TRIPURA UNIVERSITY

(A Central University)

Suryamaninagar

Syllabus

For

Three Year Degree Course

(Under 1+1+1 Examination System)

Part – I , Part – II, Part – III

(Honours)

COURSE STRUCTURE WITH DISTRIBUTION OF MARKS FOR B.Sc HONOURS EXAMINATION
TOTAL MARKS: 1550; DURATION: 3YEARS

Part-I Examination (at the end of 1st year)	**Part-II examination** (at the end of 2nd year)	**Part-III Examination** (at the end of 3rd year)
a) Physics Honours Papers-Two Paper-I (Theoretical) : 100 Marks Paper-IIA(Theoretical): 50 Marks Paper-IIB (Practical): 50 Marks b) Elective Subjects – Two 1st Elective Subject : Paper –I (Theoretical) : 100 Marks 2nd Elective Subject : Paper-1 (Theoretical) : 100 Marks c)Language Group Paper-1 (Theoretical) : 100 Marks	a) Physics Honours Papers-Two Paper-III (Theoretical) :100 Marks Paper-IVA(Theoretical): 50 Marks Paper-IVB(Practical): 50 Marks b)Elective Subjects- Two 1st Elective Subject : Paper-II(Theoretical) : 100 Marks Paper-III(Practical) : 100Marks 2nd Elective Subject : Paper-II(Theoretical):100 Marks Paper-III(Theoretical/ Practical) : 100 Marks c)Language Group- Nil	a) Physics Honours Papers -Four Paper-V (Theoretical) : 100 Marks Paper-VI (Theoretical):100 Marks Paper-VII(Practical) : 100 Marks Paper-VIII(Practical) : 100 Marks b) Elective Subject- Nil c) Environmental Studies Paper-I : 50 Marks
Total Marks : 500	**: 600**	**: 450**

PHYSICS HONOURS

PART – I

PAPER – I (THEORY) : 100
PAPER – IIA (THEORY) : 50
PAPER – IIB (PRACTICAL) : 50

PHYSICS
TDCH PART – I
Paper - I
Total Marks: 100

UNIT – I **MATHEMATICAL METHODS – I**
UNIT – II **MECHANICS – I**
UNIT – III **GRAVITATION AND ELASTICITY**
UNIT – IV **VISCOSITY AND SURFACE TENSION**
UNIT – V **THERMODYNAMICS AND RADIATION**
UNIT – VI **VIBRATION AND WAES**

*only S.I units to be used

Question Pattern

- One Compulsory question (Q.No.1) is to be set with Ten (short/ multiple choice/ both) questions of 1 mark each from six units, all are to be answered.
- Two questions of 15 marks each are to be set from each unit, out of which one question is to be answered. Each question of 15 marks may be divided into three or more parts having a maximum of 8 marks for a part.

UNIT – I : MATHEMATICAL METHODS – I

Scalar and vectors : Scalar and vectors products of two and three vectors, scalar and vector fields, Differentiation of vectors, Gradients, Divergence and Curl – their meanings and applications. Vector integrations- Line, Surface and Volume integrations, Gauss' Divergence theorem, Stoke's theorem, Green's theorem and their applications to simple problem.

Matrices : Transpose of matrix, symmetry and skew-symmetry matrices, adjoin of a matrix, matrix inversion, trace of a matrix, Hermitian, Orthogonal and unitary matrices, eigen value and eigen vectors of a matrix, diagonalization of a matrix.

Beta and Gamma functions, their properties, interrelationship, their applications to simple problems.

Fourier expansion : Statement of Dirichlet's condition, Fourier series for the expansion of some simple functions, analysis of some simple waveforms such as square waves, outputs of half and full wave rectifier with Fourier series.

UNIT – II : MECHANICS – I

Rigid body as a system of particles, idea of centre of mass and its motion, moment of inertia, radius of gyration, angular momentum of rotating system of particles and its conservation, parallel and perpendicular axes theorem(2D), calculation of moment of inertia of uniform rod, uniform lamina, sphere & cylinder; motion of a sphere & cylinder along an inclined plane.

Plane curvilinear motion : velocity and acceleration of a particle in plane polar coordinate system(radial and transverse components of velocity and acceleration), tangential and normal components of velocity and acceleration.

Central force and central orbit, conservative force, differential equation of motion of a particle moving under central force in plane polar and pedal coordinate system, nature of orbits in an inverse square attractive force field.

Areal velocity, Kepler's laws of planetary motion, satellites, escape velocity, geostationary satellites and parking orbits.

Rotating frame of reference, transformation of operator, Corioli's and centrifugal force in a rotating frame of reference, explanation of some physical phenomenon by Corioli's force.

UNIT – III : GRAVITATION AND ELASTICITY

Gravitation : Gravitational constant, Gravitational potential and intensity for shells, hollow and solid sphere; kater's pendulum, Gauss' theorem in gravitation and its application to simple symmetric cases(spherical and cylindrical masses), Poisson's and Laplace's equation(derivation only.)

Elasticity : Hook's law, elastic constants, elastic moduli and their inter relations; bending moment, depression at the free end of a light cantilever, depression of beam supported at the two ends and loaded at the middle; bending of beam due to its own weight (fixed at one end and supported at the two ends), torsion of cylinder, torsional oscillations, strain energy in all cases.

UNIT – IV : VISCOSITY AND SURFACE TENSION

Fluid Dynamics : Streamline and Turbulent motion, derivation of equation of continuity in differential form, rigorous derivation of Bernoulli's theorem, applications of Bernoulli's theorem to venturimeter, pitot tube; Torichelli's theorem.

Viscosity : Newtonian and non-Newtonian fluids, Viscosity and Newton's law, Critical velocity and Renold's number, effect of temperature on viscosity, Poiseuille's equation for the flow of an incompressible fluid with necessary corrections, Poiseuille's equation for the flow of a compressible fluid, theory of rotating viscometer for the determination of coefficient of viscosity of a liquid, terminal velocity, statement of Stoke's law, calculation of coefficient of viscosity of a liquid by Stoke's law(experiment not necessary).

Surface tension : Surface tension and surface energy, molecular theory of surface tension, factors affecting surface tension, angle of contact, explanation of elevation and depression of liquid in a capillary tube with calculation of rise, jurin's law, excess pressure across a curved film with special cases.

UNIT – V : THERMODYNAMICS AND RADIATION

Thermodynamics: First law of thermodynamics, internal energy, external work, quasi-static process, specific heat of gas, C_p & C_v, their ratio, relation between them, isothermal, adiabatic,, isobaric and isochoric processes, reversible and irreversible process.

Second law of thermodynamics, Carnot's cycle and its efficiency, Carnot's theorem, thermodynamics scale of temperature, Clausius inequality. **Entropy :** Its properties and physical significance, change of entropy in reversible and irreversible changes, entropy of perfect gas, entropy of a mixture of N-number of gases, principle of degradation of entropy, Temperature-entropy (T-S) diagram and representation of Carnot's cycle with the help of T-S diagram.

State functions, exact and in exact differentials, Thermodynamic functions, Maxwell's thermodynamic relations, their simple deductions and their applications, Clausius-Clapeyron equation, Thermodynamics potentials, enthalpy.

Porus plug experiment, Joule-Thomson effect and inversion temperature.

Radiation : Emissive power and absorptive power of a body, black body, blackbody spectrum, blackbody in practice, Kirchoff's law and its rigorous derivation, pressure and energy density of diffused radiation, Stefan-Boltzmann law, Wien's law, Rayleigh-Jeans law, basic assumptions and statement of Plank's law, solar constant and solar temperature.

UNIT – VI : VIBRATION AND WAVES

S.H.M : Differential equation of S.H.M and its solution, composition of S.H.M, Lissajou's figures, damped and forced vibration, their differential equations and solutions, resonance and sharpness of resonance.

Differential equation of plane progressive wave and its solution in one and three dimension, energy of waves, pressure distribution in longitudinal waves, dispersion in wave propagation, phase velocity and group velocity.

Interference of waves, derivation of velocity of sound wave in solid and gas, intensity of sound, bel and decibel.

Doppler's effect and calculation of Doppler's shift in all possible cases.

Theories of plucked and struck string, basic principle underlying the production of combination tone.

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PHYSICS
TDCH PART – I
Paper – II A
Total Marks: 50

UNIT – I **ELECTROSTATICS**

UNIT – II **OPTICS - I**

UNIT – III **OPTICS - II**

*only S.I units to be used

Question Pattern

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- Two questions of 15 marks each are to be set from each unit, out of which one question is to be answered. Each question of 15 marks may be divided into three or more parts having a maximum of 8 marks for a part.

UNIT – I : ELECTROSTATICS

Gauss's theorem in electrostatics and its applications, Coloumb's theorem, mechanical force on a charged surface, energy per unit volume, Poisson,s & Laplace's equations and their solutionsin the case of spherical and cylindrical charged distribution.

Electrical images, use of electrical image to the field problems in the case of point charges near conducting plate and conducting sphere.

Capacitance of spherical and cylindrical capacitors, attracted disc electrometer and quadrant electrometer.

Electric dipole and dipole moment, potential and intensity at any point due to a dipole, torque on a dipole in electric field and work done, dipole-dipole interaction, dielectric medium, polarization and susceptibility, boundary conditions of D and E, dielectric spheres in uniform field.

UNIT – II : OPTICS – I

Geometrical : Fermat's principle, reflection and refraction at plane surfaces by Fermat's principle, and vice versa, dispersion and dispersive power in case of prism.

Rrefraction at spherical surface, thin lenses and their combination, cardinal points, equivalent lens, chromatic and spherical aberration, qualitative and quantitative study of their remedies with reference to the construction of Ramsden and Huygen's eyepiece.

Physical : Wave nature of light, Huygen's principle, explanation of reflection, refraction and rectilinear propagation of light on the basis of wave theory. **Interference :** Young's experiment, Fresnel's bi-prism, Interference by Lloyd mirror, interference in thin films including wedge shaped film, **Newton's ring:** theory and experiment.

UNIT – III : OPTICS – II

Diffraction (Fresnel class) : Half period zone, explanations of rectilinear propagation of light, principle of zone plate and its behavior as convergent lens.

Diffraction(Fraunhoffer class): diffraction pattern of single slit and double slit and plane transmission grating (rigorous treatment), circular aperture (qualitative). Rayleigh criterion of resolution, resolving power of grating, prism, telescope and microscope.

Polarization : Polarization of light by reflection, double refraction, Huygen's construction for uniaxial crustal, Nicol prism, polaroids and their uses, production and analysis of plane, circularly and elliptically polarized light by retardation plates and Babinet's compensator, optical activity; Fresnel's explanation of optical activity; Biquartz and half shade polarimeter.

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PHYSICS
TDCH PART – I
Paper – II B (Practical)
Total Marks: 50

Expt. No	Name of Experiment
1	Determination of thermal conductivity of material of disc by Lees and Chorlton's method(applying Bedford's correction)
2	Determination of dispersive power of material of a prism
3	To draw (δ - λ) curve and to determine unknown wavelength by prism
4	To determine unknown concentration of an optically active substance by a polarimeter to find the specific rotation of the substance
5	To find the slit width and the separation between slits of a double slit for Fraunhoffer diffraction
6	To determine the coefficient of viscosity of a liquid by Poiseuillie's method

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PHYSICS HONOURS

PART – II

PAPER – III (THEORY): 100
PAPER – IV (A) (THEORY): 50
PAPER – IV (B) (PRACTICAL): 50

PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – II
(According to 1+1+1 system implemented in 2008)
PAPER – III
MARKS - 100

UNIT-I: MECHANICS
UNIT-II: RELATIVITY
UNIT-III: ELECTRO-MAGNETOSTATICS
UNIT-IV: CURRENT ELECTRICITY-I
UNIT -V: CURRENT ELECTRICITY -II
UNIT-VI: ELECTRONICS-I

*only S.I units to be used

Question Pattern

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UNIT-I : MECHANICS

Generalized coordinate, constraints and degrees of freedom, application of generalized coordinate in harmonic oscillator, simple pendulum, coupled point masses.

Principle of virtual work, D'Alembert principle, Lagrange's equation for a conservative system and its application of simple cases, cyclic coordinates.

Definition of Hamiltonian, Hamilton's canonical equations and their applications to simple cases.

Small oscillation, normal modes, eigen frequencies, simple examples.

Rigid body, ellipsoid of inertia and inertia tensor, setting up of principal axes in simple symmetric cases, kinetic energy of rotation, angular momentum, force free motion of rigid bodies-free spherical top and free symmetric top.

UNIT-II : RELATIVITY

Concept of space-time according to Newtonian mechanis, Gallilean transformation and invariance, inertial and non inertial frames of reference.

Michelson-Morley experiment-its difficulties. Postulates of the special theory of relativity, simple derivation of Lorentz transformation formula, Length contraction, time dilation, addition of velocities (velocities along same line), variation of mass with velocity (head-on and oblique collision), Equivalence of mass and energy.

UNIT-III : ELECTRO-MAGNETOSTATICS

Biot-savart law and its application to simple cases, Lorentz force and concept of magnetic induction, force on linear current element. B=0; magnetic vector potential, calculation of vector potential and magnetic induction in simple cases. Magnetic dipole and field due to a dipole. Ampere's circuital law and its applications. Force between long parallel current carrying conductors.

Magnetization, permeability, susceptibility and their relation, Boundary conditions for B and H.

Hysteresis and hysteresis loss, its importance, magnetic current: its theory and application.

UNIT-IV: CURRENT ELECTRICITY-I

D.C. circuits: Kirchoff's laws, Thevenin's theorem, Norton theorem, Superposition theorem, maximum power transfer theorem, problems on current in complicated circuits, inadequacy of Wheatstone's bridge. Platinum resistance thermometer, Callender and Griffith bridge and measurement of high temperature by Platinum resistance thermometer. working principle of potentiometer and its applications.

Thermoelectricity, Seebeck, Peltier and Thomson effect. Explanation of Seebeck, Peltier and Thomson effect on the basis of free electron theory. Peltier and Thomson's coefficient, law of Thermoelectricity, total emf developed in a thermocouple, thermoelectric curve and the concept of neutral temperature and temperature of inversion of a thermocouple, thermoelectric power, thermoelectric diagram and its applications, calculation of Peltier and Thomson's coefficient from thermodynamic considerations, use of thermocouple.

Theory of moving coil dead-beat and ballistic galvanometer, corrections due to damping in ballistic galvanometer, applications of ballistic galvanometer: measurement of capacitance of a capacitor, measurement of high resistance by method of leakage.

UNIT – V : CURRENT ELECTRICITY -2

Electromagnetic induction: self and mutual inductance, self inductance of a circular coil and solenoid, mutual inductance between two circular coils and between two coaxial solenoids. Eddy current and its explanation.

Growth and decay of current in L-R circuit, charging and discharging of condenser in C-R circuit, time constant, charging and discharging of condenser in L-C-R circuit considering various conditions.

Mean and RMS value of current and emf in an AC circuit, current in L-R, C-R and L-C-R circuits, analysis of these circuits using both operator and imaginary quantity method, resonance in seris and parallel L-C-R circuits, phase diagram and analysis of L-R, C-R and L-C-R circuits with it, power in AC circuits, power factor, wattles current, choke coil and by-pass capacitor, principle pf ideal transformer, transformer loss.

UNIT-VI : ELECTRONICS

Application of PN junction diode to half wave, full wave and bridge rectifier, calculation of average current and voltage, RMS current and voltage, ripple and ripple factor, efficiency of half and full wave rectifier, removal of ripples-T and π- filters.

Zener breakdown and Zener voltage,Zener diode and its use as voltage regulator.

Transistors, working of PNP and NPN transistor, current components in a junction transistor, CB, CE and CC configuration and their comparisons.

Transistor characteristic in CB, CE and CC configuration, definition of α, β and interrelations.

Working of a CE transistor amplifier, hybrid parameters, analysis of small signal single stage low frequency CE transistor amplifier with hybrid parameters, calculation of current gain, input impedance, voltage gain and output conductance.

Transistor biasing, fixed bias and its disadvantage, self bias or emitter bias and its advantage with respect to stability, voltage divider method.

Field effect transistor (FET) and its difference from bipolar transistor, n and p-channel FET, FET operation, FET characteristics: static and dynamic characteristics, FET parameters and their relation, use of FET as a voltage amplifier and calculation voltage gain.

MOSFET: structure, description and explanation of enhancement type and depletion type MOSFET, static characteristic.

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PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – II
(According to 1+1+1 system implemented in 2008)
Paper – IV (A)
Marks - 50

UNIT – I: MATHEMATICAL PHYSICS

UNIT – II: ELECTROMAGNETIC THEORY

UNIT – III: NUCLEAR PHYSICS-I

*only S.I units to be used

Question Pattern

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UNIT – I: MATHEMATICAL PHYSICS

Partial differential equation: Laplace equation and wave equation and their solutions in Cartesian, spherical polar and cylindrical polar coordinates by the method of separation of variables.

Series solution of Legendre, Hermite, Bessel, and Laguerre's differential equations, orthogonality of the solutions and recurrence relations.

Orthogonal curvilinear coordinate system, unit vectors in such systems, gradient, divergence, curl and Laplacian in orthogonal curvilinear coordinates, illustration by spherical polar and cylindrical polar coordinate systems as special case.

UNIT – II: ELECTROMAGNETIC THEORY

Displacement current, Maxwell's electromagnetic equations, propagation of plane electromagnetic waves in free space, transverse character and polarized electromagnetic wave, Poynting vector, energy density in electromagnetic field, Hertz's experiment.

Reflection and refraction of plane wave at boundary of two dielectrics (law in generalized case and calculation of intensity only for normal incidence), waves in conducting media – skin effect and skin depth.

Equation of motion of an electron in a radiation field, radiation damping (Formula to be assumed), Lorentz theory of dispersion – normal and anomalous, Cauchy and Sellemier equation.

UNIT – III: NUCLEAR PHYSICS-I

Properties of nuclei: nuclear mass, charge, size, binding energy, spin, magnetic moment, packing fraction, atomic mass unit, isobars, isotopes, isotones.

Nuclear structure: name of force between nucleons, nuclear stability and nuclear binding, binding energy curve and its significance, description of liquid drop model and Bethe-Weizsacker mass formula, single particle shell model (qualitative discussions).

Radioactivity: Decay law, half life, mean life, successive disintegration, secular and transient equilibrium, Determination of age of a sample.

α-decay: Rutherford α-scattering experiment and formula (deduction not necessary) and its significance, range of α particles, Geiger-Nuttal law, α-ray spectrum, theory of α-disintegration.

β-decay: Different types of β- ray spectrum and their natures, neutrino hypoyhesis, β-disintegration energy, internal conversion, Curie plot, β-ray absorption (qualitative discussion).

γ-decay: γ -ray spectra and nuclear energy level, qualitative discussion on – γ ray absorption in matter-photoelectric process, Compton scattering and pair production, electron-positron annihilation(qualitative).

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PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – II

(According to 1+1+1 system implemented in 2008)

Paper – IV (B)

PRACTICAL

Marks – 50

Experiment No.	Name of Experiment
1	To construct a 1-ohm coil and its comparison with standard 1-ohm.
2	To draw thermoelectric curve and to find thermoelectric power at 60^0C using thermocouple.
3	To determine the boiling point of a liquid by platinum resistance thermometer.
4	Determine of high resistance by the method of leakage.
5	Determine the mutual inductance between two coils.
6	Construction of a rectifier circuit and study of output using a CRO with filter and without filter.

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PHYSICS : HONOURS

Part - III

PAPER – V (THEORY) : 100

PAPER – VI (THEORY) : 100

PAPER – VII (PRACTICAL) : 100

PAPER – VIII (PRACTICAL) : 100

PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – III

(According to 1+1+1 system implemented in 2008)

Paper – V

MARKS – 100

UNIT – I: ATOMIC, MOLECULAR AND X-RAY SPECTRA

UNIT – II: NUCLEAR PHYSICS –II

UNIT – III: ELECTRONICS – II

UNIT – IV: SOLID STATE – I

UNIT – V: SOLID STATE – II

UNIT – VI: MATHEMATICAL PHYSICS – III

Question Pattern

- One Compulsory question (Q.No.1) is to be set with Ten (short/ multiple choice/ both) questions of 1 mark each from six units, all are to be answered.
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UNIT – I : ATOMIC, MOLECULAR AND X-RAY SPECTRA

Spectrum of hydrogen atom with reduced mass correction, vector atom model, space quantization, Stern – Gerlach experiment and intrinsic spin of electron, magnetic moment of electron, Bohr magneton.

L-S and J-J coupling, lande g-factor, spectra of alkali atoms, double structure of spectral lines, normal and anomalous Zeeman effect.

Basic ideas about molecular spectra, rotational and vibrational spectra of diatomic molecules, Raman effect and its application to molecular spectroscopy.

Continuous and characteristic X-ray spectra, Mosley's law and its explanation from Bohr's theory.

Compton effect and calculation of Compton shift.

UNIT – II : NUCLEAR PHYSICS –II

Nuclear reaction: Nuclear reaction, conservation principles in nuclear reations, Q-value and thresholds, exoergic and endoergic reactions, nuclear reaction cross section, Artificial radioactivity, nuclear reactions induced by α-particle, proton, γ-rays, neutron. Bohr's postulates of compound nuclear reaction, Ghoshal's experiment.

Nuclear fission and fusion: Nuclear fission, general characteristic, simple explanation by liquid drop model, energy released in nuclear fission, spontaneous and induced fission, nuclear chain reaction and basic principle of nuclear reactor, nuclear fusion and basic mechanism of energy generation in stars.

Four basic interactions in nature and their relative strengths, examples of different types of interactions.

Accelerators and detectors : Linear accelerator, Cyclotron, Betatron, Synchrotron (principle only), Ionized Chamber, Proportional counter, G.M. counter, Scintillation counter, Cloud chamber (basic principle only) and Bubble chamber.

UNIT – III : ELECTRONICS – II

Operational amplifier (ideal), concept of virtual ground, uses of OP-AMP as an inverter, phase shifter, adder, differentiator, integrator, solution of simultaneous equation, real OPAMP – input offset voltage, input offset current, common mode rejection ratio and slew rate, square wave and triangular wave generator.

Feedback amplifiers: Positive and negative feedback, voltage gain with feedback, Barkhausen criterion for oscillators, Hartley, Colpitt and Wien Bridge oscillators with transistors and FET, crystal oscillator – description and advantages.

Principle of radio transmission and reception.

Ionosphere: cause of formation, different layers, their role in radio wave propagation.

Binary system, conversion of binary to decimal and vice versa, binary addition and substraction, Boolean expression, Logic gates (AND, OR, NOT), DDL, DTL, digital electronics – combinational circuits, circuit adder & subtractor, multiplexer, sequential circuits – Flip – flop: RS, D & J-K.

UNIT – IV: SOLID STATE – I

Crystalline and amorphous solids, translational symmetry, classification of crystalline solids, elementary ideas about crystal structure, concept of lattices and basis, unit cell, fundamental types of lattices, Miller indices, simple cubic, B.C.C. and F.C.C. lattices, reciprocal lattices, laue and Bragg's equations, powder diffraction method, study of NaCl & KCl structures.

Different types and natures of binding: ionic, covalent, molecular, metallic and van der Walls.

Lattice vibration, conept of phonon (basic idea only), theory of specific heat of solid : Einstein & Debye model.

Free electron theory of metals: effective mass, drift velocity, mobility and conductivity, Boltzmann transport equation, calculation of thermal and electrical conductivities of metals, Wiedmann Franz law.

UNIT – V: SOLID STATE – II

Modification of electronic energy levels of atoms in a crystalline solid, band structure of electronic states: Kroing – Penny model, distinction between metals, insulators and semiconductors, qualitative discussion on n and p-type semiconductors, Hall effect in both conductor and in semiconductors.

Magnetic properties of materials, dia, para and ferromagnetic properties of solid, Langevin's theory of diamagnetism, classical and quantum theory of paramagnetism, Curie's law, spontaneous magnetization and domain structure, temperature dependence of magnetic property, Curie – Wiess law and explanation of hysteresis.

UNIT – VI : MATHEMATICAL PHYSICS – III

Tensor Analysis: n-dimensional space, superscript and subscript, Einstein's summation convention, dummy index, definition of tensor and its necessity, rank of tensor, addition, subtraction, outer product, inner product, contraction theorem and quotient law.

Function of a complex variable: complex variable and function of a complex variable, continuity, differentiability, singular points, removable singularities, essential singularities, isolated singularities, poles, singularity at infinity, Branch points, Branch cuts, Riemann's sheet and Riemann surface, single and multi-valued function, idea about complex plane, analytic function and necessary and sufficient condition for a function to be analytic, Cauchy Riemann Equations, harmonic functions, Taylor's theorem, Laurent's theorem, Cauchy theorem.

Laplace transform, properties of Laplace transform, important formulae related to Laplace transform, Laplace transform of the derivative of $f(t)$, Laplace transform of the integral of $f(t)$, Laplace transform t.$f(t)$, Laplace transform of $f(t)/t$, evaluation of integrals using Laplace transform.

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PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – III

(According to 1+1+1 system implemented in 2008)

Paper – VI

MARKS – 100

UNIT – I: COMPUTER PROGRAMMING

UNIT – II: QUANTUM MECHANICS – I

UNIT – III: QUANTUM MECHANICS – II

UNIT – IV: STATISTICAL MECHANICS

UNIT – V: LASER AND FIBRE OPTICS

UNIT – VI: INSTRUMENTAL METHODS

Question Pattern

- One Compulsory question (Q.No.1) is to be set with Ten (short/ multiple choice/ both) questions of 1 mark each from six units, all are to be answered.
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UNIT – I : COMPUTER PROGRAMMING

Essential part of an electronic computer: CPU, INPUT and OUTPUT devices.

Computer Memory: Idea about primary and secondary memory, RAM, ROM, CD-ROM, HARD DISK, Removable storage devices.

Operating system : Familiarity with different operating systems in common use. Simple MS DOS commands. Simple Windows commands, simple Linux/Unix commands.

Algorithm and Flow chart for solving simple problems.

Elementary idea about machine, assembly and high level languages, assembler, compiler, characteristics & field of application of high level languages such as BASIC, FORTRAN, C.

Development of simple programs BASIC language using command listed: CLS, REM, INPUT, PRINT, assignment statement (LET), READ – DATA, arithmetic logic, DEFFN, GOSUB, IF-

THEN, GOTO, FOR – NEXT, FILES (INPUT, OUTPUT, FILE open), DIM, PRINT USING, LPRINT, TAB, LOCATE, END, RUN, SAVE.

UNIT – II : QUANTUM MECHANICS – I

Black body radiation and discussion of the failure of classical theory with special mentioning of Wien's and Rayleigh – Jeans formula, Planck's hypothesis and Planck's energy distribution law in black body radiation, explanation of the variation of specific heat with temperature.

Matter wave, wave function, physical significance of ψ, concept of wave packet associated with free particle. Schrödinger time independent equation from the classical differential wave equation in one and three dimension, one and three dimensional representation of position, momentum and energy by quantum mechanical operators, Schrödinger equation using idea of quantum mechanical operator and separation of one and three dimensional space part and time part, expectation value of an observable, probability current density, equation of continuity, Ehrenfest theorem, eigen functions and eigen values, stationary states, orthogonality of eigen functions, normalization, fundamental postulates of quantum mechanics, Hermitian property.

UNIT – III : QUANTUM MECHANICS – II

Free particle in one dimensional box, three dimensional box normalization, energy level diagram, explanation of continuous energy ocean as a limiting case of discontinuous energy eigen values, degeneracy, zero point energy, momentum and wave functions for a free particle in one dimensional box, particle in a finite one dimensional potential barrier, one dimensional harmonic oscillator, particle in a finite rotator in fixed plane, the hydrogen atom problem.

UNIT – IV: STATISTICAL MECHANICS

Microstates and macro-states, postulates of equal apriori probability, systems and ensembles, microcanonical, canonical and grand canonical ensembles, phase space, dimension of elementary phase cell, definition of thermodynamic probability and

calculation of thermodynamic probability, partition function and its significance, Planck – Boltzmann definition of entropy, derivation of distribution functions for Boltzmann, Bose – Einstein and Fermi – Dirac statistics for system of non-interacting particle.

Application: Equipartition of energy in Boltzmann statistics, Planck's law, specific heat of electron in metals (at low temperature), Richardson's equation, third law of thermodynamics and its consequences.

***UNIT – V*: LASER AND FIBRE OPTICS**

Laser: Population inversion, Einstein's A & B coefficients, feedback of energy in reasonator, 3-level and 4-level systems, Ruby, Helium – Neon and semiconductor lasers. Laser applications, holography (Basic principle)

Optical Fibre: Core and cladding, total internal reflection, optical fibre as waveguide, step index and graded index fibre, communication through optical fibres, energy loss, band width and channel capacity – a typical system, attenuation and dispersion, splicing and couplers, fibre sensor.

UNIT – VI : INSTRUMENTAL METHODS

Michelson's steller interferometer – theory and use, Fabry – Perot interferometer and Etalon theory.

Theory of rotating magnetic field, induction motor, tuned coupled circuit, theory of real transformer, A.C. bridges: Generalised A.C. bridges, Anderson and Schering bridges.

Cathode ray oscilloscope, magnetic deflection, electrostatic deflection, sensitivity, time – base circuit, use of CRO in frequency determination.

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PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – III

(According to 1+1+1 system implemented in 2008)

Paper – VII(A)

PRACTICAL

MARKS – 50

Experiment No.	Name of the Experiment
1	Determination of wavelength by Fresnel's biprism
2	Determination of wavelength of spectral line by plane transmission grating
3	Determination of **J** by Callender and Barnes method
4	Drawing of B-H loop and determination of hysteresis loss
5	Measurement of self-inductance by Anderson's bridge
6	Determination of the Q-factor for LCR resonant circuit for different frequencies
7	Determination of susceptibility of a magnetic material

PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – III

(According to 1+1+1 system implemented in 2008)

Paper – VII(B)

PRACTICAL

MARKS – 50

Experiment No.	Name of the Experiment
1	To draw the dynamic characteristic of a triode and to determine the voltage gain of a triode amplifier
2	To draw the input and output characteristics of a transistor amplifier in CE mode and calculation of α and hybrid parameters
3	To draw the characteristic of Zener diode and study of line and load regulation
4	To draw the static, dynamic and transfer characteristics of FET and calculation voltage gain in FET amplifiers
5	Construction and study of half wave and full wave rectifier without and with R-C filter
6	Study of operational amplifier (IC – 741)
7	(a) Construction and study of OR, AND & NOT circuits using diode, transistor, resistances etc.
	(b) Boolean expressions and realization of relevant truth tables using digital IC 74**

PHYSICS

TDC (HONOURS) SYLLABUS FOR PART – III

(According to 1+1+1 system implemented in 2008)

PRACTICAL

Paper – VIII (A)

MARKS – 50

This paper consists of

a) Viva-voce of the paper VII(A) & VII(B)	**15+15 = 30**
b) Laboratory note books (LNB) of the paper VII(A) & VII(B)	**10+10=20**

Paper – VIII (B)

MARKS – 50

This paper consists of

Project work	**=25**
Computer programming in BASIC/FORTRAN	**=25**

(Please note that the students can use any of the MS-DOS/MS-WINDOWS/UNIX/LINUX operating systems as a platform to run the programs)

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