Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

An "Autonomous College" Affiliated to

KBC North Maharashtra University, Jalgaon

KNOWLEDGE IS POWER

ESTD. 1945

SYLLABUS

Physics

S.Y.B.Sc.

(Semester – III & IV)

Under Choice Based Credit System (CBCS)

[w. e. f. Academic Year: 2020-21]

Course Structure: S.Y.B.Sc. (Physics)

Duration: The duration of B.Sc. (Physics) degree program shall be of three years.

Term / Semester	Course Module	Subject Code	Title of Paper	Credit	Hours per Week
III	DSC	PHY-231	Thermodynamics	2	2
	DSC	PHY-232	Basic electronics	2	2
	DSC	PHY-233	Laboratory I	2	4
	SEC	PHY-230	Basic instrumentation skills	2	2
IV	DSC	PHY-241	Waves and oscillations	2	2
	DSC	PHY-242	Optics	2	2
	DSC	PHY-243	Laboratory II	2	4
	SEC	PHY-240	Electrical circuits and network skills	2	2

DSC : Discipline Specific Elective Core Course
SEC : Skill Enhancement Course
PHY-YSC : Physics (Y-year; S-Semester; C-Course number)

Examination pattern for S.Y.B.Sc.

Nature	Marks
External Marks	40
Internal Marks	10
Total Marks	50

S.Y.B.Sc. (Physics): Semester-III
PHY-231: Thermodynamics

Total Hours: 30 **Credits: 02**

Course objectives:

- To develop comprehension of fundamental thermodynamics concepts and principles.
- To impart knowledge of kinetic theory of gases.

Course outcomes:

Student will be able to ….

- Apply the concept of use of knowledge of thermal physics to real life problems.
- Apply the first law of thermodynamics and calculate Heat, Internal energy, Work in a various thermo dynamical processes and systems.
- Estimate the entropy changes in reversible and irreversible processes.

Unit I: Basics of thermodynamics and its First Law: 8h

- Thermodynamic, Description of system, Zeroth Law of thermodynamics and temperature. First Law and internal energy, conversion of heat into work, Various Thermo dynamical Processes, Applications of First Law: General Relation between CP and CV, Work Done during Isothermal And Adiabatic Processes, Compressibility and Expansion Coefficient.

Unit II: Second and Third Law of Thermodynamics and Entropy: **8h**

- Reversible and irreversible Processes Second law & Entropy, Entropy changes in reversible and irreversible Processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of Absolute zero.

Unit III: Heat Engines: 7h

- Carnot's cycle, theorem & Carnot's Engine, Otto Engine and Cycle, Diesel Engine and Cycle, Efficiencies of all heat Engines.

Unit IV: Kinetic Theory of Gases: 7h

- Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Degrees of freedom, Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

References:

1. Garg S., Bansal R.and Ghosh C. (1993). Thermal Physics, Tata McGraw-Hill, Edition -2
2. Meghnad Saha, and B.N. Srivastava (1969). A Treatise on Heat, Indian Press., Edition -5
3. Enrico Fermi (1956). Thermodynamics, Courier Dover Publications., paperback print
4. Zemasky M. W. and Dittman R. (1981). Heat and Thermodynamics, McGraw Hill, subsequent edition, ISBN-13: 978-0070170599
5. Sears F.W. & Salinger G. L. (Reprint 2013). Thermodynamics, Kinetic theory & Statistical thermodynamics, Narosa, Third Edition, ISBN: 978-81-85015-71-2
6. Ronald Lane Reese (2003). University Physics, Thomson Brooks/Cole.
7. Kumar A. and Taneja S. P. (2014). Thermal Physics, R. Chand Publications, ISBN : 81-8045-083-X

S.Y.B.Sc. (Physics): Semester-III
PHY-232: Basic electronics

Total Hours: 30 **Credits: 02**

Course objectives:

1. To understand the basic concepts of analog and digital electronics
2. To get a basic idea about rectifier, transistor and power supply.
3. To acquire the basic knowledge of digital gates and Boolean algebra.

Course outcomes:

Student will be able to ….

1. Analyze and distinguish the various electronic components such as resistor, capacitor, inductor, transformer, diode and transistor.
2. Understand the various logic gates and design the logic circuit using Boolean algebra.

Unit I: Semiconductor diodes: 7h

- (Revision on metal, insulator and semiconductors, Intrinsic and Extrinsic semiconductor),
- Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle, Construction, Working and Characteristics of (1) LEDs (2) Photodiode (3) Solar Cell (P-N Junction), (4) Zener Diode

Unit II: Rectifiers and Power Supplies: 7h

- Introduction to Rectifiers, Types: Half-wave & Full-Wave Rectifiers (Centre-tapped and Bridge Rectifiers), Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, D.C. power Supply (unregulated and regulated), Zener Diode as a voltage regulator.

Unit III: Bipolar junction transistor : 7h

- Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC configurations. Active, Cutoff, and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q point.

Unit IV: Digital Electronics: 9h

- Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, Binary Addition, Binary Subtraction using 2's Complement Method, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gates, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra.

References:

1. Malvino A. P. Electronic Principles, (2019) Mc Graw-Hill Publishing House, New Delhi. Edition: 7
2. Ryder J. D. Electronic fundamentals and applications, (1970) Prentice Hall, 4th Edition, ISBN-10: 0132513552;
3. Mehta V. K. Principles of Electronics, S. Chand Publications, New Delhi, ISBN-9788121924504

4. Allen Mottershead. Electronic Devices and Circuits, (1973) Good year Publishing Company, ISBN- 0608161306
5. Malvino and Leach. Digital Principles and Applications,(1993) Mc Graw-Hill Publication. ISBN- 9339203410
6. Jain R. P. Modern Digital Electronics,(2010) Tata Mc Graw-Hill Pvt. Ltd., New Delhi, ISBN- 97800706691
7. Millman J. and Halkias C.C. (1991). Integrated Electronics, Tata Mc-Graw Hill.
8. Salivahanan S. and Suresh Kumar N. (2012). Electronic devices and circuits, Tata Mc- Graw Hill.
9. Rashid M.H. (2011). Microelectronic Circuits, 2nd Edn, Cengage Learning.
10. Sedra A.S., Smith K.C., Chandorkar A.N. (2014). Microelectronic circuits, 6th Edn., Oxford University Press,ISBN 978–0–19–933913
11. Anand Kumar A. (2009). Fundamentals of Digital Circuits, 2nd Edition, PHI Learning Pvt. Ltd, ISBN: 9788120336797,

S.Y.B.Sc. (Physics): Semester-III
PHY-233: Laboratory I

Total Hours: 60 **Credits: 02**

Course objectives:

1. To give hands on training on thermodynamics experiments
2. To give hands on training on basic electronics experiments

Course outcomes:

On completion of the course student will be able to ….

1. Understand and verify the practical aspects of thermodynamics.
2. Test and use various electronic components such as resistor, capacitor, inductor, transformer, diode and transistor in electronic circuits.
3. Understand the various logic gates and design the logic circuit using Boolean algebra.

Note: Students should perform total 10 experiments from the section-A and section-B, 05 experiments from each section is compulsory.

Section – A (Any 05)

1. To determine mechanical equivalent of heat, J, by Callender and Barne's constant flow method.
2. To determine the mechanical equivalent of heat (J) with the help of Joules calorimeter.
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee's method and Charlton's disc method.
4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
5. To determine the coefficient of thermal conductivity of Cu by Angstrom's Method.
6. To determine thermal conductivity of rubber by tubing method.
7. To determine thermal conductivity of metal by Forbe's method.

8. To verify Clausius-Clapeyron equation.
9. Jolly's steam calorimeter.
10. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
11. To study the variation of thermo e. m. f. across two junctions of a thermocouple with
    temperature.
12. Stefan's fourth power law using bulb.
13. To determine Stefan's constant
14. To determine characteristics of thermistor and to find an unknown temperature by using thermistor.
15. Use of thermocouple for measurement of temperature.
16. Platinum resistance thermometer. (Determine the melting temperature of Wax)

Section – B (Any 05)

01. Study of full wave rectifier with capacitor filter and to calculate its ripple factor.
02. Study of zener diode as a voltage regulator.
03. Study of CE transistor characteristics to find out 'β' of the transistor.
04. To study the characteristics of Light Emitting Diode (LED).
05. To study the I–V characteristic of (i) a resistor and (ii) a p–n junction diode and compare it.
06. Frequency response of CE single stage transistor amplifier and to calculate its bandwidth.
07. To determine fill factor and efficiency of solar cell.
08. Comparison of luminous intensities of two light sources by using photo voltaic cell.
09. Study of logic gates (AND, OR and NOT) using diodes and transistors.
10. Verification of De Morgan's Theorems (using ICs).
11. Experimental verification of NAND gate as a universal building block.
12. Experimental verification of NOR gate as a universal building block.

References:

1. Flint B.L.& Worsnop H.T. (1971). Advanced Practical Physics for students, Asia Publishing House. New Delhi
2. Michael Nelson and Jon M. Ogborn. Advanced level Physics Practicals, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Indu Prakash and Ramakrishna (2011). A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi.
4. Khandelwal D.P. (1985). A Laboratory Manual of Physics for Undergraduate Classes,
   Vani Publication. New Delhi

S.Y.B.Sc. (Physics): Semester-III

PHY-230: Basic Instrumentation Skills

Total Hours: 30 **Credits: 02**

Course objectives:

1. To impart knowledge of basic concepts in Instrumentation.
2. To provide the knowledge, techniques and use of various instruments in the real life applications for measurement of various parameters in physics

Course outcomes:

Student will be able to ….

1. Apply the concept of use of knowledge of Instrumentation to real life problems.
2. Develop an understanding of principle, construction and working of different devices.

Unit I: Fundamentals of Measurements: 4h

- Aim of measurement, Functional elements of typical measurement system, Standards of measurements and calibration, Static performance characteristics: Accuracy, Precision, Accuracy versus precision, Sensitivity, Linearity, Error in measurement: Concept of Errors and, types (systematic, random & miscellaneous error), way of expressing error in measurement.

Unit II: Measurement of Temperature: 8h

- Non - electrical Methods: Liquid- in-glass Thermometer, Pressure Thermometer construction and their types: constant volume gas thermometer and Vapour pressure Thermometer, Electrical Methods: Thermo-electric Sensors (Thermocouple), Metallic resistance Thermometer (Platinum resistance thermometer), Semiconductor resistance sensors (Thermistor).

Unit III: Measurement of Pressure: 4h

- High pressure Measurement, Measurement of low pressure (Vacuum): McLaud Guage, Pirani Gauge, Calibration & Testing (Dead - weight tester).

Unit IV: Acoustics (Sound) Measurement: 7h

- Characteristics of sound, Sound pressure level, Sound power level, Variation of intensity of sound with distance, Typical sound measuring system (Sound level Meter), Microphones : Condenser or capacitor type Microphone, Electrets Microphone, Electrodynamics types of Microphone, Carbon granules type Microphone

Unit V: Measurement of Magnetic Field and Use of CRO: 7h

- Introduction to magnetic materials, Hysterisis loop and its application, Measurement of magnetic field by Hall probe. CRO: Block diagram of CRO, Application of CRO: 1) study of waveform 2) Measurement of voltage, current, frequency and phase difference.

Reference:

1. Nakra and Chaudhary. Instrumentation, Measurement & Analysis, Tata McGraw-Hill , 1985, ISBN 0074517910, 9780074517918, 2nd Edition
2. Rangan, Mani & Sarma. Instrumentation: Devices & Systems, Tata McGraw-Hill , 2001, ISBN 0074633503, 9780074633502, 2nd Edition

3. Thereja B. L. 2007 S.Chand publication, New Delhi, , ISBN 812192555X, Basic Electronics
4. Sawhney A. K. 2012Dhanpat Raiublication, New Delhi Course In Electrical & Electronics Measurement & Instrumentation
5. Helfrick & Cooper. (1992) Modern electronic instrumentation and Measurement Techniques Prentice Hall India Learning Private Limited ISBN-10: 8120307526, ISBN-13: 978-8120307520
6. Khare, Shrivastav. 1961 Electricity & Magnetism L.B.S. publication
7. Battula Tirumala Krishna, Dharma Raj Cheruku. 2008, Electronic Devices and Circuits, Publisher(s): Pearson India , ISBN: 9788131700983 Second Edition
8. Bakshi U. A., Bakshi A. V. 2009 Measurements and Instrumentation, technical publications, ISBN – 8184316658, 9788184316650

S.Y. B.Sc. (Physics): Semester-IV
PHY-241: Waves and oscillations

Total Hours: 30 **Credits: 02**

Course objectives:

1. To impart knowledge of basic concepts in Waves and Oscillations.
2. To provide the knowledge and methodology necessary for solving problems in physics.
3. The course also involves the related experiments based on the theory.

Course outcomes:

On the completion of this course learner will be able to ….

1. Apply the concept of use of knowledge of Waves and Oscillation to real life problems.
2. Understanding of the course will create scientific temperament.
3. To create the ability of students towards application of sound knowledge of acoustics.
4. Interpretation of solutions for different waves equations.

Unit I: **7h**

- Different types of equilibria (stable, unstable, and neutral equilibrium), Definition of linear and angular S.H.M., Differential equation of S.H.M. and its solution (exponential form), Composition of two perpendicular linear S.H.Ms. for frequencies 1:1 and 1:2 (analytical method), Illustrative Numericals, Lissajous's figures and its uses, Applications (mechanical, electrical and optical).

Unit II: **5h**

- Waves Motion General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Plane waves, Spherical waves, Wave intensity.

Unit III: **8h**

- Forced oscillations and Resonance: Idea of forced oscillations, circuit Resonance and its types- Mechanical resonance (Barton's pendulum), Acoustic resonance

(resonance tube), Electrical resonance (LCR circuit) and Optical resonance (sodium vapour lamp), Differential equation of forced oscillations and its solution, Amplitude of forced oscillations, Amplitude resonance, Application to series L-C-R.

Unit IV: **5h**

- **Parameters of Sound**: Sound intensity, Loudness, Pitch, Quality and timber, Acoustic intensity level measurement, Acoustic pressure and its measurement. Reverberation and time of reverberation. Fourier's Theorem: Application to saw tooth wave and square wave
- **Ultrasonic:** Classification of sound frequencies, Piezoelectric effect, Generation of ultrasonic waves by piezoelectric oscillator (using transistor), Application of ultrasonic waves.

Unit V: **5h**

- Doppler effect in sound, Expression for apparent frequency (no derivation), discussion of different cases when source, observer and medium are in relative motion, Asymmetric nature of Doppler effect in sound, Doppler effect in light, Symmetric nature of Doppler effect in light, Applications of Doppler effect in sound and light**.**

References:

1. Pain H J (2013). The Physics of Vibrations and Waves, Wiley ELBS, 7TH edition
2. Ghosh R K (1975). The mathematics of waves and vibrations, Macmillan co. pvt ltd, New Dehi
3. Khandelwal D.P., 1976Oscillations and Waves,Himalaya Pub. House, Bombay
4. Ghosh M., 2016, A text book of Sound, S.Chand & Co.5th edition, ISBN 9385676156
5. Brijlal and Subramaniyam. Waves and oscillations, Vikas Publishing House, ISBN 9780706985436
6. Chaudhari R.N.. Waves and Oscillations, New Age International (Pvt.) Ltd. New Delhi, 2ND edition, ISBN 13 - 9788122428421
7. Taggarase A. P., Jivan Sheshan. Conceptual Physics, Himalaya Publishing.
8. Bajaj N. K. 1988, The Physics of Waves and Oscillations, Tata McGraw Hill. ISBN – 0074516108, 9780074516102
9. Agarwal B. S.. Oscillations and Waves, KedarNath, Ram Nath Publishers ISBN - 1234567146749
10. Mee and Heinmann. 1967 Sound, London Edition 2ND Edition

S.Y. B.Sc. (Physics): Semester-IV

PHY-242: Optics

Total Hours: 30 **Credits: 02**

Course objectives:

1. To impart knowledge of basic concepts in Optics.
2. This course provides students with an understanding of optical phenomena based on the wave description of light.
3. To describe the principles of polarization, interference, diffraction.

Course outcomes:

After the completion of the course, Students will be able to

1. Understand the concept of polarization, interference and diffraction.
2. Understand the idea of various kinds of polarization of light wave and their detection.
3. Study Fraunhofer and Fresnel diffraction.
4. Clear the idea of spatial and temporal coherence for the formation of interference fringes.
5. Describe the operation of optical devices including, polarisers, retarders, and interferometers.

Unit I: Geometrical Optics: 7h

- The nature of light, Images by Reflection, Refraction, Dispersion, Snell's law, Lenses Deviation produced by thin lenses, equivalent focal length of two thin lenses separated by a distance and when in contact. Power of lens, Spherical aberration in lens, reduction of spherical aberration, Definition and Properties of wave front. Huygens Principle.

Unit II: Interference: 8h

- Phase change on reflection [Stoke's treatment], Interference due to thin film i] Uniform thickness: Reflection and Transmission, ii] Wedge shaped film: Reflection and Newton's ring, Colors in thin film, Principle construction and working of Michelson interferometer, Applications of Michelson Interferometer, i] Determination of thickness of transparent media, ii] Resolution of spectral lines, iii] Standardization of meters.

Unit III: Diffraction: 7h

- Definition, difference between interference and diffraction, types of diffraction Fresnel's diffraction: i] Diffraction at straight edge and thin wire, ii] Diffraction at circular aperture, rectangular aperture and circular disc, iii] Zone plate: Derivation of focal length and comparison with converging lens , Fraunhoffer's Diffraction, i] Diffraction through Single slit, double slit and grating, Rayleigh criteria for resolution, Resolving power of telescopes and microscopes, Dispersive and resolving power of grating

Unit IV: Polarization: 8h

- Polarization of transverse waves, Polarization by reflection, Biot's polariscope, Brewster's law and Brewster's window Pile of plates, Malus law, Double refraction: Huygen's explanation of double refraction in uniaxial crystal, Nicol prism, Nature of refraction for different position of optical axis [parallel, Perpendicular, oblique to crystal surface], Elliptically and circularly polarized light, Quarter wave plate, production and detection of plane, circularly and elliptically polarized light, Optical Activity: Fresnel's experiment and explanation of rotation, Polarimeter

References:

1. Hetch E., Ganesan A.R.. Optics, fourth edition, Pearson education,
2. Subhramanyam N., Brijlal, Avadhanulu M. N.. A Text book of Optics, S. Chand publication.
3. Ghatak A. K. Physical Optics, McMillan, New Delhi.
4. Jenkins F. A., White H. E. Fundamentals of Optics, McGraw- Hill international Edition.

5. E. Hetch, A.R. Ganesan. 2008 Optics, fourth edition, Pearson education, 4th edition, ISBN 10- 8131718077 , ISBN 13 - 9788131718070
6. Subhramanyam N., Brijlal, Avadhanulu M. N. A Text book of Optics, S. Chand publication. ISBN - 9788121926119
7. Ghatak A. K. Physical Optics, McMillan, New Delhi. ISBN - 9781259004346
8. Jenkins F. A., White H. E. 1957Fundamentals of Optics, McGraw- Hill international Edition.
9. Mathur D. S. 1999 Principles of optics, Gopal Press, Kanpur, 7TH edition ,

S.Y. B.Sc. (Physics): Semester-IV
PHY-243: Laboratory II

Total Hours: 60 **Credits: 02**

Course objectives:

- To give hands on training on Waves and oscillations experiments
- To give hands on training on sound and light experiments

Course outcome:

On completion of the course student will be able to ….

- Understand and verify the practical aspects of Waves and oscillations, sound and light.

Note: Students should perform at least 10 experiments from the following list

1. To investigate the motion of coupled oscillators.
2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ2 – T Law.
3. To study Lissajous Figures and demonstration of Lissajous figures by using C.R.O.
4. Study of acoustic resonance by using bottle as a resonator.
5. Determination of velocity of sound by using Kundt's tube.
6. Study of resonance using Kater's pendulum.
7. Log decrement.
8. Damping coefficient.
9. Study of acoustic resonance by using resonance tube.
10. To determine the Resolving Power of a Prism.
11. To determine the value of Cauchy Constants of a material of a prism.
12. To determine wavelength of sodium light using Fresnel Biprism.
13. To determine wavelength of sodium light using Newton's Rings.
14. To determine the refractive index of a liquid by using Newton's rings apparatus.
15. Determination of specific rotation α of optically active substance using Polarimeter.
16. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating
17. To determine the Resolving Power of a Plane Diffraction Grating.
18. To measure the intensity using photo sensor and laser in diffraction patterns of single and double slits.

19. Directional characteristics of a microphone.
20. Velocity of sound by phase shift method.

References:

1. Flint B.L. & Worsnop H.T. (1971). Advanced Practical Physics for students, Asia Publishing House. 2nd edition
2. Michael Nelson and Jon M. Ogborn. Advanced level Physics Practicals, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Indu Prakash and Ramakrishna (2011) A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi.
4. Arora C. L. B.Sc. Practical Physics, S. Chand Publishing Co. Ltd., New Delhi, ISBN - 9788121909099

S.Y.B.Sc. (Physics): Semester-IV

PHY-240: Electrical circuits and network skills

Total Hours: 30 **Credits: 02**

Course objectives:

1. To understand the basic principal of electricity.
2. To get a basic idea of electrical circuits and its wiring.
3. To understand the design, construction and working of single phase AC and DC motors

Course outcomes:

On completion of the course student will be able to ….

1. Familiarize to use various electricity measuring instruments.
2. Design various simple electrical circuits.
3. Apply the concept of use of knowledge of electrical circuits and network skills to real life problems

Unit I: Basic Electricity Principles: 3h

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

Unit II: Understanding Electrical Circuits: 7h

- Main electric circuit elements (R, L, C) and their combination, Rules to analyze DC sourced electrical circuits (KCL, KVL) Current and voltage drop across the DC circuit elements, Diode and rectifiers, Response of inductors and capacitors with DC or AC sources Single-phase and three-phase alternating current sources, Rules to analyze AC sourced electrical circuits, Real, imaginary and complex power components AC source, Power factor, Saving energy and money

Unit III: Electrical Drawing and Symbols: 3h

- 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.

Unit IV: Generators and Transformers: 4h

- Types of DC Power sources, Principle of DC/AC generators, construction of DC generator, Operation of transformers.

Unit V: Electric Motors: Single-phase AC & DC motors (Basic design): 4h

- Interfacing DC or AC sources to control heaters & motors, Speed & power of ac motor,

Unit VI: Electrical Protection: 4h

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

Unit VII: Electrical Wiring: 5h

- 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.

References:

1. Thereja B. L. 2007 S. Chand publication, New Delhi, ISBN 812192555X, Basic Electronics
2. Theraja A K. 2005 A text book of Electrical Technology 1ST Edition, ISBN - 9788121924900
3. Performance and design of AC machines, M G Say ELBS Edn. ISBN 10 – 8123910274, ISBN 13 - 9788123910277
4. Meheta V. K. Electrical Technology ISBN 10- 8192092173, ISBN 13 - 9788192091271