D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester

Title of Paper: 101: CLASSICAL MECHANICS

Introduction, Mechanic of particle
Mechanics of system of particles, constraints, D'Alembbert's principle
Lagrange's equations velocity dependent potentials and Dissipation function simple application of the Lagrangian formulation
Hamilton's principle some techniques of variations Derivation of Lagrange's equations from Hamilton's principle Conservation theorems and symmetry properties Energy function and the conservation of energy
Reduction to the equivalent one body problem The equation of motion and first Integrals, The equivalent One – Dimensional problem and classification of orbits, The differential equation for the orbit, and Integrable power –law potentials, Conditions for closed orbits (Bertrand's theorem).
The Kepler problem inverse square law of force, The motion in time in the Kepler problem, Scattering in a central force field Legendre transformations and Hamilton's equations of motion.
Cyclic Coordinates and conservation theorems, Derivation of Hamilton's equation of motion from variational principle, Principle of Least Action.
Equations of canonical transformation, Examples of Canonical transformations, The harmonic Oscillator, Poisson brackets and other Canonical invariants formulation.
Equations of motion, Infinitesimal canonical transformations, and conservation theorems in the Poisson bracket
Conservation theorems in the Poisson bracket
The angular momentum Poisson bracket relations. Hamilton – Jacobi equation of Hamilton's principal function.
The Harmonic oscillator problem as an example of the Hamilton – Jacobi Method. Hamilton –Jacobi equation for Hamilton's characteristic function
Action – angle variables in systems of one degree of freedom. Independent coordinates of rigid body, The Euler angles and Euler's theorem on the Motion of a rigid body.
DASARA VECATION
Infinitesimal rotations, Rate of change of a vector, The Coriolis Effect. The Inertia tensor and the moment of inertia
The Eigen values of the inertia tensor and the principal axis transformation, Solving rigid body problems and Euler equations of motion, Torque – free motion of a rigid body The Eigen value equation and the principal axis transformation, Frequencies of free vibration, and normal coordinates, Free vibrations of a linear tri atomic molecule

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester

Title of Paper: 102: INTRODUCTORY QUANTUM MECHANICS

Basics of physics. Recollecting the subject from Inter and Degree
Introduction and wave particle duality, Uncertainty principle
Principle of superposition, wave packets, phase velocity and group velocity
Schrodinger wave Equation, wave function interpretation and admissibility conditions, probability current density, expectation values
One dimensional problem, particle in a potential well with finite and infinite walls, Potential step.
Potential barrier, Linear harmonic oscillator, Free particle
Particle moving in a spherically symmetric potential, spherical harmonics, radial equation,
Eigen values and Eigen functions of rigid rotator, hydrogen atom, hydrogenic orbital's, angular momentum operators, commutation relations
L,L^2,L_+,L_-,Spin angular momentum, general angular momentum
Bracket notation, ortho normal functions, linear operators and their properties
Hermit an operator, Schmidt orthogonalization, Postulates of quantum mechanics, simultaneous measurability of observables
Commutator algebra, equation of motion of an operator (Schrodinger representation), Momentum representation – Dirac delta function and properties.
Perturbation, Time-dependent perturbation theory for non degenerate systems and application to ground state of helium atom.
DASARA VECATION
Degenerate systems, application to linear stark effect in hydrogen. Variation method its application to helium atom. Exchange energy
Low lying excited states of helium atom. WKB method, barrier penetration.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 1^{st} Semester

Title of Paper: 103: MATHEMATICAL METHODS OF PHYSICS

Function of complex number-definition-properties, analytic function-Cauchy-Riemann conditions
Polar form-problems ,complex differentiation, complex integration -Cauchy's integral theorem-Cauchy's integral formulae
Multiply connected region-problems, infinite series-Taylor's theorem
Laurent's theorem- problems, Cauchy's Residue theorem-evaluation of definite integrals-problems
Beta & Gamma functions-definition, relation between them-properties-evaluation some integrals.
Legendre Polynomial, Her mite Polynomial, Laguerre Polynomial
Generating function-recurrence relations-Rodriguez's formula- orthogonal property
Associated Legendre polynomial-simple recurrence relation- orthogonal property-spherical harmonics
Laplace transforms-definition-properties-Laplace transform of elementary functions-inverse Laplace transforms properties-evaluation of inverse Laplace transforms
Elementary function method-partial fraction method-heavy side expansion method-convolution method-complex inversion formula method
Application to differential equations Fourier series-evaluation of Fourier coefficients-Fourier integral theorem-problems-square wave-rectangular wave-triangular wave.
Fourier transforms-infinite Fourier transforms-finite Fourier transforms-properties-problems-application to boundary value problem, Solutions of algebraic and Transcendental equations-bisection method.
Method of successive approximations- method of false position- iteration method Newton Rapson method simultaneous linear algebraic equations-Gauss elimination method
DASARAVECATION
Gauss Jardon method- matrix inversion method-Jacobi method Gauss-siedel method inter polation with equal intervals-finite differences – Newton forward &backward
Interpolation with equal intervals-finite differences-Newton forward& backward interpolation

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester

Title of Paper: 104: ELECTRONIC DEVICES AND CIRCUITS

Introduction of electronic device and circuits and brief explanation of following unites, Explanation of Tunnel diode
photo diode and solar cell, Explanation of led
silicon controlled rectifier , uni junction
Explanation of transistors , FET,JFET,MOSFET, CMOS
Introduction of microwave devices. Explanation of different types diodes
Varactor diode ,parametric amplifier and different types of amplifiers explained
Thyristors, Klystron, Reflex Klystron, Gunn Diode
Magnetron, CFA, TWT, BWO, IMPATT
Explanation of TRAPATT (Principle, working and Applications for all devices) revisions of the chapter
OPERATIONAL AMPLIFIERS The ideal Op Amp – Practical inverting and Non inverting Op Amp stages.
Op Amp Architecture – differential stage, gain stage
DC level shifting, output stage, offset voltages and currents. Common Mode Rejection Ratio, Slew Rate
Operational Amplifier parameters- input offset voltage, input bias current, OP- AMP APPLICATIONS Summing amplifier, Integrator, Differentiator.
DASARA VECATION
Voltage to Current converter, Current to Voltage converter Oscillators
Phase shift oscillator, Wien-Bridge Oscillator, Voltage Controlled Oscillator, Schmitt Trigger Special applications Mono stable and A stable Multi vibrators using 555, Phase locked Loop

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 2nd Semester
Title of Paper : 201: ELECTRODYNAMICS

Introduction of unit –I Gauss Theorem, Poisson's equation and explanation
Laplace equation, solution to Laplace equation in Cartesian coordinates, spherical coordinates
Cylindrical coordinates, use of Laplace equation in the solutions of electrostatic problems.
Ampere's circuital law, magnetic vector potential, displacement current, Faraday's law of electromagnetic induction
Maxwell's equations, differential and integral forms, physical significance of Maxwell's equations.
Wave equation, plane electromagnetic waves in free space , in non conducting isotropic medium, in conducting medium, electromagnetic vector and scalar potentials,
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz gauge, Coulomb gauge
Charged particles in electric and magnetic fields: charged particles in uniform electric field,
Charged particles in homogenous magnetic fields,
Charged particles in simultaneous electric and magnetic fields, charged particles in non homogeneous magnetic fields
Lenard- Wiechert potentials, electromagnetic fields from Lenard -wiechert potentials of a moving charge, electromagnetic fields of a uniformly moving charge, radiation due to non-relativistic charges,
Radiation damping, Abraham-Lorentz formula, Cherenkov radiation, radiation due to an oscillatory electric dipole, radiation due to a small current element.
Condition for plasma existence, occurrence of plasma, magneto hydrodynamics, plasma waves
Transformation of electromagnetic potentials, Lorentz condition in covariant form
Invariance or covariance of Maxwell field equations in terms of 4 vectors,
Electromagnetic field tensor, Lorentz transformation of electric and magnetic fields
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz gauge, Coulomb gauge

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics Class: 1M.Sc. Semester: 2nd Semester
Title of Paper : 202: STATISTICAL MECHANICS

Introduction to thermodynamics
Specification of the state of a system, phase space and quantum states, Liouvilles theorem, Basic postulates, Probability calculations, concept of ensembles, thermal interaction,
Mechanical interaction, quasi static process, distribution of energy between systems in equilibrium, statistical calculations of thermo dynamic quantities, Isolated systems (Micro canonical ensemble).
Entropy of a perfect gas in micro canonical ensemble. Canonical ensemble - system in contact with heat reservoir, system with specified mean energy, connection with thermodynamics, Energy fluctuations in the canonical ensemble.
Grand canonical ensemble, Thermodynamic function for the grand canonical ensemble. Density and energy fluctuations in the grand canonical ensemble. Thermodynamic equivalence of ensembles.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas. Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion
Harmonic Oscillator, Specific heats of solids (Einstein and Debye model of solids), Para magnetism, Partition function for polyatomic molecules, Electronic energy,
Vibrational energy and rotational energy of a diatomic molecule.
Effect of Nuclear spin-ortho and para Hydrogen. Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas.
Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion. Harmonic Oscillator, Specific heats of solids
Para magnetism, Partition function for polyatomic molecules, Electronic energy, vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen
Formulation of the statistical problem. Maxwell–Boltzmann statistics. Photon statistics, Bose-Einstein statistics, Fermi–Dirac statistics
Quantum statistics in the classical limit, calculation of dispersion for MB, BE & FD statistics Equation of state of an Ideal Bose Gas,
Black body radiation, Bose-Einstein condensation, Equation of state for a weakly degenerate and strongly degenerate ideal Fermi gas. Thermionic emission. The theory of white dwarf stars.
Non ideal classical gas: Calculation of the partition functions for low densities. Equation of state and virial coefficients (Van Dar Walls equation)
Phase transition, conditions for Phase equilibrium, First order Phase transition..
Clausius-Clayperon equation, Second order phase transition, The critical indices.
Vander walls theory of liquid gas transition. Order parameter, Landau theory.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,

SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 2nd Semester
Title of Paper : 203: ATOMIC AND MOLECULAR PHYSICS

Quantum numbers, Term values. Relation between Magnetic dipole moment and angular momentum of an orbiting electron.
Stern–Gerlach experiment and electron spin . Spin- orbit interaction, relativistic kinetic energy correction and dependence of energy on J value only.
Selection rules. Fine structure of Balmer series of Hydrogen and Fowler series of ionized Helium. Hyperfine structure of Hα line of hydrogen (I = ½) .
Modified term values (quantum defect) due to lifting of orbital degeneracy by core penetration (penetrating orbits) and core polarization (non-penetrating orbits) by n & l electrons. Term values and fine structure of chief spectral series of sodium.
Intensity rules and application to doublets of sodium. Hyperfine structure of 2P-2S of sodium (I= 3/2). Indistinguishable particles, bosons, fermions. Pauli's principle. Ground states.
LS coupling and Hund's rules based on Residual coulomb bic interaction and spin-orbit interaction. Lande's interval rule. Equivalent and non-equivalent electrons. Spectral terms in LS and JJ coupling (ss,s2 ,pp,p2 configurations). Exchange force and Spectral series of Helium.
Normal and Anomalous Zeeman Effects, Experimental study of Zeeman effect, Explanation of Normal and Anomalous Zeeman Effects, Quantum theory of Zeeman effect
Paschen-Back effects and its applications, Transition from weak to strong field, Examples of Zeeman effect in some transitions
Linear stark pattern of Hα line of hydrogen, weak field and strong field Stark effects in Hydrogen, Quadratic stark pattern of D1 and D2 lines of Sodium.
Molecular quantum numbers. Bonding and anti-bonding orbitals from LCAO's. Explanation of bond order for N2 and O2 and their ions. Rotational spectra and the effect of isotopic substitution.
Effect of nuclear spin functions on Raman rotation spectra of H2 (Fermions') and D2 (Boson). Vibrating rotator.
Spectrum. Combination relations and evaluation of rotational constants (infrared and Raman).
Intensity of vibrational bands of an electronic band system in absorption.(The Franck-Condon principle). Sequences and progressions. Deslandre's table and vibrational constants
Sequences and progressions. Deslandre's table and vibrational constants of diatomic molecules.
Symmetry operations and identification of point Groups
Point group identification of HCN, CO2,BH3,NH3,H20 molecules
Properties of irreducible and reducible representations, character of the point operation

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,

SYLLABUS FOR THE YEAR 2014-15.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 2nd Semester
Title of Paper : 204: NUCLEAR AND PARTICLE PHYSICS

Objective of studying Nuclear Physics, Nomenclature, nuclear radius, mass & Binding energy, angular momentum, magnetic dipole momentum
Electric quadrupole momentum, parity & symmetry, domains of instability, energy levels, mirror nuclei. Simple theory deuteron,
scattering cross-sections, qualitative discussion neutron-proton and proton-proton scattering, charge independence and charge symmetry of nuclear forces, exchange forces
Yukawa's Potential, characteristics of nuclear forces
Liquid drop model:, Weissackers semi-empirical mass formula
Mass-parabolas ,nuclear shell model: spin orbit interaction ,magic numbers ,prediction of angular momenta and parities for ground states
Collective model More-realistic models , Alpha decay process, Energy release in beta –decay, Fermi's theory of beta-decay ,selection rules. parity violation in beta -decay
Detection and properties of neutrino , Energetic of gamma –decay, selection rules
angular correlation ,Mossbauer effect, Types of reaction and conservation Laws ,the Q-equation, Optical model, Heavy ion reaction ,Stability limit against spontaneous fission, characteristics of fission, delayed neutrons,
Four factor formula for controlled fission, nuclear fusion, prospects of continued fusion energy. Particle interactions and families, symmetries and conservation laws,(energy and momentum ,angular momentum)
Conservation laws (parity, Baryon number, lepton number , iso spin), Strangeness quantum number(Gellman and Nishijiman formula) and charm
Elementary ideas of CP and CPT invariance
SU (2),SU (3) multiplets ,Quark model. Interaction of radiation with matter
Gas filled counters ,scintillation detectors, semi conductor detectors, energy measurements, Coincidence measurements and time resolution ,magnetic spectra meters
Electrostatic accelerators, cyclotron accelerators ,synchrotrons, linear accelerators, colliding beam accelerators'
Trace element Analysis ,Rutherford Back-scattering, Mass spectrometry with accelerators
Diagnostic nuclear medicine, Therapeutic Nuclear Medicine.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 1st Semester

Title of Paper: 101: CLASSICAL MECHANICS

Introduction, Mechanic of particle
Mechanics of system of particles, constraints, D'Alembbert's principle
Lagrange's equations velocity dependent potentials and Dissipation function simple application of the Lagrangian formulation
Hamilton's principle some techniques of variations Derivation of Lagrange's equations from Hamilton's principle Conservation theorems and symmetry properties Energy function and the conservation of energy
Reduction to the equivalent one body problem The equation of motion and first Integrals, The equivalent One – Dimensional problem and classification of orbits, The differential equation for the orbit, and Integrable power –law potentials, Conditions for closed orbits (Bertrand's theorem).
The Kepler problem inverse square law of force, The motion in time in the Kepler problem, Scattering in a central force field Legendre transformations and Hamilton's equations of motion.
Cyclic Coordinates and conservation theorems, Derivation of Hamilton's equation of motion from variational principle, Principle of Least Action.
Equations of canonical transformation, Examples of Canonical transformations, The harmonic Oscillator, Poisson brackets and other Canonical invariants formulation.
Equations of motion, Infinitesimal canonical transformations, and conservation theorems in the Poisson bracket
Conservation theorems in the Poisson bracket
The angular momentum Poisson bracket relations. Hamilton – Jacobi equation of Hamilton's principal function.
The Harmonic oscillator problem as an example of the Hamilton – Jacobi Method. Hamilton –Jacobi equation for Hamilton's characteristic function
Action – angle variables in systems of one degree of freedom.
Independent coordinates of rigid body , The Euler angles, Euler's theorem on the Motion of a rigid body, Infinitesimal rotations, Rate of change of a vector
The Coriolis Effect. The Inertia tensor and the moment of inertia The Eigen values of the inertia tensor and the principal axis transformation,
Solving rigid body problems and Euler equations of motion, Torque – free motion of a rigid body The Eigen value equation and the principal axis transformation, Frequencies of free vibration, and normal coordinates, Free vibrations of a linear tri atomic molecule

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,

SYLLABUS FOR THE YEAR 2015-16.

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One dimensional problem, particle in a potential well with finite and infinite walls, Potential step.
Potential barrier, Linear harmonic oscillator, Free particle
Particle moving in a spherically symmetric potential, spherical harmonics, radial equation,
Eigen values and Eigen functions of rigid rotator, hydrogen atom, hydrogenic orbitals, angular momentum operators, commutation relations
L, L^2, L_+, L_-, Spin angular momentum, general angular momentum
Bracket notation, ortho normal functions, linear operators and their properties
Hermitian operator, Schmidt orthogonalization, Postulates of quantum mechanics, simultaneous measurability of observables
Commutator algebra, equation of motion of an operator (Schrodinger representation), Momentum representation – Dirac delta function and properties.
Perturbation, Time-dependent perturbation theory for non degenerate systems
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Degenerate systems, application to linear stark effect in hydrogen. Variation method its application to helium atom. Exchange energy
Low lying excited states of helium atom. WKB method, barrier penetration.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester

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Function of complex number-definition-properties, analytic function-Cauchy-Riemann conditions
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Multiply connected region-problems, infinite series-Taylor's theorem
Laurent's theorem- problems, Cauchy's Residue theorem-evaluation of definite integrals-problems
Beta & Gamma functions-definition, relation between them-properties-evaluation some integrals.
Legendre Polynomial, Her mite Polynomial, Laguerre Polynomial
Generating function-recurrence relations-Rodriguez's formula- orthogonal property
Associated Legendre polynomial-simple recurrence relation- orthogonal property-spherical harmonics
Laplace transforms-definition-properties-Laplace transform of elementary functions-inverse Laplace transforms properties-evaluation of inverse Laplace transforms
Elementary function method-partial fraction method-heavy side expansion method-convolution method-complex inversion formula method
Application to differential equations Fourier series-evaluation of Fourier coefficients-Fourier integral theorem-problems-square wave-rectangular wave-triangular wave.
Fourier transforms-infinite Fourier transforms-finite Fourier transforms-properties-problems-application to boundary value problem, Solutions of algebraic and Transcendental equations-bisection method.
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Gauss Jardon method- matrix inversion method-Jacobi method
Gauss-siedel method inter polation with equal intervals-finite differences – Newton forward &backward
Interpolation with equal intervals-finite differences-Newton forward& backward interpolation

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 1st Semester

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photo diode and solar cell, Explanation of led
silicon controlled rectifier , uni junction
Explanation of transistors , FET,JFET,MOSFET, CMOS
Introduction of microwave devices. Explanation of different types diodes
Varactor diode ,parametric amplifier and different types of amplifiers explained
Thyristors, Klystron, Reflex Klystron, Gunn Diode
Magnetron, CFA, TWT, BWO, IMPATT
Explanation of TRAPATT (Principle, working and Applications for all devices) revisions of the chapter
OPERATIONAL AMPLIFIERS The ideal Op Amp – Practical inverting and Non inverting Op Amp stages.
Op Amp Architecture – differential stage, gain stage
DC level shifting, output stage, offset voltages and currents. Common Mode Rejection Ratio, Slew Rate
Operational Amplifier parameters- input offset voltage, input bias current,
OP- AMP APPLICATIONS Summing amplifier
Integrator, Differentiator, Voltage to Current converter, Current to Voltage converter Oscillators
Phase shift oscillator, Wien-Bridge Oscillator, Voltage Controlled Oscillator, Schmitt Trigger Special applications Mono stable and A stable Multi vibrators using 555, Phase locked Loop

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 301: SOLID STATE PHYSICS

Introduction to solids, Explanation of structure of atoms and molecules
Periodic array of atoms—Lattice translation vectors and lattices, symmetry operations, The Basis and the Crystal Structure
Primitive Lattice cell, Fundamental types of lattices—Two Dimensional lattice types
Three Dimensional lattice types, Index system for crystal planes.
Simple crystal structures-- sodium chloride, cesium chloride and diamond structures.
Bragg's law, Experimental diffraction methods-- Laue method and powder method, Derivation of scattered wave amplitude
Indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical Structure Factor, Determination of number of atoms in a cell and position of atoms
Reciprocal lattice, Brillion Zone, Reciprocal lattice to bcc and fcc Lattices
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Lattice with two atoms per primitive cell, Quantization of Lattice Vibrations-Phonon momentum.
Energy levels and density of orbital's in one dimension, Free electron gas in 3 dimensions, Heat capacity of the electron gas
Experimental heat capacity of metals, Motion in Magnetic Fields- Hall effect, Ratio of thermal to electrical conductivity
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Wave equation of electron in a periodic potential, Crystal momentum of an electron-Approximate solution near a zone boundary
Number of orbital's in a band--metals and isolators. The distinction between metals, insulators and semiconductors.
Concept of zero resistance, Magnetic behavior, distinction between a perfect conductor and superconductor.
Meissner effect, Isotope effect–specific heat behavior. Two-fluid model. Expression for entropy difference between normal and superconducting states. London's equations
Penetration depth. BCS theory. Josephson junctions–SQUIDS and its applications
Applications of superconductors. High TC superconductors, Preparation, Properties.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,

SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 302: LASERS & FIBER OPTICS

Introduction
Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems
Laser systems: Ruby laser, Nd-YAG laser, CO_2 Laser, Dye laser, Excimer laser, Semiconductor laser. Line shape function and Full Width at half maximum (FWHM) for Natural broadening,
Collision broadening, Doppler broadening, Saturation behavior of broadened transitions Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for Con focal resonators
Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking
Basic optical laws and Self focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure
Ray optics representation, wave representation. Mode theory of circular step-index wave guides.
Wave equation for step-index fibers, modes in step-index fibers
Power flow in step index fibers. Graded – index fiber structure
Graded-index numerical aperture, modes in Graded-index fibers
Signal Degradation In Fibers - Attenuation, Absorption
Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay
Material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers
Power launching in Optical fibers, Source-output pattern, Len sing schemes.
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors
Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion
Waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Len sing schemes
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses
Fiber and face preparation. Fiber splicing techniques, fiber connectors

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 303: DIGITAL ELECTRONICS & MICROPROCESSORS

Introduction of syllabus and brief explanation of all units
Number Systems and Codes: Binary, Octal, Hexadecimal number systems, Gray code, BCD code, ASCII code.
Logic Gates and Boolean Algebra: OR, AND, NOT, NOR, NAND gates, Boolean theorems, De Morgan laws.
Combinational Logic Circuits Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, EX-OR, EX-NOR gates, ENCODER, DECODER, Multiplexer, De multiplexers.
Digital Arithmetic Operations and Circuits: Binary addition, Design of Adders and Sub tractors , Parallel binary adder, IC parallel adder.
Boolean Algebra: Magnitude Comparator, Parity generator, Checker, Code converter, Seven-segment decoder/ Driver display
Sequential Logic Circuits Flip-Flops and Related Devices: NAND latch, NOR latch, Clocked flip-flops, Clocked S-C flip-flop, J-K flip-flop, D flip-flop, D latch, Asynchronous inputs, Timing problem in flip flops
Counters: Asynchronous counters (Ripple), Counters with MOD number $< 2N$, Asynchronous down counter, Synchronous counters, Up-down counter, Preset table counter
Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO Applications of Counters: Frequency Counter and Digital clock. A/D and D/A Converter Circuits: D/A Converter
Linear weighted and ladder type, An integrated circuit DAC; Analog-to-Digital Conversion, Digital Ramp ADC, Successive Approximation Method, Sample and Hold Circuit, Digital Voltmeter.
Intel 8085 Microprocessor: Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle. Programming the 8085 Microprocessor: (i) Addressing Methods, Instruction set, Assembly language programming.
Examples of Assembly Language Programming: Simple Arithmetic - Addition/Subtraction of two 8- bit/16-bit numbers, Addition of two decimal numbers, Masking of digits, word disassembly.
Programming using Loops: Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.
Data Transfer Technique: Serial transfer, Parallel transfer, Synchronous, Asynchronous.
8085 Interfacing: I/O Interfacing: Programmable Peripheral Interfacing
8255, Programmable Peripheral Interval Timer 8253
Programmable Communication Interface 8251
DAC 0800 and ADC 0800 interfacing
DMA transfer, Interrupt Date transfer.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 304: COMMUNICATION ELECTRONICS

Introduction
Amplitude modulation
For sinusoidal AM, Amplitude modulator and demodulator circuits
Double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver..
Single side band modulation(SSB): Angle modulation ,Frequency deviation modulation index Average power in sinusoidal FM, FM generations
Phase modulation: Equivalence between PM and FM , FM detectors: Slope detectors, Balanced slope detectors
Foster – Seley discriminator Ratio detector, Amplitude modulator ,FM receiver Digital line code: Symbols
Functional notation for pulses. Line codes and wave forms : RZ, NRZ ,Polar , Unipolar AMI, HDBn and Manchester codes M-Ary encoding, Differential encoding . Sampling theorem
Principles of pulse amplitude modulation (PAM) and Pulse Time modulation (PTM), Pulse code modulation (PCM), Quantization
Non linear quantization , Comparing, Differential pulse code modeling (DPCM),
Delta modulation (DM) .Digital Carrier systems. Mixer circuits : Diode mixer
IC balanced mixer ,Filters : Active filters, Ceramic ,Mechanical and Crystal filters
Oscillator : crystal oscillator, Voltage controlled oscillator
Phase locked loop (PLL) . Thermal noise, Shot noise, Partition noise.
Signal – to – noise ratio, Noise factor, Amplifier input noise in terms of F, noise factor of amplifiers in cascade (Friss formula),
Noise temperature, Noise in AM, Noise in FM in systems.
Noise in pulse modulation systems: Inter symbol interference(ISI), Eye diagrams.
HDBn and Manchester codes M-Ary encoding, Differential encoding,
Sampling theorem

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 201: ELECTRODYNAMICS

Introduction of unit –I Gauss Theorem, Poission's equation and explanation
Laplace equation, solution to Laplace equation in Cartesian coordinates, spherical coordinates
Cylindrical coordinates, use of Laplace equation in the solutions of electrostatic problems.
Ampere's circuital law, magnetic vector potential, displacement current, Faraday's law of electromagnetic induction
Maxwell's equations, differential and integral forms, physical significance of Maxwell's equations.
Wave equation, plane electromagnetic waves in free space , in no conducting isotropic medium, in conducting medium, electromagnetic vector and scalar potentials
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz auge
Coulomb gauge
Charged particles in electric and magnetic fields: charged particles in uniform electric field charged particles in homogenous magnetic fields,
Charged particles in simultaneous electric and magnetic fields, charged particles in no homogeneous magnetic fields
Lienard-Wiechert potentials, electromagnetic fields from Lienard-wiechert potentials of a moving charge
Electromagnetic fields of a uniformly moving charge, radiation due to non-relativistic charges
Radiation damping, Abraham-Lorentz formula, cherenkov radiation, radiation due to an oscillatory electric dipole, radiation due to a small current element.
Condition for plasma existence, occurrence of plasma, magneto hydrodynamics, plasma waves
Transformation of electromagnetic potentials, Lorentz condition in covariant form
Invariance or covariance of Maxwell field equations in terms of 4 vectors
Electromagnetic field tensor, Lorentz transformation of electric and magnetic fields

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 202: STATISTICAL MECHANICS

Introduction to thermodynamics
Specification of the state of a system, phase space and quantum states, Liouvilles theorem, Basic postulates, Probability calculations, concept of ensembles, thermal interaction,
Mechanical interaction, quasi static process, distribution of energy between systems in equilibrium, statistical calculations of thermo dynamic quantities, Isolated systems(Micro canonical ensemble).
Entropy of a perfect gas in micro canonical ensemble. Canonical ensemble - system in contact with heat reservoir, system with specified mean energy, connection with thermodynamics, Energy fluctuations in the canonical ensemble.
Grand canonical ensemble, Thermodynamic function for the grand canonical ensemble. Density and energy fluctuations in the grand canonical ensemble. Thermodynamic equivalence of ensembles.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas. Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion
Harmonic Oscillator, Specific heats of solids (Einstein and Debye model of solids), Para magnetism, Partition function for polyatomic molecules, Electronic energy,
Vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas.
Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion. Harmonic Oscillator, Specific heats of solids
Para magnetism, Partition function for polyatomic molecules, Electronic energy, vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen
Formulation of the statistical problem. Maxwell–Boltzmann statistics. Photon statistics, Bose-Einstein statistics, Fermi–Dirac statistics
Quantum statistics in the classical limit, calculation of dispersion for MB, BE & FD statistics Equation of state of an Ideal Bose Gas,
Black body radiation, Bose-Einstein condensation, Equation of state for a weakly degenerate and strongly degenerate ideal Fermi gas. Thermionic emission. The theory of white dwarf stars.
Non ideal classical gas: Calculation of the partition functions for low densities. Equation of state and virial coefficients (Van Dar Walls equation)
Phase transition, conditions for Phase equilibrium, First order Phase transition..
Clausius - Clayperon equation, Second order phase transition, The critical indices.
Vander walls theory of liquid gas transition. Order parameter, Landau theory.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: I M.Sc. Semester: 2^{nd} Semester
Title of Paper: 203: ATOMIC AND MOLECULAR PHYSICS

Quantum numbers, Term values . Relation between Magnetic dipole moment and angular momentum of an orbiting electron. Stern–Gerlach experiment and electron spin
Spin- orbit interaction, relativistic kinetic energy correction and dependence of energy on J value only
Selection rules. Fine structure of Balmer series of Hydrogen and Fowler series of ionized Helium. Hyperfine structure of Hα line of hydrogen (I = ½) .
Modified term values (quantum defect) due to lifting of orbital degeneracy by core penetration (penetrating orbits) and core polarization (non-penetrating orbits) by electrons.
Term values and fine structure of chief spectral series of sodium. Intensity rules and application to doublets of sodium.
Hyperfine structure of 2P-2S of sodium (I= 3/2).
LS coupling and Hund’s rules based on Residual columbic interaction and spin-orbit interaction. Lande’s interval rule.
Equivalent and non-equivalent electrons. Spectral terms in LS and JJ coupling (ss,s2 ,pp,p2 configurations). Exchange force and Spectral series of Helium.
Indistinguishable particles, bosons, fermions. Pauli’s principle. Ground state.
Normal and Anomalous Zeeman Effects
Experimental study of Zeeman effect, Explanation of Normal and Anomalous Zeeman Effects, Quantum theory of Zeeman effect
Paschen-Back effects and its applications, Transition from weak to strong field, Examples of Zeeman effect in some transitions
Linear stark pattern of H□ line of hydrogen, weak field and strong field Stark effects in Hydrogen, Quadratic stark pattern of D1 and D2 lines of Sodium.
Molecular quantum numbers. Bonding and anti-bonding orbitals from LCAO’s..
Effect of nuclear spin functions on Raman rotation spectra of H2 (Fermion) and D2 (Boson). Vibrating rotator.
Spectrum. Combination relations and evaluation of rotational constants (infrared and Raman).
Intensity of vibrational bands of an electronic band system in absorption.(The Franck-Condon principle).
Sequences and progressions. Deslandre’s table and vibrational constants of diatomic molecules.
Explanation of bond order for N2 and O2 and their ions. Rotational spectra and the effect of isotopic substitution

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SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics   Class: I M.Sc.   Semester: 2nd Semester
Title of Paper: 204: NUCLEAR AND PARTICLE PHYSICS

Introduction
Objective of studying Nuclear Physics, Nomenclature, nuclear radius,
Mass & Binding energy, angular momentum, magnetic dipole momentum
Electric quardrapole momentum, parity & symmetry, domains of instability, energy levels, mirror nuclei .Simple theory deuteron
Scattering cross-sections ,qualitative discussion neutron-proton and proton-proton scattering , charge independence and charge symmetry of nuclear forces, exchange forces
Yukawa’s Potential, characteristics of nuclear forces, Liquid drop model: Weissackers semi-empirical mass formula
Mass-parabolas, nuclear shell model: spin orbit interaction, magic numbers, prediction of angular moment a and parities for ground states
Collective model. More-realistic models ,Alpha decay process, Energy release in beta –decay, Fermi’s theory of beta-decay, selection rules. parity violation in beta -decay
Detection and properties of neutrino, Energetic of gamma –decay, selection rules, angular correlation, Mossbauer effect, Types of reaction and conservation Laws, The Q-equation. Optical model, Heavy ion reaction,
Stability limit against spontaneous fission, characteristics of fission, delayed neutrons,
Four factor formula for controlled fission, nuclear fusion, prospects of continued fusion energy.
Particle interactions and families ,symmetries and conservation laws,(energy and momentum, angular momentum, parity, Baryon number ,Lepton number, isospin
Strangeness quantum number(Gellmann and Nishijiman formula)and charm),Elementary ideas of CP and CPT invariance
SU(2),SU(3) multiplets, Quark model. Interaction of radiation with matter. Gas filled counters
Scintillation detectors ,semi conductor detectors, energy measurements
Coincidence measurements and time resolution, magnetic spectrometers Electrostatic accelerators
cyclotron accelerators, synchrotrons ,linear accelerators, colliding beam accelerators’
Trace element Analysis, Rutherford Back-scattering ,Mass spectrometry with accelerators
Diagnostic nuclear medicine, Therapeutic Nuclear Medicine.

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SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester
Title of Paper: 401: ADVANCED QUANTUM MECHANICS

Change of basis Dirac's bra and ket notations
Eigen value problem for operators ,the continuous spectrum.
Application to wave mechanics in one dimension
The equation of motion , Quantization postulates
Canonical quantization, constants of motion
Invariance properties, Heisenberg picture
Harmonic oscillator
Development of time –dependent perturbation theory
The golden rule for constants
Addition of two angular momentum, Tensor operators.
Wigner –Eckart theorem Matrix elements of vector operators
Parity and time reversal symmetries
Concept of differential cross- section Scattering of a wave packet.
Born approximation , partial waves and phase shift analysis
Klein –Gordon equation, Dirac equation for a free particle
Equation of continuity, spin Dirac particle
Solutions of free particle Dirac equation , negative energy states and hole theory

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester
Title of Paper: 402: PROPERTIES AND CHARACTERIZATION OF MATERIALS

Introduction to properties of materials, An harmonic crystal interactions-thermal expansion
Thermal conductivity, lattice thermal resistivity, umklapp processes, and imperfections. Lattice Vacancies, Diffusion
Colour Centers—F Centers, other centers in alkali halides.
Alloys
Order-disorder transformations, Elementary theory of Order.
Fundamentals of Transmission electron microscopy and study of crystal structure using TEM
Fundamentals of Scanning electron microscopy and study of microstructure using SEM
Spin and an applied field—the nature of spinning particles, interaction between spin and a magnetic field, population of energy levels, the Larmor precession
Relaxation times—spin- spin relation, spin-lattice relaxation
Electron Spin Resonance: Introduction, g-factor, experimental methods.
Nuclear Magnetic Resonance—equations of motion, line width, motional narrowing, hyperfine splitting,
Nuclear Gamma Ray Resonance: Principles of Mossbauer Spectroscopy, Line Width, Resonance absorption, Mossbauer Spectrometer
Isomer Shift, Quadrapole Splitting, magnetic field effects,
Applications of Mossbauer Spectroscopy, DC & AC Conductivity
Curie temperature, Saturation Magnetization
Susceptibility , Fundamentals of Infra-red Spectroscopy and Applications
FTIR Spectroscopy and its applications.

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SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 403: RADAR AND SATILLITE COMMUNICATION

Introduction
Amplitude modulation
For sinusoidal AM, Amplitude modulator and demodulator circuits
Double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver..
Single side band modulation(SSB): Angle modulation ,Frequency deviation modulation index Average power in sinusoidal FM, FM generations
Phase modulation: Equivalence between PM and FM , FM detectors: Slope detectors, Balanced slope detectors
Foster – Seley discriminator Ratio detector, Amplitude modulator ,FM receiver Digital line code: Symbols
Functional notation for pulses. Line codes and wave forms : RZ, NRZ ,Polar , Unipolar AMI, HDBn and Manchester codes M-Ary encoding, Differential encoding . Sampling theorem
Principles of pulse amplitude modulation (PAM) and Pulse Time modulation (PTM), Pulse code modulation (PCM), Quantization
Non linear quantization , Comparing, Differential pulse code modeling (DPCM),
Delta modulation (DM) .Digital Carrier systems. Mixer circuits : Diode mixer
IC balanced mixer ,Filters : Active filters, Ceramic ,Mechanical and Crystal filters
Oscillator : crystal oscillator, Voltage controlled oscillator
Phase locked loop (PLL) . Thermal noise, Shot noise, Partition noise.
Signal – to – noise ratio, Noise factor, Amplifier input noise in terms of F, noise factor of amplifiers in cascade (Friss formula),
Noise temperature, Noise in AM, Noise in FM in systems.
Noise in pulse modulation systems: Inter symbol interference(ISI), Eye diagrams.
HDBn and Manchester codes M-Ary encoding, Differential encoding,
Sampling theorem

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SYLLABUS FOR THE YEAR 2015-16.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 404: ANTENNA THEORY AND RADIO WAVE PROPAGATION

Introduction to Radiation Potential functions of electromagnetic fields. Potential function for sinusoidal oscillations. Fields radiated by an alternating current element.
Power radiated by a current element and radiation resistance. Radiation from a quarter wave monopole or a half wave dipole.
EM field close to an antenna and far field approximation. (Chapter 10 in Jordan and Balmain)
Antenna Fundamentals Definition of an antenna. Antenna properties – radiation pattern, gain, directive gain and directivity.
Effective area. Antenna beam width and band width. Directional properties of dipole antennas.
Antenna Arrays Two element array. Linear arrays. Multiplication of patterns and binomial array
Effect of Earth on vertical patterns. Mathematical theory of linear arrays.
Antenna synthesis – T chebycheff polynomial method. Wave polarization.
Impedance Antenna terminal impedance.
Mutual impedance between two antennas. Computation of mutual impedance.
Radiation resistance by induced emf method. Reactance of an antenna. Biconcal antenna and its impedance.
Frequency Independent (FI) Antennas Frequency Independence concept. Equiangular spiral. Log Periodic (LP) antennas.
Array theory of LP and FI structures.
Methods of excitation and Practical Antennas Methods of excitation and stub matching and baluns. Folded dipole, loop antennas. Parasitic elements and Yagi-Uda arrays and Helical antenna.
Radio Wave Propagation Elements of Ground wave and Space wave propagation. Tropospheric propagation and Troposcatter.
Fundamentals of Ionosphere. Sky wave propagation
Critical frequency, MUF and skip distance.

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 101: CLASSICAL MECHANICS

Introduction
Mechanic of particle, mechanics of system of particles, constraints, D'Alembbert's principle
Lagrange's equations velocity dependent potentials and Dissipation function simple application of the Lagrangian formulation
Hamilton's principle some techniques of variations Derivation of Lagrange's equations from Hamilton's principle Conservation theorems and symmetry properties Energy function and the conservation of energy
Reduction to the equivalent one body problem The equation of motion and first Integrals, The equivalent One – Dimensional problem and classification of orbits, The differential equation for the orbit, and Integrable power –law potentials, Conditions for closed orbits (Bertrand's theorem),..
The Kepler problem inverse square law of force , The motion in time in the Kepler problem, Scattering in a central force field Legendre transformations and Hamilton's equations of motion.
Cyclic Coordinates and conservation theorems, Derivation of Hamilton's equation of motion from variational principle, Principle of Least Action.
Equations of canonical transformation, Examples of Canonical transformations, The harmonic Oscillator, Poisson brackets and other Canonical invariants formulation
Equations of motion, Infinitesimal canonical transformations, and conservation theorems in the poisson bracket
The angular momentum poisson bracket relations. Hamilton – Jacobi equation of Hamilton's principal function
The Harmonic oscillator problem as an example of the Hamilton – Jacobi Method
Hamilton –Jacobi equation for Hamilton's characteristic function. Action – angle variables in systems of one degree of freedom, Independent coordinates of rigid body
The Euler angles, Euler's theorem on the Motion of a rigid body, Infinitesimal rotations, Rate of change of a vector, The Carioles' Effect. The Inertia tensor and the moment of inertia,
The Eigen values of the inertia tensor and the principal axis transformation, Solving rigid body problems and Euler equations of motion, Torque – free motion of a rigid body
The Eigen value equation and the principal axis transformation, Frequencies of free vibration, and normal coordinates, Free vibrations of a linear tri atomic molecule

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 102: ATOMIC AND MOLECULAR PHYSICS

Quantum numbers, Term values . Relation between Magnetic dipole moment and angular momentum of an orbiting electron. Stern–Gerlach experiment and electron spin
Spin- orbit interaction, relativistic kinetic energy correction and dependence of energy on J value only
Selection rules. Fine structure of Balmer series of Hydrogen and Fowler series of ionized Helium. Hyperfine structure of Hα line of hydrogen (I = ½)
Modified term values (quantum defect) due to lifting of orbital degeneracy by core penetration (penetrating orbits) and core polarization (non-penetrating orbits) by electrons.
Term values and fine structure of chief spectral series of sodium. Intensity rules and application to doublets of sodium.
Hyperfine structure of 2P-2S of sodium (I= 3/2).
LS coupling and Hund's rules based on Residual columbic interaction and spin-orbit interaction. Lande's interval rule.
Equivalent and non-equivalent electrons. Spectral terms in LS and JJ coupling (ss,s2 ,pp,p2 configurations). Exchange force and Spectral series of Helium.
Indistinguishable particles, bosons, fermions. Pauli's principle. Ground state. Normal and Anomalous Zeeman Effects
Experimental study of Zeeman effect, Explanation of Normal and Anomalous Zeeman Effects
Quantum theory of Zeeman effect, Paschen-Back effects and its applications, Transition from weak to strong field, Examples of Zeeman effect in some transitions
Linear stark pattern of Hα line of hydrogen, weak field and strong field Stark effects in Hydrogen, Quadratic stark pattern of D1 and D2 lines of Sodium. Molecular quantum numbers. Bonding and anti-bonding orbital's from LCAO's
Effect of nuclear spin functions on Raman rotation spectra of H2 (Fermion) and D2 (Boson). Vibrating rotator Spectrum. Combination relations and evaluation of rotational constants (infrared and Raman)..
Intensity of vibrational bands of an electronic band system in absorption.(The Franck-Condon principle). Sequences and progressions. Deslandre's table and vibrational constants of diatomic molecules
Explanation of bond order for N2 and O2 and their ions. Rotational spectra and the effect of isotopic substitution

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 103: MATHEMATICAL METHODS OF PHYSICS

Function of complex number-definition-properties, analytic function-Cauchy-Riemann conditions
Polar form-problems ,complex differentiation, complex integration-Cauchy's integral theorem-Cauchy's integral formulae
Multiply connected region-problems, infinite series-Taylor's theorem
Laurent's theorem- problems, Cauchy's Residue theorem-evaluation of definite integrals-problems
Beta & Gamma functions-definition ,relation between them-properties-evaluation some integrals
Legendre Polynomial, Her mite Polynomial, Laguerre Polynomial
Generating function-recurrence relations-Rodriguez's formula-orthogonal property
Associated Legendre polynomial-simple recurrence relation-orthogonal property-spherical harmonics
Laplace transforms-definition-properties-Laplace transform of elementary functions-inverse Laplace transforms properties
Evaluation of inverse Laplace transforms
Elementary function method-partial fraction method
Heavy side expansion method-convolution method-complex inversion formula method
Application to differential equations Fourier series-evaluation of Fourier coefficients, Fourier integral theorem-problems-square wave
Rectangular wave-triangular wave. Fourier transforms-infinite Fourier transforms-finite Fourier transforms
Properties-problems-application to boundary value problem, Revision

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 104: ELECTRONIC DEVICES AND CIRCUITS

Introduction of electronic device and circuits and brief explanation of following unites, Explanation of Tunnel diode
Photo diode and solar cell, Explanation of led
Silicon controlled rectifier , uni junction
Explanation of transistors , FET,JFET,MOSFET, CMOS
Introduction of microwave devices. Explanation of different types diodes.
Varactor diode ,parametric amplifier and different types of amplifiers explained
Thyristors, klystron, reflex klystron, gunn diode
Magnetron, CFA,TWT, BWO, IMPATT
Explanation of TRAPATT (Principle, working and Applications for all devices) revisions of the chapter
OPERATIONAL AMPLIFIERS The ideal Op Amp – Practical inverting and Non inverting Op Amp stages.
Op Amp Architecture – differential stage, gain stage
DC level shifting, output stage, offset voltages and currents .
Operational Amplifier parameters- input offset voltage, input bias current, Common Mode Rejection Ratio, Slew Rate
OP- AMP APPLICATIONS Summing amplifier, Integrator, Differentiator, Voltage to Current converter, Current to Voltage converter Oscillators
Phase shift oscillator, Wien-Bridge Oscillator, Voltage Controlled Oscillator, Schmitt Trigger Special applications Mono stable and A stable multi vibrators using 555, Phase locked Loop,

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 301: SOLID STATE PHYSICS

Introduction to solids, Explanation of structure of atoms and molecules
Periodic array of atoms—Lattice translation vectors and lattices, symmetry operations, The Basis and the Crystal Structure
Primitive Lattice cell, Fundamental types of lattices—Two Dimensional lattice types
Three Dimensional lattice types, Index system for crystal planes.
Simple crystal structures-- sodium chloride, cesium chloride and diamond structures.
Bragg's law, Experimental diffraction methods-- Laue method and powder method, Derivation of scattered wave amplitude
Indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical Structure Factor, Determination of number of atoms in a cell and position of atoms
Reciprocal lattice, Brillion Zone, Reciprocal lattice to bcc and fcc Lattices
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Lattice with two atoms per primitive cell, Quantization of Lattice Vibrations-Phonon momentum.
Energy levels and density of orbital's in one dimension, Free electron gas in 3 dimensions, Heat capacity of the electron gas
Experimental heat capacity of metals, Motion in Magnetic Fields- Hall effect, Ratio of thermal to electrical conductivity
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Wave equation of electron in a periodic potential, Crystal momentum of an electron-Approximate solution near a zone boundary
Number of orbital's in a band--metals and isolators. The distinction between metals, insulators and semiconductors.
Concept of zero resistance, Magnetic behavior, distinction between a perfect conductor and superconductor.
Meissner effect, Isotope effect–specific heat behavior. Two-fluid model. Expression for entropy difference between normal and superconducting states
London's equations. Penetration depth. BCS theory. Josephson junctions–SQUIDS and its applications. Applications of superconductors. High TC superconductors, Preparation, Properties.

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics   Class: II M.Sc.   Semester: 3rd Semester
Title of Paper: 302: LASERS & FIBER OPTICS

Introduction
Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems
Laser systems: Ruby laser, Nd-YAG laser, CO2 Laser, Dye laser, Excimer laser, Semiconductor laser. Line shape function and Full Width at half maximum (FWHM) for Natural broadening,
Collision broadening, Doppler broadening, Saturation behavior of broadened transitions Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for Con focal resonators
Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking
Basic optical laws and Self focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure
Ray optics representation, wave representation. Mode theory of circular step-index wave guides.
Wave equation for step-index fibers, modes in step-index fibers and,
Power flow in step index fibers. Graded – index fiber structure
Graded-index numerical aperture, modes in Graded-index fibers
Signal Degradation In Fibers - Attenuation, Absorption
Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay
Material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers
Power launching in Optical fibers, Source-output pattern, Len sing schemes.
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors
Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion
Waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Len sing schemes
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics   Class: II M.Sc.   Semester: 3rd Semester

Title of Paper: 303: DIGITAL ELECTRONICS & MICROPROCESSORS

Introduction of syllabus and brief explanation of all units
Introduction of unit 1 Digital Circuits explanation (i) Number Systems and Codes: Binary, Octal, Hexadecimal number systems, Gray code, BCD code, ASCII code.
Logic Gates and Boolean Algebra: OR, AND, NOT, NOR, NAND gates, Boolean theorems, De Morgan laws.
Combinational Logic Circuits Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, EX-OR, EX-NOR gates, ENCODER, DECODER, Multiplexer, De multiplexers.
Digital Arithmetic Operations and Circuits: Binary addition, Design of Adders and Sub tractors, Parallel binary adder, IC parallel adder.
of Boolean Algebra: Magnitude Comparator, Parity generator, Checker, Code converter, Seven-segment decoder/ Driver display
Sequential Logic Circuits Flip-Flops and Related Devices: NAND latch, NOR latch, Clocked flip-flops, Clocked S-C flip-flop, J-K flip-flop, D flip-flop, D latch, Asynchronous inputs, Timing problem in flip flops
Counters: Asynchronous counters (Ripple), Counters with MOD number < 2N , Asynchronous down counter, Synchronous counters, Up-down counter, Pre settable counter
Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO Applications of Counters: Frequency Counter and Digital clock. A/D and D/A Converter Circuits: D/A Converter
Linear weighted and ladder type, An integrated circuit DAC; Analog-to-Digital Conversion, Digital Ramp ADC, Successive Approximation Method, Sample and Hold Circuit, Digital Voltmeter.
Intel 8085 Microprocessor: Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle. Programming the 8085 Microprocessor: (i) Addressing Methods, Instruction set, Assembly language programming.
Examples of Assembly Language Programming: Simple Arithmetic - Addition/Subtraction of two 8- bit/16-bit numbers
Addition of two decimal numbers, Masking of digits, word disassembly.
Programming using Loops: Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.
Data Transfer Technique: Serial transfer, Parallel transfer, Synchronous, Asynchronous, DMA transfer, Interrupt driven Data transfer.
8085 Interfacing: I/O Interfacing: Programmable Peripheral Interfacing
8255, Programmable Peripheral Interval Timer 8253, Programmable Communication Interface 8251
DAC 0800 and ADC 0800 interfacing.

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 304: COMMUNICATION ELECTRONICS

Introduction
Amplitude modulation
For sinusoidal AM, Amplitude modulator and demodulator circuits,
Double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver..
Single side band modulation(SSB): Angle modulation ,Frequency deviation modulation index Average power in sinusoidal FM, FM generations, ,
Phase modulation: Equivalence between PM and FM FM detectors: Slope detectors, Balanced slope detectors,
Foster – Seley discriminator Ratio detector, Amplitude modulator ,FM receiver Digital line code: Symbols,
Functional notation for pulses. Line codes and wave forms : RZ, NRZ ,Polar uni polar ,AMI
Principles of pulse amplitude modulation (PAM) and Pulse Time modulation (PTM), Pulse code modulation (PCM), Quantization
Non linear quantization , Comparing, Differential pulse code modeling (DPCM),
Delta modulation(DM) .Digital Carrier systems .Mixer circuits : Diode mixer
IC balanced mixer .Filters : Active filters, Ceramic, Mechanical and Crystal filters
Oscillator : crystal oscillator, Voltage controlled oscillator, Phase locked loop (PLL) .
Thermal noise, Shot noise, Partition noise
Signal – to – noise ratio, Noise factor
Amplifier input noise in terms of F, noise factor of amplifiers in cascade (Friss formula)
Noise temperature, Noise in AM ,Noise in FM in systems. Noise in pulse modulation systems: Inter symbol interference(ISI), Eye diagrams
HDBn and Manchester codes M-Ary encoding, Differential encoding . Sampling theorem

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SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 201: ELECTRODYNAMICS

Introduction of unit –I Gauss Theorem, Poisson's equation and explanation
Laplace's equation, solution to Laplace's equation in Cartesian coordinates, spherical coordinates
Cylindrical coordinates, use of Laplace's equation in the solutions of electrostatic problems.
Ampere's circuital law, magnetic vector potential, displacement current, Faraday's law of electromagnetic induction
Maxwell's equations, differential and integral forms, physical significance of Maxwell's equations.
Wave equation, plane electromagnetic waves in free space , in non conducting isotropic medium, in conducting medium, electromagnetic vector and scalar potentials
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz gauge, Coulomb gauge ,Charged particles in electric and magnetic fields
Charged particles in uniform electric field,
Charged particles in homogenous magnetic fields,
Charged particles in simultaneous electric and magnetic fields, charged particles in non homogeneous magnetic fields
Lie nard -Wiechert potentials, electromagnetic fields from Lienard-wiechert potentials of a moving charge, electromagnetic fields of a uniformly moving charge, radiation due to non-relativistic charges,
Radiation damping, Abraham-Lorentz formula, Cherenkov radiation.
Radiation due to an oscillatory electric dipole, radiation due to a small current element
Condition for plasma existence, occurrence of plasma, magneto hydrodynamics, plasma waves Transformation of electromagnetic potentials,
Invariance or covariance of Maxwell field equations in terms of 4 vectors,
Lorentz condition in covariant form electromagnetic field tensor,
Lorentz transformation of electric and magnetic fields

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 202: STATISTICAL MECHANICS

Introduction to thermodynamics
Specification of the state of a system, phase space and quantum states, Liou villes theorem, Basic postulates, Probability calculations, concept of ensembles, thermal interaction,
Mechanical interaction, quasi static process, distribution of energy between systems in equilibrium, statistical calculations of thermo dynamic quantities, Isolated systems(Micro canonical ensemble).
Entropy of a perfect gas in micro canonical ensemble. Canonical ensemble - system in contact with heat reservoir, system with specified mean energy, connection with thermodynamics, Energy fluctuations in the canonical ensemble.
Grand canonical ensemble, Thermodynamic function for the grand canonical ensemble. Density and energy fluctuations in the grand canonical ensemble. Thermodynamic equivalence of ensembles.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas. Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion
Harmonic Oscillator, Specific heats of solids (Einstein and Debye model of solids), Para magnetism, Partition function for polyatomic molecules, Electronic energy,
Vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas.
Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion. Harmonic Oscillator, Specific heats of solids
Para magnetism, Partition function for polyatomic molecules, Electronic energy, vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen
Formulation of the statistical problem. Maxwell–Boltzmann statistics. Photon statistics, Bose-Einstein statistics, Fermi–Dirac statistics
Quantum statistics in the classical limit, calculation of dispersion for MB, BE & FD statistics Equation of state of an Ideal Bose Gas,
Black body radiation, Bose-Einstein condensation, Equation of state for a weakly degenerate and strongly degenerate ideal Fermi gas. Thermionic emission. The theory of white dwarf stars.
Non ideal classical gas: Calculation of the partition functions for low densities. Equation of state and virial coeffiecients (Van Dar Walls equation)
Phase transition, conditions for Phase equilibrium, First order Phase transition..
Clausius-Clayperon equation, Second order phase transition, The critical indices.
Vander waals theory of liquid gas transition. Order parameter, Landau theory.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 203: NUMERICAL METHODS AND PROGRAMMING WITH C

Solution of algebraic and transcendental equations: Bisection method, Method of false position
Newton-Raphson method. Principle of least squares – fitting of polynomials. Interpolation: Finite differences(forward, backward and central difference),
Newton's formula for Interpolation, Central difference Interpolation formula (Gauss's & Sterling formula)
Lagrange's Interpolation formula, Inverse Interpolation.
Differentiation: Cubic Spiline Method, Maximum and Minimum values of a Tabulated function
Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule and 3/8 Rule. Solutions of linear systems
Direct methods: Solutions of linear systems, Matrix Inversion method, Gauss Elimination method, Modification of Gauss Elimination method (Gauss-Jordan Method).
Iterative methods: Jacobi method, Gauss Seidel method.
Numerical solutions of ordinary differential equations: Solution by Taylor's series,
Picard's method of successive approximations, Euler's method (Error estimates for the Euler's method, Modified Euler's method)and Range-Kutta method.
Character Set, C tokens, Key words and Identifiers, Constants and Variables, Data types, Declaration of variables
Operators and expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement operators, Conditional, Bitwise and special operators. Precedence in evaluating arithmetic operators.
Reading and Writing a character. IF, IF-ELSE, Nesting IF-ELSE, ELSE IF ladder and GOTO statements, WHILE, DO
FOR loop statements. Simple programs Arrays: One and Two dimensional arrays, Declaring and initializing string variables.
Reading strings from terminal and Writing strings to screen. User defined functions: definition of functions Return values and their types. Function calls and function declaration.
Pointers: Declaring and initializing pointers, Accessing a variable through its pointer. C- Programming: Linear regression
Sorting of numbers, Calculation of standard deviation and matrix multiplication

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics   Class: I M.Sc.   Semester: 2^{nd} Semester
Title of Paper: 204: NUCLEAR AND PARTICLE PHYSICS

Introduction
Objective of studying Nuclear Physics, Nomenclature, nuclear radius,
Mass & Binding energy, angular momentum, magnetic dipole momentum
Electric quardra pole momentum, parity & symmetry, domains of instability, energy levels, mirror nuclei. Simple theory deuteron
Scattering cross-sections, qualitative discussion neutron-proton and proton-proton scattering, charge independence and charge symmetry of nuclear forces, exchange forces
Yukawa's Potential, characteristics of nuclear forces, Liquid drop model: Weissackers semi-empirical mass formula
Mass-parabolas, nuclear shell model: spin orbit interaction, magic numbers, prediction of angular moment a and parities for ground states
Collective model. More-realistic models, Alpha decay process, Energy release in beta –decay, Fermi's theory of beta-decay, selection rules
Parity violation in beta –decay, Detection and properties of neutrino
Energetic of gamma –decay, selection rules, angular correlation, ,
Mossbauer effect, Types of reaction and conservation Laws, the Q-equation. Optical model, Heavy ion reaction,
Characteristics of fission, delayed neutrons
Four factor formula for controlled fission, nuclear fusion, prospects of continued fission energy.
Stability limit against spontaneous fission
Particle interactions and families, symmetries and conservation laws, energy and momentum, angular momentum, parity, Baryon number, lepton number, isospin
Strangeness quantum number(Gellmann and Nishijiman formula)and charm),Elementary ideas of CP and CPT invariance
Quark model. Interaction of radiation with matter. Gas filled counters, scintillation detectors, semi conductor detectors, energy measurements
Coincidence measurements and time resolution, magnetic spectro meters Electrostatic accelerators
Cyclotron accelerators, synchrotrons, linear accelerators, colliding beam accelerators

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 401: ADVANCED QUANTUM MECHANICS

Recollection of basic concepts of quantum mechanics
Change of basis Dirac’s bra and ket notations
Application to wave mechanics in one dimension, Eigen value problem for operators, the continuous spectrum
The equation of motion , Quantization postulates
Canonical quantization, constants of motion
Invariance properties, Heisenberg picture
Development of time –dependent perturbation theory
Harmonic oscillator
The golden rule for constants
Addition of two angular moment a, Tensor operators
Wigner –Eckart theorem Matrix elements of vector operators
Parity and time reversal symmetries
Concept of differential cross- section Scattering of a wave packet.
Born approximation , partial waves and phase shift analysis
Klein –Gordon equation, Dirac equation for a free particle
Equation of continuity, spin Dirac particle
Solutions of free particle Dirac equation , negative energy states and hole theory

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester

Title of Paper: 402: PROPERTIES AND CHARACTERIZATION OF MATERIAL

Introduction to properties of materials, An harmonic crystal interactions-thermal expansion
Thermal conductivity, lattice thermal resistivity, Umklapp processes, and imperfections. Lattice Vacancies, Diffusion
Colour Centers—F Centers, other centers in alkali halides.
Alloys
Order-disorder transformations, Elementary theory of Order.
Fundamentals of Transmission electron microscopy and study of crystal structure using TEM
Fundamentals of Scanning electron microscopy and study of microstructure using SEM
Spin and an applied field—the nature of spinning particles, interaction between spin and a magnetic field, population of energy levels, the Larmor precession
Relaxation times—spin- spin relation, spin-lattice relaxation
Electron Spin Resonance: Introduction, g-factor, experimental methods.
Nuclear Magnetic Resonance—equations of motion, line width, motional narrowing, hyperfine splitting,
Nuclear Gamma Ray Resonance: Principles of Mossbauer Spectroscopy, Line Width, Resonance absorption, Mossbauer Spectrometer
Isomer Shift, Quadra pole Splitting, magnetic field effects,
Applications of Mossbauer Spectroscopy, DC & AC Conductivity
Curie temperature, Saturation Magnetization
Susceptibility , Fundamentals of Infra-red Spectroscopy and Applications
FTIR Spectroscopy and its applications.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2016-17.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester
Title of Paper: 403: RADAR AND SATILLITE COMMUNICATION

Introduction
Integration time and the Doppler shift-Designing a surveillance-Antenna beam-width consideration-pulse repetation frequency-unambiguous range and velocity
Pulse length and sampling-radar cross section-clutter noise-Tracking radar-sequential lobbing-conical scanning
Mono Pulse Radar-Tracking accuracy and Process-Frequency Agility-Radar guidance
Signal and Data Processing-Properties of clutter-Moving target Indicator Processing Thersholding
Plot extraction-Tract Association, Initiation and Tracking- Radar Antenna-Antenna parameters
Antenna radiation pattern and aperture efficiency-Parabolic reflection- Cosecant squared antenna pattern
Effect of errors on radiation pattern-Stabilization of antennas
Satellite system-Historical development of satellites-communication satellite systems-communication satellites-orbiting satellites
Satellite frequency bands-satellite multiple access formats-Look angles, orbital perturbations,
Space craft and its subsystems-attitude and orbit control system-Telemetry, Tracking and Command
Power system-Transponder-Reliability and space qualification-launch vehicles
Multiple Access Technique-Time division multiple access-Frequency division multiple access
Code division multiple access-Space domain multiple access-Earth Station technology-Subsystem of an earth station-Transmitter
Receiver Tracking and pointing-Small earth station-different types of earth stations-Frequency coordination
Basic principles of special communication satellites- INMARSAT VSAT
GPS, RADARSAT, INTELST

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEA R 2016-17.

Introduction to Radiation Potential functions of electromagnetic fields. Potential function for sinusoidal oscillations. Fields radiated by an alternating current element.
Power radiated by a current element and radiation resistance. Radiation from a quarter wave monopole or a half wave dipole.
EM field close to an antenna and far field approximation. (Chapter 10 in Jordan and Balmain)
Antenna Fundamentals Definition of an antenna. Antenna properties – radiation pattern, gain, directive gain and directivity.
Effective area. Antenna beam width and band width. Directional properties of dipole antennas.
Antenna Arrays Two element array. Linear arrays. Multiplication of patterns and binomial array
Effect of Earth on vertical patterns. Mathematical theory of linear arrays.
Antenna synthesis – Tchebycheff polynomial method. Wave polarization.
Impedance Antenna terminal impedance.
Mutual impedance between two antennas. Computation of mutual impedance.
Radiation resistance by induced emf method. Reactance of an antenna. Biconcal antenna and its impedance.
Frequency Independent (FI) Antennas Frequency Independence concept. Equiangular spiral. Log Periodic (LP) antennas.
Array theory of LP and FI structures. (Chapter 15 in Jordan and Balmain and Chapter 15 in Kraus)
Methods of excitation and Practical Antennas Methods of excitation and stub matching and baluns. Folded dipole, loop antennas. Parasitic elements and Yagi-Uda arrays and Helical antenna.
Radio Wave Propagation Elements of Ground wave and Space wave propagation. Tropospheric propagation and Troposcatter.
Fundamentals of Ionosphere. Sky wave propagation –
Critical frequency, MUF and skip distance.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 101: CLASSICAL MECHANICS

Introduction
Mechanic of particle, mechanics of system of particles, constraints, D'Alembbert's principle
Lagrange's equations velocity dependent potentials and Dissipation function simple application of the Lagrangian formulation
Hamilton's principle some techniques of variations Derivation of Lagrange's equations from Hamilton's principle Conservation theorems and symmetry properties Energy function and the conservation of energy
Reduction to the equivalent one body problem The equation of motion and first Integrals, The equivalent One – Dimensional problem and classification of orbits, The differential equation for the orbit, and Integrable power –law potentials, Conditions for closed orbits (Bertrand's theorem),..
The Kepler problem inverse square law of force , The motion in time in the Kepler problem, Scattering in a central force field Legendre transformations and Hamilton's equations of motion.
Cyclic Coordinates and conservation theorems, Derivation of Hamilton's equation of motion from variational principle, Principle of Least Action.
Equations of canonical transformation, Examples of Canonical transformations, The harmonic Oscillator, Poisson brackets and other Canonical invariants formulation
Equations of motion, Infinitesimal canonical transformations, and conservation theorems in the poisson bracket
The angular momentum poisson bracket relations. Hamilton – Jacobi equation of Hamilton's principal function
The Harmonic oscillator problem as an example of the Hamilton – Jacobi Method
Hamilton –Jacobi equation for Hamilton's characteristic function. Action – angle variables in systems of one degree of freedom, Independent coordinates of rigid body
The Euler angles, Euler's theorem on the Motion of a rigid body, Infinitesimal rotations, Rate of change of a vector, The Carioles' Effect. The Inertia tensor and the moment of inertia,
The Eigen values of the inertia tensor and the principal axis transformation, Solving rigid body problems and Euler equations of motion, Torque – free motion of a rigid body
The Eigen value equation and the principal axis transformation, Frequencies of free vibration, and normal coordinates, Free vibrations of a linear tri atomic molecule

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 1st Semester
Title of Paper: 102: ATOMIC AND MOLECULAR PHYSICS

Quantum numbers, Term values . Relation between Magnetic dipole moment and angular momentum of an orbiting electron. Stern–Gerlach experiment and electron spin
Spin- orbit interaction, relativistic kinetic energy correction and dependence of energy on J value only
Selection rules. Fine structure of Balmer series of Hydrogen and Fowler series of ionized Helium. Hyperfine structure of Hα line of hydrogen (I = ½)
Modified term values (quantum defect) due to lifting of orbital degeneracy by core penetration (penetrating orbits) and core polarization (non-penetrating orbits) by electrons.
Term values and fine structure of chief spectral series of sodium. Intensity rules and application to doublets of sodium.
Hyperfine structure of 2P-2S of sodium (I= 3/2).
LS coupling and Hund's rules based on Residual columbic interaction and spin-orbit interaction. Lande's interval rule.
Equivalent and non-equivalent electrons. Spectral terms in LS and JJ coupling (ss,s2 ,pp,p2 configurations). Exchange force and Spectral series of Helium.
Indistinguishable particles, bosons, fermions. Pauli's principle. Ground state. Normal and Anomalous Zeeman Effects
Experimental study of Zeeman effect, Explanation of Normal and Anomalous Zeeman Effects
Quantum theory of Zeeman effect, Paschen-Back effects and its applications, Transition from weak to strong field, Examples of Zeeman effect in some transitions
Linear stark pattern of Hα line of hydrogen, weak field and strong field Stark effects in Hydrogen, Quadratic stark pattern of D1 and D2 lines of Sodium. Molecular quantum numbers. Bonding and anti-bonding orbital's from LCAO's
Effect of nuclear spin functions on Raman rotation spectra of H2 (Fermion) and D2 (Boson). Vibrating rotator Spectrum. Combination relations and evaluation of rotational constants (infrared and Raman)..
Intensity of vibrational bands of an electronic band system in absorption.(The Franck-Condon principle). Sequences and progressions. Deslandre's table and vibrational constants of diatomic molecules
Explanation of bond order for N2 and O2 and their ions. Rotational spectra and the effect of isotopic substitution

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 103: MATHEMATICAL METHODS OF PHYSICS

Function of complex number-definition-properties, analytic function-Cauchy-Riemann conditions
Polar form-problems ,complex differentiation, complex integration-Cauchy's integral theorem-Cauchy's integral formulae
Multiply connected region-problems, infinite series-Taylor's theorem
Laurent's theorem- problems, Cauchy's Residue theorem-evaluation of definite integrals-problems
Beta & Gamma functions-definition ,relation between them-properties-evaluation some integrals
Legendre Polynomial, Her mite Polynomial, Laguerre Polynomial
Generating function-recurrence relations-Rodriguez's formula-orthogonal property
Associated Legendre polynomial-simple recurrence relation-orthogonal property-spherical harmonics
Laplace transforms-definition-properties-Laplace transform of elementary functions-inverse Laplace transforms properties
Evaluation of inverse Laplace transforms
Elementary function method-partial fraction method
Heavy side expansion method-convolution method-complex inversion formula method
Application to differential equations Fourier series-evaluation of Fourier coefficients, Fourier integral theorem-problems-square wave
Rectangular wave-triangular wave. Fourier transforms-infinite Fourier transforms-finite Fourier transforms
Properties-problems-application to boundary value problem, Revision

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: 1M.Sc.   Semester: 1st Semester
Title of Paper: 104: ELECTRONIC DEVICES AND CIRCUITS

Introduction of electronic device and circuits and brief explanation of following unites, Explanation of Tunnel diode
Photo diode and solar cell, Explanation of led
Silicon controlled rectifier , uni junction
Explanation of transistors , FET,JFET,MOSFET, CMOS
Introduction of microwave devices. Explanation of different types diodes.
Varactor diode ,parametric amplifier and different types of amplifiers explained
Thyristors, klystron, reflex klystron, gunn diode
Magnetron, CFA,TWT, BWO, IMPATT
Explanation of TRAPATT (Principle, working and Applications for all devices) revisions of the chapter
OPERATIONAL AMPLIFIERS The ideal Op Amp – Practical inverting and Non inverting Op Amp stages.
Op Amp Architecture – differential stage, gain stage
DC level shifting, output stage, offset voltages and currents .
Operational Amplifier parameters- input offset voltage, input bias current, Common Mode Rejection Ratio, Slew Rate
OP- AMP APPLICATIONS Summing amplifier, Integrator, Differentiator, Voltage to Current converter, Current to Voltage converter Oscillators
Phase shift oscillator, Wien-Bridge Oscillator, Voltage Controlled Oscillator, Schmitt Trigger Special applications Mono stable and A stable multi vibrators using 555, Phase locked Loop,

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 301: SOLID STATE PHYSICS

Introduction to solids, Explanation of structure of atoms and molecules
Periodic array of atoms—Lattice translation vectors and lattices, symmetry operations, The Basis and the Crystal Structure
Primitive Lattice cell, Fundamental types of lattices—Two Dimensional lattice types
Three Dimensional lattice types, Index system for crystal planes.
Simple crystal structures-- sodium chloride, cesium chloride and diamond structures.
Bragg's law, Experimental diffraction methods-- Laue method and powder method, Derivation of scattered wave amplitude
Indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical Structure Factor, Determination of number of atoms in a cell and position of atoms
Reciprocal lattice, Brillion Zone, Reciprocal lattice to bcc and fcc Lattices
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Lattice with two atoms per primitive cell, Quantization of Lattice Vibrations-Phonon momentum.
Energy levels and density of orbital's in one dimension, Free electron gas in 3 dimensions, Heat capacity of the electron gas
Experimental heat capacity of metals, Motion in Magnetic Fields- Hall effect, Ratio of thermal to electrical conductivity
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Wave equation of electron in a periodic potential, Crystal momentum of an electron-Approximate solution near a zone boundary
Number of orbital's in a band--metals and isolators. The distinction between metals, insulators and semiconductors.
Concept of zero resistance, Magnetic behavior, distinction between a perfect conductor and superconductor.
Meissner effect, Isotope effect–specific heat behavior. Two-fluid model. Expression for entropy difference between normal and superconducting states
London's equations. Penetration depth. BCS theory. Josephson junctions–SQUIDS and its applications. Applications of superconductors. High TC superconductors, Preparation, Properties.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: II M.Sc.   Semester: 3rd Semester
Title of Paper: 302: LASERS & FIBER OPTICS

Introduction
Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems
Laser systems: Ruby laser, Nd-YAG laser, CO_2 Laser, Dye laser, Excimer laser, Semiconductor laser. Line shape function and Full Width at half maximum (FWHM) for Natural broadening,
Collision broadening, Doppler broadening, Saturation behavior of broadened transitions Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for Con focal resonators
Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking
Basic optical laws and Self focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure
Ray optics representation, wave representation. Mode theory of circular step-index wave guides.
Wave equation for step-index fibers, modes in step-index fibers and,
Power flow in step index fibers. Graded – index fiber structure
Graded-index numerical aperture, modes in Graded-index fibers
Signal Degradation In Fibers - Attenuation, Absorption
Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay
Material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers
Power launching in Optical fibers, Source-output pattern, Len sing schemes.
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors
Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion
Waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Len sing schemes
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: II M.Sc.   Semester: 3rd Semester
Title of Paper: 303: DIGITAL ELECTRONICS & MICROPROCESSORS

Introduction of syllabus and brief explanation of all units
Introduction of unit 1 Digital Circuits explanation (i) Number Systems and Codes: Binary, Octal, Hexadecimal number systems, Gray code, BCD code, ASCII code.
Logic Gates and Boolean Algebra: OR, AND, NOT, NOR, NAND gates, Boolean theorems, De Morgan laws.
Combinational Logic Circuits Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, EX-OR, EX-NOR gates, ENCODER, DECODER, Multiplexer, De multiplexers.
Digital Arithmetic Operations and Circuits: Binary addition, Design of Adders and Sub tractors, Parallel binary adder, IC parallel adder.
of Boolean Algebra: Magnitude Comparator, Parity generator, Checker, Code converter, Seven-segment decoder/ Driver display
Sequential Logic Circuits Flip-Flops and Related Devices: NAND latch, NOR latch, Clocked flip-flops, Clocked S-C flip-flop, J-K flip-flop, D flip-flop, D latch, Asynchronous inputs, Timing problem in flip flops
Counters: Asynchronous counters (Ripple), Counters with MOD number < 2N , Asynchronous down counter, Synchronous counters, Up-down counter, Pre settable counter
Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO Applications of Counters: Frequency Counter and Digital clock. A/D and D/A Converter Circuits: D/A Converter
Linear weighted and ladder type, An integrated circuit DAC; Analog-to-Digital Conversion, Digital Ramp ADC, Successive Approximation Method, Sample and Hold Circuit, Digital Voltmeter.
Intel 8085 Microprocessor: Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle. Programming the 8085 Microprocessor: (i) Addressing Methods, Instruction set, Assembly language programming.
Examples of Assembly Language Programming: Simple Arithmetic - Addition/Subtraction of two 8- bit/16-bit numbers
Addition of two decimal numbers, Masking of digits, word disassembly.
Programming using Loops: Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.
Data Transfer Technique: Serial transfer, Parallel transfer, Synchronous, Asynchronous, DMA transfer, Interrupt driven Data transfer.
8085 Interfacing: I/O Interfacing: Programmable Peripheral Interfacing
8255, Programmable Peripheral Interval Timer 8253, Programmable Communication Interface 8251
DAC 0800 and ADC 0800 interfacing.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 304: COMMUNICATION ELECTRONICS

Introduction
Amplitude modulation
For sinusoidal AM, Amplitude modulator and demodulator circuits,
Double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver..
Single side band modulation(SSB): Angle modulation ,Frequency deviation modulation index Average power in sinusoidal FM, FM generations, ,
Phase modulation: Equivalence between PM and FM FM detectors: Slope detectors, Balanced slope detectors,
Foster – Seley discriminator Ratio detector, Amplitude modulator ,FM receiver Digital line code: Symbols,
Functional notation for pulses. Line codes and wave forms : RZ, NRZ ,Polar uni polar ,AMI
Principles of pulse amplitude modulation (PAM) and Pulse Time modulation (PTM), Pulse code modulation (PCM), Quantization
Non linear quantization , Comparing, Differential pulse code modeling (DPCM),
Delta modulation(DM) .Digital Carrier systems .Mixer circuits : Diode mixer
IC balanced mixer .Filters : Active filters, Ceramic, Mechanical and Crystal filters
Oscillator : crystal oscillator, Voltage controlled oscillator, Phase locked loop (PLL) .
Thermal noise, Shot noise, Partition noise
Signal – to – noise ratio, Noise factor
Amplifier input noise in terms of F, noise factor of amplifiers in cascade (Friss formula)
Noise temperature, Noise in AM ,Noise in FM in systems. Noise in pulse modulation systems: Inter symbol interference(ISI), Eye diagrams
HDBn and Manchester codes M-Ary encoding, Differential encoding . Sampling theorem

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: I M.Sc.   Semester: 2nd Semester
Title of Paper: 201: ELECTRODYNAMICS

Introduction of unit –I Gauss Theorem, Poisson's equation and explanation
Laplace's equation, solution to Laplace's equation in Cartesian coordinates, spherical coordinates
Cylindrical coordinates, use of Laplace's equation in the solutions of electrostatic problems.
Ampere's circuital law, magnetic vector potential, displacement current, Faraday's law of electromagnetic induction
Maxwell's equations, differential and integral forms, physical significance of Maxwell's equations.
Wave equation, plane electromagnetic waves in free space , in non conducting isotropic medium, in conducting medium, electromagnetic vector and scalar potentials
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz gauge, Coulomb gauge ,Charged particles in electric and magnetic fields
Charged particles in uniform electric field,
Charged particles in homogenous magnetic fields,
Charged particles in simultaneous electric and magnetic fields, charged particles in non homogeneous magnetic fields
Lie nard -Wiechert potentials, electromagnetic fields from Lienard-wiechert potentials of a moving charge, electromagnetic fields of a uniformly moving charge, radiation due to non-relativistic charges,
Radiation damping, Abraham-Lorentz formula, Cherenkov radiation.
Radiation due to an oscillatory electric dipole, radiation due to a small current element
Condition for plasma existence, occurrence of plasma, magneto hydrodynamics, plasma waves Transformation of electromagnetic potentials,
Invariance or covariance of Maxwell field equations in terms of 4 vectors,
Lorentz condition in covariant form electromagnetic field tensor,
Lorentz transformation of electric and magnetic fields

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 202: STATISTICAL MECHANICS

Introduction to thermodynamics
Specification of the state of a system, phase space and quantum states, Liou villes theorem, Basic postulates, Probability calculations, concept of ensembles, thermal interaction,
Mechanical interaction, quasi static process, distribution of energy between systems in equilibrium, statistical calculations of thermo dynamic quantities, Isolated systems(Micro canonical ensemble).
Entropy of a perfect gas in micro canonical ensemble. Canonical ensemble - system in contact with heat reservoir, system with specified mean energy, connection with thermodynamics, Energy fluctuations in the canonical ensemble.
Grand canonical ensemble, Thermodynamic function for the grand canonical ensemble. Density and energy fluctuations in the grand canonical ensemble. Thermodynamic equivalence of ensembles.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas. Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion
Harmonic Oscillator, Specific heats of solids (Einstein and Debye model of solids), Para magnetism, Partition function for polyatomic molecules, Electronic energy,
Vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas.
Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion. Harmonic Oscillator, Specific heats of solids
Para magnetism, Partition function for polyatomic molecules, Electronic energy, vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen
Formulation of the statistical problem. Maxwell–Boltzmann statistics. Photon statistics, Bose-Einstein statistics, Fermi–Dirac statistics
Quantum statistics in the classical limit, calculation of dispersion for MB, BE & FD statistics Equation of state of an Ideal Bose Gas,
Black body radiation, Bose-Einstein condensation, Equation of state for a weakly degenerate and strongly degenerate ideal Fermi gas. Thermionic emission. The theory of white dwarf stars.
Non ideal classical gas: Calculation of the partition functions for low densities. Equation of state and virial coeffiecients (Van Dar Walls equation)
Phase transition, conditions for Phase equilibrium, First order Phase transition..
Clausius-Clayperon equation, Second order phase transition, The critical indices.
Vander waals theory of liquid gas transition. Order parameter, Landau theory.

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 203: NUMERICAL METHODS AND PROGRAMMING WITH C

Solution of algebraic and transcendental equations: Bisection method, Method of false position
Newton-Raphson method. Principle of least squares – fitting of polynomials. Interpolation: Finite differences(forward, backward and central difference),
Newton's formula for Interpolation, Central difference Interpolation formula (Gauss's & Sterling formula)
Lagrange's Interpolation formula, Inverse Interpolation.
Differentiation: Cubic Spiline Method, Maximum and Minimum values of a Tabulated function
Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule and 3/8 Rule. Solutions of linear systems
Direct methods: Solutions of linear systems, Matrix Inversion method, Gauss Elimination method, Modification of Gauss Elimination method (Gauss-Jordan Method).
Iterative methods: Jacobi method, Gauss Seidel method.
Numerical solutions of ordinary differential equations: Solution by Taylor's series,
Picard's method of successive approximations, Euler's method (Error estimates for the Euler's method, Modified Euler's method)and Range-Kutta method.
Character Set, C tokens, Key words and Identifiers, Constants and Variables, Data types, Declaration of variables
Operators and expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement operators, Conditional, Bitwise and special operators. Precedence in evaluating arithmetic operators.
Reading and Writing a character. IF, IF-ELSE, Nesting IF-ELSE, ELSE IF ladder and GOTO statements, WHILE, DO
FOR loop statements. Simple programs Arrays: One and Two dimensional arrays, Declaring and initializing string variables.
Reading strings from terminal and Writing strings to screen. User defined functions: definition of functions Return values and their types. Function calls and function declaration.
Pointers: Declaring and initializing pointers, Accessing a variable through its pointer. C- Programming: Linear regression
Sorting of numbers, Calculation of standard deviation and matrix multiplication

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Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 204: NUCLEAR AND PARTICLE PHYSICS

Introduction
Objective of studying Nuclear Physics, Nomenclature, nuclear radius,
Mass & Binding energy, angular momentum, magnetic dipole momentum
Electric quardra pole momentum, parity & symmetry, domains of instability, energy levels, mirror nuclei. Simple theory deuteron
Scattering cross-sections, qualitative discussion neutron-proton and proton-proton scattering, charge independence and charge symmetry of nuclear forces, exchange forces
Yukawa's Potential, characteristics of nuclear forces, Liquid drop model: Weissackers semi-empirical mass formula
Mass-parabolas, nuclear shell model: spin orbit interaction, magic numbers, prediction of angular moment a and parities for ground states
Collective model. More-realistic models, Alpha decay process, Energy release in beta –decay, Fermi's theory of beta-decay, selection rules
Parity violation in beta –decay, Detection and properties of neutrino
Energetic of gamma –decay, selection rules, angular correlation, ,
Mossbauer effect, Types of reaction and conservation Laws, the Q-equation. Optical model, Heavy ion reaction,
Characteristics of fission, delayed neutrons
Four factor formula for controlled fission, nuclear fusion, prospects of continued fission energy.
Stability limit against spontaneous fission
Particle interactions and families, symmetries and conservation laws, energy and momentum, angular momentum, parity, Baryon number, lepton number, isospin
Strangeness quantum number(Gellmann and Nishijiman formula)and charm),Elementary ideas of CP and CPT invariance
Quark model. Interaction of radiation with matter. Gas filled counters, scintillation detectors, semi conductor detectors, energy measurements
Coincidence measurements and time resolution, magnetic spectro meters Electrostatic accelerators
Cyclotron accelerators, synchrotrons, linear accelerators, colliding beam accelerators

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: II M.Sc. Semester: 4^{th} Semester
Title of Paper: 401: ADVANCED QUANTUM MECHANICS

Recollection of basic concepts of quantum mechanics
Change of basis Dirac's bra and ket notations
Application to wave mechanics in one dimension, Eigen value problem for operators, the continuous spectrum
The equation of motion , Quantization postulates
Canonical quantization, constants of motion
Invariance properties, Heisenberg picture
Development of time –dependent perturbation theory
Harmonic oscillator
The golden rule for constants
Addition of two angular moment a, Tensor operators
Wigner –Eckart theorem Matrix elements of vector operators
Parity and time reversal symmetries
Concept of differential cross- section Scattering of a wave packet.
Born approximation , partial waves and phase shift analysis
Klein –Gordon equation, Dirac equation for a free particle
Equation of continuity, spin Dirac particle
Solutions of free particle Dirac equation , negative energy states and hole theory

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester

Title of Paper: 402: PROPERTIES AND CHARACTERIZATION OF MATERIALS

Introduction to properties of materials, An harmonic crystal interactions-thermal expansion
Thermal conductivity, lattice thermal resistivity, Umklapp processes, and imperfections. Lattice Vacancies, Diffusion
Colour Centers—F Centers, other centers in alkali halides.
Alloys
Order-disorder transformations, Elementary theory of Order.
Fundamentals of Transmission electron microscopy and study of crystal structure using TEM
Fundamentals of Scanning electron microscopy and study of microstructure using SEM
Spin and an applied field—the nature of spinning particles, interaction between spin and a magnetic field, population of energy levels, the Larmor precession
Relaxation times—spin- spin relation, spin-lattice relaxation
Electron Spin Resonance: Introduction, g-factor, experimental methods.
Nuclear Magnetic Resonance—equations of motion, line width, motional narrowing, hyperfine splitting,
Nuclear Gamma Ray Resonance: Principles of Mossbauer Spectroscopy, Line Width, Resonance absorption, Mossbauer Spectrometer
Isomer Shift, Quadra pole Splitting, magnetic field effects,
Applications of Mossbauer Spectroscopy, DC & AC Conductivity
Curie temperature, Saturation Magnetization
Susceptibility , Fundamentals of Infra-red Spectroscopy and Applications
FTIR Spectroscopy and its applications.

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SYLLABUS FOR THE YEAR 2017-18.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 403: RADAR AND SATILLITE COMMUNICATION

Introduction
Integration time and the Doppler shift-Designing a surveillance-Antenna beam-width consideration-pulse repetation frequency-unambiguous range and velocity
Pulse length and sampling-radar cross section-clutter noise-Tracking radar-sequential lobbing-conical scanning
Mono Pulse Radar-Tracking accuracy and Process-Frequency Agility-Radar guidance
Signal and Data Processing-Properties of clutter-Moving target Indicator Processing Thersholding
Plot extraction-Tract Association, Initiation and Tracking- Radar Antenna-Antenna parameters
Antenna radiation pattern and aperture efficiency-Parabolic reflection- Cosecant squared antenna pattern
Effect of errors on radiation pattern-Stabilization of antennas
Satellite system-Historical development of satellites-communication satellite systems-communication satellites-orbiting satellites
Satellite frequency bands-satellite multiple access formats-Look angles, orbital perturbations,
Space craft and its subsystems-attitude and orbit control system-Telemetry, Tracking and Command
Power system-Transponder-Reliability and space qualification-launch vehicles
Multiple Access Technique-Time division multiple access-Frequency division multiple access
Code division multiple access-Space domain multiple access-Earth Station technology-Subsystem of an earth station-Transmitter
Receiver Tracking and pointing-Small earth station-different types of earth stations-Frequency coordination
Basic principles of special communication satellites- INMARSAT VSAT
GPS, RADARSAT, INTELST

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2017-18.

Introduction to Radiation Potential functions of electromagnetic fields. Potential function for sinusoidal oscillations. Fields radiated by an alternating current element.
Power radiated by a current element and radiation resistance. Radiation from a quarter wave monopole or a half wave dipole.
EM field close to an antenna and far field approximation. (Chapter 10 in Jordan and Balmain)
Antenna Fundamentals Definition of an antenna. Antenna properties – radiation pattern, gain, directive gain and directivity.
Effective area. Antenna beam width and band width. Directional properties of dipole antennas.
Antenna Arrays Two element array. Linear arrays. Multiplication of patterns and binomial array
Effect of Earth on vertical patterns. Mathematical theory of linear arrays.
Antenna synthesis – Tchebycheff polynomial method. Wave polarization.
Impedance Antenna terminal impedance.
Mutual impedance between two antennas. Computation of mutual impedance.
Radiation resistance by induced emf method. Reactance of an antenna. Biconcal antenna and its impedance.
Frequency Independent (FI) Antennas Frequency Independence concept. Equiangular spiral. Log Periodic (LP) antennas.
Array theory of LP and FI structures. (Chapter 15 in Jordan and Balmain and Chapter 15 in Kraus)
Methods of excitation and Practical Antennas Methods of excitation and stub matching and baluns. Folded dipole, loop antennas. Parasitic elements and Yagi-Uda arrays and Helical antenna.
Radio Wave Propagation Elements of Ground wave and Space wave propagation. Tropospheric propagation and Troposcatter.
Fundamentals of Ionosphere. Sky wave propagation –
Critical frequency, MUF and skip distance.

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 101: CLASSICAL MECHANICS

Introduction
Mechanic of particle, mechanics of system of particles, constraints, D'Alembbert's principle
Lagrange's equations velocity dependent potentials and Dissipation function simple application of the Lagrangian formulation
Hamilton's principle some techniques of variations Derivation of Lagrange's equations from Hamilton's principle Conservation theorems and symmetry properties Energy function and the conservation of energy
Reduction to the equivalent one body problem The equation of motion and first Integrals, The equivalent One – Dimensional problem and classification of orbits, The differential equation for the orbit, and Integrable power –law potentials, Conditions for closed orbits (Bertrand's theorem),..
The Kepler problem inverse square law of force , The motion in time in the Kepler problem, Scattering in a central force field Legendre transformations and Hamilton's equations of motion.
Cyclic Coordinates and conservation theorems, Derivation of Hamilton's equation of motion from variational principle, Principle of Least Action.
Equations of canonical transformation, Examples of Canonical transformations, The harmonic Oscillator, Poisson brackets and other Canonical invariants formulation
Equations of motion, Infinitesimal canonical transformations, and conservation theorems in the poisson bracket
The angular momentum poisson bracket relations. Hamilton – Jacobi equation of Hamilton's principal function
The Harmonic oscillator problem as an example of the Hamilton – Jacobi Method
Hamilton –Jacobi equation for Hamilton's characteristic function. Action – angle variables in systems of one degree of freedom, Independent coordinates of rigid body
The Euler angles, Euler's theorem on the Motion of a rigid body, Infinitesimal rotations, Rate of change of a vector, The Carioles' Effect. The Inertia tensor and the moment of inertia,
The Eigen values of the inertia tensor and the principal axis transformation, Solving rigid body problems and Euler equations of motion, Torque – free motion of a rigid body
The Eigen value equation and the principal axis transformation, Frequencies of free vibration, and normal coordinates, Free vibrations of a linear tri atomic molecule

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 102: ATOMIC AND MOLECULAR PHYSICS

Quantum numbers, Term values . Relation between Magnetic dipole moment and angular momentum of an orbiting electron. Stern–Gerlach experiment and electron spin
Spin- orbit interaction, relativistic kinetic energy correction and dependence of energy on J value only
Selection rules. Fine structure of Balmer series of Hydrogen and Fowler series of ionized Helium. Hyperfine structure of Hα line of hydrogen (I = ½)
Modified term values (quantum defect) due to lifting of orbital degeneracy by core penetration (penetrating orbits) and core polarization (non-penetrating orbits) by electrons.
Term values and fine structure of chief spectral series of sodium. Intensity rules and application to doublets of sodium.
Hyperfine structure of 2P-2S of sodium (I= 3/2).
LS coupling and Hund's rules based on Residual columbic interaction and spin-orbit interaction. Lande's interval rule.
Equivalent and non-equivalent electrons. Spectral terms in LS and JJ coupling (ss,s2 ,pp,p2 configurations). Exchange force and Spectral series of Helium.
Indistinguishable particles, bosons, fermions. Pauli's principle. Ground state. Normal and Anomalous Zeeman Effects
Experimental study of Zeeman effect, Explanation of Normal and Anomalous Zeeman Effects
Quantum theory of Zeeman effect, Paschen-Back effects and its applications, Transition from weak to strong field, Examples of Zeeman effect in some transitions
Linear stark pattern of Hα line of hydrogen, weak field and strong field Stark effects in Hydrogen, Quadratic stark pattern of D1 and D2 lines of Sodium. Molecular quantum numbers. Bonding and anti-bonding orbital's from LCAO's
Effect of nuclear spin functions on Raman rotation spectra of H2 (Fermion) and D2 (Boson). Vibrating rotator Spectrum. Combination relations and evaluation of rotational constants (infrared and Raman)..
Intensity of vibrational bands of an electronic band system in absorption.(The Franck-Condon principle). Sequences and progressions. Deslandre's table and vibrational constants of diatomic molecules
Explanation of bond order for N2 and O2 and their ions. Rotational spectra and the effect of isotopic substitution

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Department: P.G. Physics   Class: 1M.Sc.   Semester: 1st Semester
Title of Paper: 103: MATHEMATICAL METHODS OF PHYSICS

Function of complex number-definition-properties, analytic function-Cauchy-Riemann conditions
Polar form-problems ,complex differentiation, complex integration-Cauchy's integral theorem-Cauchy's integral formulae
Multiply connected region-problems, infinite series-Taylor's theorem
Laurent's theorem- problems, Cauchy's Residue theorem-evaluation of definite integrals-problems
Beta & Gamma functions-definition ,relation between them-properties-evaluation some integrals
Legendre Polynomial, Her mite Polynomial, Laguerre Polynomial
Generating function-recurrence relations-Rodriguez's formula-orthogonal property
Associated Legendre polynomial-simple recurrence relation-orthogonal property-spherical harmonics
Laplace transforms-definition-properties-Laplace transform of elementary functions-inverse Laplace transforms properties
Evaluation of inverse Laplace transforms
Elementary function method-partial fraction method
Heavy side expansion method-convolution method-complex inversion formula method
Application to differential equations Fourier series-evaluation of Fourier coefficients, Fourier integral theorem-problems-square wave
Rectangular wave-triangular wave. Fourier transforms-infinite Fourier transforms-finite Fourier transforms
Properties-problems-application to boundary value problem, Revision

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: 1M.Sc. Semester: 1st Semester
Title of Paper: 104: ELECTRONIC DEVICES AND CIRCUITS

Introduction of electronic device and circuits and brief explanation of following unites, Explanation of Tunnel diode
Photo diode and solar cell, Explanation of led
Silicon controlled rectifier , uni junction
Explanation of transistors , FET,JFET,MOSFET, CMOS
Introduction of microwave devices. Explanation of different types diodes.
Varactor diode ,parametric amplifier and different types of amplifiers explained
Thyristors, klystron, reflex klystron, gunn diode
Magnetron, CFA,TWT, BWO, IMPATT
Explanation of TRAPATT (Principle, working and Applications for all devices) revisions of the chapter
OPERATIONAL AMPLIFIERS The ideal Op Amp – Practical inverting and Non inverting Op Amp stages.
Op Amp Architecture – differential stage, gain stage
DC level shifting, output stage, offset voltages and currents .
Operational Amplifier parameters- input offset voltage, input bias current, Common Mode Rejection Ratio, Slew Rate
OP- AMP APPLICATIONS Summing amplifier, Integrator, Differentiator, Voltage to Current converter, Current to Voltage converter Oscillators
Phase shift oscillator, Wien-Bridge Oscillator, Voltage Controlled Oscillator, Schmitt Trigger Special applications Mono stable and A stable multi vibrators using 555, Phase locked Loop,

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Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 301: SOLID STATE PHYSICS

Introduction to solids, Explanation of structure of atoms and molecules
Periodic array of atoms—Lattice translation vectors and lattices, symmetry operations, The Basis and the Crystal Structure
Primitive Lattice cell, Fundamental types of lattices—Two Dimensional lattice types
Three Dimensional lattice types, Index system for crystal planes.
Simple crystal structures-- sodium chloride, cesium chloride and diamond structures.
Bragg's law, Experimental diffraction methods-- Laue method and powder method, Derivation of scattered wave amplitude
Indexing pattern of cubic crystals and non-cubic crystals (analytical methods). Geometrical Structure Factor, Determination of number of atoms in a cell and position of atoms
Reciprocal lattice, Brillion Zone, Reciprocal lattice to bcc and fcc Lattices
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Lattice with two atoms per primitive cell, Quantization of Lattice Vibrations-Phonon momentum.
Energy levels and density of orbital's in one dimension, Free electron gas in 3 dimensions, Heat capacity of the electron gas
Experimental heat capacity of metals, Motion in Magnetic Fields- Hall effect, Ratio of thermal to electrical conductivity
Nearly free electron model, Origin of the energy gap, The Block Theorem, Kronig-Penny Model
Wave equation of electron in a periodic potential, Crystal momentum of an electron-Approximate solution near a zone boundary
Number of orbital's in a band--metals and isolators. The distinction between metals, insulators and semiconductors.
Concept of zero resistance, Magnetic behavior, distinction between a perfect conductor and superconductor.
Meissner effect, Isotope effect–specific heat behavior. Two-fluid model. Expression for entropy difference between normal and superconducting states
London's equations. Penetration depth. BCS theory. Josephson junctions–SQUIDS and its applications. Applications of superconductors. High TC superconductors, Preparation, Properties.

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 302: LASERS & FIBER OPTICS

Introduction
Light Amplification and relation between Einstein A and B Coefficients. Rate equations for three level and four level systems
Laser systems: Ruby laser, Nd-YAG laser, CO2 Laser, Dye laser, Excimer laser, Semiconductor laser. Line shape function and Full Width at half maximum (FWHM) for Natural broadening,
Collision broadening, Doppler broadening, Saturation behavior of broadened transitions Longitudinal and Transverse modes. ABCD matrices and cavity Stability criteria for Con focal resonators
Quality factor, Q-Switching, Mode Locking in lasers. Expression for Intensity for modes oscillating at random and modes locked in phase. Methods of Q-Switching and Mode locking
Basic optical laws and Self focusing. Optical fiber modes and configurations Fiber types, Rays and Modes, Step-index fiber structure
Ray optics representation, wave representation. Mode theory of circular step-index wave guides.
Wave equation for step-index fibers, modes in step-index fibers and,
Power flow in step index fibers. Graded – index fiber structure
Graded-index numerical aperture, modes in Graded-index fibers
Signal Degradation In Fibers - Attenuation, Absorption
Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay
Material dispersion, waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers
Power launching in Optical fibers, Source-output pattern, Len sing schemes.
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors
Signal Degradation In Fibers - Attenuation, Absorption, Scattering and Bending losses in fibers, Radiative losses, Core and Cladding losses. Signal distortion in optical wave guides: Group delay, material dispersion
Waveguide dispersion and intermodal dispersion. Pulse broadening in optical fibers. Power launching in Optical fibers, Source-output pattern, Len sing schemes
Fiber-to-fiber joints: Mechanical misalignment, fiber related losses, Fiber and face preparation. Fiber splicing techniques, fiber connectors

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 303: DIGITAL ELECTRONICS & MICROPROCESSORS

Introduction of syllabus and brief explanation of all units
Introduction of unit 1 Digital Circuits explanation (i) Number Systems and Codes: Binary, Octal, Hexadecimal number systems, Gray code, BCD code, ASCII code.
Logic Gates and Boolean Algebra: OR, AND, NOT, NOR, NAND gates, Boolean theorems, De Morgan laws.
Combinational Logic Circuits Simplification of Boolean Expressions: Algebraic method, Karnaugh Map method, EX-OR, EX-NOR gates, ENCODER, DECODER, Multiplexer, De multiplexers.
Digital Arithmetic Operations and Circuits: Binary addition, Design of Adders and Sub tractors, Parallel binary adder, IC parallel adder.
of Boolean Algebra: Magnitude Comparator, Parity generator, Checker, Code converter, Seven-segment decoder/ Driver display
Sequential Logic Circuits Flip-Flops and Related Devices: NAND latch, NOR latch, Clocked flip-flops, Clocked S-C flip-flop, J-K flip-flop, D flip-flop, D latch, Asynchronous inputs, Timing problem in flip flops
Counters: Asynchronous counters (Ripple), Counters with MOD number < 2N , Asynchronous down counter, Synchronous counters, Up-down counter, Pre settable counter
Registers: Shift Register, Integrated Circuit registers, Parallel In Parallel Out (PIPO), SISO, SIPO, PISO Applications of Counters: Frequency Counter and Digital clock. A/D and D/A Converter Circuits: D/A Converter
Linear weighted and ladder type, An integrated circuit DAC; Analog-to-Digital Conversion, Digital Ramp ADC, Successive Approximation Method, Sample and Hold Circuit, Digital Voltmeter.
Intel 8085 Microprocessor: Architecture, Functional diagram, Pin description, Timing Diagram of Read Cycle, Timing diagram of write Cycle. Programming the 8085 Microprocessor: (i) Addressing Methods, Instruction set, Assembly language programming.
Examples of Assembly Language Programming: Simple Arithmetic - Addition/Subtraction of two 8- bit/16-bit numbers
Addition of two decimal numbers, Masking of digits, word disassembly.
Programming using Loops: Sum of series of 8-bit numbers, Largest element in the array, Multiple byte addition, Delay sub-routine.
Data Transfer Technique: Serial transfer, Parallel transfer, Synchronous, Asynchronous, DMA transfer, Interrupt driven Data transfer.
8085 Interfacing: I/O Interfacing: Programmable Peripheral Interfacing
8255, Programmable Peripheral Interval Timer 8253, Programmable Communication Interface 8251
DAC 0800 and ADC 0800 interfacing.

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Department: P.G. Physics Class: II M.Sc. Semester: 3rd Semester
Title of Paper: 304: COMMUNICATION ELECTRONICS

Introduction
Amplitude modulation
For sinusoidal AM, Amplitude modulator and demodulator circuits,
Double side band suppressed carrier (DSBSC) Modulation, Super heterodyne receiver..
Single side band modulation(SSB): Angle modulation ,Frequency deviation modulation index Average power in sinusoidal FM, FM generations, ,
Phase modulation: Equivalence between PM and FM FM detectors: Slope detectors, Balanced slope detectors,
Foster – Seley discriminator Ratio detector, Amplitude modulator ,FM receiver Digital line code: Symbols,
Functional notation for pulses. Line codes and wave forms : RZ, NRZ ,Polar uni polar ,AMI
Principles of pulse amplitude modulation (PAM) and Pulse Time modulation (PTM), Pulse code modulation (PCM), Quantization
Non linear quantization , Comparing, Differential pulse code modeling (DPCM),
Delta modulation(DM) .Digital Carrier systems .Mixer circuits : Diode mixer
IC balanced mixer .Filters : Active filters, Ceramic, Mechanical and Crystal filters
Oscillator : crystal oscillator, Voltage controlled oscillator, Phase locked loop (PLL) .
Thermal noise, Shot noise, Partition noise
Signal – to – noise ratio, Noise factor
Amplifier input noise in terms of F, noise factor of amplifiers in cascade (Friss formula)
Noise temperature, Noise in AM ,Noise in FM in systems. Noise in pulse modulation systems: Inter symbol interference(ISI), Eye diagrams
HDBn and Manchester codes M-Ary encoding, Differential encoding . Sampling theorem

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 201: ELECTRODYNAMICS

Introduction of unit –I Gauss Theorem, Poisson's equation and explanation
Laplace's equation, solution to Laplace's equation in Cartesian coordinates, spherical coordinates
Cylindrical coordinates, use of Laplace's equation in the solutions of electrostatic problems.
Ampere's circuital law, magnetic vector potential, displacement current, Faraday's law of electromagnetic induction
Maxwell's equations, differential and integral forms, physical significance of Maxwell's equations.
Wave equation, plane electromagnetic waves in free space , in non conducting isotropic medium, in conducting medium, electromagnetic vector and scalar potentials
Uniqueness of electromagnetic potentials and concept of gauge, Lorentz gauge, Coulomb gauge ,Charged particles in electric and magnetic fields
Charged particles in uniform electric field,
Charged particles in homogenous magnetic fields,
Charged particles in simultaneous electric and magnetic fields, charged particles in non homogeneous magnetic fields
Lie nard -Wiechert potentials, electromagnetic fields from Lienard-wiechert potentials of a moving charge, electromagnetic fields of a uniformly moving charge, radiation due to non-relativistic charges,
Radiation damping, Abraham-Lorentz formula, Cherenkov radiation.
Radiation due to an oscillatory electric dipole, radiation due to a small current element
Condition for plasma existence, occurrence of plasma, magneto hydrodynamics, plasma waves Transformation of electromagnetic potentials,
Invariance or covariance of Maxwell field equations in terms of 4 vectors,
Lorentz condition in covariant form electromagnetic field tensor,
Lorentz transformation of electric and magnetic fields

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SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics   Class: I M.Sc.   Semester: 2nd Semester

Title of Paper: 202: STATISTICAL MECHANICS

Introduction to thermodynamics
Specification of the state of a system, phase space and quantum states, Liou villes theorem, Basic postulates, Probability calculations, concept of ensembles, thermal interaction,
Mechanical interaction, quasi static process, distribution of energy between systems in equilibrium, statistical calculations of thermo dynamic quantities, Isolated systems(Micro canonical ensemble).
Entropy of a perfect gas in micro canonical ensemble. Canonical ensemble - system in contact with heat reservoir, system with specified mean energy, connection with thermodynamics, Energy fluctuations in the canonical ensemble.
Grand canonical ensemble, Thermodynamic function for the grand canonical ensemble. Density and energy fluctuations in the grand canonical ensemble. Thermodynamic equivalence of ensembles.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas. Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion
Harmonic Oscillator, Specific heats of solids (Einstein and Debye model of solids), Para magnetism, Partition function for polyatomic molecules, Electronic energy,
Vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen.
Partition functions and their properties. Calculation of thermo dynamic quantities to an ideal mono atomic gas.
Gibbs paradox, validity of the classical approximation. Proof of the equipartition theorem. Simple applications – mean K.E. of a molecule in a gas. Brownian motion. Harmonic Oscillator, Specific heats of solids
Para magnetism, Partition function for polyatomic molecules, Electronic energy, vibrational energy and rotational energy of a diatomic molecule. Effect of Nuclear spin-ortho and para Hydrogen
Formulation of the statistical problem. Maxwell–Boltzmann statistics. Photon statistics, Bose-Einstein statistics, Fermi–Dirac statistics
Quantum statistics in the classical limit, calculation of dispersion for MB, BE & FD statistics Equation of state of an Ideal Bose Gas,
Black body radiation, Bose-Einstein condensation, Equation of state for a weakly degenerate and strongly degenerate ideal Fermi gas. Thermionic emission. The theory of white dwarf stars.
Non ideal classical gas: Calculation of the partition functions for low densities. Equation of state and virial coeffiecients (Van Dar Walls equation)
Phase transition, conditions for Phase equilibrium, First order Phase transition..
Clausius-Clayperon equation, Second order phase transition, The critical indices.
Vander waals theory of liquid gas transition. Order parameter, Landau theory.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 203: NUMERICAL METHODS AND PROGRAMMING WITH C

Solution of algebraic and transcendental equations: Bisection method, Method of false position
Newton-Raphson method. Principle of least squares – fitting of polynomials. Interpolation: Finite differences(forward, backward and central difference),
Newton's formula for Interpolation, Central difference Interpolation formula (Gauss's & Sterling formula)
Lagrange's Interpolation formula, Inverse Interpolation.
Differentiation: Cubic Spiline Method, Maximum and Minimum values of a Tabulated function
Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule and 3/8 Rule. Solutions of linear systems
Direct methods: Solutions of linear systems, Matrix Inversion method, Gauss Elimination method, Modification of Gauss Elimination method (Gauss-Jordan Method).
Iterative methods: Jacobi method, Gauss Seidel method.
Numerical solutions of ordinary differential equations: Solution by Taylor's series,
Picard's method of successive approximations, Euler's method (Error estimates for the Euler's method, Modified Euler's method)and Range-Kutta method.
Character Set, C tokens, Key words and Identifiers, Constants and Variables, Data types, Declaration of variables
Operators and expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement operators, Conditional, Bitwise and special operators. Precedence in evaluating arithmetic operators.
Reading and Writing a character. IF, IF-ELSE, Nesting IF-ELSE, ELSE IF ladder and GOTO statements, WHILE, DO
FOR loop statements. Simple programs Arrays: One and Two dimensional arrays, Declaring and initializing string variables.
Reading strings from terminal and Writing strings to screen. User defined functions: definition of functions Return values and their types. Function calls and function declaration.
Pointers: Declaring and initializing pointers, Accessing a variable through its pointer. C- Programming: Linear regression
Sorting of numbers, Calculation of standard deviation and matrix multiplication

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt., SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: I M.Sc. Semester: 2nd Semester
Title of Paper: 204: NUCLEAR AND PARTICLE PHYSICS

Introduction
Objective of studying Nuclear Physics, Nomenclature, nuclear radius,
Mass & Binding energy, angular momentum, magnetic dipole momentum
Electric quardra pole momentum, parity & symmetry, domains of instability, energy levels, mirror nuclei. Simple theory deuteron
Scattering cross-sections, qualitative discussion neutron-proton and proton-proton scattering, charge independence and charge symmetry of nuclear forces, exchange forces
Yukawa's Potential, characteristics of nuclear forces, Liquid drop model: Weissackers semi-empirical mass formula
Mass-parabolas, nuclear shell model: spin orbit interaction, magic numbers, prediction of angular moment a and parities for ground states
Collective model. More-realistic models, Alpha decay process, Energy release in beta –decay, Fermi's theory of beta-decay, selection rules
Parity violation in beta –decay, Detection and properties of neutrino
Energetic of gamma –decay, selection rules, angular correlation, ,
Mossbauer effect, Types of reaction and conservation Laws, the Q-equation. Optical model, Heavy ion reaction,
Characteristics of fission, delayed neutrons
Four factor formula for controlled fission, nuclear fusion, prospects of continued fission energy.
Stability limit against spontaneous fission
Particle interactions and families, symmetries and conservation laws, energy and momentum, angular momentum, parity, Baryon number, lepton number, isospin
Strangeness quantum number(Gellmann and Nishijiman formula)and charm),Elementary ideas of CP and CPT invariance
Quark model. Interaction of radiation with matter. Gas filled counters, scintillation detectors, semi conductor detectors, energy measurements
Coincidence measurements and time resolution, magnetic spectro meters Electrostatic accelerators
Cyclotron accelerators, synchrotrons, linear accelerators, colliding beam accelerators

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 401: ADVANCED QUANTUM MECHANICS

Recollection of basic concepts of quantum mechanics
Change of basis Dirac's bra and ket notations
Application to wave mechanics in one dimension, Eigen value problem for operators, the continuous spectrum
The equation of motion , Quantization postulates
Canonical quantization, constants of motion
Invariance properties, Heisenberg picture
Development of time –dependent perturbation theory
Harmonic oscillator
The golden rule for constants
Addition of two angular moment a, Tensor operators
Wigner –Eckart theorem Matrix elements of vector operators
Parity and time reversal symmetries
Concept of differential cross- section Scattering of a wave packet.
Born approximation , partial waves and phase shift analysis
Klein –Gordon equation, Dirac equation for a free particle
Equation of continuity, spin Dirac particle
Solutions of free particle Dirac equation , negative energy states and hole theory

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics   Class: II M.Sc.   Semester: 4th Semester

Title of Paper: 402: PROPERTIES AND CHARACTERIZATION OF MATERIALS

Introduction to properties of materials, An harmonic crystal interactions-thermal expansion
Thermal conductivity, lattice thermal resistivity, Umklapp processes, and imperfections. Lattice Vacancies, Diffusion
Colour Centers—F Centers, other centers in alkali halides.
Alloys
Order-disorder transformations, Elementary theory of Order.
Fundamentals of Transmission electron microscopy and study of crystal structure using TEM
Fundamentals of Scanning electron microscopy and study of microstructure using SEM
Spin and an applied field—the nature of spinning particles, interaction between spin and a magnetic field, population of energy levels, the Larmor precession
Relaxation times—spin- spin relation, spin-lattice relaxation
Electron Spin Resonance: Introduction, g-factor, experimental methods.
Nuclear Magnetic Resonance—equations of motion, line width, motional narrowing, hyperfine splitting,
Nuclear Gamma Ray Resonance: Principles of Mossbauer Spectroscopy, Line Width, Resonance absorption, Mossbauer Spectrometer
Isomer Shift, Quadra pole Splitting, magnetic field effects,
Applications of Mossbauer Spectroscopy, DC & AC Conductivity
Curie temperature, Saturation Magnetization
Susceptibility , Fundamentals of Infra-red Spectroscopy and Applications
FTIR Spectroscopy and its applications.

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.,
SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 403: RADAR AND SATILLITE COMMUNICATION

Introduction
Integration time and the Doppler shift-Designing a surveillance-Antenna beam-width consideration-pulse repetation frequency-unambiguous range and velocity
Pulse length and sampling-radar cross section-clutter noise-Tracking radar-sequential lobbing-conical scanning
Mono Pulse Radar-Tracking accuracy and Process-Frequency Agility-Radar guidance
Signal and Data Processing-Properties of clutter-Moving target Indicator Processing Thersholding
Plot extraction-Tract Association, Initiation and Tracking- Radar Antenna-Antenna parameters
Antenna radiation pattern and aperture efficiency-Parabolic reflection- Cosecant squared antenna pattern
Effect of errors on radiation pattern-Stabilization of antennas
Satellite system-Historical development of satellites-communication satellite systems-communication satellites-orbiting satellites
Satellite frequency bands-satellite multiple access formats-Look angles, orbital perturbations,
Space craft and its subsystems-attitude and orbit control system-Telemetry, Tracking and Command
Power system-Transponder-Reliability and space qualification-launch vehicles
Multiple Access Technique-Time division multiple access-Frequency division multiple access
Code division multiple access-Space domain multiple access-Earth Station technology-Subsystem of an earth station-Transmitter
Receiver Tracking and pointing-Small earth station-different types of earth stations-Frequency coordination
Basic principles of special communication satellites- INMARSAT VSAT
GPS, RADARSAT, INTELST

D.N.R. COLLEGE (AUTONOMOUS), BHIMAVARAM, W.G.Dt.
SYLLABUS FOR THE YEAR 2018-19.

Department: P.G. Physics Class: II M.Sc. Semester: 4th Semester
Title of Paper: 403: RADAR AND SATILLITE COMMUNICATION

Introduction to Radiation Potential functions of electromagnetic fields. Potential function for sinusoidal oscillations. Fields radiated by an alternating current element.
Power radiated by a current element and radiation resistance. Radiation from a quarter wave monopole or a half wave dipole.
EM field close to an antenna and far field approximation. (Chapter 10 in Jordan and Balmain)
Antenna Fundamentals Definition of an antenna. Antenna properties – radiation pattern, gain, directive gain and directivity.
Effective area. Antenna beam width and band width. Directional properties of dipole antennas.
Antenna Arrays Two element array. Linear arrays. Multiplication of patterns and binomial array
Effect of Earth on vertical patterns. Mathematical theory of linear arrays.
Antenna synthesis – Tchebycheff polynomial method. Wave polarization.
Impedance Antenna terminal impedance.
Mutual impedance between two antennas. Computation of mutual impedance.
Radiation resistance by induced emf method. Reactance of an antenna. Biconcal antenna and its impedance.
Frequency Independent (FI) Antennas Frequency Independence concept. Equiangular spiral. Log Periodic (LP) antennas.
Array theory of LP and FI structures. (Chapter 15 in Jordan and Balmain and Chapter 15 in Kraus)
Methods of excitation and Practical Antennas Methods of excitation and stub matching and baluns. Folded dipole, loop antennas. Parasitic elements and Yagi-Uda arrays and Helical antenna.
Radio Wave Propagation Elements of Ground wave and Space wave propagation. Tropospheric propagation and Troposcatter.
Fundamentals of Ionosphere. Sky wave propagation –
Critical frequency, MUF and skip distance.