9. Spectrometer – Hydrogen Spectrum – Rydberg's constant.

10. Spectrometer – Polarisability of liquids.

11. Spectrometer – Charge of an electron.

12. Biprism – Determination of Refractive index.

13. Polarimeter – Determination of Specific rotatory power of a liquid.

14. Four probe method – Determination of resistivities of the given samples.

15. Iron arc spectrum.

16. Brass arc spectrum.

17. Michelson's interferometer – Determination of wavelength of monochromatic source.

18. Ultrasonic Interferometer

19. Determination of L of a coil using Anderson's method.

ELECTIVE COURSE –I-ELECTRONICS

UNIT – I:

OPERATIONAL AMPLIFIER

Op-amp characteristics – Inverting and non inverting amplifier – voltage follower – summing and Difference amplifier – integrating and differential circuits – log and antilog amplifiers – op-amp as comparator – active filters – low pass, high pass, band pass and band.

Rejection filters – solving simultaneous and differential equations.

UNIT – II:

OP-AMP APPLICATIONS (OSCILLATIORS AND CONVERTORS)

Wien bridge, phase shift oscillators and twin – T oscillators – triangular, Saw – tooth and square wave generators – Schmitt's trigger – Sample and Hold circuits – voltage control oscillators – phase locked loops – basic D to A conversion: Weighted resister DAC – binary R-2R dual slope ADC.

UNIT – III:

MICROPROCESSOR ARCHITECTURE

8085 Microprocessor architecture – various registers – central processing unit of micro computers – timing and control unit – instruction and data flow – system timings – examples – instruction set – Data transfer group – logical group – branch group – stack and I/O control instruction – addressing modes.

UNIT – IV:

MICROPROCESSOR PROGRAMS

8 Bit Addition, Subtraction, Multiplication, Division – Ascending order and Descending order – Square, Square root of a number – Time Delay program – Square wave generator.

UNIT – V:

INTERFACING MEMORY AND I/O DEVICES

Interfacing memory and devices – I/O and memory mapped I/O – Type of interfacing devices – Data transfer schemes – Programmed and DMA data transfer scheme – programmable peripheral interface (8255A) – 8253 Timer Interface – DMA controller – Programmable Interrupt controller (8259) – programmable communication Interface (8251).

BOOKS FOR STUDY:

RELEVANT CHAPTERS IN

- **J.MILMAN** and **C.C.HALKIAS**, Integrated Electronics, Mc Graw Hill (1972).

- **R.P.JAIN**, Integrated Electronics, Mc Graw Hill.

- **B.RAM**, Fundamental of Microprocessors and Micro computers(Dhanapet Rai and Sons, New Delhi, 1995).

BOOKS FOR REFERNCE

- **R.A.GAYAKWAD**, Op Amp and liner integrated circuits, printice Hall India pvt Ltd(1999)

- **R.GOANKAR**, Microprocessor architecture, programming and application(Wiley Eastern, New Delhi, 1985).

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CORE COURSE-V-NUMERICAL METHODS

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UNIT – I:

METHODS OF CURVE FITTING

   Principle of least Square method – Fitting a straight line, parabola, exponential curve.

UNIT – II:

SOLUTION OF ALGEBRAIC AND TRANSCENDETAL EQUATION

   Bisection method – successive approximation – Newton Raphson method – convergence of Newton Raphson method and geometrical interpolation – Horner's method.

UNIT – III:

INTERPOLATION

   Newton forward interpolation – Backward interpolation formula – Error in Newton forward interpolation formula – Gauss forward interpolation formula – Backward interpolation formula.

UNIT –IV:

NUMERICAL INTEGRATION AND DIFFERENTIATION

   Newton forward difference formula and Newton backward difference formula.

   Trapezoidal rule – Simpson rule – Extended Simpson's rule – Simpson's 1/3 rule and 3/8 rule – Application of Simpson's rule.

UNIT – V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION

   Solution by Taylor series – Euler's method – Fourth order Runge Kutta method – First order and second order equation.

BOOKS FOR STUDY:

- Numerical Method in Science and Engineering, M.K. Venkatraman, National publishing Company-Chennai.

- Introductory methods of Numerical Analysis- S.S. Sastry.

CC VI: QUANTUM MECHANICS

Unit 1: Schrödinger Equation and General Formulation

Schrödinger Equation – Physical meaning and conditions on the wave function – Expectation values and Ehrenfest's theorem – Hermitian operators and their properties – Commutator relations - Uncertainty relation - Properties of Bra and ket vectors - Hilbert space – Schrödinger, Heisenberg and interaction pictures.

Unit 2: Exactly Solvable Systems

Solving the one dimensional harmonic oscillator-– Particle in a box – Square well potential -- Rectangular barrier potential – Rigid rotator – Hydrogen atom.

Unit 3: Approximation Methods

Time independent perturbation theory: Non-degenerate and degenerate perturbation theories (first order)-- Stark effect – WKB Approximation -- Application to tunneling problem .Time dependent perturbation theory: Harmonic Perturbation -- Transition probability-Fermi golden rule.

Unit 4: Scattering Theory and Angular Momentum

Scattering theory: Scattering cross section – Green's function approach -- Born Approximation – Partial wave analysis .

Angular momentum: Matrix Representation of J (J^2 and J_Z)-Spin angular momentum -- Eigenvalues -- Addition of angular momenta - Clebsch-Gordan coefficients (basic ideas only).

Unit 5: Relativistic Quantum Mechanics

Klein-Gordon equation for a free particle and in an electromagnetic field – Plane wave solutions-equation of continuity- Dirac equation for a free particle - Dirac matrices – Plane wave solution – Negative energy states – Spin-orbit coupling.- Magnetic Moment of an electron.

Books for Study :

 1. P. M. Mathews and K. Venkatesan, A Text Book of Quantum Mechanics (Tata McGraw

Hill, New Delhi, 1987).

2.Quantum mechanics-Gupta Kumar.

3.Quantum mechanics-Sathya Prakash.

4.Theory and problems of Quantum mechanics-Schaum outline series

Books for Reference :

1.L. Schiff, Quantum Mechanics (Tata McGraw Hill, New Delhi, 1968).

2. V. Devanathan, Quantum Mechanics, Naroso Publishing House (2005)

3. V. K. Thankappan, Quantum Mechanics (Wiley-Eastern, New Delhi, 1985).

4.J.Singh,Quantum mechanics:Fundaamental and applications to technology(John-Wiley New York,1997)

5.A.Goswami,QWuantum mechanics(W.C.Brown Dubuque,1992)

CORE COURSE-VII-ELECTRONICS EXPERIMENTS

CODE:

CREDIT:

ANY 12 EXPERIMENTS

1.Emitter follower.

2.Dual power supply-Construction.

3.Common Drain FET amplifier.

4. Common Source FET amplifier.

5.Operational amplifier filters.

6.Darlington Pair amplifier.

7.Operational Amplifier –Parameters(Input impedance,Output impedance,Offset voltage)

8. Operational Amplifier –Summing and Difference Amplifiers.

9. Operational Amplifier –Differentiator and Integrator circuits.

10.Bistable Multivibrator.

11.Characteristics of UJT.

12.SCR characteristics.

13.DIAC,TRIAC characteristics.

14.Phase shift Oscillator.

15.Feed –back Amplifier.

16.Characteristics of LDR.

CORE COURSE-VIII -PROGRAMMING IN C++

CODE:

CREDIT:

UNIT I:

Principles of Procedure oriented Programming(POP)-Principles of object oriented programming(OOP)-Software Evolution-object oriented programming paradigm-Basic concepts of oop's :Introduction to C++-Tokens-Keyword's-Identifiers-variables-Operators-Manipulators Expressions.

UNIT II:

Control structural in C++-Functions in C++-Main function-Function Prototyping-Call by Reference-Return by Reference-Function overloading.

UNIT III:

Classes and objects:Passing objects as function arguments -Friend functions-Constant member functions Special member function constructors-Destructors-Operator overloading-Rules for overloading operator-Type conversions.

UNIT IV:

Inheritance: Single Inheritance-Multilevel Inheritance-Multiple Inheritance-Hierarchal Inheritance.

Pointers-Virtual function and polymorphism-Managing console I/O Operators. Working with files: Classes for file stream operators-Opening and Closing a file-End of file.

UNIT V:Programs:

1. Arranging words in alphabetical order

2. Picking largest and of a set of numbers

3. Solving Quadratic equation

4. Multiplication of two square Matrix

5. Least square curve fitting

6. Integration-Simpson's rule

7. Trapezoidal Rule

8. Euler's Rule

9. Solution of differential equation by runge kutta 11th order method

10. To solve simultaneous equation by Gauss Elimination method

Books for Study and Reference:

1.Object oriented Programming in C++-Balagurusamy

2.Object oriented Programming in C++-Schmum Series E.Balagurusamy

 3.Object oriented Programming in C++-Yashwant Kanetkar.

ELECTIVE II- EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION

Unit I: DATA INTERPRETATION AND ANALYSIS

Types of errors – systematic and random errors – Accuracy and precision – significant figures and round off – uncertainties and probable error – Random variable – mean, variance and standard deviation – Normal distribution – sampling techniques – propagation of errors – estimates of mean and errors: instrumental uncertainties – statistical fluctuations – Chi square test – goodness of fit.

Unit II: DYNAMIC CHARACTERISTICS

Introduction-Transfer function-Order of the Instrument –Zero,First and Second order instruments-Dynamic response to step and ramp input.

Unit III: SENSORS AND TRANSDUCERS

Inductive, capacitive and resistive transducers, Force, pressure, temperature, humidity, light, magnetic and ultrasonic flow sensors. (Load cell, LVDT, potentiometric, moderate low, high pressure sensors, Thermo, thermistor, RTD, LDR, solar cell, photodiode, hall probe – piezoelectric, flow sensors).

Unit IV: MATERIALS CHARACTERIZATION

Structural analysis – single crystal XRD, Micro hardness, conductivity, impedance analysis – LCR bridge – optical –FTIR-UV absorbance- transmittance-reflectance.

Unit V:RECORDERS

Different types of recorders-pen and strip chart recorders-XY recorders-Digital recorders-NMR Spectrometer-Bragg's X-ray Spectrometer.

Books for study and Reference

1. B.C Nakra and K.K.Chaudry – Instrumentaion Measurement and Analysis – Tata McGraw Hill, New Delhi
2. A.K.Sawhney – A Course in Electrical and Electronic Measurements and Instruments.
3. Willard etal – Instrumentation method and Analysis.
4.Instrumentation methods of analysis-H.H.Willard(Von Nestrand)
5.Advanced optival techniques –Van Heal(Mc Graw Hill)
6.Mechanical and Industrial instrumentation.R.K.Jain(Kanna Publishers)
7.Principles of Industical Instrumentation-D.Pratanbis.(Tata Mcgraw)
8.Measurements systems,application and Design-Doeblin(Tata Mcgraw Hill)

CORE COURSE-IX- ATOMIC AND MOLECULAR PHYSICS

CODE:

CREDIT:

UNIT – I: ATOMIC SPECTRA

Quantum states of electron in atom – Hydrogen atom spectrum – Electron spin – Stern – Gerlach experiment – spin orbit interaction – Two electron systems – LS – JJ coupling schemes – Fine structure – Spectroscopic terms and selection rules – Hyper fine structure – Exchange symmetry of wave functions – Pauli's exclusion principle – Periodic table – Alkali type spectra – Hund's rule.

UNIT – II: ATOMS IN EXERNAL FIELDS AND QUANTUM CHEMISTRY

Quantum chemistry of molecules: Covalent, ionic and Vander Waals interactions – Structions - Bond Oppenheimer approximation – Heitler – London and molecular orbital theories of H_2 – Bonding and Anti bonding - Molecular orbital – Hartee fock equation self consistent field – Application to Butadiene and Benzene.

UNIT – III: MICROWAVE AND IR SPECTROSCOPY

Rotational spectra of diatomic molecule – Non rigid rotator – rotational spectra of polyatomic molecules – liner and symmetric top molecules – Experimental techniques vibrating diatomic molecules – Diatomic vibrating rotator – Linear and symmetric top molecules analysis by IR techniques – Experimental techniques of microwave spectroscopy – Inversion spectrum of ammonia.

UNIT – IV: RAMAN SPECTROSCOPY AND ELECTRONIC SPECTROSCOPY OF MOLECULES

Raman spectroscopy: Raman effect – Quantum theory of Raman effect – Rotational and vibration Raman spectra of Diatomic Molecules – Selection rules – Experimental techniques of Raman spectroscopy – Laser as a Raman sources.

Electron spectroscopy: Electronic spectra of Diatomic molecules – The Franck Condon principle – Dissociation energy and Dissociation products – Rotational fine structure of electronic vibrational transitions.

UNIT – V: RESONANCE SPECTROSCOPY

NMR: Basic principles – Classical and Quantum mechanical description – Bloth equations – Spin – spin and spin lattice relaxation times – Chemical shift and coupling constant – Experimental methods – Single coil and double coil methods – High resolution methods.

ESR: Basic principles – ESR spectrometer – Nuclear interaction and hyper fine structure – Relaxation effects – G factor – Characteristics – Free radical and Biological applications – Massbauer spectroscopy and its applications.

BOOKS FOR STUDY:

- Fundamentals of molecular spectroscopy C.N. Ban well McGraw Hill New York.

- Introduction to modern physics – H.S. Mani & G.K. Metha, Affiliated East west, New Delhi.

- Introduction to Quantum chemistry A.K. Chandra, Tata McGraw Hill, New Delhi.

- High Resolution NMR – Pople Schneiduer & Berstein, McGraw Hill, New York.

- Atomic structure and chemical bond – Manas Chanda.

- Quantum chemistry – Ira N. Leyine Pretic – Hall New Delhi,1994.

- Introduction to Quantum Chemistry B.K. Sen.

- Spectroscopy – Aruldoss.

- Spectroscopy – R. Chang.

- Spectroscopy – G.M Barrow.

- Atomic and molecular physics – Gurudeep Chadwal.

CORE COURSE-X- ELECTROMAGNETIC THEORY

UNIT – I: STATIC ELECTRIC FIELDS

Introduction – Columb's law – Electric fields – Electric flux density – Gauss law with application – Electrostatic potential and Equipotential surfaces – Boundary conditions for electrostatic fields – Poisson's and Laplace's equations – Uniqueness Theorem – Method of images – A point charge near an infinite conducting plane – Electrostatic boundary Conditions.

UNIT – II: STATIC MAGNETIC FIELDS

Introductions – Biot-Savart law and its applications – Ampere's Circuital law and its applications – Magnetic flux density – Magnetic scalar and vector potentials – Magneto statics – Boundary conditions.

UNIT – III: TIME VARYING FIELD & MAXWELL'S EQUATIONS

Introductions – Faraday's law of electromagnetic induction – Equation of Continuity – Maxwell's equations – Boundary conditions of electromagnetic fields – Non uniqueness of em potential – Lorentz gauge.

UNIT – IV: ELECTROMAGNETIC WAVES

The Helmholtz equation – Plane waves in Lossy medium – Plane waves in a free space – Pointing vector and power flow in Electromagnetic Fields – Relection of plane waves at the normal & oblique incidence – Snell's law – Fresnel's equations.

UNIT – V: FUNDAMENTAL OF ANTENNAS AND RADIATING SYSTEMS

Introductions – Fundamentals of Radiation – Radiated field of and Hertzian dipole – Basic Antenna parameters – Half wave dipole Antenna – Quarter wave Monopole Antenna – Small Loop Antennas – Introduction to Antenna Arrays.

BOOKS FOR STUDY

- Introduction to Electrodynamics – David j. Griffiths.

- Electromagnetic theory – Chopra & Agrawal.

- Electromagnetic theory – B.B. Laud

- Electromagnetic theory – Sathya Prakash.

- Classical Electrodynamics – J.D. Jackson (2nd Ed) John Wiley & sons.

- 2.E.M. Waves & Radiating Systems – E.C.Jordon & Keith G.Balmeum.

- Principle of Electromagnetic – Mathew, N.O. Sadiku (Oxford University Press, 2011).

UNIT – I: BASIC NUCLEAR PROPERTIES

Basic ideas of Nuclear size – mass – charge distribution – spin and parity – Binding energy – semi empirical mass formula – Nuclear stability – Mass parabola – Ground state of Deutron – Magnetic dipole moment of Deutron – Neutron – Neutron scattering at low energies – spin dependence – charge symmetry – charge independence - Meson theory of Exchange forces.

UNIT – II: RADIOACTIVE DECAYS

Alpha emission – Giger – Nuttal law – Gamow's theory – Neutrino hypothesis – Fermi theory of beta decay – Curie point – Energies of beta spectrum selection rules – Non conversation of parity – Gamma emission selection rules – Transition probability – Internal conversion – Nuclear isomerism.

UNIT – III: NUCLEAR MODELS

Conservation of energy – Q-values of nuclear reaction – Energitics of nuclear reaction – Reciprocity theorem – Breit Formula – Compound nucleus – Resonance theory – Shell model – Liquid drop model.

UNIT –IV: NUCLEAR REACTORS

Characteristics of fission – Mass distribution of fragments – Radioactivity decay process – Fission cross section – Energy in fission – Bohr Wheeler theory of nuclear Fission – Fission reactors – Generation of electric power – Fast Breeder reactor – Basic fusion process – Characteristics of Fusion - Laser fusion – Plasma confinement.

UNIT – V: ELEMENTARY PARTICLES

Building blocks of nucleus – Nucleons, leptons, mesons, baryons, hyperons, strange hadrons – Classification of fundamental forces and elementary particles – Basic conservation laws – Quantum numbers – Gell– Mann- Nishijima formula – invariance under time reveals(T) charge conjugation(C) and parity(P) – TCP theorem – Parity and conservation in weak interaction – SU(3) symmetry – Meson Octet.

BOOKS FOR STUDY AND REFERENCE

RELEVANT CHAPTERS IN,

- Introductory Nuclear Physics – K.S. Krane, John – Wiley, New York, 1987

- Nuclear Physics an introduction – S.B. Patem, Wiley Eastern, New Delhi, 1991

- Concepts of Nuclear Physics – B.L.cohen,Tata McGraw Hill, New Delhi,1998.

- Nuclear Physics - H.S. Hans, New Age international Publishers, New Delhi

- Elementary Particle Physics an introduction – D.C Cheng & G.K. O'Neill, Addition – Wesely, 1979

- Introduction to elementary Particles – D. Giffits, Wiley particles international New York 1978

- The Atomic Nucleus – R.D. Evans, Tata McGraw Hill

- Basic Nuclear Physics – D.N. Srivastava, Experimental and Theoretical Pragati Prakashan, Meerut

- Basic Nuclear Physics – D.C. Tayal

- Nuclear Physics – Roy & Nigam, Wiley Eastern

- Nuclear physics – Sharma Pandya & Yadav

- Nuclear Physics – S.K. Pandey

- Nuclear physics – S.N. Ghoshal – S. Chand publishers

PRACTICAL III

ADVANCED ELECTRONICS-I

CODE:

CREDIT:

ANY 12 EXPERIMENTS

1. logic gates -Univesality of NAND and NOR gates using Ics.

2. Verification of Demorgan's theorem and Boolean expressions

3. Astable,monostable multivibrators and Schmitt trigger using IC 555.

4. HAlf and Full wave precision rectifier usingIC 741.

5. Digital to Analog convertor-Binary Weighted network metod.

6. Study the function of decoders and Encoders.

7. Study the function multiplexer and demultiplexer.(1:8,1:4,8:1,4:1)

8. Flip flops-Clocked RS,Clocked D and RS flip flop.

9. Half adder and Full adder(using NAND and NOR only)

10. Half Substractor and Full Subtractor(using NAND and NOR only)

11. Digital comparatpr(using NAND and NOR only)

12. BCD seven segment display

13. Study of counter using IC 74900(0-9 &0-99)

14. Solving simultaneous equations

15. Verification of Karnugh maps-Reduction & Logic circut implementation.

16. Set IC 7490 as a Scalar.

ELECTIVE COURSE-III-COMMUNICATION ELECTRONICS

CODE:

CREDIT:

UNIT I: TRANSMISSION SYSTEMS

ANTENNAS:

Non resonant antenna – loop antenna – Radiation fields – Polarization – Isotropic radiator – Power gain – Effective parameters of an antenna – Dipole arrayed antenna – VHF, UHF and microwave antennas – Thin linear antenna.

UNIT – II: MICROWAVES AND COLOUR TELEVISION

MICROWAVE GENERATION AND APPLICATIONS

Klystron – Magnetron – Microwave propagation through wave guides – Crystal detection – measurement of SWR – Transmitters and receivers.

COLOUR TELEVISION

Introduction – Perception – Three colour theory – Luminescence – TV camera – Image Orthicon – Vidicon – LCD Colour Television.

UNIT – III: FIBER STRUCTURE AND PROPERTIES

Fiber structure – Fiber materials – Fiber fabrication – Mechanical properties of fibers – Attenuation – Single distortion in optical waveguides – mode coupling.

UNIT – IV: SATELLITE COMMUNICATIONS

Ground station – Antenna angle of elevation and transmission path – Height of Geostation orbits – Problems – Satellite works – Frequency allocation and polarization – Various blocks of equipment about the satellite – Transmit and receive contour – Block diagram of network control station (NCS).

UNIT – V: CELLULAR COMMUNICATIONS

Basic ideas of Cellular network – Operational principles of WDM – the 2*2 fiber Coupler – Fiber grating filters – Erbium Doped fiber Amplifiers – Amplication mechanism – EDFA architecture – Performance of WDM+EDFA system – Link Bandwidth – Optical power requirements for a specific BER – Cross talk – Optical CDMA – Interconnecting telephone traffic between remote stations.

BOOKS FOR STUDY AND REFERENCE:

- Optical fiber Communication – G. Keiser, McGraw Hill – New Delhi 1991

- Understanding of fiber optics – J. Heeht, Sams Publishing BPB, 1997

- Optical fiber Communication – Principles and practice – J.M. Senior, Prentice Hall, New Delhi 1996

- Fiber Optics technology and applications – S.D. Personick, Khanna Publishers, New Delhi 1996

- Communication systems and techniques – M. Schwarits, W.R. Bannet

- Electronic devices and circuits – J. Millman & C. Halkias. McGraw Hill Singapore 1972

- Electronic communication system – G. Kennedy, Tata McGraw Hill – New Delhi 1995

- Electronic communication – D. Roddy and Coolen

<center>**CORE COURSE-XIII : SOLID STATE PHYSICS**</center>

Unit 1 : Lattice Vibrations and Thermal Properties

Vibration of monoatomic lattices – Lattices with two atoms per primitive cell – Quantization of lattice vibrations – Phonon momentum – Inelastic scattering of neutrons by phonons -- Lattice heat capacity – Einstein model – Density of modes in one-dimension and three-dimension – Debye model of the lattice heat capacity – Thermal conductivity – Umklapp process.

Unit 2: Free Electron Theory, Energy Bands and Semiconductor Crystals

Energy levels and density of orbitals – Fermi-Dirac distribution – Free electron gas in three-dimensions – Heat capacity of the electron gas – Electrical conductivity and Ohm's law – Motion in magnetic fields – Hall effect – Thermal conductivity of metals – Nearly free electron model –Kroneig Penny model– Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration.

Unit 3: Magnetism:

Weiss theory of Paramagnetism- Quantum theory of paramagnetism -Demagnetization of a paramagnetic salt – Paramagnetic susceptibility of conduction electrons - Hund's rules - Ferromagnetic order – Curie point and the exchange integral – Temperature dependence of saturation magnetization – Magnons –Anti ferromagnetic order – Ferromagnetic domains – Origin of domains and hysteresis-Introduction of Ferrites.

Unit 4: Dielectrics and Ferroelectrics

Macroscopic electric field – Local electric field at an atom – Dielectric constant and polarizability –Types of Polarizability-temperature and frequency dependency-Determination of Dielectric constant- Clausius-Mossotti equation-Polarization catastrophe-Ferroelectric Domains.

Unit 5: Super Conductivity

Occurrence of Superconductivity – Meissner effect – Thermodynamics of superconducting transition – London equation – BCS Theory - Coherence length – Flux quantization – Type I and Type II Superconductors – Super Conductor Tunneling - DC and AC Josephson effect – Recent developments in high Temperature Superconductivity– Application of Superconductors – SQUID – Magnetic levitation.

Books for Study and Reference

1. Introduction to Solid State Physics -C. Kittel Wiley Eastern, New Delhi.

2. Solid State Physics - N. W. Ashcrof and N. D. Mermin.? Half, Rineharf and Winston Philadelphia.

3. Solid State Physics- J. S. Blakemore, Cambridge University Press.

4.Solid State Physics-A. J. Dekker, McMillion, Madras, 1971.

5.An Introduction to X-ray Crystallography- M. M. Woolfron, Cambridge University Press 1991.

6. Solid State Physics - S. O. Pillai, New Age International, New Delhi, 1995.

7. Solid State Physics – Singhal.

8. Solid State Physics – Gupta, Kumar and Sharma.

PRACTICAL IV

ADVANCED   ELECTRONICS II

CODE :

CREDIT :

A. Microprocessor Practical
1.   8 Bit addition, subtraction, Multiplication and division using 8085.
2.   16 bit addition, 2's complement and 1's complement subtraction using 8085.
3.   Conversion from decimal to octal and hexa systems.
4.   Conversion from octal, hexa to decimal systems.
5.   Largest and Smallest element of N numbers.
6.   Ascending and Descending order of N numbers using 8085.
7.   Square, square root and factorial of a given number using 8085.
8.   Study of DAC interfacing.
9.   Study of ADC interfacing.
10. Traffic control system using microprocessor.
11. Stepper motor control using microprocessor.
12. Square wave, Triangular wave generation using microprocessor.
13. Micro Controller
14. Character words display using microprocessor..

B. Computer practicals by C++ programming
1.   Roots of algebraic equations – Newton Raphson method.
2.   Least square curve fitting – Straight line.
3.   Lagrangian interpolation method.
4.   Numerical integration – Trapezoidal rule.
5.   Numerical integration – Simpson's rule.
6.   Numerical integration – Euler's rule.
7.   Solution of differential equations- Runge Kutta 2nd order method.
8.   Solution of differential equations – Runge Kutta 4th order method.
9.   Calculation of Hartmann's constant.
10. Transpose of matrix.

ELECTIVE COURSE-IV-ADVANCED PHYSICS

Unit 1: Advanced Mathematics:

Fourier Transforms- Faltung theorem- Application to heat and wave equations-Green's function-Properties-Applications-Linear Integral equation-Fredholm and VolterraType-Neumann series-Eigen function- Expansion-Application.

Unit 2 : Crystal Growth Techniques:

Solution Growth Technique:

Low temperature solution growth: Solution - Solubility and super solubility – Expression for super saturation – Miers T-C diagram - Constant temperature bath and crystallizer – Seed preparation and mounting - Slow cooling and solvent evaporation methods.

Gel Growth Technique :

Principle – Various types – Structure of gel – Importance of gel – Experimental procedure – Chemical reaction method – Single and double diffusion method – Chemical reduction method –Complex and decomplexion method,.

UNIT :3Thin Film Deposition Techniques:

Thin Films – Introduction to Vacuum Technology - Deposition Techniques - Physical Methods – Resistive Heating, Laser Gun Evaporation, Sputtering - Reactive Sputtering, - Chemical Methods – Spray Pyrolysis .

Unit 4: Basics of nanotechnology:

Atomic structures-Molecular and atomic size-Bohr radius – Emergence of Nanotechnology – Challenges in Nanotechnology - Carbon age–New forms of carbon. (from Graphene sheet to CNT)- Definition of a Nano system - Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) nanostructured materials - Quantum dots

Unit 5: Introduction to Nonlinear Optics:

Wave propagation in an anisotropic crystal – Polarization response of materials to light -Harmonic generation – Second harmonic generation- Self Phase modulation-Cross Phase modulation-Dispersion of dielectric media- Kerr effect- Nonlinear Schrodinger equation-Optical Parametric oscillator.

Books for study:

1.Mathematical Methods for Physicists &Engineers-A.W.Joshi.

2.J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986)

3. P. SanthanaRagavan and P. Ramasamy, Crystal Growth Processes and Methods, KRU Publications, Kumbakonam (2001)

4. A. Goswami, Thin Film Fundamentals, New Age International (P) Limited, New

Delhi (1996)

5. M. Wilson, K. Kannangara, G Smith, M. Simmons, B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.

6. G.Cao, Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperical College Press, 2004

7.Non-Linear Optics-Robert W.Boyd-Acedamic Press-London-2008.

8.George Poole-Nanotechnology.

9.H.L.Bhat-Introduction to crystal growth.