TRIPURA UNIVERSITY

(A Central University)
Suryamaninagar-799022

SYLLABUS
OF
Physics
(General)

Semester –I-V

2014

First Semester (General)
Paper Name: C1 (Theory = 100, Practical = 00)
FULL MARKS = 100

UNIT – I: VECTORS, MECHANICS

Vectors: Differentiation of vectors, Gradient, Divergence and Curl-their meanings and applications, Vector integrations: line, Surface and Volume integration, Gauss's divergence theorem, Green's theorem and Stoke's theorem (only their statements), their applications to simple problems.

Moment of inertia, Radius of gyration, parallel and perpendicular axes theorems (in two dimensions), calculation of moments of inertia for uniform rod, uniform lamina, sphere, cylinder.Velocity and acceleration in Cartesian and plane polar co-ordinate systems. Degrees of freedom, Generalised co-ordinates, Lagrange's and Hamilton's equations (only their statements), applications in simple pendulum, simple harmonic oscillator and projectile, cyclic co-ordinates and its importance.

UNIT – II GRAVITATION, ELASTICITY AND FLUID

Gravitation: Gravitational potential and intensity for Spherical shell, hollow and solid sphere; Kater's pendulum with Bessel's correction.
Elasticity: Elastic constants, elastic moduli and their interrelations; bending moment, depression at the free end of a light cantilever, depression of a beam supported at two ends and loaded at the middle; torsion of cylinder, torsional constant, torsional oscillations, strain energy of torsion.
Surface tension: Surface tension and surface energy, molecular theory of surface tension, explanation of elevation and depression of liquid in a capillary tube with calculation of rise, Jurin's law.
Viscosity: Newton's law, Poiseuille's equation for the flow of an incompressible fluid (correction only qualitative), statement of Stoke's law with terminal velocity,

UNIT – III THERMODYNAMICS AND RADIATION

Andrew's and Amagat's experiment, Vander Waal's equation (simple derivation), merits and demerits of Vander Waal's equation, Critical constants, expression for Boyle temperature
Second law of thermodynamics, reversible and irreversible changes, Carnot's cycle and its efficiency, Carnot's theorem, thermodynamic scale of temperature, Entropy-it's property and physical significance, change of entropy in reversible and irreversible changes. Porus-plug experiment, Joule-Thomson effect and inversion temperature. Kirchhoff's law and its simple derivation, pressure and energy density of diffused radiation (expressions only).

UNIT – IV OPTICS

Fermat's principle, reflection and refraction at plane surface by Fermat's principle, refraction at spherical surface, thin lenses and their combination, cardinal points, equivalent lens, Ramsden and Huygens eyepiece.
Wave nature of light, Huygen's principle, explanation of reflection, refraction.
Interference: Young's experiment, Fresnel's bi-prism experiment, Newton's ring experiment with theory
Diffraction (Fresnel's class): Half period zone, explanations of rectilinear propagation oflight, principle of zone plate, and its behavior as convergent lens. Diffraction(Fraunhoffer class): Diffraction pattern of single slit, double slit and plane transmission grating (simple treatment), circular aperture (qualitative),
Polarisation: Double refraction, Huygen's construction for uniaxial crystal.

Second Semester General
Paper PH-201 A
Full Marks-50 (Internal Assessment: 10, Semester Exam: 40)

Unit-l: Acoustic

Composition of SHMs, Lissajou's figure, Damped and Forced vibrations (Solutions are to be assumed without derivations), resonance and sharpness of resonance. Differential equation of longitudinal wave using pressure distribution, Stationary waves in strings with various nodes, Characteristic features of plucked and struck strings, Young's law. Acoustics of building: Reverberation, Sabine's law, live and dead rooms.

Unit-ll: Electrostatics, Magneto statics, Magnetic effect of Current

Coulomb's theorem, mechanical force on a charged surface, energy density. Capacitance of spherical and cylindrical capacitors. Use of Biot-Savart law for the calculation of magnetic induction due to circular coil and solenoid (finite and infinite).Magnetic shell and potential due to magnetic shell, equivalence of magnetic shell and current carrying loop.Hysteresis and calculation of hysteresis loss, selection of material for core of electromagnet.Theory of Ballistic galvanometer with damping correction.

Physics Practical Paper PH-201B

Full marks: 50 (Internal Assessment: 10, Semester Exam: 40)

1. Determination of Young's modulus of the material of a beam by the method of flexure(single length only).

2. Determination of modulus of rigidity by statical method or by dynamical method.

3. Determination of moment of inertia of a body about an axis passing through its centre ofgravity.

4. To determine frequency of tuning fork by Melde's experiment.

5. To determine the refractive index of the given liquid with the help of travelling microscope.

6. To determine the refractive index of the given liquid with the help of a plane mirror and a convex lens (radius of curvature is to be determined with the help of spherometer).

7. To determine the focal length of a concave lens by the combination of concave andconvex lens using optical bench.

8. Determination of 'g' by Kater's pendulum.
9. Viscosity of water by Poseuillie's method (diameter of the tube to be measured by microscope).

TRIPURA UNIVERSITY

PHYSICS (General)Syllabus, Third semester syllabus

Paper PH-301(Theory)

Full marks:50(Internal Assessment :10.Semester Exam:40)

Total Lecture 40, (Each lecture period = 1 hour)

Unit I : Current Electricity -I

Total Lecture period :20 (Total:20 marks , Internal Assesment:05 , Semester Exam :20)

Thermoelectricity: Seebeck, Peltier and Thomson's effect, Peltier and Thomson's coefficient, laws of thermoelectricity, total e.m.f developed in a thermocouple, thermoelectric curve and concept of neutral temperature and temperature of inversion, thermoelectric power, thermoelectric diagram and its applications, calculation of Peltier and Thomson coefficient from thermodynamic considerations.

Electromagnetic Induction: Self inductance of Circular coil and solenoid; Mutual inductance between two coaxial circular coils, Mutual inductance between a small coil and a solenoid on which the small coil is wound coaxially.

Growth and decay of current in LR circuit, Charging and discharging of capacitor through a resistance (CR circuit),Transient current in LCR circuit (qualitative considerations of different cases without mathematical analyses).

Unit II: Current Electricity II and Atomic theory

Total Lecture Period:20(Total: 25

marks , Internal Assessment : 05 , Semester Exam :20)

Current Electricity II Alternating emf and Alternating current : General expressions , their mean and rms values , Mean power and power factor , wattless current , R,L,C,LR, CR and LCR circuit ,rejector circuit ,choke coil ,principle of ideal transformer,various losses in real transformer.

Atomic Theory: Positive rays, analysis by parabola method, Limitation of Bohr's Theory, Extension of Bohr's model as vector atom model , quantum numbers ,normal Zeeman effect ,statement of pauli's exclusion principle.

X-Ray : Bragg's law and explanation , Crystalline and amorphous solids , elementary of crystal study : NaCl and KCL structure , Crompton effect and calculation of Compton shift.

Paper PH-301B (Practical)
Full marks : 50 (Internal Assessment : 10 , Semester Exam : 40)
Total Practical Period: 60 hours

Name of the Experiments.

1. Determination of H and M by deflection magnetometer and vibration magnetometer.
2. Determination of the end correction of a meter-bridge wire and to find the specific resistance of the material of the given wire.
3. Determination of resistance per unit length of the meter bridge wire by Carey-Foster's method anddetermination of unknown resistance.
4. Comparison of the values of two resistances by their fall of potential method with the help of Carey Foster's bridge.
5. Determination of the reduction factor of a tangent galvanometer with the help of copper voltmeter and hence finds the value of H.
6. To determine temperature coefficient of resistance of material of a given wire by meter bridge.

7. To determine the resistance of a suspended coil galvanometer by half deflection method and hence to find its figure of merit.
8. To determine the current flowing in a circuit by using a potentiometer (r should be supplied)
9. To determine the refractive index of material of prism by using spectrometer.

4th Semester General

Paper PH-401 A

Full Marks-50 (Internal Assessment: 10, Semester Exam: 40)

Unit I: ELECTRONICS

Diode Rectifier: Calculation of average current and voltage, r.m.s current and voltage, ripple factor and efficiency of half wave and full wave rectifier, removal of ripples : T and ∏ filters.Zener breakdown, zener voltage, zener diode and its use as a voltage regulator.

Transistor characteristics in CE mode, load line analysis, Q- point , Working of CE transistor amplifier and calculation of voltage gain (preliminary method).Field effect transistor (FET) and its difference from bipolar transistor, n and p channel FET, FET operations , static and dynamic characteristics, FET parameters and their relation , use of FET as a voltage amplifier.

Operational amplifier (ideal), concept of virtual ground, basic equation of an ideal OP-AMP, use of OP-AMP as inverter, phase shifter, adder, differentiator and integrator.

Network theorems: Thevenin's, Norton, Superposition, Maximum power transfer theorem.

Unit-II Relativity and Nuclear physics: Total lecture period: 20

Galilean invariance, inertial and non-inertial frames, pseudo forces, apparent weight in accelerated frame. Concept of space, time and mass according to Newtonian mechanics. Michelson-Morley experiment and its difficulties. Postulates of special theory of relativity, simple derivation of Lorentz transformation formula, length contraction, time dilation, addition of velocities (velocity along the same line), variation of mass with velocity (deduction on the basis of head –on-collision) , equivalence of mass and energy.

Radio activity: Radioactive disintegration: secular and transient equilibrium.

α – rays: range of α particles. Geiger Nuttal rule

β rays: spectrum and its natures. Neutrino hypothesis (qualitative idea only).Internal conversion.

ϒ rays: qualitative discussion on ϒ-ray absorption in matte electron-positron annihilation (qualitative).

Cosmic ray: primary and secondary cosmic ray, muons, Van Allen belt.

Properties of nuclei : nuclear mass , charge, size , packing fraction , atomic mass unit , isobars , isotopes, isotones, binding energy curve and its significance.

Nuclear reaction : Nuclear reaction , conservation principle in nuclear reactions, Q- value and thresholds , exoergic and endoergic reactions , artificial radioactivity.

Physics Practical
Paper PH-401 B
Full marks – 50 (Internal assessment: 10, Semester Examination: 40)

1. To draw the characteristic curves of PN-junction diode for both forward and reverse bias and hence to determine the AC and DC resistance of the diode.

2. To draw static characteristic curves (only mutual characteristics) of a triode and to find μ ,$r_{p\ and}\ g_m$.

3. Study of the characteristic response curve of a photo diode cell to determine of plank's constant.

4. Zener diode reverse characteristics, reverse impedance and break down voltage.

5. Input characteristics of common emitter (CE) transistor.

6. Output characteristics of common emitter (CE) transistor.

7. Drawing characteristics of FET and to determine FET parameters.

8. To construct 2-input OR & AND gates using diodes and to verify the truth table.

Physics (General) syllabus
Vth Semester

Paper PH-501(T) **Full marks: 50 (Internal assessment: 10, Semester Exam: 40)**

Unit I: Electromagnetic theory, Laser, Computer science, Programming and Digital electronics

Electromagnetic theory: Maxwell's electromagnetic equation, propagation of plane electromagnetic waves in free space, transverse characteristic of an electromagnetic wave, energy density in transverse field, Poynting theorem.

LASER: Quantitative idea of co-axial cable, Optical fibre, structure, step-index fibre, graded index fibre, single and multimode propagation, different types of losses in fibre, advantage of optical fibre over the co-axial cable media. Temporal and spatial coherence, Einstein's A and B co-efficient, LASER as monochromatic source of light, spontaneous and stimulated emission, population inversion, optical pumping, Ruby LASER.

Computer programming: Essential parts of an electronic computer, CPU, INPUT, OUTPUT devices, RAM, ROM, CD-ROM, Familiarity with different operating systems with common use, Machine language, Assemble language (idea only). Characteristic and field applications of high level languages such as BASIC, FORTRAN, C and C^{++}. Algorithm and flow chart for solving simple problems. Simple MS-DOS commands. Development of simple program in BASIC language using commands listed –AUTO, CLOSE, CLS, DATA-READ, DAE, DEFFN, DELETE, DIM, END, FILES, FOR-NEXT, GOSUB-RETURN, GOTO, IF-THEN, IF-THEN-ELSE, INPUT, KILL, LET, LINE, LIST, LPRINT, NEW, PRINT, REM, RUN, SAVE, SCREEN, STOP, SYSTEM.

Digital electronics Binary System, binary numbers, binary to decimal and decimal to binary conversion, AND, NOT, NAND, NOR, XOR, XNOR gates, circuits with discrete components, De-Morgan's theorem and application, Half and full adder, RS flip flop and D-flip flop.

Unit-II: Quantum Mechanics I and Quantum Mechanics II

Quantum Mechanics –I: Black Body radiation and discussion of the failure of classical theory with special mentioning of Wien's law and Rayleigh-Jean's formula, Plank's hypothesis and Plank's energy distribution law in black body radiation. Dual character of radiation, de Broglie hypothesis of mater wave, de-Broglie wavelength.Heisenberg uncertainty principle and time-energy uncertainty principle, experimental illustrations of diffraction by a single slit, complementary principle.

Quantum Mechanics –II : Schrodinger's equation and its derivation, operator, eigen function and eigen values, representation of position, momentum and energy by quantum mechanical operator, Born's interpretation of wave function, required properties of wave function.

Solution of time independent Schrodinger's equation for a free particle in one dimensional box with infinite potential wall at x=0 and x=l, normalization of wave function and $|\Psi|^2$-x graph, energy level diagram, zero point energy.

Physics (General) Practical
V^{th} Semester
Paper PH-502(P) **Full marks: 50**
(Internal assessment: 10, Semester Exam: 40)

Programming in BASIC

1) Write a program in BASIC to find the largest side of a triangle where the three sides are given as input. First of all you have to check whether the three sides can form the triangle and then you have to find the largest side. (A+B > C or B+C > A or C+A > A)

2) Write a program in BASIC to find the area of a triangle using Heron's formula. The three sides are given as input. First of all you have to check whether the three sides can form the

triangle and then you calculate the area of the triangle. (Heron's Formula $A = \sqrt{S(S-A)(S-B)(S-C)},\ S = \frac{A+B+C}{2}$)

3) Write a program in BASIC to check whether a right angle triangle is possible by the three sides given as input. First of all you have to check whether the three sides can form a triangle and then you have to the condition for right angle triangle.

4) Write a programme in BASIC to input an integer and print all its divisors at the output.

5) Write a programme in BASIC to input 10 random numbers. Print all the odd numbers at the output.

6) Write a programme in BASIC to input 10 random numbers. Print all the even numbers at the output.

7) Write a programme in BASIC to find the all the prime numbers from 1 to 100.

8) Write a programme in BASIC to calculate the sum of 10 natural numbers.

9) Write a programme in BASIC to calculate factorial of N, where N is given as input.

10) Write a programme in BASIC to input two numbers and calculate their L.C.M.

11) Write a programme in BASIC to input two numbers and calculate their H.C.F.

12) Write a programme in BASIC to input 10 numbers and print the numbers at the output in ascending order.

13) Write a programme in BASIC to input 10 numbers and print the numbers at the output in descending order.

14) Write a programme in BASIC to input 10 numbers and arrange the numbers in reverse order and print both the original order and reverse order in two columns at the output.

15) Write a programme in BASIC to print 10 Fibonecci numbers at the output where T(1) = 0and T(2) = 1.

16) Write a programme in BASIC to input a temperature in Celsius scale and convert it into in Fahrenheit scale.

17) Write a programme in BASIC to input a temperature in Fahrenheit scale and convert it into in Celsius scale.

18) Write a programme in BASIC to input the radius of a sphere in centimeter and calculate its area and volume.

19) Write a programme in BASIC to input a five digit number. Construct a new numbers where the digits are arranged in reverse order and print both five digit number at output.

20) Write a programme in BASIC to input a five digit number. Construct a new numbers where the digits are arranged in ascending and descending order and print both five digit number at the output.

21) Write a programme in BASIC to input the focal length of a convex lens. If the object distance is given, calculate the image distance.

22) Write a programme in BASIC to input five resistances. Calculate the equivalent resistance when they are in parallel combination.

23) Write a programme in BASIC to print the first ten terms of the following series 0, 3, 8, 15, 24, 35 ……..

24) Write a programme in BASIC to input the number of days and convert it into year, month and day.

25) Write a programme in BASIC to find all the three digit numbers for which sum of the cube of the digits is equal to the numbers itself. e.g. $153 = 1^3 + 5^3 + 3^3$ (Armstrong Number).