VEER NARMAD SOUTH GUJARAT UNIVERSITY

S.Y.B.Sc.

Physics

Syllabus in force from 2005 - 2006
Paper III

UNIT I

THERMODYNAMICS:

Maxwell's thermodynamical relations, Helmholtz function, thermodynamic potentials or gibb's function, enthalpy, C_P, C_v and μ, Joule kelvin co-efficient, T-dS equations. Ref: SB(H&T) – 6.52 to 6.56, 6.58, 6.62.

BLACKBODY RADIATION:

Black body, Kirchoff's laws of heat radiation, Prevost theory of heat exchanges, Stefan's law, mathematical derivation of Stefan's law, derivation of Newton's law of cooling from Stefan's law, distribution of energy in the spectrum of blackbody, solar constant, temperature of the sun. Ref: BS – 8.30 to 8.32, 8.35 to 8.37, 8.42 to 8.44.

Production of low temperatures, adiabatic demagnetization. Ref: BS – 7.9,7.10

UNIT II

QUANTUM HYPOTHESIS:

Blackbody radiation, Photoelectric effect, Compton effect. Ref: AB – 2.2, 2.3, 2.7

Wave particle duality, Debroglie hypothesis of matter waves, concepts of wave groups, group velocity and phase velocity, explanation of quantisation of angular momentum in bohr's theory of hydrogen atom on the basis of de broglie's hypothesis of matter waves

Ref: SBS 2.1, 2.2, 2.5, 2.6, 2.12.

UNIT III

QUANTUM MECHANICS:

Wave nature of particles, The uncertainty principle. The principle of superposition, wave packet. GA – 2.1 to 2.4

Quantum mechanics, the wave equation, Schroginger's equation: Time dependent form, linearity and superposition, expectation value, operators, Schrodinger's equation: Steady state form,. Ref: AB – 5.1 to 5.9

NUCLEAR PHYSICS:

Nuclear composition, Some nuclear properties, Stable nuclei, Binding energy. Ref: AB –11.1 to 11.4

UNIT IV

DYNAMICS OF CHARGED PARTICLE:

Charged particle in a uniform and constant electric field, charged particle in alternating electric field, charged particle in a uniform and constant magnetic field, the cyclotron, magnetic focussing, charged particle in combined electric and magnetic field.Ref: DSM – 4.3 to 4.9

UNIT V

WAVES AND OSCILLATIONS:

Free vibrations, undamped vibrations, damped vibrations, damped S H M in an electrical circuit, forced vibrations, resonance and sharpness of resonance, phase of resonance, quality factor, examples of forced resonance and resonant vibrations. Ref: SB(W&O) – 3.1 to 3.9

Two coupled pendulums, energy exchange between two coupled identical oscillators, two coupled masses – normal modes of longitudinal oscillations, normal modes of longitudinal oscillations of many (N) coupled oscillators. Ref: SB(W&O) – 1.26 to 1.28, 1.32.

Note: Examples/problems of relevant topics in each unit should be covered.

REFERENCES:

1. DSM – Mechanics by D S Mathur. S. Chand & Co.
2. BS – Waves and Oscillations by Subramanyam &Brijlal. S. Chand & Co. 2nd Rev. Ed.
3. BS(H&T)– Heat and Themodynamics by Subramanyam & Brijlal. S. Chand & Co. 6th Ed.
4. GA – Quantum Mechanics by G Aruldhas PHI
5. AB – Concepts of Modern Physics by A. Beiser. 5th TMH

ADDITIONAL REFERENCES:

1. Mechanics – Berkley Physics course II.
2. Waves and oscillations by I. Main.
3. Heat and Themodynamics by Zemansky & Dittmann.
4. Modern Physics by S H Patil
5. Modern Physics by K Krane. J. Wiley & Sons.

GG: Atomic and Nuclear Physics by Gupta and Ghosh. Books & Allied(P) Ltd

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S.Y.B.Sc.

Physics

Paper IV

UNIT I

OPTICS:

Fermats principle of stationary time, maximum time. Ref: BS – 1.3 and 1.4

Aberrations: Aberrations, spherical aberration in a lens, reducing spherical aberrations, coma, aplanatic lens, astigmmatism, curvature of the field, distortion, chromatic aberration, chromatic aberration in a lens, circle of least confusion, achromatic lenses, condition for achromatism of two thin lenses separated by a finite distance Ref: SB(O) – 3.1, 3.5 to 3.12, 3.25 to 3.28

UNIT II

DIFFRACTION:

Introduction, Fresnal'assumptions, rectilinear propagation of light, Plane diffractiuon grating, theory of plane diffracting grating, width of principle maxima, oblique incidence, Ref: SB(O)- 9.1 to 9.3, 9.33 to 9.36,

POLARIZATION:

plane of polarization, polarization by reflection, Brewster's law, Polarization by refraction, Malus law, double refraction, Nicol prism, quarter wave plate, half wave plate, optical activity, Fresnel's explanation of rotation, specific rotation, Laurent's half shade polarimeter, Ref: SB(O)- 10.3 , 10.4, 10.6, 10.8, 10.9, 10.10, 10.13,10.24, 10.25, 10.31, 10.32, 10.34, 10.35

UNIT III

AC BRIDGES:

Introduction, The De Sauty bridge, Maxwell's bridge, Maxwell's L/C bridge, Anderson's bridge, Owen's bridge. Ref: SCS – 19.1, 19.2, 19. 5, 19.6, 19.7, 19.8

NETWORK ANALYSIS:

Network with linear controlled sources and resistances, Thevenin's theorem, Norton's theorem. Ref: SCS – 20.2, 20.3, 20.4.

UNIT IV

SOLID STATE PHYSICS

Introduction, translational symmetry, unit cell, basis and crystal structure, crystal classification, direction indices, miller indices, simple lattice, close-packed structures. Ref. CMK 1.1 to 1.9

ELECTRONICS: TRANSISTOR BIASING:

Faithful amplification, transistor biasing, inherent variations of transistor parameters, stabilization, essentials of transistor biasing circuit, stability factor, methods of transistor biasing, base resistor method, biasing with feedback resistor, voltage divider bias method, design of a transistor circuit, Mid-point biasing. Ref: VKM – 11.1 to 11.12

UNIT V

SINGLE STAGE TRANSISTOR AMPLIFIER:

Single stage transistor amplifier, How transistor amplifies? Graphical demonstration of transistor amplifier, practical circuit of transistor amplifier. Ref: VKM – 12.1 to 12.4

FIELD EFFECT TRANSISTOR:

Types of FET, JFET, working principle of JFET, schematic symbol of JFET, importance of JFET, difference between JFET and bipolar transistor, MOSFET, working principles of MOSFET. Ref: VKM – 21.1 to 21.6, 21.18, 21.19.

Note: Examples/problems of relevant topics in each unit should be covered.

REFERENCES:

1. SB(O)– T textbook of optics by Subramanyam & Brijlal. S. Chand & Co.
2. VKM – Principles of Electronics by V K Mehta. S. Chand & Co.
3. CMK : Solid state physics by C.M. Kachhava
4. SCS: Electricity and Magnetism by Sehgal, Chopra & Sehgal. S Chand & Co.

ADDITIONAL REFERENCES:

1. Optics by A Ghatak.
2. Optics by Hecht. Person Education. LPE
3. Fundamentals of Optics by Jenkins and White. McGrawhill International Publictions.
4. Integrated Electronics by Millman & Halkias. TMH.
5. Microelectronisc by Millman & Grable. TMH.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

S.Y.B.Sc.

Physics

Paper V

UNIT I

CURVILINEAR COORDINATES:

Orthogonal curvilinear coordinates, Starting from Cartesian coordinates to find the values of div V and ∇^2 in terms of circular cylindrical coordinates and spherical coordinates. Ref: R – 1.20, 1.21.

VECTOR INTEGRATION:

Line integral, surface integral and volume integral, Gauss divergence theorem, stoke's theorem, Green's theorem, Gauss' theorem of electrostatics from Gauss' divergence theorem. Ref: R – 1.22 to 1.26.

UNIT II

SINGLE STAGE TRANSISTOR AMPLIFIER:

Phase reversal, DC and AC equivalent circuits, load line analysis, voltage gain, ac emitter resistance, formula for ac emitter resistance, voltage gain in terms of ac emitter resistance, input impedance of an amplifier, classification of an amplifier, amplifier equivalent circuits, equivalent circuits with signal source. Ref: VKM – 12.5 to 12.15

UNIT III

MULTISTAGE TRANSISTOR AMPLIFIER:

Multistage transistor amplifier, important terms, RC coupled transistor amplifier, transformer coupled amplifier, Direct coupled amplifier. Ref: VKM – 13.1 to 13.5

FET AMPLIFIER:

JFET as an amplifier, Output characteristics of JFET, important terms, expression for drain current, advantages of JFET, parameters of JFET, Relation among JFET parameters, JFET biasing, JFET connections, voltage gain of JFET amplifier, JFET applications, Ref: VKM – 21.7 to 21.17.

UNIT IV

COMPLEX VARIABLES:

Function of complex variable, analytic function-Cauchy Reimann equation, Cauchy's theorem (statement only) Ref: R- 4.9,4.11

FOURIER SERIES:

Definition, evaluation of coefficients of fourier series, cosine and sine series, Dirichlet's theorem, extension of the interval. R- 7.1, 7.2, 7.4

APPLICATIONS OF QUANTUM MECHANICS:

Particle in a box, finite potential well, tunnel effect, harmonic oscillator. Ref: AB- 5.8 to 5.11

UNIT V

NUCLEAR PHYSICS:

Liquid drop model of a nucleus: Introduction, binding energy of nuclei: Plot of B/A against A, Weizsacher semi empirical mass formula. Ref: SBP – 5.1 to 5.3

Shell model Ref: AB – 11.6

Nuclear energy: Introduction, neutron induced fission, asymmetrical fission-mass yield, emission of delayed neutrons by fission fragments, energy released in the fission of U^{235}, fission of lighter nuclei, fission chain reaction, neutron cycle in a thermal reactor, nuclear reactor. Ref: SBP – 6.1 to 6.9

Note: Examples/problems of relevant topics in each unit should be covered.

REFERENCES:

1. R – Mathematical Physics by Rajput. Pragati Prakashan. Meerut.
2. SCS – Electricity and Magnetism by Sehgal Chopra & Sehgal.
3. SBP - Nuclear Physics by S B Patel. Wiley Eastern.
4. VKM – Principles of electronics by V K Mehta. S Chand & Co.
5. GA – Quantum Mechanics by G Aruldhas. PHI
6. AB – Concept of modern Physics Aurther Beiser.

ADDITIONAL REFERENCES:

1. Mathematical Physics by M. Boas.
2. Schaum's outline series – Vector analysis by Spiegel.
3. Basic electronics by B L Theraja. S. Chand & Co.
4. Modern Physics by S H Patil
5. Nuclear Physics by S N Ghoshal. S Chand & Co.
6. Nuclear Physics by Kaplan. Narosa Pub. Ltd.
7. Quantum Mechanics by Mathews & Venkateshan. TMH.
8. Basic Quantum Mechanics by A. Ghatak. Macmillan India. Ltd.

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S.Y.B.Sc.

Physics

SYLLABUS FOR EXPERIMENTS

GROUP A

1. To determine moment of inertia of a fly wheel.
2. Study of bar pendulum.
3. 'Y' by elevation method.
4. Verification of Stefan's fourth power law.
5. Thermocouple.
6. Constants of Ballistic galvanometers
7. Absolute capacity by ballistic galvanometer.
8. Comparision of capacities by De Sauty's method.
9. Maxwell bridge
10. Low resistance by Carey-Foster's bridge.
11. 'h' by photocell.
12. Study of simple harmonic motion.
13. Numerical solution of equation of motion using PC (D)

GROUP B

1. Cauchy's constant.
2. 'λ' by biprism.
3. Spherical aberration.
4. Optical lever.
5. diffraction grating, [Normal incidence]
6. Diffraction grating [minimum deviation]
7. Malus law
8. Polarimeter
9. FET characteristics.
10. Study of Norton's theorem
11. Study of Thevenin's theorem
12. CE characteristics of a transistor
13. Study of CRO (D)
14. Computer simulation of interaction of a wave function with potential barrier [D]

VEER NARMAD SOUTH GUJARAT UNIVERSITY

S.Y. B.Sc.

Physics

SYLLABUS FOR EXPERIMENTS
(Special Physics)
GROUP C

1. Goniometer
2. Coefficient of resistance of a thermistor using post-office box.
3. Comparision of capacities by method of mixtures.
4. Rydberg's constant.
5. Mutual inductance by ballistic galvanometer.
6. Wavelength of monochromatic light by cylindrical obstacle.
7. Resolving power of telescope.
8. Viscosity of liquid by log decrement.
9. Two stage RC coupled amplifier.
10. Estimate the temperature of flame.
11. Energy band gap of a semiconductor diode.
12. Use of CRO frequency & phase difference.(D)
13. Study of VTVM and its uses. (D)