K.L.E. Society's

R. L. Science Institute (Autonomous), Belagavi

DEPARTMENT OF PHYSICS

B.Sc. PHYSICS

DSE & SEC Syllabus

(CBCS)

of

Undergraduate Programme

B.Sc. V & VI Semester

w.e.f Academic year 2022-23

B.Sc. V Semester
DSE- 1: QUANTUM MECHANICS, SPECTROSCOPY & ELECTRONICS-I

Teaching Hours: 4 Hrs / Week **Total Hours:** 60
Credits : 04

Course outcome

On successful completion of the course students would have;

CO1: Understand the importance of quantum mechanics at microscopic level.

CO2: Acquire basic knowledge of quantum mechanical aspect of atomic spectra.

CO3: Enhance the knowledge of energy distribution in electromagnetic spectrum

CO4: Relates the basic concepts of electronic equipment and its functioning

UNIT I : QUANTUM MECHANICS

Quantum Mechanics: Origin of Quantum Theory, Compton effect- explanation, Derivation of Compton Shift, de-Broglie Hypothesis. Derivation of expression for de-Broglie wavelength. Davisson and Germer Experiment, Heisenberg's Uncertainty principle, Statement, Illustration by Gamma – Ray Microscope and Diffraction of Electrons at a Single Slit.

Problems **(06+1 hrs)**

Wave Mechanics: Schrodinger's wave equation for free particle (derivation) Physical significance & conditions of wave function. Eigen function and Eigen values. Derivation of expression for energy & wave function of a particle in 1 dimensional box. Concept of Degeneracy. Linear harmonic oscillator with energy expression (qualitative). Concept of zero point energy.

Problems **(07+1 hrs)**

UNIT II : ATOMIC SPECTRA

Atomic Spectra : Introduction, Vector atom model- electron spin, Space quantization and quantum numbers. Pauli's Exclusion Principle and Electron Configuration. Stern Gerlach experiment. Spectral terms, Coupling scheme: LS and jj Coupling .
Problems

(05+1 hrs)

Effect of Magnetic field on light emitting atom: Magnetic moment of electron due to orbital motion. Larmor precession. Normal Zeeman effect: explanation of experimental setup and expression for Zeeman shift. Quantum theory of normal Zeeman effect. Energy level

diagram for sodium D lines. Anomalous Zeeman effect (qualitative). Lande's g factor (qualitative).

Problems **(07+2 hrs)**

UNIT III : MOLECULAR SPECTRA

Spectra of diatomic molecules: Nature of Molecular spectrum, Different types of energies of a molecule, Molecular energy distribution in electromagnetic spectrum. General features of band spectra compared to atomic spectra. Diatomic molecule as a Rigid Rotator. Derivation of expression for rotational energy of a diatomic molecule. Application of Molecular spectra, Energy of a diatomic molecule as a non rigid rotator (qualitative).

Raman Effect: Rayleigh scattering and Raman Scattering. Experimental set up. Raman Spectrum, Explanation of Raman effect on the basis of quantum theory. Applications of Raman Effect.

Problems **(13+2 hrs)**

UNIT IV: ANALOG ELECTRONICS

Network theorems: Current and voltage sources, Thevinin's and Norton's Theorem

Power supply: Bridge rectifier: efficiency, ripple factor, PIV & voltage regulation.

Filters: Capacitor filter, LC filter, $\boldsymbol{\pi}$ section filter : Nature of wave forms, & Mention of expression for efficiency, ripple factor and voltage regulation **(08 hrs)**

Voltage Regulators : Basic block diagram of voltage regulator, load regulation, line regulation,

Zener diode : characteristics parameter, Zener diode used as voltage regulator using unregulated DC voltage bridge rectifier. Classification of voltage regulation : fixed, adjustable, switching.

Clippers : Biased and Unbiased, **Clampers** : Biased and Unbiased

Problems **(07 hrs)**

REFERENCE BOOKS

1. Introduction to Quantum Mechanics, David J. Griffiths, 2nd Edition, Pearson Education , (2005)
2. Modern Quantum Mechanics, J.J. Sakurai, Pearson Education, (2000)
3. Principles of Quantum Mechanics, Ghatak and Lokanathan, Macmillan, (2004)
4. Quantum mechanics, Aruldhas, G, PHI Learning Pvt. Ltd., 2008.

5. Quantum Mechanics : Leonard I. SCHIEF , Tata McGraw Hill Publication, NewDehli, 2010.
6. Quantum Mechanics : B.H.Branden, C.J. Joachain, Pearson Publication, NewDehli, 2011.
7. Quantum Mechanics : B.K. Agarwal, Hariprakash, PHI Publication, NewDehli, 2010.
8. Introduction to Quantum Mechanics : K. Venkateshan, P.M.Mathews, Tata McGraw Hill Publication, NewDehli, 2011.
9. Fundamentals of molecular spectra : C.N.Banwell, Tata McGraw Hill, NewDehli, 1992.
10. Elements of Spectroscopy : Gupta, Kumar & Sharma, A Pragati Edition,2000
11. Atomic spectra : White,Tata McGraw Hill Publication, NewDehli 1999.
12. Modern Physics : R.Murugeshan . S.Chand & Co-Ltd publication, New Delhi, 2014, 14^{th} edition.
13. Modern Physics : S.L. Kakani & Shubhra Kakani, Viva Books Publication, NewDelhi, 2009.
14. Modern Physics Vol II : B. Basavaraj, Omkar publication, Bangalore, 1999.
15. Relativistic Mechanics –Prakash , Kumar, Karnatak Sahaitya publication, Bangalore, 2008.
16. Modern Physics – D.L.Sehgal and Chabra K.I, S.Chand publication, New Delhi 2010.
17. Electronics devices and circuits – Allan Mottershed, Prentic Hallof Matis publication, New Delhi, 2010.
18. Basic Electronics & Solid State–B L Theraja, S.Chand & Co-Ltd publication, New Delhi, 2010.
19. Hand book of Electronics- Gupta S.L.and Kumar V, Pragati prakashan publication, Meerut, 2013.
20. Principles of Electronics- V,K,Mehta, S.Chand & Co-Ltd publication, New Delhi, 2009.

B.Sc. V Semester

DSE- 2 CLASSICAL MECHANICS, MATHEMATICAL PHYSICS, ELECTRONICS- I & C- PROGRAMMING

Teaching Hours: 4 Hrs / Week **Total Hours:** 60
Credits : 04

Course outcome

On successful completion of the course students would have;

CO1: Acquire basic knowledge of classical physics and its importance in daily life

CO2: Understand the fundamental concepts of special functions in differential forms.

CO3: Improves the skill of circuit connection with filters and rectifiers

CO4: Learns the program writing skill in C Language

UNIT I : CLASSICAL MECHA NICS

Constraints: Types with example, Degrees of Freedom, Configuration Space, Principle of Virtual Work, Generalized Co-ordinates, Virtual displacement, Velocity & Force. Expression for Kinetic energy & Potential energy in terms of generalized coordinates.

D'Alembert's Principle, Lagrange's equation of motion from D'Alembert's Principle. Applications of Lagrange's equation of Motion.

a. Motion of a Single Particle in Cartesian Co-ordinates.
b. Atwood Machine.
c. Electrical circuits.

Problems **(8+2 hrs)**

Motion under Central Force : Reduction of two body problem to equivalent one body problem. Equation of orbit (equivalent of single body) and Classification of Orbits. Kepler's Laws of Planetary Motion and their derivation from Lagranges equation of motion.

Problems **(4+ 1 hrs)**

UNIT II : MATHEMATICAL PHYSICS

Legendre functions: Legendre polynomials, Rodrigue's formula , generating functions and recursion relations , Orthogonality and Normalization, associated Legendre functions , spherical harmonics .

Bessel functions: Bessel functions of the first kind, recursion relations, Orthogonality.

Hermite fuctions : Hermite polynomials , generating functions , recursion relations , orthogonality.

Problems **(13+2 hrs)**

UNIT III: ANALOG ELECTRONICS

Network theorems: Current and voltage sources , Thevinin's and Norton's Therorem

Power supply: Bridge rectifier : Efficiency, ripple factor, PIV & voltage regulation.

Filters: Capacitor filter, LC filter, $\boldsymbol{\pi}$ section filter : Nature of wave forms, & Mention of expression for efficiency, ripple factor and voltage regulation **(06+2 hrs)**

Voltage Regulators : Basic block diagram of voltage regulator, load regulation, line regulation,

Zener diode : characteristics parameter, Zener diode used as voltage regulator using unregulated DC voltage bridge rectifier. Classification of voltage regulation : fixed, adjustable, switching.

Clippers : Baised and Unbaised, **Clampers** : Baised and Unbaised

Problems **(06 +1hrs)**

Unit – IV : C – Programming : Introduction, features, applications, basic structure of C-programming, C-tokens , Keywords, identifiers, constants, variables and data types. Operators and expressions, decision making: If, Ifelse, nested if and switch. **(15 hrs)**

REFERENCE BOOKS:

1. Classical Mechanics – Goldstein H. Pearson publication, New Delhi, 2011.
2. Classical Mechanics – S.L.Gupta, Kumar V and Sharma H.V. Pragati prakashan publication, Meerut, 2010.
3. Classical Mechanics – Takwale R.G. and Puranik P.S. Tata MCGRAW Hill publication, Delhi, 2010.
4. Classical Mechanics – G. Aruldhas, PHI publication, New Delhi, 2009.
5. Mathematical Physics- H. K. Dass and Dr. Rama Varma,2008
6. Mathematical Methods for physicists (4^{th} Edition) George Arfken and Hans J. Weber Academic Press San Diego(1995)
7. Mathematical Physics- P. K. Chattopadhyay Wiley Eastern Limited New Delhi(1990)
8. Introduction to Mathematical Physics-Charlie Harper, Prentice- Hall of India Private Limited New Delhi(1995)
9. Mathematical Physics-Mary L. Boas, Third Edition, Wiley student edition,1994.
10. Electronics devices and circuits – Allan Mottershed, Prentic Hallof Matis publication, New Delhi, 2010.
11. Basic Electronics & Solid State–B L Theraja, S.Chand & Co-Ltd publication, New Delhi, 2010.

12. Hand book of Electronics- Gupta S.L.and Kumar V, Pragati prakashan publication, Meerut, 2013.
13. Principles of Electronics- V,K,Mehta, S.Chand & Co-Ltd publication, New Delhi, 2009.
14. E.Balagurusamy –Programming in ANSI C-Tata McGraw Hill 6th Edition 2012
15. C-Programming Language, Kernighan and Ritchie, 2nd Edition, PHM Publication, 2011
16. Computer Concepts and C-Programming, P.B.Kotur, Sapna Publication.22nd Edition 2012

Practical – V

Course outcomes:

- Improves the skill of circuit connection with filters and rectifiers
- Understands the working principle of Zener diode and characterictics
- Verify Thevenin's and Norton's theorem using ladder network

LIST OF EXPERIMENTS

Credits : 2

1. Thevenin's & Norton's Theorem (Ladder Network).
2. Plank's constant by photo cell
3. Power supply using bridge rectifier with and without π section filter.
4. Zener diode as voltage regulator using bridge rectifier power supply.
5. Clippers and Clampers.
6. Study of voltage doubler & tripler using CRO (representation of waveforms)
7. Low pass filter.
8. High pass filter.
9. I-V Characteristics of a thermistor at different temperatures
10. Observation of Photoelectric effects.

Practical – VI

Course outcomes:

- Learns the program writing and excecuting skill in C Language.
- Get exposed to various aspects of instruments & their usage through hands-on mode.

LIST OF EXPERIMENTS

Credits : 2

1. Construction of multirange voltmeter.
2. Construction of multirange ammeter
3. Photoconductive cell.
4. Astable multivibrator using transistor
5. Ionisation potential of xenon or mercury.
6. Photovoltaic cell.
7. Write a C Programme to check the largest of given three numbers.
8. Write a C Programme to find the area of triangle for given three sides.
9. Write a C Programme to find the sum of n natural numbers
10. Thevenin's & Norton's theorem using Wheatstone's Network

NOTE:

1. Experiments are of four hours duration.
2. Minimum of eight experiments are to be performed.

VI SEMESTER

DSE-1: SOLID STATE PHYSICS, NUCLEAR PHYSICS & ELECTRONICS- II

Teaching Hours: 4 Hrs / Week **Total Hours:** 60
Credits : 04

Course outcomes:

On successful completion of the course students would have;

CO1: Improves the understanding of crystal structure through X-ray diffraction.

CO2: Become acquainted with concept of energy gap in semiconductor material.

CO3: Exposed to fundamental concepts and working principles of various nuclear instruments

CO 4: Learn the problem solving skill in numbering system and their inter conversions.

UNIT I : SOLID STATE PHYSICS

Crystal structure : Lattice, lattice translational vectors, Basis of crystal structure, types of unit cells., coordination numbers, Bravias lattices, seven crystal system, Miller Indices, expression for inter planner spacing, crystal structure of NaC1 and KC1 **(5 hrs)**

X-ray diffraction by crystals : Laue diffraction. Bragg's law, Bragg's X-ray diffractometer - powder crystal method
(3 hrs)

Specific heats of solids: Classical theory, Einstein's and Debye's theory of specific heats **(3 hrs)**

Free electron Theory: Classical free electron model, expression for electrical and thermal conductivity, Weidman-Franz law, Failure of classical free electron theory, Band theory of Solid (Qualitative). **(3 hrs)**

Problems **(1 hr)**

UNIT II : SEMICONDUCTOR PHYSICS

Semiconductors - Expression for electrical conductivity in case of intrinsic semiconductors, experimental determination of energy gap, Hall Effect, expression for Hall coefficient and applications. **(3 hrs)**

Transistors : h-parameters of a transistor and their determination using CE configuration transistor as CE amplifier with frequency response. Brief explanation of positive and negative feedback. **(4 hrs)**

Oscillators: Transistor as an oscillator, the oscillatory circuit, frequency of oscillatory current, essentials of a feedback LC oscillator. Hartley and Phase shift oscillators. **(3 hrs)**

FET: Types, Characteristics and parameters. FET as a common source amplifier (Qualitative). **(2 hrs)**

Problems **(2 hrs)**

UNIT III : NUCLEAR PHYSICS

Alpha –rays: Rutherford's α scattering, Theory of α decay, Range and Geiger-Nuttal relation. Gamow's theory of α decay.

Beta – decay: Types of Beta – decay, Neutrino Hypothesis.

Nuclear Models: Liquid drop model- Explanation of semi empirical mass formula, nuclear fission on the basis of liquid drop model, Shell model (qualitative) and Magic numbers.

Nuclear Instruments: GM counter, Scintillation counter, Linear accelerator and Cyclotron.

Problems **(13 + 2 hrs**)

Unit IV : Op-Amp, Timer and Digital Electronics

Op-Amp : IC741- block diagram , pin configuration. symbol. Characteristics of an ideal op -Amp. Op -Amp as phase – shift and wein bridge oscillator.

(3hrs)

Timer : IC – 555 block diagram, pin configuration. Applications, Timer as astable multivibrator (Quantitative study) **(3 hrs)**

Digital Electronics :

Number System : Decimal, Binary, Octal, Hexadecimal and their inter conversion.1's &2's compliment (Subtraction)

(3 hrs)

Logic Gates : Logic family**,** positive and negative logic, basic and universal logic gates**.**

(2 hrs)

Boolean Algebra : Basic theorems, De Morgan's theorems, Combinational logic circuits -Half adder and Full adder, serial and parallel adder.

(4 hrs)

REFERENCE BOOKS

1. Solid state physics: C. Kittel, Willey Publication, India NewDhelhi,2010.
2. Solid State Physics: A.J. Dekkar, Macmillan Publication, NewDhelhi,2011.
3. Solid state physics & Electronics : A.B.Gupta & Nural Islam, Book & Allied Publication, Kolkata, 2012.
4. Elementary Solid State Physics : M.Ali omar, Pearson Publication,NewDelhi,2011.
5. Elementary Solid State Physics : J.P.Srivastava, PHI Learning Publication, NewDehli, 2011.
6. Nuclear Physics : I.Kaplan, Naresa Publishing House, NewDehli, 2002.
7. Nuclear Physics : S. N. Ghoshal, S. Chand Publications, New Delhi,2019
8. Modern Physics : R.Murugeshan . S.Chand & Co-Ltd publication, New Delhi, 2014, 14th edition.
9. Modern Physics : D.L.Sehgal and Chabra K.I, S.Chand publication, New Delhi 2010.
10. Modern Physics: S.L. Kakani & Shubhra Kakani, Viva Books Publication, NewDelhi, 2009.
11. Modern Physics : Arthur Beiser & S. Rai. Choudhary, Tata McGraw Hill Publication, NewDehli,2011.
12. Modern Physics : John R. Taylor. & Michael A. Dubson, PHI Learning Publication, NewDehli, 2009.
13. Electronics devices and circuits – Allan Mottershed, Prentic Hallof Matis publication, New Delhi, 2010.
14. Basic Electronics & Solid State–B L Theraja, S.Chand & Co-Ltd publication, New Delhi, 2010.
15. Hand book of Electronics- Gupta S.L.and Kumar V, Pragati prakashan publication, Meerut, 2013.
16. Principles of Electronics- V,K,Mehta, S.Chand & Co-Ltd publication, New Delhi, 2009.

VI SEMESTER

DSE -2: STATISTICAL MECHANICS, ENERGY SOURCES & ELECTRONICS-II

Teaching Hours: 4 Hrs / Week **Total Hours –** 60
Credits: 04

Course outcomes:

On successful completion of the course students would have;

CO1: Understand the statistics of the microscopic & macroscopic world.

CO2: Realize the importance of renewable energy resources.

CO3 : Design the logic gate circuits with basic electronic components.

CO4 : Describe the process of information transfer through electromagnetic waves.

UNIT I : FUNDAMENTALS OF STATISTICAL MECHANICS :

Meaning of statistical mechanics, microscopic and macroscopic systems, calculation of statistical probability, degrees of freedom, Phase space, μ space and γ space. Applications of phase space to one dimensional harmonic oscillator.

Postulates of statistical mechanics. Statistical ensembles and their types: Canonical, micro canonical and grand canonical (Qualitative).

Statistical Distribution : Statistics of identical particles: Maxwell – Boltzmann, Bose – Einstein and Fermi –Dirac statistics. Degenerate Fermi gas

Quantum Statistics : Gibb's Paradox. Identical Particle & symmetry requirement, Derivation of M-B, F-D & B-E Statistics. **(15 hrs)**

Unit II : ENERGY SOURCES

Introduction to energy sources : Energy sources and their availability, conventional and non conventional energy sources, Renewable energy sources. Advantages and prospects.

Solar Energy : Solar constant, solar radiation at earth's surface, attenuation of beam radiation, solar cell and its characteristics

(6 hrs)

Applications of solar energy : solar furnace, solar pumping, solar green houses. **(2 hrs)**

Wind Energy : Basic principles, nature of the wind, power in the wind, forces on the blades, wind energy conversion

(3hrs)

Tidal energy: characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy. Ocean Energy Potential against Wind and Solar. **(4hrs)**

Unit III : Op-Amp, Timer and Digital Electronics

Op-Amp : IC741- block diagram , pin configuration. symbol and polarity convention. Characteristics of an ideal op -Amp, virtual ground and summing point. Op -Amp as phase – shift and wein bridge oscillator. **(3 hrs)**

Timer : IC – 555 block diagram, pin configuration. Applications, Timer as astable multivibrator (Quantitative study) **(3 hrs)**

Digital Electronics :
Number System : Decimal, Binary, Octal, Hexadecimal and their inter conversion.1's &2's compliment (Subtraction) **(3 hrs)**
Logic Gates : Logic family**,** positive and negative logic, basic and universal logic gates**.**
Boolean Algebra : Basic theorems, De Morgan's theorems, Combinational logic circuits - Half adder and Full adder, serial and parallel adder. (**6 hrs)**

Unit IV : ANALOG COMMUNICATION

Radio-wave Propagation: Classification of electromagnetic waves, Types of waves, propagation of e-m waves through ionosphere (qualitative), Critical frequency, Critical angle, Virtual height, Secant law.

Modulation: Need for Modulation, Types of modulation, AM modulation, Block diagram of AM Transmitter, Significance of modulation factor, Frequency spectrum of AM and FM., Comparison of FM with AM.
Demodulation : Necessity, AM detection, Square wave detector, Block diagram of Super heterodyne receiver.
Problems **(13+2 hrs)**

REFERENCE BOOKS

1. Statistical Mechanics: B. K. Agarwal and Melvin Eisner New age International limited Publication, NewDehli 2010.
2. Statistical Mechanics: Satyaprakash, Pragati Publications.
3. Statistical Mechanics: S.L.Gupta & V. Kumar, Pragmatic Prakashan, 24th edition, 2010.
4. Statistical Mechanics: F.Reif, Tata McGraw Hill Publications, NewDehli, 2006.
5. Statistical Mechanics :C Rajagopalacharya Non Conventional Energy Sources-G. D. Rai
6. Non Conventional Energy Sources-G. D. Rai, Khanna Publications,1988
7. Digital Electronics – Malvino & Leach Tata MCH ,3rd edition 1989
8. Introductory Methods of Numerical Analysis – By S.S.Shastry PHI, 5th edition.1983
9. Numerical Methods in Engineering and Science – By B.S.Grewal, Khanna Publishers
10. Modern Physics – R.Murugeshan . S.Chand & Co-Ltd publication, New Delhi, 2014, 14th edition
11. Electronic Devices and Circuits – Anil Maini and Varsha Agarwal, Wiley India Pvt Ltd 1st edition.

12. Digital Electronics – A. P. Godse & D. P Godse, Technical Publication, 1st edition , 2010
13. Operational Amplifiers and Linear Integrated Circuits –Ramakanth A Gayakwad, Pearson India,2015
14. Digital Fundamentals -Thomas L.Floyd, 10th Edition, Pearson India,2011

Practical – VII

Course outcomes:

- Enhances the knowledge of h parameters.
- Learns the calculation skill to determine the lattice parameter using XRD pattern

List of experiments

Credits : 02

1. Thermistor Energy gap
2. Analysis of X-ray diffractogram
3. Hall Effect
4. Astable multivibrator using timer (IC – 555)
5. Solar Cell characteristics a) Open Circuit voltage b) short Circuit Current.
6. h-parameters of a transistor using DC source.
7. Transistor as CE amplifier.
8. Colpit's oscillator using transistor.
9. Hartely oscillator using transistor.
10. FET- as common source amplifier
11. FET- static characteristics and parameters.

Practical – VIII

Course outcomes:

- Constructs the Astable multivibrator using IC 555 timer
- Understands the working of GM counter.

List of Experiments

Credits : 02

1. Phase-shift oscillator using Op-Amp (IC-741)
2. Wien bridge oscillator using Op-Amp (IC-741)
3. Characteristics of G.M counter.
4. Attenuation of β-ray using G.M. counter.
5. G.M.Tube - Inverse square law.
6. Study of DTL gates.
7. Use of IC 7400 Basic gates.
8. De Morgan's theorem & verification of Boolean expressions.
9. Study of Half adder & Full adder

Note:

1. Experiments are of four hours duration.
2. Minimum of eight experiments to be performed

B.Sc. Fifth Semester (Physics)
Skill Enhancement Course
ELECTRIC CIRCUITS & NETWORK SKILLS

Teaching Hours: 2 Hrs / Week **Total Hours:** 30
Credits: 02

Course Outcomes :

CO1: Enables the students to design and the electrical circuits, networks and appliances through hands on mode.

CO2: Acquire basic knowledge of solid state electronic devices.

Unit I

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energyand money.

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor. **15 Hours**

Unit II

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Seriesor in shunt. Response of inductors and capacitors with DC or AC sources

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board. **15 Hours**

Reference Books:

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja
3. Performance and design of AC machines - M G Say ELBS Edn.

B.Sc. Sixth Semester (Physics)

Skill Enhancement Course
BASIC INSTRUMENTATION SKILLS

Teaching Hours: 2 Hrs / Week **Teaching Hours:** 30
Credits: 02

Course Outcomes :

CO1 : Get exposed to various aspects of instruments & their usage through hands-on mode.

CO2 : Improves the experimental knowledge electrical circuit connections

Unit I

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance.

AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier-amplifier. Block diagram ac millivoltmeter**,** specifications and their significance.

Cathode Ray **Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(15 hrs)**

Unit II

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges.

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time- base stability, accuracy and resolution.

(**15 Hrs)**

References:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-GrawHill
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008,Springer
8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India