

DEE 501-Instrumentation

UNIT- I

Introduction to Measurement- Measurement system, methods of measurement, classification of instrument systems, characteristics of instruments & measurement systems, accuracy and precision, sensitivity resolution, errors in measurement & its classification, factors to be considered for selecting an instrument, applications of measurement systems, instrument characteristics (static & dynamic), PMMC and MI instruments.

UNIT- II

Transducers- Classification of transducers, transducer elements, resistive transducer, piezo electric transducer, capacitive transducer, strain gauges and thermocouple.

UNIT- III-

Instrument Transformers- Definition, classification, construction and working principal of CT and PT, applications of CT and PT, phasor diagram .

UNIT- IV-

Measurement of Electrical Quantities- Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC bridges, , electrostatic & rectifier type ammeters & voltmeters, power in three phase systems electrodynamic wattmeter, three phase wattmeter, energy meter, AC potentiometers.

UNIT- V-

Digital Measurement of Electrical Quantities- Concept of digital measurement, CRO, block diagram, digital voltmeter, frequency meter, spectrum analyzer, electronic multimeter.

List of Experiments :

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurements using Instrument Transformers
4. Study of various types of Indicating Instruments
5. Measurement of Power in three phase circuit by one, two & three wattmeters.
6. Calibration of a induction type single phase energy meter

References:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement & Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India

3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH
4. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
5. M. B. Stout , "Basic Electrical Measurement", Prentice Hall of India
6. W. D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
7. J. B. Gupta, "Electrical Measurement & Measuring Instrument", S. K. Kataria & Sons

DEE 502 Power System Operation & Protection

UNIT- I

Faults: Introduction to symmetrical components and a symmetrical faults, need for protective schemes, nature and cause of faults, types of fault, per unit representation, analysis of symmetrical fault, current limiting reactors, current transformers, potential transformers and their applications in their protection schemes.

UNIT- II

Relays: Introduction, classification of relays, requirement of relays, electromagnetic relay, induction relay, non directional and directional over current relays, earth fault relays, distance relays, impedance relays, differential relays, IDMT relay, static relays, microprocessor and computer based protective relay, application of relays.

UNIT- III:

Apparatus and Line Protection: Alternator, transformer, bus bar and motor protection using relay, feeder protection, protections against lightning, lightning arresters, surge absorbers.

UNIT- IV:

Circuit Breakers: Types of CB and its relative advantages and disadvantages, principles of arc extinction, arc control devices, bulk oil, low oil, air break, air blast, and sulphur hexafluoride and vacuum circuit breakers, HVDC breakers, rating, testing of circuit breakers.

UNIT- v:

Neutral grounding: Advantages and disadvantages of neutral ungrounded system, types of neutral grounding, criteria for neutral grounding, earthing, earth wires, earthing of appliances, earthing transformers.

List of Experiments :

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.
4. Study of microprocessor and computer based protective relay
5. Study and operation of static over current relay.
6. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
7. Study of SF6 circuit breaker
8. Protectional simulation study of generator, Transformer, Feeder & Motor protection.

References:

1. CL Wadhwa, Electrical Power systems, New age International.
2. B. Ravindran and M Chander, Power System protection and Switchgear, New Age International reprint 2006.
3. Badrirka, Power System protection and switchgear, TMH
4. Haddi Saadet, Power System Analysis, TMH.
5. Switchgear & protection Sunil S. Rao. Khanna Publication.

DEE 503 Power Electronics & Applications

UNIT- I

Basics of Power Electronic Devices: Power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, fast recovery diode, schotthey diode, construction, principle , operation & characteristics, UJT.

UNIT- -II:

Thyristor: Static V-I characteristics of thyristor, construction, principle , operation & characteristics of SCR, turn on & off of SCR, firing principle of SCR, rating & protection, heating, cooling & mounting of SCR, gate triggering of SCR using UJT oscillator circuit. two transistor analogy of thyristor.

UNIT- -III

Rectifier: Principal of AC to DC conversion, Single phase half wave & full wave uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction), mid point & bridge rectifier circuits.

UNIT- IV

Inverter: Introduction, classification, series and parallel inverter, voltage source & current source inverter, single phase and three phase bridge inverter, Mc- murray & MC murray bed ford inverters , harmonics & their reduction.

UNIT- -V

Chopper & Cycloconverter: Chopper operation, Step up & step down choppers, Jones & Morgens chopper, principle and operation of Cyclo-converter operation, single phase to single phase circuit step up cyclo converter, single phase to single phase circuit step down cyclo converter dual converter, buck, boost, & chuck regulators.

List of Experiments (Extendable):

1. To study V-I characteristics of SCR.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with R load (ii) L load with and without freewheeling diode.

4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study single-phase ac voltage regulator with resistive and inductive loads.
6. To study single phase cyclo-converter.
7. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.
8. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electronics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.
6. P.S. Bhimbhra, Power Electronics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.

DEE- 504 Utilization of Electrical Power

UNIT- I

Introduction to Illuminations: Definitions, luminous flux, solid angle, depreciation factor, coefficient of utilization, glare, shadow, lux, luminous efficiency, laws of illuminations, photometer, different type of lamps ,incandescent lamps, filament materials, halogen lamp, electric discharge lamps, sodium vapor lamp, mercury vapour lamp, fluorescent lamp, light calculations: commercial, industrial, street and flood lighting.

UNIT- II

Electric Heating: Different methods of electric heating, resistance heating, direct and indirect resistance heating, high frequency induction and dielectric heating, arc furnace induction furnace, microwave heating , advantages of electrical heating.

UNIT- III

Electric Welding: Welding method, principles of resistance welding, types – spot, projection seam and butt welding and welding equipments used, advantages of electric welding, principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications, Advantages of using coated electrodes, comparison between AC and DC arc welding, TIG, MIG Welding, welding of aluminum and copper.

UNIT- IV

Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro-polishing , electro-cleaning, electroextraction, electro-refining, electro-stripping (parting) power supplies for electrolytic process.

UNIT- -V

Electric Traction: Systems of electric traction, advantages of electric traction, DC & AC systems, power supply for electric traction system: comparison and application of different systems, introduction to EMU and metro railways, electrical block diagram of an electric locomotive with description of various equipment and accessories.

References:

1. C. L. Wadhwa: Utilization of Electric Traction Electric Power. 1989
2. H. Partab: Art and Science of Electrical Energy, Dhanpat Rai & Sons
3. Gupta, J.B., Utilization of Elect. Energy , Katariya and sons, New Delhi.

4. Garg, G.C., Utilization of Elect. Power and Elect. Traction.
5. N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect.

DEE 505 Estimating and Costing

UNIT- I

Introduction :Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule costing, price list, tender document net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills, tenders, its constituents, finalization specimen tender.

UNIT- II

Types of wiring: Electrical, batten, casing-casing and conduit wiring, comparison of different wiring, selection and design of wiring schemes for particular situation (domestic and industrial). selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc, use of wire-gauge and tables.

UNIT- III

Estimating and Costing: Domestic installations, planning of circuits, sub-circuits electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (single storey and multi-storey buildings), industrial installations, relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of materials lists, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load (3-phase supply system), service line connection estimate for domestic and industrial loads (over-head and under ground connections) from pole to energy meter, different types of fans and their sizes, air-conditioners, exhaust fans, determination of size and number of fans for a given situation.

UNIT- IV

Transmission and distribution lines: (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations.

UNIT- V

Substation: Types of substations, layout of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating.

References:

1. Electrical Estimating and Costing by JB Gupta, Satya Prakashan, New Delhi
2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
3. Estimating and Costing by by Surjeet Singh, Dhanpat Rai & Co., New Delhi
4. Estimating and Costing by Qurashi
5. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
6. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi

DEE 506 Industrial Training

Duration: 2 weeks after the IV semester in the summer break, Assessment in V semester.

Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of Work etc.
- Layout if any