



# Shri Vaishnav Vidyapeeth Vishwavidyalaya

## Diploma (Electrical Engineering)

### SEMESTER V

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
DTEE501		ELECTRICAL AND ELECTRONICS INSTRUMENTATION	3	1	2	5	60	20	20	30	20

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

To introduce the students with the

1. Various concepts of measurement and instrumentation.
2. Detailed knowledge of physical quantity measurement.
3. Concepts of telemetry and DAS.

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Apply the knowledge about the instruments to use them more effectively.
2. Suggest the kind of instrument suitable for typical measurements.
3. Demonstrate the basics of various Instruments, transducers and working of electronic circuits used in electronic test and measuring instrument.

#### Syllabus

##### UNIT I

##### 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.

##### UNIT II

##### Measurement of Physical Quantities:

Measurement of Pressure-Types of pressure measurement devices, Force summing devices, Secondary transducers, Low pressure measurement, Pirani gauge and thermocouple gauge. Resistive, Inductive and Capacitive pressure measuring devices. Measurement of speed:

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Measurement of speed by stroboscope, photoelectric and reluctance pick-up devices for speed measurement. Measurement of Vibration-Necessity for Vibration Measurement, Seismic Transducer, Piezo-electric and LVDT Accelerometers. Measurement of Temperature-Temperature measuring devices, Resistance thermometers;

#### 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 format, Modulation techniques of digital data transmission, Digital multiplexers.

#### UNIT IV

##### 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.

#### UNIT V

##### Data Acquisition System

Introduction data acquisition system, generalized DAS, Single and multi channel DAS, Data loggers, Special encoders.

#### Text Books:

1. Electrical and Electronic Measurement and Instrumentation by A.K. Sawhney.

#### Reference Books

1. Instrumentation Devices and Systems by C S Rangan, G R Sharma and V S V Mani
2. Digital Electronics By Malvino Leach
3. Instrumentation By Cooper

#### List of Practical

1. Measurement of linear displacement by LVDT and draw its characteristics.
2. Measurement of temperature by-  
(a) Thermocouple (b) Resistance Thermometer
3. Measurement of pressure using LVDT and diaphragm gauge.
4. Study and use of data conversion using ADC and DAC.
5. Measurement of pH value using pH meter.
6. Measurement of Humidity by hygrometer.
7. Measurement of Vibration using piezoelectric/LVDT transducer.
8. Study and flow measurement using electromagnetic flow meter.
9. Study and measurement of temperature using optical and radiation pyrometer.
10. Study of strip chart recorder and magnetic tape recorder.

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DTEE502		INDUSTRIAL ELECTRONICS	3	1	2	5	60	20	20	30	20

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#### Course Objectives:

1. Understand the principles, merits and de-merits of Induction/ Di-electric heating
2. Draw and design regulated / controlled power supply , SMPS and UPS

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Understand solid state devices as logic switches, power controller switches.
2. Understand heating and its properties.
3. List general and industrial applications of converters, invertors, choppers, and regulator.
4. Select proper device for a given application

#### Syllabus

##### UNIT I

6 Hrs

##### Inverter Application

SMPS Types, Block diagram of SMPS, Various schemes of SMPS, advantages and disadvantages. UPS-Type (ON Line, OFF Line) and its comparison. Battery banks.

##### UNIT II

10 Hrs

##### Electric Welding

Electric welding, resistance and arc welding, control devices and welding equipment.

A.C. / D.C. timers using solid state devices, Synchronous and non synchronous timers, Sequence timer, Duty cycle of welding process, Electronic welding controls, SCR as electronic contactor in welding, Heat control, Energy storage welding.

##### UNIT III

12 Hrs

##### High frequency heating

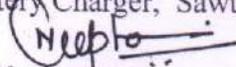
Induction Heating: Basic Principle ,Factors Governing the process, Applications, merits &demerits over other systems , Di-electric heating: Basic Principle ,Factors governing the process, applications, merits & demerits over other systems.

##### UNIT IV

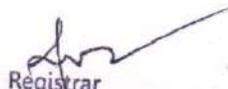
10 Hrs

##### General Applications

Static Switches, AC switches, DC Switches, Solid State Relays, DC Solid State Relays, AC Solid State Relays. Static Circuit Breakers, Static AC Circuit Breakers, Static DC Circuit Breakers, Battery Charger, Sawtooth generators, Flasher Circuits

  
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#### UNIT V

##### Industrial Applications

HVDC Transmission, Types of HVDC link, Bipolar HVDC System, Temperature control, Liquid level controllers, Alarm actuator, High frequency welding, Ultrasonic Applications, Emergency Lighting System.

##### List of Practical

1. Demonstration of SMPS.
2. Demonstration of UPS
3. Demonstration of High frequency heating
4. Demonstration of induction heating.
5. Demonstration of Sawtooth generators.
6. Study of circuit breaker.

##### Text Books:

1. Power Electronics by M. H: Rashid - PHI Publication-3 rd Edition-2005
2. Industrial Electronics and control by Biswanath Paul, PHI publications 2<sup>nd</sup> Edition 2010
3. Programmable Logic Controllers - "Frank D.Petruzela" PHI publications
4. Power Electronics by Dr.P. S. Bimbhra, Khanna publishers -2 nd Edition 1998

##### Reference Books:

1. Industrial & Power Electronics By Harish C.Rai, Umesh Publication, 5 th Edition 1994
2. 'Programmable Logic Controllers – Principles and applications - John W. Webb. Ronald A. Reis PHI publications 2017
3. Programmable Logic Controller –Pradeep Kumar& Srivashtava- BPB Publications

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DTEE503		ESTIMATING AND COSTING	3	0	0	3	60	20	20	0	0

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\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objective:

The aim of this course is to enable the students to prepare the schedule of materials with specifications and estimates for different types of electrical installations.

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Summarize the importance of estimation and specification.
2. Prepare the schedule of materials with specifications and estimates for service mains.
3. Draw the wiring plan for residential buildings, Prepare the schedule of materials with specifications and estimates for lighting Installations.
4. Prepare the schedule of materials with specifications for transmission lines, distribution line and substations.

#### UNIT I

##### Introduction

Meaning of estimation and specification, its importance and purpose and the factors to be considered while preparing estimations and specifications. Meaning of standardization and its advantages. Meaning of overhead charges, stock incidental charges, contingencies, supervision charges, labour charges, Inspection charges, transportation charges and miscellaneous charges.

#### UNIT II

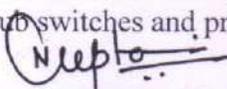
##### Service Mains

Meaning of service mains, code of Practice for service mains, types of service mains- Over Head & UG Service Mains, materials and specifications, current ratings for Aluminium, copper conductors and selection of size of conduit pipe as per the size and number of wires. Load calculation, selection of size and type of conductor/UG cable, estimates for single phase OH service connection, three phase OH service connection.

#### UNIT III

##### Lightning Installation

Interior Wiring types and their applications, factors to be considered, materials required for Interior wiring and their specifications, calculating the quantity of wiring materials and accessories for the Interior Wiring, load calculations for residential buildings, size of conductors, main switch, sub switches and protective devices.

  
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#### UNIT IV

##### Power Installation

Code of Practice for Power Installations, materials required for power circuit wiring and their specifications, Prepare the layout diagram of machines showing clearances as per IS standards, load calculations, determine the size of conductors, main switch, Isolators, sub switches and protective devices,

#### UNIT V

##### Distribution Line and transformer centre

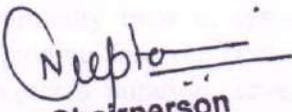
Code of practice for Distribution Lines and Transformer centre, types of transformer centres - Pole mounted, plinth mounted, indoor and outdoor types. Determining the rating of Distribution Transformer. Write Specifications of the Distribution Transformer. Code of practice for Transmission lines and substations, transmission line materials and their specifications, types of Towers, ACSR conductors and Number of Disc insulators in suspension string.

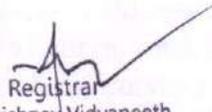
#### Text Books:

1. KB Raina, SK Bhattacharya, "Electrical Design Estimating and Costing", New Age Publishers.
2. J.B.Gupta, "Electrical Installation Estimating and Costing", S.K.Kataria and Sons.

#### Reference Books:

1. SL Uppal, G.C.Garg, "Electrical Wiring Estimating and Costing", Khanna Publisher,
2. Surjit Singh, "Electrical Estimating and costing", Dhanpat Rai & Co.
3. Raghvendra Rao, "Electrical Design Estimating and Costing", published by sapna book house.

  
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DTEE504		POWER SYSTEM OPERATION AND PROTECTION	3	0	0	3	60	20	20	0	0

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\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

1. To introduce the concepts power system operation.
2. To gain the concepts of various switchgear and protection equipment in power system.

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Apply core concepts in of economics of generation.
2. Analyze the types of faults in power system
3. Understand the operation and functioning of circuit breakers, lightning arrester and relays
4. Understand the types of substation and their component.

#### Syllabus

##### UNIT I

(8 Hrs)

##### Economics of Power Generation

Terms commonly used in system operation: connected load, firm power, cold reserve, hot reserve, spinning reserve. Terms used in system operation such as Load curve, load duration curve, integrated duration curve. (Simple numerical based on plotting above curves.) Factors affecting the cost of Generation: Average demand, Maximum demand, plant capacity factor & plant use factor, Diversity factor & load factor. (Simple numerical based on above)

##### UNIT II

(10Hrs)

##### Power System Faults

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. Type of faults - symmetrical and unsymmetrical: 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.

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#### UNIT III

(8 Hrs)

##### Relays

Type of relays- induction, electromagnetic, thermal. Primary and back up 8 relaying. Types of back up relays, causes of failure of primary relaying. Explanation of terms used in relaying. Principle and working of different types of relays- electromagnetic and induction type. Induction type over current relay, reverse power relay, time and current settings. Differential relays., distance relays, thermal relays, inverse current characteristics..

#### UNIT IV

(8 Hrs)

##### Circuit Breakers and Fuses

Function of fuse. fusing factor, fusing characteristic. Application of isolator and circuit breakers. Circuit breaker capacities. Arc formation in C.B. and methods of arc extinction. Definition of various terms with reference to circuit interruption wave form. working principle and operation of Bulk Oil/Minimum oil/air blast/SF CB. Merits and Demerits of different types of C.B.

#### UNIT V

(8Hrs)

##### Substations

Introduction, Classification of indoor & outdoor sub-stations, Advantages & Disadvantages, Selection & location of site, Main connection schemes, Equipment's circuit element of substations, In coming & outgoing lines, Transformers, CT&PT, Relays, CB's, fuses, Isolators, batteries, lightning arresters. Insulators and Bus bar's material, types in detail. Connection diagram and layout of sub-stations

#### Text Books:

1. Leonard L. Grigsby; Electric Power Generation, Transmission, and Distribution; CRC Press, 3rd edition, 2012.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

#### Reference Books:

1. Soni, Gupta, Bhatnagar, Electrical Power (Generation, Transmission, Distribution, Protection and Utilization), Dhanpath Rai And Sons, Delhi.
2. B.R.Gupta, S.Chand, 'Power System Analysis And Design' New Delhi, Fifth Edition, 2008.
3. C.L.Wadhwa, 'Electrical Power Systems', New Age International Publishers.
4. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition, 2008.

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
DTEE505		RESIDENTIAL, COMMERCIAL AND INDUSTRIAL ELECTRICAL SYSTEMS	3	0	2	4	60	20	20	30	20

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\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

The aim of this course is to develop the requisite knowledge of electrical regulations, standards and residential and commercial networks in the students.

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Interpret various rules, regulations and standards applicable while designing an electrical system.
2. Analyze the residential system networks for power requirements.
3. Analyze the commercial system networks for power requirements.
4. Understand the design process of industrial system network.
5. Apply different methods for cable laying and installation.

#### Syllabus

##### UNIT I

###### Regulations and Standards

Local Electrical Regulations, Local Building Regulations, Local Fire Regulations, Insurance Company Requirements, Local Power Company Requirements, Local Dangerous Goods Requirements, Local Council Requirements, Client or User Standards, National and International Standards, Compliance Procedure.

##### UNIT II

###### Residential System Networks

Incoming Power Supply Free Standing House. Incoming Power Supply to an Apartment building, Incoming Power Supply to a complex Containing More than one building, Distribution System for Apartment building and Complex, Revenue Metering for Apartment building and Complex, Power Requirement for House and for Apartment, Power Requirement for Common Areas or Services within Apartment buildings and Complex, Luminaries for House or Apartment, Luminaries for Common Areas in Apartment building and Complex, Control System, Standby Power, Cable Installation in a Complex, Cable Installation within an Apartment building, Internal Distribution within an Apartment/ House, Outdoor Distribution.

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##### Commercial System Networks

Power Requirement, UPS and Emergency Lighting, Revenue and check metering Warehouse Building, Cinemas, Entertainment/ Conference Centre, Hotel, Restaurant, Communication Facility/ IT Centre, Educational Building, Workshop, Office Building, Shopping Centre Building, Shop/ Departmental Store/ Super Market, Marina, Airport, Ports, Motion Sensors- Working, Types and Applications.

#### UNIT IV

##### Industrial System Networks

General design Process, Industries with Load Less than or Equal to 1000 kVA, Industries with Load above 1 MVA and Multiple Buildings/ Outdoor Plants.

#### UNIT V

##### Cable Installation and Support Systems

General Cable Delivery, Cable pulling, Pulling Tensions, Bending Radius, General Precautions, Installation Practice, Tunnel; Trench, Directly Buried, UPVC Ducts, Cable Pull Pit, Concrete or Steel Pipe, Conduits, Raised Floor or Platforms, Cable Support Systems, General Installation and Fixing, Force on Clamps due to Short Circuit .

#### Text Books:

1. Hemant Joshi, "Residential Commercial and Industrial Electrical systems", Vol. 2, McGraw Hill Education(India) Private Ltd. New Delhi, 2014.
2. K. B. Raina, S. K. Bhattacharya, "Electrical Design, Estimating and Costing", New Age International Publishers. New Delhi, 2007.
3. Jacob Fraden, "Handbook of Modern Sensors- Physics, Designs, and Applications", Fourth Edition, Springer, 2010

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