



SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

Three Year Diploma in Electrical Engineering (EE)

DEE501

Instrumentation

Unit I

Measuring System: Elements of a measuring system, Block diagram of system configuration, performance, standards, time lag, error, distortion and distortion meters, noise and noise factor.

Unit II

Transducers: Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Electrical transducers, Advantages of electric transducers, Active and passive transducers, Classification, Resistive, inductive and capacitive transducers, Potentiometric, Metallic and semiconductor strain gauges, Gauge factor, types, material used and applications. Thermistor, RTD, Inductive, LVDT, RVDT and Capacitive transducers and their application. Thermocouples, Piezo-Electric transducers, principle, materials used, mode of operation and application.

Frequency generating transducers. Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, and photo conductive cells, constructional details, characteristics and applications. Photo diodes and transistors, characteristics and applications. Digital transducers, Optical encoders for linear and angular displacement measurement. Purpose of signal conditioning, Classification, Input modifier, Operational amplifiers circuits used in

Unit III

Telemetry

Necessity, Principle, classification, current and voltage telemetry, Position telemetry, synchros. Frequency and pulse telemetry, Principle of frequency and pulse modulation, PAM, PPM and PCM. Idea about landline and R.F. telemetry and multiplexing. Pulse code

Unit IV

Data Acquisition System

Introduction data acquisition system, generalized DAS, Single and multi channel DAS,

Unit V



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Display Devices and Recorders:

Digital display system and indicators like CRT, Seven Segment LED , LED, LCD.

Analog and digital recorders, Strip and circular chart recorder and Magnetic tape recorder,

X-Y recorders. Ultraviolet recorders, Frequency modulated (FM) recording. Digital tape recorders.

List of Experiment

1. Measurement of Distortion using wave distortion meter.
2. Measurement of load/weight using strain gauge and cantilever.
3. Measurement of linear displacement by LVDT and draw its characteristics.
4. Measurement of temperature by-
(a) Thermocouple (b) Resistance Thermometer
5. Measurement of pressure using LVDT and diaphragm gauge.
6. Study and use of data conversion using ADC and DAC.
7. Measurement of pH value using pH meter.
8. Measurement of Humidity by hygrometer.
9. Study and use of synchros in position telemetry system.

Reference Books

- (1) Electrical and Electronic Measurement and Instrumentation by A.K. Sawhney
- (2) Instrumentation Devices and Systems by C S Rangan, G R Sharma and V S V Mani
- (3) Digital Electronics By Malvino Leach
- (4) Instrumentation By Cooper



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DEE – 502

POWER SYSTEM OPERATION AND PROTECTION

Unit I	<p>Introduction to power system -</p> <p>Growth of power system in India, future schemes, various elements of power system. Interconnection, its necessity and advantages, planning, operation and improvement of power system. Load study, type of faults. AC/DC calculating board/digital computers.</p>
Unit II	<p>Representation of power system -</p> <p>Single line diagram, use of standard symbol. Per unit quantity - definition and advantages, base impedance conversion of per unit values from one base values to other base values. Generalized ABCD constants, their values in terms of circuit parameters. To prove $AD-BC=1$ characteristics of ABCD constants. The relations of Z_{so}, Z_{ro}, Z_{rs} in terms of generalized constants.</p>
Unit III	<p>Fault analysis -</p> <p>Type of faults - symmetrical and unsymmetrical.</p> <p>Phase sequence impedance, phase sequence networks, analysis of symmetrical faults. Analysis of L-G, L-L and L-L-G fault by symmetrical components, simple numerical problems.</p>
Unit IV	<p>Modern trends -</p> <p>E.H.T Lines, bundled conductors, HVDC system, block diagram, advantages and disadvantages. Block diagram of Power Line Carrier communication.</p>
Unit V	<p>Introduction to protection -</p> <p>Purpose of protective system, requirement and selection. Abnormalities in a power system and their effects. Reasons for failure. Self and non self clearing faults. Use of CT/PT in protective scheme. Definition of terms regarding CT/PT. Advantages of CT/PT. Neutral earthing, their methods and advantages.</p>



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LIST OF EXPERIMENTS

1. To determine the ABCD constants of a given / T network.
2. To determine Z_{so} , Z_{ss} , Z_{ro} , Z_{rs} for a given / T network.
3. Study of a HVDC system.
4. Study and use of CT/PT employed for protection and determine their ratio error.



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DEE503

POWER ELECTRONICS AND APPLICATIONS

Unit I	Thyristor - SCR - Structure, Two transistor model, characteristics, turn-on methods, factor responsible for temperature rise, circuit for over voltage, over current, voltage surge & high dv/dt, Gate production. Modes of heat transfer. Triggering circuits - Resistance phase shift, UJT, Schmitt trigger. Turn-off types of commutation, methods of commutation. SCR rating, series and parallel connection. Thyristor family and other devices, DIAC, TRIAC, SCS, SUS, LASCR, MOSFET, IGRT, GTO, MCT.
	Rectification - Single phase HW and FW converters. Mathematical relations of I_{dc} and I_{rms} . Applications Advantages of polyphase rectification.
Unit II	Inverter - Series and parallel inverter, current and voltage source inverter, emergency tube light, comparison of inverters using different types of (transistor, MOSFET, IGRT) devices, block diagram of UPS (on load / off load). Applications of Inverter
	Converter - Block diagram of DC to DC converter. Converter duty cycle, 4-quadrant operation of choppers, applications. Working of single phase cyclo-converter, basic concept of three phase cyclo-converter, application of cyclo-converters.
Unit III	Speed control of Motors - Advantages of electronic speed control, 4-quadrant operation of DC motors, constant torque and constant horse power operation, speed control of separately excited DC motor, single and 3 phase controlled rectifiers, field failure protection and armature current limiter, speed control using chopper, dual converter.
Unit IV	Speed control of induction motor using rectifier, inverter and cyclo-convector (block diagram only). Speed control of slip ring induction motor using SCRS in rotor circuit.
Unit V	Applications - High frequency heating - induction and dielectric, principle, applications. Resistance welding, electronic line contactor, heat control circuit. Static AC & DC switch, over voltage protection, time delay circuits, reversing switch with plugging logic and digit circuits, PF corrections



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LIST OF EXPERIMENT

1. Characteristics of thyristor family devices.
2. Study of single phase controlled rectifiers.
3. Study of emergency tube light
4. Study of SCR triggering circuits
5. Study of commutation circuits
6. Electronic speed control of d.c.motor
7. Electronic speed control of induction motor
8. Study of electronic
9. Study of UPS
10. Study of chopper

REFERENCE BOOKS

1. Power electronics : Circuits, devices applications, M. H. Rashid, PHI
2. Power Electronics, P.C. Jain, TMH



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DEE - 504

UTILIZATION OF ELECTRICAL POWER

Unit I	Electric drives Merits and demerits of electric drives, factors governing selection of motors, drive requirements. Group and individual drive, starting and running characteristics of various motors. Selection of starters, hand operated and contactor type starters, liquid resistor type starter. Speed control of motors, load equalization, use of fly wheel. Motor enclosures, selection of motors for particular service, size and rating of motors.
Unit II	Electric Heating Advantages and disadvantages of electric heating, methods of electric heating. Principle of electric heating. Resistance heating, heating elements and alloys. Causes of failures of heating elements. Arc furnaces, principle, construction, working and uses. Induction heating principle, construction and use of Ajax Wyatt (core type) and coreless type. L.F. and H.F. induction furnaces. Dielectric heating principles and uses.
Unit III	Electric welding Definition, classification of electrical welding, principle of arc welding. Qualities of a good weld. Welding defects. Resistance welding, advantages, classification, principle and working, comparison of resistance and arc welding process, A.C. & D.C. arc welding.
Unit IV	Illumination Electromagnetic wave spectrum, solid and plane angle, definition of electrical terms in use, sensitivity of human eye. Luminous efficiency, horizontal and vertical laws of illumination, definition of terms used in lighting, lighting scheme, various types of lamps, their use and fittings.
Unit V	Power factor improvements



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	Causes of low P.F., effects of low P.F., methods of improvement of P.F. and its economics.
	Electro deposition and faraday's laws of electrolysis, various electro-chemical processes like electroplating, electro-extraction, regions. Storage batteries, classification, construction. Battery maintenance, battery charging, circuit diagram. Application of storage batteries.

LIST OF EXPERIMENT

1. Study of dielectric / induction heating.
2. Speed control of slip ring induction motor by variation of rotor resistance
3. To verify the change in power factor by changing load parameters and its improvement using capacitance
4. To draw 'V' curves of synchronous motor.
5. Study and operation of resistance oven and to control its temperature.



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DEE – 505

ESTIMATING AND COSTING

Unit I	Elements of Estimating Principles of estimating, purchase procedure, cost of materials, various charges like labor, stores, overhead tools, contingency etc.
Unit II	Domestic and Industrial Wiring Various types of wiring systems including P.V.C. pipe, their merits and demerits. Calculation of total load & selection of wire, preparation of estimates for a small residential building, big institution or office building. Estimate for single store yard, multistory building. Estimate for a small workshop and industrial installation, agricultural pump, domestic pump, floor mills etc. Estimation of total cost.
Unit III	Service connections For a single storey and multistoried building, single phase and three phase service connections, various methods of service connections. Distribution of circuits for light and power load. (Guidance may be taken by the M.P. Electricity Boards estimates).
Unit IV	Substations Various types of sub-stations, pole-mounted in-door and out-door substations. Estimating quantity and cost for a substation of a given specification.
Unit V	Overhead lines : H.T. & H.T. lines Preparation of estimate and costing of 11KV or 33KV line. Selection of routes. Estimates for distribution lines- Location of poles for a given situation or locality. Providing street lights, necessary hardware, stay arrangements, underground cables, providing services lines using underground cables



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DEE506P MINOR PROJECT

The objective of the course 'Project' is

- Ø To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- Ø To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- Ø To students an opportunity to do something creative and to assimilate real life work situation in institution.
- Ø To adapt students for latest developments and to handle independently new situations.
- Ø To develop good experiences power and presentation abilities in students

Students already have a glimpse of project work as they have worked on Minor Project Work in V semester. This gives the students an occasion to observe the work on real life projects and select some application area in which he/she will be undertaking project. External guide from industry can also be selected for project work along with an internal guide to prepare innovative and real projects. Students also have the flexibility of extending the minor project work into Major project, if the area has a scope for that.

The purpose of providing six hours per week is to orient the student's in-groups on the following objectives:

- Ø Provide general guidelines regarding execution of work.
- Ø Impart instructions regarding write-up work and preparation of project documents.
- Ø Sharing and solving common problems associated with execution of project work.
- Ø Monitor and evaluate the progress of project work.

The faculty and student should work according to following schedule:

1. Each student undertakes substantial and individual project in an approved area of the subject and supervised by member of staff.
2. The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
3. The project development must be carried out according to following steps and final write-up should have the same sequence.



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- Ø Project objectives.
- Ø Requirement gathering.
- Ø Modeling of project should be done in any well- known modeling tools.
- Ø Analysis of Project.
- Ø Design of Project.
- Ø Implementation of project.
- Ø Testing on project.
- Ø Quality consideration of project.
- Ø Designing a small user manual.
- Ø Estimating the cost of the project.
- Ø Future scope and suggestions.

ACTION PLAN FOR PROJECT WORK AND EVALUATION SCHEME # (SUGGESTIVE):

TASK/PROCESS	WEEK	EVALUTION
<ul style="list-style-type: none">· Orientation of students by HOD/Project supervisor· Literature survey and resource collection· Selection and finalization of topic before a committee*· Detailing and preparation of project (Modeling, Analysis and Design of Project work)· Development Stage· Testing, improvements, quality control of project· Acceptance testing· Report writing· Presentation before a committee	1st	-
	2nd	-
	3rd	-
	4 th to 6 th	Seminar-I
	7 th to 11 th	-
	12 th	-
	13 th	-
	14 th	-
	15 th	Seminar-II
		-
		-
		-
		-
		-
		-

* Committee comprises of HOD, all project supervisors including external guide from industry (if any).

the above marking scheme is suggestive, it can be changed to alternative scheme depending on the type of project, but the alternative scheme should be prepared in advance while finalizing the topic of project before a committee and explained to the concerned student as well.



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LIST OF SUGGESTED TOPICS

S. No.	Name of Topic
1	Solar power generating station
2	Wind power generating station
3	Load dispatch techniques in modern power system
4	Energy auditing of small industrial / commercial / residential / office building
5	Estimation and costing of wiring of industrial / commercial / residential / office building
6	Load survey
7	Software based projects
8	Industry based projects
9	Syllabus Based project



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DEE507P

Professional Activities

OBJECTIVES:

1. To allow for professional development of students as per the demand of engineering profession.
2. To provide time for organization of student chapter activities of professional bodies) i.e. Institute of engineers, ISTE or Computer Society of India etc.)
3. TO allow for development of abilities in students for leadership and public speaking through organization of student's seminar etc.
4. To provide time for organization of guest lectures by expert engineers/eminant professionals of industry.
5. To provide time for organization of technical quiz or group discussion or any other group activity.
6. To provide time for visiting library or using Internet.
7. To provide time for group discussion or solving case studies.
8. To provide time for personality development of students.
9. To provide time for working for social cause like awareness for environmental and ecology etc.

DETAILED INSTRUCTIONS TO CONDUCT PROFESSIONAL ACTIVITIES

- A. Study hours, if possible should be given greater time slot with a minimum of two hrs/week to a maximum of four hrs/week.
- B. This course should be evaluated on the basis of grades and mark sheet of students, should have a separate mention of the grade awarded. There will be no pass/fail in professional activities (PA).
- C. Following grade scale of evaluation of performance in PA has been established.

Grades Level of performance

Excellent

Good

Fair

Average

Below Expectations

4. Grades once obtained in a particular examination shall become final and no chance of improvement in grades will be given to the students.

5. Assessment of performance in PA is to be done internally by the Institution, twice in a Semester/Term through a simultaneous evaluation of the candidate by a group of three teachers, of the deptt. Concerned. Group of teachers will jointly award the grade



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to candidate in the assessment. Best of the grades obtained by the student in these two assessments shall be finally taken on the mark sheet of the respective Semester/Term.

Candidate abstaining from the prescribed course work and/or assessment planned at the Institute shall be marked ABSENT in the mark sheet, instead of any grade.

6. While awarding the grades for performance in PA, examining teacher should reach the final consensus based on the attendance, punctuality, interest, presentation skills in seminar on the topic assigned (collection of relevant data, observations, analysis, findings/conclusion) and its written report, awareness of latest developments in the chosen programme of study.

G. Institution shall maintain the record of grades awarded to all the students in PA for a period of 1 year.

8. It shall be mandatory for students to submit a compendium for his PA in the form of a Journal.

9. Compendium shall contain following:

61. Abstract of the guest lectures arranged in the Institution.
- IV. Topic and outcome of the group discussion held.
 - V. Report on the problems solved through case studies.
 - VI. Report on social awareness camps(organized for social and environmental prevention).
 - VII. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.
- J. PA is not a descriptive course to be taught in the classroom by a particular teacher. Various activities involved in the achievement of objectives of this course should be distributed to a number of teachers so that the talent and creativity of group of teacher's benefit the treatment of the course content.
- These activities should preferably be conducted in English language to maintain continuity and provide reinforcement to skill development. Small groups shall be formed like in tutorials, group discussion, case studies, seminar, project methods, roll play and simulation to make the development of personality affective.

Treatment of PA demands special efforts, attention, close co-operation and creative instinct on the part of teachers of department concerned. Since this course is totally learner centered, many of the activities planned under this course shall come out from the useful interaction of student, among themselves and with the teachers. The guide teacher/s shall best act as a facilitator of these creative hunts/ exercises, which unfold many of the hidden talents of the students or bring out greater amount of confidence in them, to execute certain activity.



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