GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR – 639 005
M.SC PHYSICS COURSE STRUCTURE UNDER CBCS SYSTEM
(For the candidates admitted from the year 2015-2016 onwards)

SEMESTER	COURSE	SUBJECT TITLE	SUBJECT CODE	INSTR. HOURS WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
							INT	ESE	
I	Core Course – I	Mathematical Physics - I	P15PH1C1	6	5	3	**25**	**75**	100
	Core Course – II	Classical Dynamics and Relativity	P15PH1C2	6	5	3	**25**	**75**	100
	Core Course - III	Analog and Digital Electronics	P15PH1C3	6	5	3	**25**	**75**	100
	Core Course – IV	Basic Practical Lab (Gen & Electronics)	-	3	-	-	**-**	**-**	-
	Core Course – V	Advanced General Experiment Lab	-	3	-	-	**-**	**-**	-
	Elective Course - I	Condensed Matter Physics	P15PH1E1	6	5	3	**25**	**75**	100
				30	**20**				**400**
II	Core Course – IV	Basic Practical -General & Electronics	P15PH2C4P	3	5	4	**25**	**75**	100
	Core Course – V	Advanced General and Microprocessor Lab	P15PH2C5P	3	5	4	**25**	**75**	100
	Core Course – VI	Mathematical Physics- II	P15PH2C6	6	5	3	**25**	**75**	100
	Core Course – VII	Quantum Mechanics	P15PH2C7	6	5	3	**25**	**75**	100
	Core Course – VIII	Electromagnetic Theory	P15PH2C8	6	5	3	**25**	**75**	100
	Elective Course – II	Microprocessor and Microcontroller	P15PH2E2	6	5	3	**25**	**75**	100
				30	**30**				**600**
III	Core Course – IX	Thermodynamics and Statistical Mechanies	P15PH3C9	6	5	3	**25**	**75**	100
	Core Course - X	Nuclear and Particle Physics	P15PH3C10	6	5	3	**25**	**75**	100
	Core Course – XI	Communication Electronics	P15PH3C11	6	5	3	**25**	**75**	100
	Core Course – XII	Advanced General & Electronics Practical I	-	3	-	-	**-**	**-**	-
	Core Course - XIII	Advanced General & Electronics Practical II	-	3	-	-	**-**	**-**	-
	Elective Course – III	Research Methodology	P15PH3E3	6	5	3	**25**	**75**	100
				30	**20**				**400**
IV	Core Course – XII	Advanced Electronics Practical 1	P15PH4C12P	3	5	4	**25**	**75**	100
	Core Course – XIII	Advanced Electronics Practical II	P15PH4C13P	3	5	4	**25**	**75**	100
	Elective Course – IV	Molecular Spectroscopy	P15PH4E4	6	5	3	**25**	**75**	100
	Project Work	Project Work	P15PH4PW	18	5	3	**	**	100
				30	**20**				**400**
TOTAL				**120**	**90**				**1800**

** Dissertation – 80 Marks and Viva Voce Examinations – 20 Marks

CHAIRMAN
BOARD OF STUDIES IN PHYSICS

CONTROLLER OF EXAMINATIONS

Sl. No.: | | **Subject Code:** P15PH1C1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-05
M.Sc., PHYSICS – I SEMESTER – CORE COURSE - I
(For the candidates admitted from the year 2015-16 onwards)

MATHEMATICAL PHYSICS -I

UNIT- I: VECTOR FIELDS

Concept of vector and scalar fields–Vector identities–addition, multiplication, orthogonal resolution vectors, product of two, three and four vectors – Gradient, Divergence, Curl and Laplacian Line integral, Surface Integral and Volume integral – Gauss theorem, Green's theorem, Stokes's theorem - Classification of vector fields - Helmholtz theorem- Orthogonal curvilinear coordinates- Expressions for Gradient, Divergence, Curl and Laplacian for cylindrical and spherical coordinates.

UNIT- II: VECTOR SPACE AND TENSORS

Definitions – Linear independence of vectors – Bilinear and quadratic forms – Change of basis – Schmidt's orthogonalisation process – Schwartz inequality - introduction to tensors- n-dimensional space -superscripts and subscripts- Transformation of coordinates – Summation convention-dummy and real indices – Contra variant, covariant and mixed Tensors – Rank of a tensor – Symmetric and anti symmetric tensors – Contraction of tensor – Raising and Lowering of suffixes – Metric tensor.

UNIT-III: MATRIX THEORY

Introduction-Solution of linear algebraic equations – sub matrices- partitioning of matrices- Transpose of a matrix- The conjugate of a matrix - The conjugate of a transpose- Symmetric and anti symmetric matrices - Hermitian and skew - Hermitian matrices - Minors, Adjoint, Inverse and Determinant of a matrix- Orthogonal matrix- Unitary matrix and Trace of a matrix- Rank of a matrix- Eigen values and Eigen vectors – characteristic equation of a matrix - Cayley – Hamilton theorem – Diagonalization of a matrix.

UNIT-IV: ORDINARY DIFFERENTIAL EQUATIONS

Linear ordinary differential equations of first order - Solution of second order differential equations with constant co-efficients - Power series solutions: Frobenius method – Linear independence of solutions - Orthogonal set of functions and expansion theorem – Christoffel's expansion-Jacobi series - Sturm – Liouville differential equation.

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS

Solution of Laplace Equation in Cartesian co-ordinates- Diffusion equation or Fourier equation of heat flow-Method of forming partial differential equations –Method of separation of variables – Partial differential equations in physics problems -Wave equation – Equation of vibrating string – One dimensional heat flow – Two dimensional heat flow - Laplace equation - D' Alembert's solution- Fourier series solution.

BOOKS FOR STUDY:

1. Mathematical Physics – Sathya Prakash.
2. Mathematical Physics – B.D. Gupta Vikas Publishing House (P) Ltd.Noida-(2008).
3. A.W. Joshi - Matrices and Tensors in Physics - Wiley Eastern Ltd., New Delhi (1975).
4. P.K. Chattopadhyaya - Mathematical Physics - Wiley Eastern Ltd., New Delhi, (1990).

BOOKS FOR REFERENCE:

1. Eugene Butkov - Mathematical Physics - Addison Wesley, London (1973).
2. L.A. Pipes and L.R Havil - Applied Mathematics for Engineers and Physicists - McGraw Hill Company, Singapore (1967).
3. H.K.Das & Dr. Rama Verma- Higher Mathematical Physics-S.Chand & Company Pvt Ltd., New Delhi, 2014.
4. G. Arfken and H.J. Weber - Mathematical Methods for Physicists, 4thcd. Prism Books, Bangalore, 1995).
5. M.D. Greenberg - Advanced Engineering Mathematics, 2nd ed. International ed., Prentice – Hall International NJ, (1998).
6. E. Kreyszig - Advanced Engineering Mathematics, 8th ed. Wiley, NY, (1999).

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Sl. No.: | | **Subject Code:** P15PH1C2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – I SEMESTER – CORE COURSE – II

(For the candidates admitted from the year 2015-16 onwards)

CLASSICAL DYNAMICS AND RELATIVITY

UNIT–I: FUNDAMENTAL PRINCIPLES AND LAGRANGIAN FORMULATION

Mechanics of a particle and system of particles – Conservation laws – constraints – Generalized co–ordinates – D'Alembert's principle and Lagrangian equation – Hamilton's principle – Langrange's equations – Applications: simple pendulum – compound pendulum – Atwood's Machine – Hamilton's Principle – Deduction of Hamilton's Principle.

UNIT –II: TWO BODY CENTRAL FORCE PROBLEMS

Equation of motion and first integral - The equivalent one dimensional problem and classification of orbits virial theorem – The Kepler problem – Inverse square law of force, the Laplace range – Lenz vector scattering in a centre force field – scattering in laboratory and centre of mass frames – Rutherford scattering.

UNIT – III: HAMILTON'S FORMULATION

Cyclic co-ordinates and conservation theorems- Hamilton's equation from variational principle – principle of least action- canonical transformation - Examples– Infinitesimal constant transformation – Lagrange and Poisson brackets – Hamilton Jacobi method – Action angle variables – Kepler problem in action angle variable – one dimensional Harmonic oscillator- motion of a particle in a plane under a central force field.

UNIT –IV: RIGID BODY DYNAMICS AND OSCILLATORY MOTION

Euler angles – Moments and products of inertia –Euler's equation – symmetrical top – Theory of small oscillations and normal modes – Frequencies of free vibration and normal co–ordinates – Linear triatomic molecule – Vibration of molecules – Longitudinal Vibrations of CO_2 molecule.

UNIT – V: RELATIVITY

Postulates of Special theory of relativity - four vector in special theory of relativity – Lorentz transformation in real four dimensional spaces – Minkowski space-covariant four dimensional formulations – force and energy equation relativistic mechanics – Lagrangian and Hamiltonian of relativistic mechanics.

BOOK FOR STUDY:

1. Classical Mechanics: Herbert Goldstein, 3rd Edition, New Delhi, Narosa publishing House.
2. Classical Mechanics: S.L. Gupta, V. Kumar, Pragati Prakashan, 2013.
3. Classical Mechanics: J. Upadhyaya, Himalaya, 2010.
4. Theory of Relativity: R.K.Pathira, Dover Pub., Inc., New York 2003.

BOOKS FOR REFERENCE:

1. Classical Mechanics: N.C.Rana and P.S.Joag, Tata McGraw Hill.
2. Introduction to Classical Mechanics: R.G.Takwalcal P.S.Puranik, TMGH.
3. Lagrangian and Hamiltonian: M.G.Calkin, Scientific Pub. Co., Ltd.,
4. Introduction to general Relativity: S.K Bose, Wiley and Sons.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR-5.
M.Sc. PHYSICS–I SEMESTER –CORE COURSE –III
(For the candidates admitted from the year 2015-16 onwards)

ANALOG AND DIGITAL ELECTRONICS

UNIT- I: THYRISTORS AND THEIR APPLICATIONS

Silicon control rectifier – operation –equivalent circuit –V-I Characteristics- half wave rectifier- 90^0 variable half wave rectifier -180^0 variable half wave rectifier –SCR-full wave rectifier - TRIAC – operation –V-I Characteristics - TRIAC power control – TRIAC phase control - Unijunction transistor – construction – equivalent circuit – operation – V-I characteristics - UJT triggered SCR phase control –DIAC – V-I characteristics – DIAC Phase control.

UNIT-II : TRANSDUCERS AND INSTRUMENTATION AMPLIFIERS

Transducers: Displacement Transducer – Capacitive Transducer –Inductive Transducer- Variable Differential Transformer Transducer (LVDT) –Oscillation Transducer – Piezo electric Transducer – Potentiometer Transducer – Velocity Transducer.

Instrumentation amplifiers: Instrumentation amplifier using transduced bridge- temperature indicator- temperature controller –light intensity meter – measurement of flow and thermal conductivity – analog weight scale – differential input and differential output amplifier.

UNIT-III: OP-AMP FILTERS AND OSCILLATORS

Active filters: First and second order low and high pass Butter worth filter – band pass filter- Log and antilog amplifiers – solving second order differential equations - Oscillators: Phase shift oscillator - Wien bridge oscillator- square wave generator – triangular wave generator- saw tooth generator – voltage controlled oscillator.

UNIT –IV: BINARY CODES AND LOGIC HARDWARE

Binary codes: Weighted Binary Codes - non weighted codes – error deducting codes – error correcting codes- Logic hardware: Diode as a DC switch – Diode as a AC switch – Bipolar Transistor as a DC switch – Bipolar Transistor as a AC switch – Logic families: Resistor Transistor Logic (RTL) - Diode Transistor Logic (DTL) – Transistor - Transistor Logic(TTL).

UNIT –V: SEQUENTIAL AND MEMORY CIRCUITS

Sequential circuits: Ripple Counters – Up/Down Counters – type T design - Non sequential counting– Type D design - Shift Register – Ring Counters – type JK design – Cycle Counters - Memory circuits: Introduction to memories – Read only memories – Bipolar ROMs – MOSROMs - Applications of ROM – Static Random Access Memories – Bipolar RAMs – MOS RAMs - Dynamic Random Access Memories.

BOOKS FOR STUDY

1. A Text book of applied electronics – Dr. R.S. Sedha- revised edition 2013 – S.Chand Company limited **(For Unit I)**
2. Modern electronic instrumentation and measurement techniques – A.D Helfrick and W.D Cooper – PHI Private Ltd. **(For unit-II)**
3. OPAMPs and linear integrated circuits – Ramakant A Gayakwad 3rd edition PHI private ltd. New Delhi. **(For unit-II and III)**
4. Digital electronics – William H.Gothman - 2nd edition PHI private limited New Delhi (**For unit IVand V**)

BOOKS FOR REFERENCE

1. Digital Principles and Applications- A.P. Malvino and D.P. Leach- McGraw Hill Publications.
2. Digital Design-M.Morris Mano- 3rd Edition- PHI (P) Ltd., New Delhi.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR- 05
M.Sc., PHYSICS- I SEMSTER – ELECTIVE COURSE I
(For the candidates admitted from the year 2015-16 onwards)

CONDENSED MATTER PHYSICS

UNIT - I: RECIPROCAL LATTICE AND X-RAY DIFFRACTION TECHNIQUES:

Reciprocal lattices and their applications to diffraction techniques- Ewald Sphere-interaction of X-Rays with matter-absorption of X-rays- experimental diffraction techniques-Laue's diffraction technique- Powder X-ray Diffraction Technique- indexing of powder photographs and lattice parameter determination-applications of powder X-ray diffraction method-general concept of atomic scattering factor and structure factor.

UNIT – II: DEFECTS IN SOLIDS AND NON-DESTRUCTIVE TESTING (NDT)

Defects in Solids: Point defects- line defects (slip, plastic deformation, edge dislocation, screw dislocation, Burger's vector, concentration of line defects, estimation of dislocation density), surface (Planar) defects- grain boundaries and stacking faults. Non-Destructive Testing: X-Ray Radiography Technique and displacement method – X-ray fluoroscopy – merits and demerits of X-Ray Radiography – liquid penetrate method - Ultrasonic flaw detector - merits and demerits of Ultrasonic testing.

UNIT – III: ENERGY BANDS IN METALS AND SEMICONDUCTOR MATERIALS

Energy levels and density of states – Fermi-Dirac distribution – Free electron gas in three dimensions – Heat capacity of the electron gas – Kronig Penny model– Semiconductors – Band gap – Effective mass – Intrinsic carrier concentration - derivation- Fermi level- variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration - derivation – compound semiconductors .

UNIT - IV: LATTICE VIBRATIONS AND THERMAL PROPERTIES

Vibration of mono atomic lattices - Lattices with two atoms per Primitive cell - Quantization of lattice vibrations - Phonon momentum – Inelastic scattering of neutrons by Phonons - Lattice heat capacity - Classical theory of lattice heat capacity - Einstein model - Density of modes in one dimension and three dimension - Debye model of lattice heat capacity- Thermal conductivity.

UNIT V: ADVANCED MATERIALS

Shape Memory Alloys (SMAs) - Characteristics – Properties of Ni-Ti alloy - applications – advantages and disadvantages of Shape Memory Alloys –Metallic glasses: Preparation, properties and uses - Bio materials – properties - uses. Nanomaterials: Synthesis- plasma arc method- chemical vapour deposition method- ball milling - Properties-applications.

BOOKS FOR STUDY:

1. Introduction to Solid State Physics, C. Kittel, Wiley Eastern- New Delhi.
2. Solid State Physics, A.J. Dekker, Macmillan, India.
3. Solid State Physics, S.O. Pillai, Wiley Eastern Ltd.
4. Solid State Physics, B.S. Saxena, R.C. Gupta & P.N. Saxena Pragati Prakashan, Meerut.
5. Crystallography for solid state physics, A.R. Verma and O.N. Srivastava, Wiley.
6. Elements of X-ray crystallography, L.V. Azaroff, McGraw-Hill.

BOOKS FOR REFERENCE:

1. Solid State Physics – S.L.Gupta & Dr.V.Kumar.
2. Fundamentals of Solid State Physics – Saxena Gupta and Saxena.
3. N.W.Asherof and N. D. Mermin, Solid State Physics, Holt, Rinehart and Winston,International Edition, Philadelphia.
4. J. S. Blakemore, Solid State Physics, Second edition Cambridge University press, Cambridge,London (1974)
5. M. M. Woolfson, An Introduction to X-ray Crystallography, Vikas publishing Ltd. (1978).

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Sl. No.: | | **Subject Code:** | P15PH2C4P |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – II SEMESTER – CORE COURSE – IV

(For the candidates admitted from the year 2015-16 onwards)

BASIC PRACTICAL (GENERAL AND ELECTRONICS)
(Any Fifteen experiments)

A GENERAL EXPERIMENTS (MINIMUM SIX)

1. Determination of Co-efficient of coupling by ac Bridge Method.
2. Determination of q, n, σ by Elliptical fringes Method.
3. Determination of q, n, σ by Hyperbolic fringes Method.
4. Determination of Stefan's Constant.
5. Determination of Dielectric Constant at high frequency by Lecher Wire.
6. Determination of e/m of an Electron Magnetron Method.
7. Determination of L of a coil by Anderson's Method.
8. Photo Electric Effect (Planck's Constant Determination).
9. Determination of numerical aperture of an optical fiber.
10. Diameter of a thin wire & pin hole using laser.
11. Determination of particle size & verification of Malus law.
12. B-H loop – Energy loss of a magnetic material Anchor ring using BG.

B. ELECTRONICS EXPERIMENTS (MINIMUM SIX)

13. Design and study of monostable Multivibrator using IC.
14. Design and study of Astable Multivibrator using IC.
15. UJT Characteristics and Relaxation oscillator using UJT.
16. Common Drain Amplifier using FET.
17. FET Amplifier design.
18. Construction of Dual regulated power supply.
19. Design and study of Wien bridge oscillator using IC 741.
20. Design and study of Phase shift oscillator using IC 741.
21. Filters using IC 741.
22. Solving simultaneous and differential equations using IC 741.

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GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – II SEMESTER – CORE COURSE – V

(For the candidates admitted from the year 2015-16 onwards)

ADVANCED GENERAL AND MICROPROCESSOR LAB

(Any Fifteen experiments)

A. ADVANCED GENERAL EXPERIMENTS (MINIMUM SIX)

1. Four Probe Method-Determination of resistivity of a sample
2. Determination of Carrier concentration and Hall Co-efficient in Semiconductors
3. Determination of Magnetic Susceptibility of liquid by Guoy's Method
4. Determination of Magnetic Susceptibility of Quincke's Method
5. Determination of Wavelength and thickness of a film using Michelson's Interferometer.
6. Charge of an electron by Spectrometer.
7. Polarizability of liquids by finding the refractive indices at different wavelengths by spectrometer.
8. Refractive Index of Transparent Solids, Liquids and Brewster's angle using laser.
9. Rydberg's constant by spectrometer.
10. Wavelength calculation using Hartmann's formula by constant deviation spectrograph.
11. Determination of specific rotatory power of a liquid using Polarimeter.
12. Determination of wavelength of monochromatic source using biprism.

B. MICROPROCESSOR EXPERIMENTS (MINIMUM SIX)

1. To find the largest and smallest number
2. To find the sum of series
3. Interfacing - LED
4. Interfacing – A/D converter
5. Interfacing – D/A converter
6. Interfacing – Relay
7. Interfacing – Stepper Motor
8. Interfacing – Temperature Measurement
9. Interfacing – Traffic control system.
10. Interfacing – Seven Segment Display add on board

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Sl. No.: Subject Code: P15PH2C6

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR- 05

M.Sc., PHYSICS- II SEMSTER – CORE COURSE VI

(For the candidates admitted from the year 2015-16 onwards)

MATHEMATICAL PHYSICS – II

UNIT- I: COMPLEX ANALYSIS

Complex numbers- Review of algebraic operations on complex numbers- Complex conjugates-Modulus and argument of a complex number- Functions of complex variables- Limit, Continuity and Differentiability – 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- II: INTEGRAL TRANSFORMS

Fourier series – Uses - Dirichlet's theorem: Dirichlet's conditions- change of Interval form- Physical examples of fourier series- Properties of fourier series- Determination of Fourier coefficients – Fourier integrals – Fourier transforms – Faltung theorem – Application to heat and wave Equations – Laplace transform – Convolution theorem – Solution of ordinary differential equations.

UNIT-III: GREEN'S FUNCTION TECHNIQUES AND INTEGRAL EQUATIONS

Green's functions – Properties – Green's function for one dimensional case- Green's function for Poisson's equation and solution – Methods of solutions in one dimension – Applications of linear integral equations – Fredholm and Volterra type - Neumann series – Eigen function expansion – Applications.

UNIT-IV: SPECIAL FUNCTIONS

Gamma and Beta functions- Symmetry property of beta functions- Evaluation of beta function-– Legendre, Bessel, Laugerre and Hermite differential equations: Series solution – Rodrigue's formula generating functions – Orthogonality relations – importance of recurrence relations.

UNIT-V: GROUP THEORY

Concept of a group- Abelian group- The generators of a finite group- The cyclic group- Multiplication table – Subgroups, cosets and classes – Direct product groups – Point groups – Space groups – Representation theory –Homomorphism and isomorphism – Reducible and irreducible representations –Cayley's theorem- The unitary and point groups- Schur's lemma – The great Orthogonality theorem – Character table – C_3V and D_3H as examples – Elementary ideas of rotation groups.

BOOKS FOR STUDY:

1. Mathematical Physics – Sathya Prakash.
2. Mathematical Physics – B.D.Gupta- Vikas Publishing House (P) Ltd., Noida-2008.
3. A.W. Joshi - Elements of Group Theory for Physicists (Wiley Eastern, New Delhi, 1971).
4. E. Kreyszig - Advanced Engineering mathematics (Wiley Eastern, New Delhi, 1983).
5. G. Arfken and H.J. Weber - Mathematical Methods for Physicists (Prism Books, Bangalore, 1995).

BOOKS FOR REFERENCE:

1. H.K.Das & Dr. Rama Verma- Higher Mathematical Physics- S.Chand & Company Pvt Ltd., NewDelhi, 2014.
2. A.K. Ghatak, I.C. Goyaland A.J. Chua - Mathematical Physics (McMillan, New Delhi, 1995).
3. P.K. Chattopadhyaya - Mathematical Physics (Wiley, Eastern, New Delhi, 1990).
4. W.W.Bell- Special Functions for Scientists and Engineers (Van Nostrand, New York, 1968).
5. L.A.Pipes and L.R. Harvil - Applied Mathematics for Engineers and Physicists (McGraw Hill, Singapore, 1970)
6. F.A. Cotton - Chemical Applications of Group theory (Wiley Eastern, New Delhi, 1987).

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Sl. No.: | | **Subject Code:** | P15PH2C7 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – II SEMESTER – CORE COURSE – VII

(For the candidates admitted from the year 2015-16 onwards)

QUANTUM MECHANICS

UNIT – I: MATRIX FORMULATION AND REPRESENTATION THEORY

Dirac's bra and ket notation – Hilbert space - Dynamical Variables and linear Operators; projection operators, Unitary operator, matrix representation of an operator – Unitary transformation: Change of basis – Significant properties of Unitary transformations – Matrix theory of Harmonic oscillator – Schrodinger, Heisenberg and Interaction pictures.

UNIT–II: APPROXIMATION METHODS

Time dependent perturbation theory - Transition to the Continuum States – Fermi's Golden rule – Harmonic Perturbation – Selection rules for dipole radiations -Non – Degenerate and degenerate cases – Stark effect in the ground state and first excited state of hydrogen atom – Zeeman effect in alkali atoms – WKB approximation and its validity.

UNIT –III: APPROXIMATION IN ATOMIC AND MOLECULAR TRUCTURE

Central field approximation – Thomas – Fermi statistical Model – Hartee's self consistent field theory – Hartee–Fock modification – Hydrogen ion – Born–Oppenheimer approximation – Heitler – London theory of hydrogen molecule. Molecular orbital theory – Concept of atomic, hybrid and molecular orbit – LCAO treatment of molecular orbitals of CH_4 – Hybridization.

UNIT-IV: SCATTERING THEORY AND ANGULAR MOMENTUM

Scattering cross section–Scattering Amplitude – Green's function – Born approximation and its validity – Partial wave analysis – Differential and total cross–sections (optical theorem) Angular Momentum: Orbital angular momentum – Spin angular momentum – Total angular momentum operators – Commutation relations of total angular momentum with components – Ladder operators – Commutation relation of J_z with J_+ and J_- – Eigen values of J^2 and J_Z – Addition of angular momenta – Clebsch–Gordan co-efficients (basic ideas only).

UNIT-V: RELATIVISTIC QUANTUM MECHANICS

Klein–Gordan equation for free particle – Equation of continuity, probability density and probability current density for Klein–Gordan equation – Dirac's relativistic wave equation for free particle – Dirac Matrices – Plane wave solution of Dirac's relativistic wave equation – Negative energy states – Equation of continuity, probability density and probability current density for Dirac equation – Spin angular momentum – spin–orbit coupling.

BOOKS FOR STUDY:

1. P.M.Mathews & K.Venkatesan, *A Text Book of Quantum Mechanics* – TMH, New Delhi – 2008
2. G.Aruldas, *Quantum Mechanics*, PHI, New Delhi -2006.
3. Satyaprakash, *Quantum Mechanics*, Kedar Nath Ram Nath & Co, Meerut, 2006.
4. B.S. Rajput, *Advanced Quantum Mechanics*, Pragati Prakashan, Meerut, 2008.
5. Manas Chanda, *Atomic Structures and chemical bond* – TMH, New Delhi, 1991
6. Peter W. Atkins, Ronald S Friedman, *Molecular Quantum Mechanics*, Oxford University Press, IV Edition, 2007

BOOKS FOR REFERENCE:

1. Sujaul Chowdhury, *Quantum Mechanics* – Narosa publishing House, New Delhi, 2014
2. V.Devanathan, *Quantum Mechanics* – Narosa publishing House, New Delhi, 2011

3. V.K.Thankappan, *Quantum Mechanics*, New Age International publishers, New Delhi, 2006.
4. Lenord I Schiff, *Quantum Mechanics*, TMH, New Delhi, III Edition, 2010

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Sl. No.: **Subject Code:** **P15PH2C8**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – II SEMESTER – CORE COURSE – VIII

(For the candidates admitted from the year 2015-16 onwards)

ELECTRO MAGNETIC THEORY

UNIT – I: INTRODUCTION TO ELECTROSTATICS

Coulomb's law – Electric field – Gauss law – Scalar potential – Poisson and Laplace Equation – Green's theorem – Dirichlet and Neumann boundary conditions – Electrostatic boundary value problems: Solution using Green's function – Method of images illustrations: point charge in the presence of (i) a grounded conducting sphere, (ii) a charged, insulated and conducting sphere, (iii) near a conducting sphere at fixed potential and (iv) conducting sphere in a uniform electric field – Green's function for the sphere.

UNIT – II: ELECTROSTATICS OF MACROSCOPIC MEDIA

Multipole expansion – Boundary value problems with dielectrics – Illustrations: (i) point charge embedded at a distance away from a dielectric interfaced, (ii) dielectric sphere in a uniform electric field and (iii) spherical cavity in a dielectric medium with applied electric field – Molecular Polarizability and Electric Susceptibility – Electrostatic energy in dielectric media.

UNIT – III: MAGNETOSTATICS

Biot and Savert's law –Divergence and Curl of Magnetic Induction- Force between current carrying conductors – Differential equations of Magnetostatics – Magnetic Vector potential –- Magnetic field of a localized current distribution –Magnetic moment and force on a current distribution in an external field – Magnetostatic energy- Magnetic Field of boundary conditions on B and H – Methods of solving boundary value problems in magnetostatics – Uniformly magnetized sphere.

UNIT – IV: ELECTROMAGNETIC INDUCTION

Faraday's law of induction – Maxwell's displacement current – Maxwell equations – Maxwell equations in terms of vector and scalar potentials – Gauge transformation – Lorentz gauge- Coulomb gauge – Poynting's theorem – Conservation of energy and momentum for a system of charged particles and electromagnetic fields.

UNIT – V: PLANE ELECTROMAGNETIC WAVES AND WAVE PROPAGATION

Plane waves in a non-conducting medium – Linear and circular polarization, Stokes parameters – Reflection and refraction of electromagnetic waves at a plane interface between dielectrics – Propagation of electromagnetic waves in hollow metallic cylinders -cylindrical and rectangular wave guides – TM and TE modes.

BOOKS FOR STUDY:

1. David J Griffths-Introduction to Electromagnetics- III edition, Prentice Hall of India Pvt., Ltd., - New Delhi (2000).
2. Classical Electrodynamics – John David Jackson-III Edition, John Wiley & co., (2000).
3. Electromagnetic theory – Sathya Prakash- Kedarnath Ramnath Publishing Co.,
4. Electromagnetic theory – Chopra Agarwal – K.Nath & Co.,(1984).

BOOKS FOR REFERENCE:

1. N.Narayana Rao- Basic Electromagnetics with Applications- , Prentice Hall of India Pvt., Ltd., - New Delhi (2002).
2. Umesh Sinha- Electomagnetic theory and applications- Technology India Publications, New Delhi, (2000).
3. Edward C. Jordan and Keith G. Balmain- Electromagnetic Waves and radiating systems- III Edition-, Prantice Hall of India Pvt., Ltd., - New Delhi (2000).
4. John R. Reitz- Foundations of Electromagnetic Theory- VI Edition, Narosa Publishing House, New Delhi.

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Sl. No.: Subject Code: P15PH2E2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – II SEMESTER – ELECTIVE COURSE – II

(For the candidates admitted from the year 2015-16 onwards)

MICROPROCESSOR AND MICROCONTROLLER

UNIT-I: MICROPROCESSOR ARCHITECTURE, INSTRUCTION SET AND INTERFACING:

Intel 8085 Microprocessor Architecture- Pin configuration- Instruction cycle- Timing diagram-Instruction and data formats- Addressing modes- Status flags- Intel 8085 instructions- Address Space partitioning- Memory and I/O Interfacing- Data transfer schemes,-Interrupts of Intel 8085-Generation of control signals for memory and I/O devices.

UNIT-II: 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 schemes- Programmable Peripheral Interface (8225A)- Timer Interface- DMA Controller – Programmable Interrupt Controller (8259) – Programmable Interface (8251)

UNIT – III: MICROCONTROLLER

8051: Microprocessor and Microcontroller - Pin Description of 8051 - Registers - Program Counter, ROM space, RAM space, Stack, PSW, SFR - Addressing Modes - Jump Call Instructions - Time delay generations and Calculations - Arithmetic and Logic Instructions – Bit Instructions - Assembly Language Programming - Data Types and Directives.

UNIT-IV: MICROCONTROLLER SFRS AND PROGRAMMING:

Counter / Timer - Counter Programming - Basics of Serial Communication - RS232 Connections and ICs Max 232 - 8051 Serial Communication Registers - Serial Communication Programming - Interrupts - Interrupts Registers - Internal and External Interrupt Programming

UNIT-V: MICROCONTROLLER APPLICATIONS:

Microcontroller Interfacing and Applications: Addition - subtraction – Multiplication and division - Interfacing - LCD, ADC 0809, Stepper Motor, Keyboard and DAC - traffic control – generation of square wave – Ramp Generator.

BOOKS FOR STUDY:

1. B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications (P) Ltd., New Delhi (2005).
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi - The 8051 Microcontroller and Embedded Systems, Pearson Education, Delhi, Seventh Indian Reprint 2004.
3. The 8051 Microcontroller Architechture Programming and Applications Kenneth J.Ayla.

BOOKS FOR REFERENCE:

1. A.P.Godse and D.A.Godse, Microprocessors and its applications (First edition), Technical Publications, Pune, 2006.
2. A.Nagoor Kani, Microprocessors & Microcontrollers, 1st edition, RBA Publications, Chennai, 2006

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Sl. No.: Subject Code: P15PH3C9

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – III SEMESTER – CORE COURSE – IX

(For the candidates admitted from the year 2015-16 onwards)

THERMODYNAMICS AND STATISTICAL MECHANICS

UNIT- I: THERMODYNAMICS

Thermodynamic coordinates- First law of thermodynamics: Applications – Adiabatic and Isothermal processes - Application of second law of thermodynamics: Carnot's theorem , Entropy disorder, Nernst's heat theorem,- Clausius inequality - Entropy changes in irreversible and reversible process- Application of third law of thermodynamics: Gibbs- Helmholtz equation- Expression for C_v and C_p – Mayer's relation - Clausius - Clapeyron Equation.

UNIT- II: CLASSICAL STATISTICAL BASIS OF THERMODYNAMICS

Phase space - Volume in Phase space, Number of phase cell in given energy range of harmonic oscillator and 3D free particles-Ensembles –uses - Statistical postulates – Boltzmann's theorem- Liouville's Theorem - Entropy of a ideal gas in micro canonical ensembles Boltzmann gas - Fermi gas and Bose gas– Free energy and its connection with thermodynamic quantities.

UNIT –III: CLASSICAL STATISTICAL DISTRIBUTION LAW

Macroscopic and Microscopic states- Stirling's approximation- classical Maxwell Boltzmann distribution law- function - velocities in ideal gas – Partition function for a gas molecule- Partition function and thermodynamic quantities – Translational, rotational, Vibrational partition function- Equation of Canonical and Micro Canonical Ensembles – Grand Canonical partition function and thermo dynamical quantities.

UNIT-IV: QUANTUM STATISTICAL MECHANICS

Quantum statistics of identical particles-Average value and quantum statistics – statistical weight of prior probability –Transport Properties: Boltzmann transport equation- Boltzmann transport equation for electrons and Lorentz solution - Sommerfield theory of electrical conductivity- thermal conductivity of metals- magneto resistance-viscosity from Boltzmann equation.

UNIT-V: APPLICATIONS OF QUANTUM STATISTICAL MECHANICS

Black body and Planck's radiation- Photons- Specific heat of solids- Gas Degeneracy- Degeneracy for molecular hydrogen- liquid Helium I and II - London theory - Properties- Vien-kinchner relationship - Slight Degeneracy-Strong Degeneracy- Electron Gas- Pauli's Paramagnetism - Ising and Heisenberg models.

BOOKS FOR STUDY:

1. Elementary Statistical Mechanics – Gupta and Kumar, Pragati Prakashan, Meerut, 8th Edition.
2. Statistical and Thermal physics – F. Reif, , McGraw Hill, International Edition, Singapore (1979)
3. Statistical Mechanics – B.K. Agarwal and M. Eisnor, New Age International Publishers, 2nd Edition.

BOOKS FOR REFERENCE:

1. Fundamentals of Statistical Mechanics – B.B.Laud, New Age International Publishers, New Delhi, 2007.
2. Statistical Mechanics – Kerson Huang, Wiley eastern Ltd., New Delhi, 1983.

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Sl. No.: | | **Subject Code:** | **P15PH3C10** |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – III SEMESTER – CORE COURSE – X

(For the candidates admitted from the year 2015-16 onwards)

NUCLEAR AND PARTICLE PHYSICS

UNIT – I: NUCLEAR PROPERTIES AND FORCE BETWEEN NUCLEONS

Nuclear radius, mass and abundance of nuclides - binding energy - nuclear angular momentum and parity- nuclear electromagnetic moments- nuclear excited state – Van-Waizacker's semi empirical mass formula- Deutron - nucleon – nucleon scattering - proton–proton and neutron-neutron interaction - properties of nuclear forces -Yukawa hypothesis.

UNIT- II: NUCLEAR DECAY

Alpha Decay : properties– Gamow's Theory of α -Decay – Geiger-Nuttal law – α -ray Energies – Fine Structure of α- rays – α-disintegration Energy – long range α- particle - Beta decay : Properties – General feature of β ray Spectrum – Neutrino theory of Beta Decay – Fermi's Theory of β- Decay – forms of interaction and selection rule - Gamma Decay : Properties-Absorption of ϒ-rays by matter – interaction of ϒ rays with matter- Measurement of ϒ-ray Energies – internal conversion.

UNIT-III : NUCLEAR MODELS AND ACCELERATORS

Nuclear Models: Liquid Drop model : Bohr-Wheeler Theory of fission – condition for spontaneous fission - Shell model: Explanation of magic numbers – prediction of nuclear spin and parity – nuclear statistics – magnetic moment of nuclei – nuclear isomerism optical model - Collective model: Explanation of quadrupole moment - Particle accelerators and Detectors:- , linear accelerator - Betatron, Synchrotron, Proportional counter, BF_3 counter, Scintillation counter, semiconductor detector.

UNIT- IV : NUCLEAR REACTIONS

Kinds of nuclear reactions and conservation laws – Q-value - energy of nuclear reactions – Iso-spin – continuum theory of reaction – Resonance – Breit-Wigner dispersion formula – stages of a nuclear reaction – statistical theory of nuclear reaction – kinematics of stripping and pick up reaction .

UNIT-V: PARTICLE PHYSICS

Building blocks of nucleus – Nucleons, Leptons , Mesons, Baryons, Hyperons, Hadrons, strange particles – classification of fundamental forces and elementary particles – basic conservation laws – additional conservation laws : baryonic , leptonic , strangeness and isospin charges /quantum numbers– Gell-Mann – Nishijima formula – multiplets – invariance under time reversal (t) charge conjugation (c) and parity (p) – CPT theorem – parity - non conservation in weak interaction - CP violation –Parity violation -Wu's experiment – Quark model.

BOOKS FOR STUDY:

1. D.C.Dayal – Nuclear Physics .
2. R.C. Sharma – Nuclear Physics
3 .T.C Tayal – Nuclear Physics-Umesh Prakashen –Gujarat
4. D.C.Cheng And G.K.O'Neil – Elementary Particle Physics.

BOOKS FOR REFERENCE:

1. K.S. Krane – Introductory Nuclaer Physics – John – Wiley, New York -1897
2. D.Griffths – Introduction to Elementary Particle Physics.
3. R.D.Evans- Atomic nucleus ,Mcgraw – Hill ,New York-1955.
4. I.Kaplan - Nuclear Physics ,Narosa , New Delhi- 1989.
5. B.L.cohen -Concepts of Nuclear physics ,TMH,New Delhi-1971.

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Sl. No.: **Subject Code:** **P15PH3C11**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – III SEMESTER –CORE COURSE – XI

(For the candidates admitted from the year 2015-16 onwards)

COMMUNICATION ELECTRONICS

UNIT- I: ANTENNAS & WAVE PROPAGATION

Radiation field and radiation resistance of a short dipole antenna- grounded λ/4 antenna- unground λ/2 antenna- antenna arrays- broadside and end side arrays- antenna Gain- directional high frequency antennas- sky wave propagation- Ionosphere-Ecles and Larmor Theory- Magneto ionic theory- ground wave propagation.

UNIT- II: ANALOG AND DIGITAL COMMUNICATION

Modulation-definition- types of modulation – Expression for amplitude modulated voltage- AM transmitter: block diagram and explanation _ Expression for amplitude modulated voltage - Pulse Modulation: definition, types- Pulse amplitude modulation- Pulse Code Modulation - Delta modulation – Data transmission: ASK, FSK, PSK - Multiplex transmission - Frequency and Time Division Multiplexing.

UNIT –III: MICROWAVES AND RADAR COMMUNICATION

Generation of microwaves – Klystron- Reflex Klystron - Magnetron - Detection of microwaves: TWT, IMPATT, TRAPATT and Gunn diodes - Radar – Principle- Radar equation - Pulse and CW Radar - MTI and Automatic Tracking Radar - uses.

UNIT-IV: OPTIC FIBER COMMUNICATION

Fiber optics - Different types of fiber: Step index and graded index fibers - Signal degradation fibers: Absorption, attenuation, scattering losses and dispersion - Optical sources and detectors (Quantitative only) - Power launching and coupling: Source to fiber launching - Fiber joints - Splicing techniques - General optical communication system.

UNIT-V: SATELLITE AND CELLULAR COMMUNICATION

Satellite links - Eclipses - Orbits and Inclination - Satellite construction - Satellite communication frequencies - Different domestic satellites-INTELSAT system - MARISAT satellites - Telemetry cellular concept - Multiple access cellular systems - Cellular systems operation and planning general principles - Analog cellular systems - Digital cellular mobile systems - GSM - CDMA cellular standards.

BOOKS FOR STUDY:

1. Dennis Reddy and John Coolen, Electronic Communication - Fourth Edition, PHI Private Ltd., (1999).
2. Hand book of Electronics by Gupta & Kumar-2008 Edition
3. *G.* Kennedy and Davis, Electronic Communication System, TMH, New Delhi 1999.
4. Gerd 3.Keiser, Optical Fiber Communication Third Edition, McGraw - Hill, Singapore 2000.
5. Raj Pandya, Mobile and Personal Communication Services and System, Prentice Hall of India, Private Ltd, New Delhi, 2003.

BOOKS FOR REFERENCE:

1. Sanjeev Gupta, Electronic Communication Systems, Khanna Publications, New Delhi,
2. N.D. Despandae, P.K. Rangole, Communication Electronics, Tata McGraw Hill Pvt. Ltd., (1998)
3. M. Arumugam, Optical Fiber Communication and Sensors, Anuradha Agencies, Kumbakonam, (2002).

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Sl. No.: | | **Subject Code:** | P15PH3E3 |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – III SEMESTER – ELECTIVE COURSE – III

(For the candidates admitted from the year 2015-16 onwards)

RESEARCH METHODOLOGY

UNIT – I: WORKING ON A RESEARCH PROBLEM

Scientific research: Aim and motivation - principles and ethics – Identification of research problems: Determining the mode of attack – Literature survey – Abstract of a research paper – Access using Internet web tools – e-mail – Impact and usefulness of the research problem – Role of research guide – Guidance and report – preparation and presentation of Scientific reports - need and methods – Power point and poster – Writing of synopsis and dissertation.

UNIT – II: CRYSTAL GROWTH

Nucleation – Different kinds of nucleation – Concept of formation of critical nucleus – Classical theory of nucleation – Solution Growth Techniques: - Solution-Solubility and super solubility - Seed preparation and mounting –Slow cooling and evaporation methods, Melt technique: Bridgman technique and Czochralski technique.

UNIT – III: THIN FILM DEPOSITION TECHNIQUES

Thin films - Introduction to Vacuum Technology - Deposition Techniques - Physical Methods - Resistive Heating, Electron Beam Gun, Laser Gun Evaporation and Flash Evaporations, Sputtering: Reactive -Radio - Frequency - Chemical Methods - Spray Pyrolysis - Preparation of Transparent Conducting Oxides.

UNIT – IV: NANOTECHNOLOGY

Emergence and challenges in Nanotechnology - Carbon age - New form of carbon - Nanocrystals - large surface to volume ratio, top-down and bottom-up approaches-self assembly process - grain boundary volume in nanocrystals - defects in nanocrystals-surface effects on the properties. Types of Nanostructures-1D, 2D, 3D nanostructured materials - Quantum dots – Quantum wire-Core/Shell structures. Properties and Applications of Nanomaterials.

UNIT – V: CHARACTERIZATION TECHNIQUES

X – Ray Diffraction(XRD) - Powder and Single crystal – Fourier transform Infrared and Raman analysis (FT-IR) - Elemental analysis – Elemental dispersive X-ray analysis(EDAX) - Scanning Electron Microscopy (SEM), UV-Vis-NIR Spectrometer – Vicker's Microhardness study Photoluminence study, Thermal study and Dielectric study.

BOOKS FOR STUDY :

1. J. Anderson, B.H Durston and M. Poole, Thesis and Assingnment writing (Wiley Eastern, New Delhi, 1977)
2. Rajammal Devadas, Hand Book of Methodology of Research (R.M.M. Vidyalaya Press, 1976).
3. C.R. Kothari, Research methodology: Methods and Techniques, (New age International, New Delhi, 2006).
4. J.C. Brice, Crystal Growth Processes, John Wiley and Sons, New York (1986).
5. P. SanthanaRagavan and P. Ramasamy,Crystal Growth Processes and Methods, KRU Publications, Kumbakonam (2001)
6. A. Goswami, Thin film fundamentals, New Age International(P) Limited, New Delhi (1996)

BOOKS FOR REFERENCE:

1. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, CBS, Publishers and Distributors, New Delhi.
2. 9. M.William and D. Steve, Instrumental Methods of Analysis (CBS Publishers, New Delhi)

Sl. No.: **Subject Code:** **P15PH4C12P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS – IV SEMESTER – CORE COURSE – XII

(For the candidates admitted from the year 2015-16 onwards)

ADVANCED ELECTRONICS – LAB – I
(Any Fifteen Experiments)

A. ADVANCED ELECTRONICS

1. Half Adder-Full Adder (using NAND gates).
2. Half Subtractor & Full Subtractor (using NAND gates).
3. Flip Flop – (RS, JK, D,T – F/F)
4. Study the function of Encoder and Decoder.
5. Study the function of Multiplexer and Demultiplexer.
6. D/A Converter: i) R-2R resistor network , ii) weighted resistor network
7. Digital Comparator using EX OR and NAND gates.
8. Study of the counter using IC 7490 (0 - 9 and 00 – 99)
9. 7 Segment display.
10. Laser diode characteristics.
11. Determination of wavelength of a laser source by using diffraction grating.
12. Diffraction of Light by single slit, Double slit and Grating using LASER.
13. Characteristic study of LED, LDR and Photo Diode using Laser.
14. Determination of Bending Losses and Attenuation by Fiber Cut-Back Method using laser.
15. Absorption of Light on Various Filter.
16. Michelson's Interferometer using LASER source.
17. Gaussian Nature of the LASER beam & Evaluation of Beam spot size.
18. DIAC, TRIAC – characteristics and applications.
19. Shift register and ring counter.
20. BCD adder.

Sl. No.: [ ] **Subject Code:** **P15PH4C13P**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS) KARUR-05

M.Sc., PHYSICS –IV SEMESTER – CORE COURSE – XIII

(For the candidates admitted from the year 2015-16 onwards)

ADVANCED ELECTRONICS – LAB - II

(Microcontroller and Interfacing Lab)

(Any fifteen experiments)

1. Interfacing – A/D converter.
2. Interfacing – D/A converter.
3. Interfacing – LED.
4. Interfacing – Printer.
5. Real time clock.
6. Six letter word display.
7. Rolling Display.
8. Traffic control system.
9. Studies of Seven Segment Display add on board.
10. Interfacing – Stepper Motor.
11. Interfacing – Temperature Measurement.
12. 16 bit Addition, 2's Complement and 1's Complement Subtraction (8086/8088)
13. Conversion from Decimal to Octal and Hexa systems.
14. Conversion from Octal, Hexa to Decimal system.
15. Generation of Square, Triangular, Sawtooth, Staircase and Sine waves using DAC 0800.
16. Ascending order Descending order.
17. Microcontroller Programming with C simulator –I.
18. Square wave generator.
19. Ramp wave generator.
20. Block of data transfer.
21. Program with subroutine.
22. Program using interrupt.

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Sl. No.: [ ] **Subject Code:** **P15PH4E4**

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR -05.
M.Sc., PHYSICS –IV SEMESTER –ELECTIVECOURSE –IV
(For the candidates admitted from the year 2015-2016 onwards)

MOLECULAR SPECTROSCOPY

UNIT – I: PRINCIPLES OF SPECTROSCOPY

Electromagnetic radiation – wave theory of e.m radiation - interaction of e.m radiation with matter – Born-Oppenheimer approximation – types of molecular spectra – characteristic features for absorption and emission of e.m radiation - spectral band – Doppler broadening – intensity of spectral lines and transition probability – energy dissipation from excited states.

UNIT –II: MICROWAVE AND IR SPECTROSCOPY

Rotational spectra of Diatomic molecules –Effect of isotopic substitution –Non- rigid rotator –Rotational spectra of polyatomic molecules –Linear, symmetric top and Asymmetric top molecules –Experimental techniques –Vibrating diatomic Molecule –Diatomic vibrating rotator –Linear and symmetric top molecules -Analysis techniques –Characteristic and group frequencies.

UNIT –III: RAMAN SPECTROSCOPY AND ELECTRONIC SPECTROSCOPY OF MOLECULES

Raman spectroscopy: Raman effect–Quantum theory –Raman shifts of diatomic molecules - rotational and vibrational spectra –selection rules.

Electronic spectroscopy of molecules: electronic spectra of diatomic molecules – Franck –Condon principle –dissociation energy and dissociation products – rotational fine structure of electronic vibration transitions.

UNIT –IV: RESONANCE SPECTROSCOPY

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

ESR: Basic principles –ESR spectrometer –Nuclear interaction and Hyperfine structure - relaxation effects –g-factor- characteristics –Free radical studies and biological applications.

UNIT – V:NQR & MOSSBAUER SPECTROSCOPY

NQR Spectroscopy: Fundamental Requirements- Principle – Experimental detection of NQR Frequencies – Interpretation and chemical Explanation of NQR Spectroscopy.

Mossbauer Spectroscopy: Mossabauer Effect-Recoil less Emission and Absorption – Mossabauer Spectrum- Experimental Methods – Hyperfine Interaction-Chemical Shift-Magnetic Hyperfine and Electric Quadrapole Interaction.

BOOKS FOR STUDY:

1. C.N Banwell _ Fundamentals of Molecular Spectroscopy –TMH-4thEdition.
2. G.Aruldas – Molecular Structure and Spectroscopy –Prentice Hall of India.

BOOKS FOR REFERENCE:

1. Arthur Beiser –Concept of Modern Physics-Tata McGraw Hill Publication.
2. D.N. Satyanarayana –Vibrational Spectroscopy and Applications –New Age International.

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Sl. No.: | | **Subject Code:** | P15PH4PW |

GOVERNMENT ARTS COLLEGE (AUTONOMOUS): KARUR-05

M.Sc., - PHYSICS – IV SEMESTER – PROJECT WORK

(For the candidates admitted from the year 2015-16 onwards)

PROJECT WORK

SL.	Area of Work	Maximum Marks
1.	**PROJECT WORK:** **(i) Plan of the Project** **(ii) Execution of the plan / Collection of data / Organization of materials/ Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.** **(iii) Individual Initiative**	**20** **45** **15**
2.	**VIVA VOCE EXAMINATION**	**20**
	TOTAL	**100**

PASSING MINIMUM – 50 MARKS

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