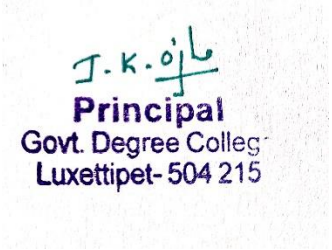
GOVERNMENT DEGREE COLLEGE, LUXETTIPET

DEPARTMENT OF PHYSICS

PHYSICS

SYLLABUS



B.Sc. (Physics)Semester I-Theory Syllabus
Paper – I: Mechanics

56 hrs

(w. e. from academic year 2019-20)
(CBCS)

Unit – I

1. Vector Analysis (14)

Scalar and vector fields, gradient of a scalar field and its physical significance.Divergence and curl of a vector field and related problems.Vector integration, line, surface and volume integrals.Stokes, Gauss and Greens theorems-simple applications.

Unit – II

2. Mechanics of Particles (07)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

3. Mechanics of rigid bodies (07)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor.Euler's equation, precession of a top, Gyroscope.

Unit – III

4. Centralforces (14)

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

Unit – IV

5. Special theory of relativity (14)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.Concept of four vector formalism.

NOTE: Problems should be solved at the end of every chapter of all units.

Chairperson
BOARDS OF STUDIES
DEPARTMENT OF PHYSICS
KAKATIYA UNIVERSITY
WARANGAL-506 009 (T.S.)

Textbooks

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007.*
3. **First Year Physics** - *Telugu Academy.*
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill.*
5. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
6. **Theory of relativity - Resnick**

Reference Books

1. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
2. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
3. **An introduction to Mechanics** by Daniel Kleppner& Robert Kolenkow. *The McGraw Hill Companies.*
4. **Mechanics**. Hans &Puri. *TMH Publications.*

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BOARDS OF STUDIES

Question paper pattern

FIRST SEMESTER PRACTICALS **36 hrs**
(3 hrs / week)

Practical Paper – I : Mechanics

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Y' by uniform Bending
3. Y by Non-uniform Bending.
4. Moment of Inertia of a fly wheel.
5. Measurement of errors –simple Pendulum.
6. 'Rigidity moduli by torsion Pendulum.
7. Determine surface tension of a liquid through capillary rise method.
8. Determination of Surface Tension of a liquid by different methods.
9. Determine of Viscosity of a fluid.
10. Calculation of slope and intercept of a Y= mX +C by theoretical method

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Text and reference books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (PragatiPrakashan, Meerut).
3. "Practical Physics" R.K Shukla, AnchalSrivastava

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KAKATIYA UNIVERSITY
WARANGAL-506 009 (A.P.)

B.Sc. (Physics)- I Year

Semester – II

Total: 48 hrs
(4 Hrs / week)

Paper II:: Waves and Oscillations

Unit – I

Fundamentals of Vibrations (12)

Simple harmonic oscillator, and solution of the differential equation– Physical characteristics of SHM, torsion pendulum, - measurements of rigidity modulus , compound pendulum, measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures

Unit – II

Damped and forced oscillations (12)

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance. Coupled Oscillators.

Unit – III

Vibrating Strings (12)

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance

Unit – IV

Vibrations of bars (12)

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **First Year Physics** - *Telugu Academy*.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
5. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
6. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.

Dr. B. Venkatram Reddy
Chairman, Board of Studies in Physics, KU, Wgl
Date: 24th Aug., 2016 & 5th June, 2017

7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
8. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
9. **Mechanics**. Hans & Puri. *TMH Publications*.
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
11. **The Feymman Lectures in Physics, Vol.-1**, R P Feymman, RB Lighton and M Sands, BI Publications,
12. **Mechanics-**P.K. Srivastava - New Age International.

B.Sc. (Physics Practicals) – I year
Semester - II
Paper – II ::Waves and Oscillations Practicals

1. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
2. Study of Oscillations under Bifilar suspension-Verification of axis theorems
3. Study of oscillations of a mass under different combination of springs-Series and parallel.
4. Verification of Laws of a stretched string (Three Laws).
5. Determination of frequency of a bar-Melde's experiment.
6. Observation of Lissajous figures from CRO-Frequency ratio.Amlitude and phase difference of two waves.
7. Volume Resonator –determination of frequency of a tuning fork.
8. Velocity of Transverse wave along a stretched string.
9. Study of damping of a bar pendulum-damping factor
10. Study of coupled oscillator-resonance

***Note**: Minimum of eight experiments should be performed .Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

Under Graduate Courses (Under CBCS 2020 – 2021 onwards)

B.Sc. PHYSICS II Year

SEMESTER – III

PAPER – III: ELECTROMAGNETIC THEORY

Theory:	**4 Hours/Week;**	**Credits: 4**	**Marks: 100 (Internal: 20; External: 80)**
Practical:	**3 Hours/Week**	**Credits: 1**	**Marks: 25**

UNIT I

Electrostatics

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions, Conservative nature of electric field 'E', Irrotational field. Electric potential: Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges, Energy density in an electric field, Calculation of potential from electric field for a spherical charge distribution.

UNIT II

Magnetostatics

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, 'B' due to a straight current carrying conductor, Force on a point charge in a magnetic field, Properties of B, curl and divergence of B, solenoidal field, Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance, Magnetic force between two current carrying conductors, Magnetic field intensity, Ballistic Galvanometer: Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

UNIT III:

Electromagnetic Induction and Electromagnetic waves

Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction, Continuity equation, modification of Ampere's law, displacement current, Maxwell equations, Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, Poyinting's theorem.

UNIT IV:

Varying and alternating currents

Growth and decay of currents in LR, CR and LCR circuits - Critical damping, Alternating current, relation between current and voltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit-Q-factor, AC & DC motors-single phase, three phase (basics only).

Network Theorems

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Suggested Books:

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Electricity and magnetism by J. H. Fewkes & John Yarwood. Vol. I (Oxford Univ. Press, 1991).
3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings, 1998).
4. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
5. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
6. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

Under Graduate Courses (Under CBCS 2020 – 2021 onwards)

B.Sc. PHYSICS II Year

SEMESTER – III

PAPER – III: ELECTROMAGNETIC THEORY PRACTICALS

1. To verify the Thevenin's Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.

Note: Minimum of eight experiments should be performed.
Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books:

1. B. L. Worsnop and H. T. Flint Advanced Practical Physics, Asia Publishing House, New Delhi.
2. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, Kitab Mahal

B.Sc. (Physics) - II Year
Semester – IV **Total: 48 hrs**
Paper – IV:: Optics **(4 Hrs / week)**
(w.e.f the academic year 2017-18)

Unit I: Interference: (12)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1,D_2 lines and thickness of a thin transparent plate.

Unit II: Diffraction: (12)

Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

Unit III: Polarization (12)

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

Unit IV: Aberrations and Fiber Optics : (12)

Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet.

Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Principles of optical fiber communication and advantages of optical fiber communication.

NOTE: *Problems should be solved at the end of every chapter of all units.*

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Suggested books

1. **Optics** by Ajoy Ghatak. *The McGraw-Hill companies*.
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications*.
7. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications*.
8. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
9. K. Ghatak, **Physical Optics'**
10. D.P. Khandelwal, Optical and Atomic Physics' (Himalaya Publishing House, Bombay,1988)
11. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
12. Smith and Thomson: 'Optics' (John Wiley and sons).

B.Sc. (Physics Practicals) – II year
Semester - IV
Paper – IV:: Optics Practicals

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.

***Note**: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

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KAKATIYA UNIVERSITY

B.Sc. Final Year (Under CBCS)

SEMESTER – V

(SEC-3) Skill Enhancement Course-III

(FOR ALL SCIENCE FACULTY DEPARTMENTS)

VERBAL REASONING FOR APTITUDE TEST

Credits: 2

Theory: 2 hours/week **Marks - 50**

Unit – I NUMBERS AND DIAGRAMS

1.1 Series Completion: Number series, Alphabet Series

1.2 Series Completion: Alpha Numeric Series, Continuous Pattern Series

1.3 Logical Venn Diagrams

1.4 Mathematical Operations: Problem solving by substitution, Interchange of signs and numbers

Unit – II ARITHMETICAL REASONING

2.1 Mathematical Operations: Deriving the appropriate conclusions

2.2 Arithmetical Reasoning: Calculation based problems, Data based problems

2.3 **Arithmetical Reasoning**: Problems on ages, Venn diagram based problems

2.4 Cause and Effect Reasoning

Text Book: A Modern Approach to Verbal & Non-Verbal Reasoning by Dr. R.S.Aggarwal

KAKATIYA UNIVERSITY
B.Sc. Final Year (Under CBCS)
SEMESTER – V
(GE-1) GENERIC ELECTIVE-I
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

PUBLIC HEALTH AND HYGIENE

Credits: 2

Theory :2 hours/week **Marks: 50**

UNIT – I : NUTRITION AND ENVIRONMENT

1.1 Balanced diet and Malnutrition.

1.2 Nutritional deficiencies and disorders- Carbohydrates, proteins, lipids, vitamins and minerals.

1.3 Occupational, Industrial, agricultural and urban Health-Exposure at work place, urban areas, industrial workers, farmers and agricultural labourers, Health workers and health disorders and diseases.

1.4 Environmental pollution and associated Health hazards, Water borne diseases and Air borne diseases.

UNIT-II : DISEASES AND HEALTH CARE

2.1 Causes, Symptoms, Diagnosis, Treatment and Prevention - Malaria, Filaria, Measles, Polio, Chicken pox, Rabies, Plague, Leprosy,.

2.2 Causes, Symptoms, Diagnosis, Treatment and Prevention of non communicable diseases - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

2.3 Health care legislation in India – Termination of pregnancy act, Maternity benefit act, Biomedical waste act, ESI act.

2.4 First Aid and Health awareness, personal health care record maintenance.

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSC-1E)

SEMESTER – V

Paper – V: Electromagnetism

Unit I : Electrostatics (11 hrs)

Electric Field:- Concept of electric field lines and electric flux, Gauss‟s law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field „E‟, Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics (12 hrs)

Concept of magnetic field „B‟ and magnetic flux, Biot-Savart‟s law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere‟s law, Applications of Ampere‟s law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction (9 hrs)

Faraday‟s laws of induction (differential and integral form), Lenz‟s law, self and mutual Induction. Continuity equation, modification of Ampere‟s law, displacement current, Maxwell equations

Unit IV : Electromagnetic waves (10 hrs)

Maxwell‟s equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium, polarization, reflection and transmission. Polarization of EM waves, Brewster‟s angle, description of linear, circular and elliptical polarization.

Text Books

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Electricity and magnetism by J.H.Fewkes& John Yarwood. Vol.I (Oxford Univ. Press, 1991).
3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).

Reference Books

1. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
2. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
3. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSC-1E)

SEMESTER – V

Paper – V:: Electromagnetism Lab

PHYSICS LABORATORY

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster‟s bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty‟s bridge.
9. To determine self-inductance of a coil by Anderson‟s bridge using AC.
10. To determine self-inductance of a coil by Rayleigh‟s method.
11. To determine coefficient of Mutual inductance by absolute method.

Note: Minimum of eight experiments should be performed.

Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books for Reference:

1. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper – VI (A):: Solid State Physics
(Elective-1)

Unit-I (11 hrs)

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis, Crystal systems, Bravais lattices, Unit Cell, Miller Indices. Types of Lattices, Reciprocal Lattice. Packing factors: SC, BCC, FCC, HCP, Brillouin Zones. Diffraction of X-rays by Crystals.

Bragg‟s Law.

Elementary Lattice Dynamics: Lattice vibrations and phonons, Linear monoatomic and diatomic chains. Acoustical and optical phonons. Qualitative description of the phonon spectrum in solids. Dulong and Petit‟s Law, Einstein and Debye theories of specific heat of solids. T^3 law.

Unit-II (11 hrs)

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin theory of dia- and paramagnetism. Curie‟s law, Weiss‟s theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Dielectric Properties of Materials: Polarization. Local electric field at an atom. Depolarization field. Electric susceptibility. Polarizability. Clausius-Mosotti Equation. Classical theory of electric polarizability.

Unit-III (10 hrs)

Elementary band theory: Kronig Penny model. Band Gap. Brillouin zones, effective mass of electron. Classification of materials based on band theory: conductor, semiconductor and insulator. Conductivity of Semiconductor, mobility, Hall Effect. Measurement of conductivity (04 probe method) & Hall coefficient.

UNIT IV (10 hrs)

Lasers: Einstein‟s A and B coefficients. Metastable states. Spontaneous and Stimulated emissions.

Optical Pumping and Population Inversion. Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser.

Superconductivity: Introduction, Critical temperature, Critical magnetic field, Meissner effect, Type I and type II superconductors, London‟s equation and penetration depth, Isotope effect, concept of BCS theory

Text Books:

1. Introduction to Solid State Physics, Charles Kittel, 8th Edition, 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India
3. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
4. Solid State Physics – S. O. Pillai (New Age Publication)
5. LASERS: Fundamentals and Applications – Thyagarajan and Ghatak (McMillanIndia)

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Date: 24th Aug., 2016 & 5th June, 2017

Reference Books:

1. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer
2. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning
5. Solid State Physics- R.K.Puri&V.K. Babbar (S.Chand Publication)2013
6. Lasers and Non linear Optics –B.B.Laud-Wiley Eastern.

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: VI (A) Solid State Physics Lab

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids (Guoy‟s method)
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To study the polarization-electric field (P-E) hysteresis loop of a Ferroelectric Crystal.
6. To draw the B-H curve of Fe using Solenoid & determine energy loss from Hysteresis.
7. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 ^{o}C) and to determine its band gap.
8. To determine the Hall coefficient of a semiconductor sample.
9. Calculation of d-values of a given Laue‟s pattern.
10. Calculation of d-values of power diffraction method.
12. To study the spectral characteristics of a Photo- Voltaic cell.
13. . Verification of Bragg‟s equation.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
4. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

Note: Minimum of eight experiments should be performed.

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U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper – VI (B):: Modern Optics
(Elective-2)

Unit I (11 hrs)

Principles of Lasers: Emission and absorption of radiation – Einstein relations. - Pumping mechanisms – Optical feedback - Laser rate equations for two, three and four level lasers. Pumping threshold conditions – Properties of Laser beams. Classification of laser systems – Gas, Liquid and Solid Lasers: He-Ne, and Argon lasers, their energy level schemes – Ruby laser and Nd:YAG laser, Ga-As laser, and their applications in various fields.

Unit II (11 hrs)

Holography: Basic principles of holography- Recording of amplitude and phase- The recording medium- Reconstruction of original wave front- Image formation by wave front reconstruction- Gaber hologram- Limitations of Gaber hologram - Off axis hologram - Fourier transform holograms - Volume holograms, Applications of holograms.

Unit III (10 hrs)

Fourier and Non-Linear Optics: Fourier optics - Thin lens as phase transformation – Thickness function- Various types of lenses- Fourier transforming properties of lenses – Object placed in front of the lens- Object placed behind the lens.

Non-Linear Optics: Harmonic generation- second harmonic generation- phase matching condition- Optical mixing- Parametric generation of light – Self focusing of light.

Unit IV (10 hrs)

Optical Fibers: Fiber types and their structures. Ray optics representation, acceptance angle and numerical aperture. Step index and graded index fibers, single mode and multimode fibers. Fiber materials for glass fibers and plastic fibers. Signal attenuation in optical fibers: Absorption, scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, inter-mode distortion and pulse broadening.

Recommended Books:

1. Opto Electronics- An Introduction – Wilson & JFB Hawkes 2nd Edition.
2. Introduction to Fourier optics – J.W. Goodman
3. Lasers and Non-Linear optics – B.B. Laud
4. Optical Electronics – Ghataknd ThygaRajan.
5. Principles of Lasers – O. Svelto
6. Optical Fiber Communications – by Gerad Keiser
7. Optical Fiber Communications – by John M. Senior (PHI)

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: VI (B): Modern Optics LAB

1. Study of the profile of a laser beam.
2. Determination of the diameter of a thin wire using laser.
3. Determination of wavelength of He-Ne laser by transmission grating.
4. Construction and recording of a hologram.
5. Study of Fourier transforming properties of lenses.
6. Study of second harmonic generation by KDP crystal.
7. Measurement of numerical aperture of an optical fiber.
8. Measurement of coupling losses in optical fibers.
9. Measurement of bending losses in optical fibers.
10. Study of audio signal transmission through optical fibers.
11. To study the interference of light using optical fibers.

Reference Books:

1) Introduction to Fourier Optics – J. Goodman
2) Optical Fiber Communications- John M. Senior
3) Principles of Lasers- O. Svelto
4) Modern Optics- Grant Fowles.
5) Principles of Optics – Born & Wolf
6) Fundamentals of Optics- Jenkins & White

Note: Minimum of eight experiments should be performed.

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KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: V I (C): QUANTUM MECHANICS AND APPLICATIONS

(DSE- Elective-3)

Unit-I (11hrs)

Schrodinger equation & the operators: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions.Normalization.Linearity and Superposition Principles.Hermitian operator, Eigen values and Eigen functions. Position, momentum and Energy operators; commutator of position and momentum operators; Expectation values of position and momentum.Wave Function of a Free Particle.

Unit II (11 hrs)

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigen values; expansion of an arbitrary wave function as a linear combination of energy eigen functions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave-packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle.

Unit-III (10 hrs)

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem-square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigen functions ground state, zero point energy & uncertainty principle. One dimensional infinitely rigid box- energy eigen values and eigen functions, normalization; Quantum dot as example; Quantum mechanical scattering and tunnelling in one dimensionacross a step potential & rectangular potential barrier.

Unit-IV (10hrs)

Atoms in Electric & Magnetic Fields: Electron angular momentum. Space quantization. Electron Spin and Spin Angular Momentum.Larmor's Theorem. Spin Magnetic Moment. Stern Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton. Atoms in External Magnetic Fields:- Normal and Anomalous Zeeman Effect. Paschen Back and Stark Effect (Qualitative Discussion only) (12 Lectures)

Text Books:

1. A Text book of Quantum Mechanics, P. M.Mathews and K.Venkatesan, 2nd Ed., 2010, McGraw Hill
2. Quantum Mechanics, Robert Eisberg and Robert Resnick, 2nd Edn., 2002, Wiley.
3. Quantum Mechanics, Leonard I. Schiff, 3rd Edn. 2010, Tata McGraw Hill.

Reference Books:

1. Quantum Mechanics, G. Aruldhas, 2nd Edn. 2002, PHI Learning of India.
2. Cohen-Tannoudji, B Diu and F Laloë, Quantum Mechanics (2 vols) Wiley-VCH 1977 • Basic Quantum Mechanics –A.Ghatak (McMillan India) 2012
3. • Introduction to Quantum Mechanics, D.J. Griffith, 2nd Ed. 2005, Pearson • Quantum Physics----S. Gasiorowicz (Wiley India) 2013

KAKATIYA UNIVERSITY

U.G. Physics (Under CBCS)

B.Sc. Final Year (DSE-1E)

SEMESTER – V

Paper: V I (C): QUANTUM MECHANICS AND APPLICATIONS LAB

Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom: Here, m is the reduced mass of the electron. Obtain the energy eigenvalues and plot the corresponding wavefunctions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take e = 3.795 (eVÅ)1/2, ħc = 1973 (eVÅ) and m = 0.511x106 eV/c2.
2. Solve the s-wave radial Schrodinger equation for an atom: where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction. Take e = 3.795 (eVÅ)1/2, m = 0.511x106 eV/c2, and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973 (eVÅ). The ground state energy is expected to be above -12 eV in all three cases.
3. Solve the s-wave radial Schrodinger equation for a particle of mass m: For the anharmonic oscillator potential for the ground state energy (in MeV) of particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c2, k = 100 MeV fm-2, b = 0, 10, 30 MeV fm-3In these units, cħ = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.
4. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule: Where μ is the reduced mass of the two-atom system for the Morse potential Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function. Take: m = 940x106eV/C2, D = 0.755501 eV, α = 1.44, ro = 0.131349 Å

Laboratory based experiments:

5. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency
6. Study of Zeeman effect: with external magnetic field; Hyperfine splitting
7. To show the tunneling effect in tunnel diode using I-V characteristics.
8. Quantum efficiency of CCDs

Reference Books:

1. Schaum's outline of Programming with C++. J.Hubbard, 2000,McGraw---Hill Publication
2. Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal., 3rd Edn., 2007, Cambridge University Press.
3. An introduction to computational Physics, T.Pang, 2nd Edn.,2006, Cambridge Univ. Press • Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific & Engineering Applications: A. VandeWouwer, P. Saucez, C. V. Fernández.2014 Springer.
4. Scilab(A Free Software to Matlab): H. Ramchandran, A.S. Nair. 2011 S. Chand & Co.
5. Scilab Image Processing: L.M.Surhone.2010 Betascript Publishing ISBN:978 613345927

KAKATIYA UNIVERSITY
U.G. Skill Enhancement Course - IV
(Under CBCS)
B.Sc. Final Year
SEMESTER - VI
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

QUANTITATIVE APTITUDE TEST

Credits: 2

Theory: 2 hours/week **Marks - 40**

Unit – I ARITHMETICAL ABILITY

1.1 Arithmetical Ability: Ratio & Proportion
1.2 Arithmetical Ability: Time & Work, Time & Distance
1.3 Arithmetical Ability: Simple Interest, Compound Interest
1.4 Arithmetical Ability: Stocks & Shares

Unit – II DATA INTERPRETATION

2.1 Data Interpretation: Tabulation
2.2 **Data Interpretation**: Bar Graphs
2.3 **Data Interpretation**: Pie Charts
2.4 **Data Interpretation**: Line Graphs

Text Book: Quantitative Aptitude by Dr. R.S.Aggarwal

KAKATIYA UNIVERSITY
U.G. B.Sc. Final Year (Under CBCS)
Semester – VI: Generic Elective Paper-II
(FOR ALL SCIENCE FACULTY DEPARTMENTS)

WATER RESOURCES MANAGEMENT

UNIT-I

1. Importance of Natural Resources – Different Types Resources
2. Significance of Water Resources and their uses
3. Conservation of water and recycling of the water – Global distribution of water
4. Water shed programmes and their management
5. Storing the rain water in tanks and recharging ground water.

Unit-II

6. Rain water harvesting in rural areas (chekdam, trenches etc.,)
7. Over use of surface and ground water and control measures.
8. Aims, objectives and implementation of Mission Bhagiratha (Telangana Government Drinking water programme)
9. Aims, objectives and implementation of Mission Kakatiya (Telangana Government minor irrigation programme)
10. Issues and challenges in Water Resources Management

B.Sc. (Physics)- III Year

Semester – VI

Paper – VII:: Modern Physics

(DSC – Compulsory)

(w.e.f the academic year 2018-2019)

42 hrs
(3 hrs / week)

UNIT-I (11 hrs)

Atomic Spectra and Models - Inadequacy of classical physics:

Brief review of black body radiation , Photoelectric effect, Compton effect, dual nature of radiation, wave nature of particles. Atomic spectra, Line spectra of hydrogen atom, Ritz -Rydberg combination principle. Alpha particle scattering, Rutherford scattering formula, Rutherford model of atom and its limitations, Bohr‟s model of hydrogen atom, explanation of atomic spectra, correction for finite mass of the nucleus, Bohr correspondence principle, limitations of Bohr model, discrete energy exchange by atom, Frank Hertz experiment. Sommerfeld's modification of Bohr‟s theory.

UNIT-II (11 hrs)

Wave particle duality, de-Broglie hypothesis, Experimental confirmation of matter wave, Davisson-Germer experiment, velocity of de-Broglie wave, wave particle duality, Complementarity. Superposition of two waves, phase velocity and group velocity, wave packets, Gaussian wave packet, spatial distribution of wave packet, Localization of wave packet in time. Time development of a wave Packet; Heisenberg uncertainty Principle, Illustration of the principle through thought experiments of Gamma ray microscope and electron diffraction through a slit. Time-independent Schroedinger wave equation and its application to linear harmonic oscillator.

UNIT-III (9 hrs)

Nuclear physics: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, Liquid-drop model: semi-empirical mass formula and binding energy, Nuclear shell model and magic numbers.

Unit IV(11 hrs)

Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus. Fission and fusion - Mass defect, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussion).

Text Books:

1. Introduction to Atomic spectra – H. E. White, McGraw-Hill
2. Nuclear Physics – D. C. Tayal, Himalaya Publishing House
3. Quantum Theory and Nuclear Physics – V. K. Srivastava, ABD Publisher, Jaipur
4. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
5. Modern Physics ---Murugesan and Sivaprasad –(S. Chand Higher Academics)

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6. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
7. Introduction to Quantum Mechanics, David J. Griffith, 2005, Pearson Education.
8. Physics for scientists and Engineers with Modern Physics, Jewett and Serway, 2010, Cengage Learning.
9. Quantum Mechanics: Theory & Applications, A. K. Ghatak & S. Lokanathan, 2004, Macmillan

Reference Books

1. Modern Physics – Bernstein, Fishbane and Gasiorowicz (Pearson India) 2010
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles -- R. Eisberg (Wiley India) 2012 Additional Books for Reference
3. Modern Physics, J.R. Taylor, C.D. Zafiratos, M.A. Dubson, 2004, PHI Learning.
4. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub.
5. Six Ideas that Shaped Physics: Particle Behave like Waves, T.A.Moore, 2003, McGraw Hill
6. Modern Physics-Serway (CENGAGE Learnings) 2014

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VII: Modern Physics Lab

1. Measurement of Planck‟s constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck‟s constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck‟s constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg‟s constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Edn, 2011,Kitab Mahal

Note: Minimum of eight experiments should be performed.

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B.Sc. (Physics)- III Year

Semester – VI

Paper – VIII(A):: Basic Electronics

(DSE– Elective-1)

42 hrs
(3 hrs / week)

Unit-I: (10 Hrs)

Network Elements and Network Theorems

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin‟s theorem, Norton‟s theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Two-port Networks – Introduction - Z-parameters, Y-parameters, h-parameters and ABCD-parameters (Simple problems).

Unit – II: (10 Hrs)

Band theory of P-N junction

1. Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.

2. Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit-III: (11 Hrs)

1. Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier - RC coupled amplifier – Frequency response (Qualitative analysis).

2. Feedback concept & Oscillators: Feedback, General theory of feedback – Concepts of oscillators, Barkhausen‟s criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-IV: (11 Hrs)

1. Digital Electronics

Binary number system, convertion of binary to decimal and vice-versa. Binary addition and subtraction (1‟s and 2‟s complement methods). Hexadecimal number system. Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

2. Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan‟s Laws – Statement and proof.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , S. Chand & Co.

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4. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI.

Reference Books

1. Basic Electronics – BernodGrob.
2. Third year Electronics – Telugu Academy
3. Digital Principles & Applications – A.P. Malvino and D.P. Leach
4. Circuit theory- Umesh.

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII(A): Basic Electronics Lab

1. AND, OR, NOT, gates – Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. NAND and NOR gates truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan‟s Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

❖ Every student should complete minimum 06 experiments.

Text Books for LAB (Practical 6)

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, PragathiPrakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

Note: Minimum of eight experiments should be performed.

B.Sc. (Physics)- III Year

Semester – VI

Paper – VIII (B):: Physics of Semiconductor Devices

(DSE – Elective-2)

42 hrs
(3 hrs / week)

Unit-I: (11 hrs)

Semiconductor Physics: Conductors, semiconductors, forbidden gap, energy levels, crystals and covalent bonds, free electrons and holes, recombination and life-time, energy bands. Intrinsic semiconductor - intrinsic carrier concentration, density of electrons in conduction band, Fermi-level, Mass action law. Carrier transport phenomena - mobility, resistivity, diffusivity, Einstein‟s relation, current density equation. Extrinsic semiconductor - n-type semiconductor, p-type semiconductor, energy band diagram of extrinsic semiconductor. Hall effect- mobility and Hall angle, experiment arrangement for the study of Hall effect, significance of Hall effect.

Unit – II: (11 hrs)

P-N junction - Depletion layer, Energy level diagram of p-n junction, Band structure of an open circuited p-n junction, Biasing of p-n junction, effect of barrier potential on forward bias, reverse leakage current, reverse breakdown, p-n junction under various conditions - thermal equilibrium, forward and reverse bias, current-voltage characteristics. Derivation of ideal diode equation of p-n junction, diode model and its approximations. Forward and reverse resistance of diode. Dynamic characteristic of diode.

Unit-III: (10 hrs)

Special diodes **–** Construction and characteristics of Zener diode, Light emitting diode (LED), Photo-diode, Schottky diode, Backward diodes and Tunnel diode.

Transistors - Bipolar junction transistor (BJT), transistor characteristics, transistor equation in active region, Field effect transistor (FET), MOSFET and photo transistor.

Unit-IV: (10 hrs)

Control devices- Shockley diode, Silicon controlled rectifier (SCR), Silicon controlled switch (SCS), Unijunction transistor (UJT), Solar cells, Opto-couplers.

Textbooks

1. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI
2. Physics of Semiconductor Devices- S. M. Sze
3. Physics of Semiconductors- Streetman.

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B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII (B): Physics of Semiconductor Devices Lab

1. Characteristics of a Transistor in CE configuration
2. Zener diode V-I characteristics.
3. P-n junction diode V- I characteristics.
4. Zener diode as a voltage regulator
5. Determination of carrier concentration using Hall effect
6. Thermistor characteristics
7. Efficiency of a LED
8. Solar cell: fill factor and efficiency
9. FET characteristics
10. SCR characteristics
11. UJT characteristics

❖ Every student should complete minimum 06 experiments.

Text Books:

1. Basic electronics - Grob
2. Practical Electronics – Zbar

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B.Sc. (Physics) – III year
Semester – VI
(DSE – Elective-3)
Paper: VIII (C): ELECTRONIC INSTRUMENTATION

42 hrs
(3 hrs / week)

Unit- I (10 hrs)

Qualities of Measurement: Specifications of instruments, their static and dynamic characteristics, errors in measurement, types of static error, sources of error, dynamic characteristics and statistical analysis.

Basic Measurement Instruments: DC measurement: dc voltmeter, ohmmeter and ammeter. Digital type voltmeter, Ammeter and ohmmeter, Digital multimeter.

Unit –II (10 hrs)

AC measurement: AC voltmeter & ammeter.

Digital frequency meter: Elements of frequency meter, universal counter and its different modes, measurement errors and extending the frequency range. Digital LCR-Q meter, digital wattmeter.

Unit-III (11 hrs)

Signal Generators: Types of generators and their operation: Audio oscillator, Function generators, Pulse generators, RF generators.

Electronic Displays: The Cathode Ray Oscilloscope (CRO): Block diagram of a General Purpose Oscilloscope and its basic operation, electrostatic focusing and deflection, screen for CRT, CRT connections, CRO probes.

Unit –IV (11 hrs)

Transducers: Various types of transducers for measurement of displacement, speed, stress and strain. Classification and selection of transducers. Strain Gages: bonded and un-bonded strain gages, strain gage transducer sensitivity. Position Transducer: capacitive, inductive, linear variable differential transformer (LVDT), Piezoelectric, potentiometer. Temperature transducers: Resistance thermometers, thermocouples, thermistor and semiconductor p-n junction transducer.

TEXT BOOKS:

1. H. S. Kalsi, Electronic Instrumentation, Tata McGraw Hill (2006)
2. Joseph J Carr, Elements of electronic instrumentation and measurement, Pearson Education (2005)
3. C. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata McGraw Hill (1998)
4. H. Cooper, Modern electronic instrumentation and measurement techniques, Pearson Education
   (2005)
5. R. A. Witte, Electronic test instruments: analog and digital measurements, Tata McGraw Hill (2004)
6. S. Wolf and R. F. M. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Pearson Education (2004)

REFERENCES:

1. Electrical Measurement in Measuring Instruments. Goldwing E.W. and Widdies
2. Electrical and Electronics Measurement and Instrumentation Sahwany A.K.
3. Instrumentation devices and systems: Rangan, Sarma, Mani, TMH
4. Instrumentation measurement and analysis: Nakra B C, Chaudry K K, TMH
5. Handbook of biomedical instrumentation: Khandpur R S, TMH
6. Measurement systems applications and design: Doeblin E O, McGraw Hill, 1990.
7. Electron measurements and instrumentation techniques: Cooper W D and Helfric AD,PHI,1989.

B.Sc. (Physics Practical) – III year
Semester – VI
Paper: VIII (C): ELECTRONIC INSTRUMENTATION LAB

1. Design of multi range ammeter and voltmeter using galvanometer.
2. To determine the Characteristics of resistance transducer - Strain Gauge
3. Measurement of Strain using half and full bridge
4. To determine the Characteristics of LVDT.
5. To determine the Characteristics of RTD.
6. Measurement of temperature by Thermocouples and study of transducers like AD 590
7. Two terminal temperature sensor PT-100, J- type, K-type.
8. Measurement of temperature using thermistor
9. Calibration of resistance thermometer
10. Frequency response of series LCR circuit

- Every student should complete minimum 06 experiments.