



Veermata Jijabai Technological Institute (V.J.T.I)

(Central Technological Institute, Maharashtra State, INDIA)

H. R. Mahajani Marg, Matunga, Mumbai 400019

Tel.No. +91 22 24198101-02 Fax: +91 22 24102874

Website: www.vjti.ac.in

Programme: Diploma in Electrical Engineering (DEE)

Semester: VI

Implemented from: 2017-18

COURSE CODE	COURSE	GR	TEACHING SCHEME (HRS/WK)				EXAMINATION SCHEME												
			L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
								Max	Min		Max	Min	Max	Min	Max	Min			
172EE61	Switchgear & Protection	C	3		3	6	3	80	32	20	100	40			25**	10	25@	10	150
172EE62	Power Electronics & Drives	C	3		3	6	3	80	32	20	100	40	25**	10			25@	10	150
172EE63	Estimation & Costing	C	3		3	6	3	80	32	20	100	40	25**	10			25@	10	150
\$	Elective :		3		2	5	3	80	32	20	100	40			25**	10	25@	10	150
172EE65	Management Principles	M	3			3	3	80	32	20	100	40					25@	10	125
172EE66	Project (Major project)	A			6	6									50**	20	100@	40	150
172EE67	New trends in Industries	A	2			2											25@	10	25
	TOTAL		17	0	17	34		400		100	500		50		100		250		900

Abbreviations: B – Basic; C – Core; A – Applied; M – Management; L – Theory Lecture; T – Tutorial; P – Practical; TH – Theory Paper; IST – In-Semester Tests (02); PR – Practical Exam; OR – Oral Exam; TW- Term Work.

*:- Assessment by Internal Examiner **:- Assessment by External And Internal Examiner @ :-TW assessment by Internal .

Curriculum Coordinator

Head

Diploma in Electrical Engineering

Dean - Diploma



DEE,

VJTI



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§ List of Electives V and VI Semester

Sr. No.	Course Code	Course Name
1	172EE56E1	PLC /SCADA
2	172EE56E2	Power System Analysis
3	172EE56E3	High Voltage Engineering
4	172EE56E4	Renewable Energy
5	172EE56E5	Solar Photovoltaic Technology And Wind Electrical Systems
6	172EE64E1	Illumination Engineering
7	172EE64E2	Energy Conservation and audit
8	172EE64E3	Smart Grid
9	172EE64E4	Substation Practices

Curriculum Coordinator

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Diploma in Electrical Engineering

Dean - Diploma

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DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: SWITCHGEAR AND PROTECTION
COURSE CODE	: 172EE61

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	0	3	6	3	80	32	20	100	40	-	-	25**	10	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner@TW Assessment by Internal Examiner

Course Objectives:

The students will be able to:

- 1) Learn the principles, concepts & procedural aspects of switchgear & protection.
- 2) Identify the various components of switchgear & protection systems.
- 3) Know the specifications & select switchgear & protection system
- 4) Identify the faults & repairs

Course Outcomes:

Student should be able to

CO1	Know the importance of different types of faults along with necessity of protection
CO2	Describe the various circuit breakers
CO3	Identify the various types of relays.
CO4	Apply different relays and circuit breakers in power system equipment for protection
CO5	Study of different types of surge arrestors

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1. Fundamental		4	5	1	40%	30%	30%
1.1	Necessity & functions of protective system						
1.2	Normal & abnormal conditions.						
1.3	Types of faults & their causes.						
2. Circuit interrupting devices		8	15	2,4	30%	40%	30%
2.1	HRC fuses - construction, types, working, characteristics, ratings and applications						
2.2	Isolators- Introduction						
2.3	Arc formation process, methods of arc extinction, related terms.						
2.4	Definition: Arc voltage, Recovery voltage, Restriking voltage, RRRV, current chopping						
2.5	Circuit breakers- Concept, Classification, Working principle, Construction, Sulphur-HexaFluoride circuit breaker (SF6). Vacuum circuit breaker. (other Circuit Breakers covered in practical)						
3. Protective Relaying		7	12	3,4	30%	30%	40%
3.1	Requirements- relay time, related terms.						
3.2	Classification - Electromagnetic attraction, induction static, μP based relays.						
3.3	Protective transformers. (No numerical on above topic.)						
3.4	Over current relay-Time current characteristics.						

	3.5	Distance relay						
	3.6	Directional relay						
	3.7	Differential Relay. (Simple numerical on relay setting)						
4.	Protection of Alternator		5	8	2,3, 4	20%	40%	40%
	4.1	Abnormalities & Faults						
	4.2	Differential protection						
	4.3	Over current, earth fault, interturn fault, negative phase sequence, over heating protection.						
	4.4	Reverse power protections. (Simple numerical on differential protection)						
Section II								
5	Protection of Transformer		6	12	2,3, 4	30%	30%	40%
	5.1	Abnormalities & faults.						
	5.2	Differential, over current, earth fault, interturn, restricted earth fault, over heating protection.						
	5.3	Buchholz relay (Simple numerical on differential protection)						

6	Protection of Motor		5	08	1,2, 3,4	20%	40%	40%
	6.1	Abnormalities & faults.						
	6.2	Short circuit protection, Overload protection, Single phase preventer.						
7	Protection of Busbar & transmission line		6	12	1,2, 3,4	20%	40%	40%
	7.1	Abnormalities & faults.						
	7.2	Bus bar protection.						
	7.3	over current, distance protection. Pilot wire protection.						
8	Over voltage Protection		7	08	5	30%	30%	40%
	8.1	Causes of overvoltages.						
	8.2	Lighting phenomena & over voltage due to lightning.						
	8.3	Protection of transmission line & substation from direct stroke.						
	8.4	Types of lightning arresters & surge absorbers & their Construction & principle of operation.						
	8.5	Insulation co-ordination						

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).

Practical Course Outcomes:

Student should be able to

CO1	Identify different types of circuit breakers.
CO2	Identify various faults on the system.
CO3	Calculate the fault levels
CO4	Simulate circuit configuration to create various faults.
CO5	Set the relays for various fault levels

List of Practical/Assignments/Tutorials:

Sr. No.	Assignments/Tutorials	Approx. Hours	CO
1	1)Identify the components of different types of circuit breakers with their specification (through visits , video or model). i)Low tension air circuit breaker.(including protective devices) ii)Minimum Oil Circuit Breaker (M O C B) iii)Miniature Circuit Breaker (M C B) iv)MouldedCase Circuit Breaker (M C C B) v)Earth Leakage Circuit Breaker (E L C B) or Residual LeakageCircuitBreaker (R L C B)	3	1
2	Plot performance characteristics of over current relay.	3	2,5
3	Simulation of alternator protection.	3	2,4,5
4	Simulation of transformer protection.	3	2,3,4
5	Collect data for different types and specifications of lightening arrestor.	3	2
6	Collect data about a typical HT/LT substation scheme.	4	1

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Ram,Badri	Power System Protection and Switchgear	1 st Edition Tata McGraw-Hill..

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	Sunil S Rao	Switchgear Protection and Power Systems	2008 Edition Khanna Publishers.
2	U A Bakshi	Switchgear and Protection	1 st Edition, Technical Publications, Pune
3	Deshpande M	Switchgear and Protection	1 st Edition, Tata McGraw-Hill
4	Haroon Asfaq	Switchgear and Protection	2 nd Edition, Khanna Publishing Book Company (P) Ltd
5	Singh, Ravindra P	Switchgear and Power System Protection	PHI Publications

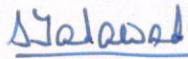
Websites:

1. <http://202.74.245.22:8080/xmlui/bitstream/handle/123456789/112/Ch-19.pdf>
2. http://www.seeei.org.il/prdFiles/2723_desc3.pdf
3. [http://www.tomcad.com/linkedin/week7POWERSYSTEMPROTECTION\(DifferentialRelays\).pdf](http://www.tomcad.com/linkedin/week7POWERSYSTEMPROTECTION(DifferentialRelays).pdf)
4. https://www.eiseverywhere.com/file_uploads/49c06f20ffcaad9555737d294109e430_Transmission_Overview_20120312.pdf

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	DEE
SEMESTER	SIXTH
COURSE TITLE	POWER ELECTRONICS & DRIVES
COURSE CODE	172EE62

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25**	10	-	-	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

- 1) Understand the working and applications of various power electronic devices.
- 2) Control dc and ac power using proper power electronic device.
- 3) Understand the steady state and dynamic behavior of electrical drives

Course Outcomes:

Student should be able to

CO1	Describe electrical characteristics of power electronic devices.
CO2	Compare advantages, disadvantages and applications of the power electronic devices.
CO3	Understand the application of devices in converter, cycloconverter, inverter & chopper.
CO4	Understand the use of dc and ac drive during motoring and braking operation
CO5	Use proper power control circuit for drives during motoring and braking operation.

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Power Electronic Devices :	06	08	1,2,3	40%	40%	20%
1.1	Power BJT, Power MOSFET, SCR, TRIAC, IGBT, GTO, PUT, DIAC. Their construction, characteristic & application. Comparing their advantages, disadvantages & application.						
1.2	Static characteristics of SCR, Two transistor model.						
1.3	Turn on methods of thyristor						
1.4	Commutation(Turn off methods) of thyristor Class A, B, C, D, E and F						
1.5	Thyristor protection, Use of Snubber circuit						
2	Converters & Cycloconverters :	09	15	1,2,3	30%	30%	40%
2.1	Single phase half wave and full wave converters with R, RL, RL & FD and RLE loads.						
2.2	Three phase half and full wave converters with R & RL loads.						
2.3	Applications of converter.						
2.4	Single Phase step up and step down cycloconverter						
2.5	Applications of cycloconverter.						
3	Inverters :	09	15	1,2,3	30%	30%	40%
3.1	Introduction and classification.						

	3.2	Single phase half and full bridge inverter with R & RL loads'						
	3.3	Single phase basic series inverter. Disadvantages of basic series inverter						
	3.4	Single phase parallel inverter.						
	3.5	Sinusoidal Pulse Width Modulated Inverter;						
	3.6	Requirements of a good inverter.						
	3.7	Applications of Inverter						
SECTION II								
4		Dynamics of Electric Drives & Braking:						
	4.1	Types of load, Passive and Active loads.						
	4.2	Speed torque characteristics of motor and load.						
	4.3	Quadrantal speed torque characteristics of motor and load combination.	06	08	4	40%	40%	20%
	4.4	Dynamics of motor-load combination.						
	4.5	Types of braking for dc and ac motors.						
5		Choppers :						
	5.1	Introduction and control strategies						
	5.2	Principle of operation of step down chopper.						
	5.3	Step up chopper operation with waveforms	09	15	1,4	30%	30%	40%
	5.4	Types of Chopper: A, B, C, D and E						
	5.5	Applications of chopper						
6		Drives applications in Power Electronics :						
	6.1	Concept of general electric drive system.						
	6.2	DC Drives: Speed control & braking operation of: Single Phase Half Wave Converter Drives. Single Phase Full Converter Drives. Three PhaseHalf ConverterDrives. Three Phase Full Converter Drives	09	15	3,4,5	25%	35%	40%

		Chopper Drives: 1) Power Control or motoring control 2) Regenerative braking control						
	6.3	AC Drives : Advantages & disadvantages over dc drives Three phase induction motor drives during speed control (motoring) and braking operation						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

Practical Course Outcomes:

Student should be able to

CO1	Understand the Voltage/Current characteristics of various power electronics devices
CO2	Explain the working of device in application
CO3	Explain the working of speed control of dc drive using converter/chopper

List of Practicals:

Sr. No.	Unit	Practical	Approx. Hours	CO
1	1	To study and plot the characteristics of SCR	03	1
2	1	To study and plot the characteristics of DIAC	03	1
3	1	To study and plot the characteristics of TRIAC	03	1
4	1	To study and plot the characteristics of PUT	03	1
5	1	To study and plot the characteristics of IGBT	03	1
6	1	To study and plot the characteristics of GTO	03	1
7	2	Single Phase half and full wave converter (with R, RL, RL & FWD loads)	03	2
8	2	Single phase step up and step down cycloconverter	03	2
9	3	Single phase half bridge inverter with R and RL load	03	2

10	3	Single phase basic series inverter	03	2
11	5	Single phase step down chopper	03	2
12	5	Single phase step up chopper	03	2
13	6	Speed Control of separately excited dc motor using Class A chopper drive	03	3

Mini Project: To built a single phase light dimmer circuit using DIAC & TRIAC.

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Dr. P. S. Bimbhra	Power Electronics, 6 th Edition	Khanna Publisher
2	M Chilikin	Electric Drives	MIR Publishers
3	Dr. S. K. Pillai	A first course on electric drives, 2 nd Edition	John Wiley Publishers

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	Khanchandani, Singh, Tata McGraw-Hill.	Power Electronics, 2 nd Edition	Tata McGraw Hill.
2	M. H. Rashid	Power Electronics, Circuits, Devices and Applications, 3 rd Edition	Pearson Education

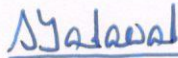
Websites:

- 1) <http://www.ssit.edu.in/dept/assignment/pelabmanual.pdf>
- 2) http://www.ee.iitgp.ernet.in/faci_pe.php
- 3) http://www.ece.umn.edu/groups/power/labs/pe/pe_manual.pdf

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: ESTIMATION & COSTING
COURSE CODE	: 172EE63

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25**	10	-	-	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

After studying this subject, students will be able to

- 1) Understand the purpose of Estimation and costing of electrical installations and Indian Electricity rules.
- 2) Read & interprets Electrical Installation drawings of residential, Commercial and industrial buildings.
- 3) Use data tables & specification of wire, cables, LT lines & Distribution Transformer, MCCB, ELCB.
- 4) Understand the concept of contract and tendering.

Course Outcomes:

Student should be able to

CO1	Prepare an estimate of quantity and cost of the material for a electrical project following IE Act-2003.
CO2	Prepare detail estimate and costing of Residential and commercial
CO3	Test Residential, commercial and Industrial Electrical Installation
CO4	Prepare detail estimate and costing of a transmission line/Overhead and underground distribution project

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	General Principles of Estimation:	4	8	1, 3	35%	35%	30%
	Introduction to estimation & costing, Electrical Schedule. Catalogues, Market Survey and source Selection. Recording of estimates						
	Determination of required quantity of material, Labor conditions, Determination of cost material and labor Contingencies. Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode.						
	Comparative statement, Purchase orders, Payment of bills. Tender form, General idea about IE rule, Indian Electricity Act and major applicable I.E rules						
	Purpose of estimation and costing, qualities of a good estimator, essential elements of good estimator						
2	Residential building Electrification	10	16	1, 2, 3	30%	30%	40%
	General Rules guidelines for wiring of residential installation and positioning of equipment's, Principles of circuit design in lighting and power circuits						
	Procedures for designing the circuits and deciding the number of circuits, Method of drawing single Line diagram. Selection of type of wiring and rating of wires and cables						
	Load calculations and selection of size of conductor, Selection of rating of main switch Distribution board, protective switchgear ELCB and MCB and wiring accessories,						

	2.4	Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation						
3		Electrification of Commercial Installation:						
	3.1	Concept of commercial installation, Differentiate between electrification of residential and commercial installation						
	3.2	Fundamental considerations for planning of an electrical installation system for commercial building, Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service Connection and nature of supply.	10	16	1, 2, 3	35%	30%	35%
	3.3	Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation, Selection of type wire, wiring system and layout						
	3.4	Sequence to be followed to prepare estimate, Preparation of detailed estimate and costing of Commercial installation.						
SECTION-II								
4		Design and estimation of overhead transmission & Distribution lines						
	4.1	Introduction, Typical AC electrical power system, Main components of overhead lines, Line supports. Factors governing height of pole, Conductor materials						
	4.2	Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances	10	16	1, 3	35%	40%	25%
	4.3	Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers, Points to be considered						

		of supports						
5		Design And Estimation of Substations						
	5.1	Introduction, Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation						
	5.2	Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram.	8	12	1, 4	35%	35%	30%
	5.3	Key diagram of typical substations. Equipment for substation and switchgear installations, Substation auxiliaries supply, Substation Earthing						
6		Contracts, Tenders and Execution						
	6.1	Concept of contract and tenders Types of contracts and contractors Types of tenders Requirements of valid contract and good contractor	6	12	1, 2, 3	40%	35%	25%
	6.2	Tender notice, Procedure for submission and opening of tenders, Comparative statements for selection of contractors						
	6.3	Principles of execution of work Billing of executed works.						
Legends: R- Remember, U-Understand, A-Apply and abovelevels (Blooms's Revised Taxonomy).								

Practical Course Outcomes:

Student should be able to

CO1	To understand various types of materials required for wiring.
CO2	To comprehend the estimation of a domestic installation.
CO3	To comprehend the estimation of substations.
CO4	To comprehend the knowledge of IS codes

List of Practical's/Assignments/Tutorials:

Drawing sheets should be prepared by the students with detailed wiring diagram, Electrical installation, estimation and costing work for the following:

Sr. No.	Unit	Practical/Assignment	Approx . Hours	CO
1	2	Undertake following wirings a. Tube light wiring b. Stair case wiring c. Go down wiring d. Parallel loop wiring.	3	1
2	2	Prepare cost estimate of a domestic installation cost (Residential building, laboratory room or Drawing hall etc).	3	1,2
3	3	Prepare cost estimate of an industrial installation. (Workshop, agriculture, flour mill, etc.)	3	1,2,3, 4
4	2	Prepare cost estimate of an overhead service connection. (Single phase and three phase).	3	1,2,3, 4
5	2	Prepare cost estimate of an underground service connection (single phase and three phase).	3	1,2,3, 4
6	2	Estimate of material and specifications required for 220kV/110kV Transmission line	3	1,3
7	3	Estimate of material and specifications required for overhead, 440 V, 3-phase, 4 wire or 3 wire distribution line.	3	1,2,3

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Uppal, S L	Electrical Estimating & costing	New Age International (p) Limited, New Delhi
2	Raina, K. B. and Bhattacharya, S.K.	Electrical Design, estimating & Costing	New Age International (p) Limited, New Delhi
3	Gupta, J.B.	Electrical Installation Estimating & Costing	S. K. Kataria & Sons, New Delhi

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Allasappan & Ekambarm	Estimating design & costing	Tata McGraw hill
2	Surjit Singh	Electrical Estimating & costing	Dhanpat Rai & co.

Websites:

i. www.vlab.com

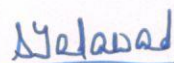
ii. www.nptel.iitm.ac.in



Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: ILLUMINATION ENGINEERING
COURSE CODE	: 172EE64E1

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25**	10	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

After studying this subject, students will be able to get the detailed information about modern lamps and their accessories.

- 1) Understand the meaning of the terms used in illumination engineering.
- 2) To get detailed insight of indoor and outdoor illumination system components, its controls And design aspects.
- 3) To know the requirements of energy efficient lighting.
- 4) To introduce the modern trends in the lighting.

Course Outcomes:

Student should be able to

CO1	Define and reproduce various terms in illumination.
CO2	Identify various parameters for illumination system design.
CO3	Design indoor and outdoor lighting systems.
CO4	Study requirements of illumination levels and modern trends for various applications

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Fundamentals of Illumination	6	8	1	30%	40%	30%
	Specific Objectives						
1.1	Identify and measure the level of illumination Design illumination schemes						
1.2	Illumination terminology: Illumination, Light intensity, Lumen, Lux.						
1.3	Laws of Illumination (Simple numerical) Features of good Illumination scheme Advantages of good Illumination scheme Good and bad effects of lighting & perfect level of illumination						
2	Lamps & Lighting Accessories	12	16	1, 2, 3	40%	30%	30%
2.1	Lamp materials: Filament, glass, ceramics, gases, phosphors and other metals and non-metals.						
2.2	Discharge Lamps: Theory of gas Discharge phenomena, lamp design considerations, characteristics of low and high mercury and Sodium vapour lamps, Low Vapour Pressure discharge lamps – Mercury Vapour lamp, Fluorescent Lamp, Compact Fluorescent Lamp (CFL)						
2.3	High Vapour Pressure discharge lamps - Mercury Vapour lamp, Sodium Vapour lamp, Metal halide Lamps, Solid Sodium Argon Neon lamps, SOX lamps, Electro luminescent lamps, Induction lamps						
2.4	Construction, working principle advantages and disadvantages of all lamps						
2.5	Lighting calculation methods a. Watt /m ² method b. Lumens or light flux method c. Point to point method (Simple numerical)						

3	Electrical Control of Light Sources:						
	Purpose of lighting control Working principle and operation of Dimmer - 3.1 a. Resistance type dimmer b. Salt water dimmer Dimmer Transformer 1) Auto transformer dimmer 2) Two winding transformer dimmer	10	16	1, 2, 3	40%	30%	30%
	3.2 Modern control technique: Electronic Dimmer : working principle and operation a. Thyrister operated dimmer b. Triac operated dimmer						
	3.3 Methods used for light control : Control circuits for lamps: single lamp controlled by single switch, two switches. Single Lamp control by two point method , three point method & four point method						
SECTION-II							
4	Illumination for Interior Applications						
	4.1 Standards for various situations in Interior Illumination Methods for Designing illumination schemes	10	16	3	35%	35%	30%
	4.2 Design considerations for Interior location of Residential, Commercial, Industrial premises Design Illumination scheme for different Interior locations of Residential, Commercial, Industrial unit Special purpose lighting schemes Decorative lighting Theatre lighting - Aquarium, swimming pool lighting						
	4.3 Numerical based on Determination of Lamp Lumen output taking into account voltage and temperature variations, Calculation of wattage of each lamp and no of lamps needed, Layout of lamp luminaire,						

		Calculation of space to mounting height ratio						
	4.4	Indian standard recommendation and standard practices for illumination levels in various areas, Special feature for entrance, staircase, Corridor lighting and industrial building						
5		Illumination for Outdoor Applications						
	5.1	Outdoor Lighting Design: Road classifications according to BIS, pole arrangement, terminology, lamp and luminaire selection, different design procedures, beam lumen method, point by point method, isolux diagram, problems on point by point method.						
	5.2	General requirements for lighting schemes 1.Factory Lighting 2. Street Lighting 3.Flood Lighting 4.Railway platform Lighting 5.Lighting for Advertisement/Hoardings 6. Sports Lighting	8	12	3	30%	35%	35%
6		Modern trends in illumination						
	6.1	LED luminary designs 1. Intelligent LED fixtures 2. Natural light conduiting						
	6.2	Organic lighting system LASERS, characteristics, features and applications, non-lighting lamps	6	12	1, 2, 3, 4	50%	25%	25%
	6.3	Optical fiber, its construction as a light guide, features and applications						
Legends: R- Remember, U-Understand, A- Apply and above levels (Blooms's Revised Taxonomy).								

List of Assignments:

Sr. No.	Practical/Assignment	Approx. Hours	CO
1	Estimate and compare luminous efficiency of incandescent and compact fluorescent lamp.	03	3
2	Compare performance of magnetic and electronic ballast. Estimate the energy saving with electronic ballast.	03	1,2,3
3	Understand energy efficient illumination equipment's	03	3
4	Design illumination scheme for any one of the following. (A) Mall (B) Cloth shop (C) Restaurant(D) Show-room. Write a report on illumination scheme used in industry by visiting small or medium.	03	1,2,3,4
5	Conduct illumination assessment in workplace using lux meter.	03	1,3
6	Understand biological implication of artificial illumination.	03	3,4

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	H. S. Mamak	Book on Lighting	Publisher International lighting Academy
2	Joseph B. Murdoch	Illumination Engineering from Edison's Lamp to Lasers	York, PA : Visions Communications
3	M. A. Cayless , A. M. Marsden,	Lamps and Lighting	Publisher-Butterworth-Heinemann(ISBN 978-0-415-50308-2)
4	Designing with light	Lighting Handbook	Anil Valia; Lighting System 2002
5	N. V. Suryanarayana	Utilisation of Electrical	Power Wiley Eastern Limited

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	D. C. Pritchard	"Lighting"	4th Edition, Longman Scientific and Technical, ISBN 0-582-23422-0.
2		"IES Lighting Handbook	Illuminating Engineering Society of North America.
3		IESNA lighting Handbook	Illuminating Engineering Society of North America 9th

			edition 2000
4	Jack L. Lindsey FIES (Author), Scott C. Dunning PHD PE CEM (Author)	Applied Illumination Engineering,	ISBN-13: 978-0824748098 ISBN-10: 0824748093, 3rd Edition.
5	Alastair Buckley	Organic Light Emitting Diodes (OLEDs): Materials, Devices and Applications	University of Sheffield, UK, ISBN: 978-0-85709-

Websites:

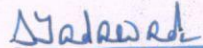
- 1) www.onlinefreebooks.net
- 2) www.ies.org/shop/
- 3) www.opticalres.com/lt/illuminationfund.pdf



Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: ENERGY CONSERVATION & AUDIT
COURSE CODE	: 172EE64E2

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25**	10	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives: ‘

The students will be able to:

- 1) Learn the principles, concepts & procedural aspects of switchgear & protection.
- 2) Identify the various components of switchgear & protection systems.
- 3) Know the specifications & select switchgear & protection system
- 4) Identify the faults & repairs

Course Outcomes:

Student should be able to

CO1	Know the importance of different types of faults along with necessity of protection
CO2	Describe the various circuit breakers
CO3	Identify the various types of relays.
CO4	Apply different relays and circuit breakers in power system equipment for protection
CO5	Study of different types of surge arrestors

Course Content:

SECTION-I

Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level	
1.	Energy Conservation	06	10	1	30%	30%	40%	
	1.1							Present energy scenario and Need of energy conservation.
	1.2							State the meaning of term Energy Conservation. Energy Conservation Act – 2003.
	1.3							Functions of Government Organization (NPC, MNRE, BEE, MEDA)
2.	Energy Conservation in Lighting System	08	10	2	40%	40%	20%	
	2.1							Basic terms used in Lighting system (Illumination).
	2.2							Recommended Luminance levels
	2.3							Procedure for assessing existing Lighting system in a facility.
	2.4							Energy Conservation techniques in lighting system. <ul style="list-style-type: none"> • By replacing Lamp sources. • Using energy efficient luminaries. • Energy Conservation techniques in fans, Electronic regulators. • Periodic survey and adequatemaintenance programs.
3.	Energy Conservation techniques in Electrical Motors and Transformer	10	20	3,4	30%	30%	40%	
	3.1							Factors governing the selection of Induction motor.
	3.2							Need for energy conservation in Induction motor.
	3.3							Various energy conservation techniques in Induction motor. <ul style="list-style-type: none"> • By improving Power quality. • By motor survey. • By matching motor. • By operating in star mode. • By improving mechanical <ol style="list-style-type: none"> 1) Power and transmission 2) Efficiency.
	3.4							Energy Efficient motors.
	3.5							Need of energy conservation in transformer.
	3.6							Methods (related to material, design) to improve the performance of transformer.
	3.7							Energy conservation techniques related to transformer. <ul style="list-style-type: none"> • Loading sharing • Parallel operation

Section II								
4.	Energy Conservation in transmission and distribution system		5	8	2,3, 4	20%	40%	40%
	4.1	Scenario of transmission and distribution losses at state level, national level and at global level.						
	4.2	Types of losses in transmission and distribution system (commercial and technical losses)						
	4.3	Energy conservation techniques in transmission and distribution system related to technical losses. <ul style="list-style-type: none"> • By reducing $I^2 R$ losses. • By compensating reactive power flow. • By optimizing distribution voltage • By balancing phase currents. • By using energy efficient 						
4.4	Energy conservation techniques related to commercial losses.							
5	Relation Between Tariff And Energy Conservation		4	10	2,3, 4	30%	30%	40%
	5.1	Types of tariff structure.						
	5.2	Terms involved in tariff.						
	5.3	Specific tariff: <ul style="list-style-type: none"> • Two Part Tariff • Three Part Tariff • Flat rate Tariff • Block Rate Tariff • Power factor tariff • Maximum Demand tariff • Load factor tariff 						
	5.4	Application of tariff system to reduce energy bill.						
5.5	Simple numerical based on power factor and load factor tariff.							
6	Energy Conservation by Cogeneration		5	08	1,2, 3,4	20%	40%	40%
	6.1	What is cogeneration?						
	6.2	Need for cogeneration.						
	6.3	Classification of cogeneration system on the basis of sequence of energy use. <ul style="list-style-type: none"> • Topping cycle • Bottoming cycle 						
6.4	Classification of cogeneration system on the basis of technology.							

	<ul style="list-style-type: none"> • Steam turbine cogeneration. • Gas turbine cogeneration • Reciprocating engine cogeneration. 						
6.5	Factors governing the selection of cogeneration system.						
6.6	Advantages of cogeneration						
7	Energy Conservation Equipment						
7.1	What is energy conservation equipment?						
7.2	Energy conservation equipment related to Lighting system.	5	06	1,2, 3,4	20%	40%	40%
8	Energy Audit						
8.1	Energy flow diagrams and its significance.						
8.2	Energy audit instruments and their use						
8.3	Prepare questionnaire for energy audit projects.						
8.4	ABC analysis and it's advantages referred to energy audit projects.	5	8	5	30%	30%	40%
8.5	Energy Audit procedure (walk through audit and detailed audit).						
8.6	Calculation of simple pay back period (Simple numerical)						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxonomy).							

Practical Course Outcomes:

Student should be able to

CO1	Study of Electricity act 2003
CO2	Collect information by commercial survey
CO3	Comparative study of energy efficient system
CO4	Visit at any residential or commercial organisation and prepare a report.

Text Books:

Sr. No.	Author	Title	Publisher and Edition
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1.	S. Sivanagraju M. Balasubba Reddy D. Srilatha	Generation And Utilization Of Electrical Energy	Pearson, New Delhi
2.	P. H. Henderson	India - The Energy Sector	University Press

Reference books

Sr. No.	Author	Title	Publisher and Edition
1	Albert Thumann, C.E. M William J Younger C.E.M	Handbook Of Energy Audits	Fairmont Press, Inc, 7 th edition
1	B. G. Desai J. S. Rana A. V. Dinesh R. Paraman	Efficient Use And Management Of Electricity In Industry	Devki Energy Consultancy PVT. Ltd.

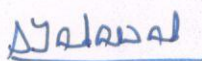
Websites:

- 1) [.http://nptel.ac.in/courses/108105058/2](http://nptel.ac.in/courses/108105058/2)
- 2) Website of bureau of energy and efficiency : www.bee-india.nic.in
- 3) Website of Akshay Urja News Bulletin : www.mnes.nic.in
- 4) Notes on energy management on
www.energymanagertraining.com www.greenbusiness.com, www.worldenergy.org

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: SMART GRID
COURSE CODE	: 172EE64E3

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	-	2	5	3	80	32	20	100	40	-	-	25**	10	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

After studying this subject, students will be able

- 1) To know a high level of qualitative and quantitative understanding of how modern power systems operate from a physical and economic perspective.
- 2) To analyze the information and communication technologies are being deployed to modernize the electric energy infrastructure.
- 3) To know various technologies like smart metering, electric vehicle, etc.
- 4) To evaluate energy efficiency and demand response in smart grid.
- 5) To know the challenges of smart transmission.

Course Outcomes:

Student should be able to

CO1	Develop a basic understanding of the current electric grid and power system that may be incrementally altered or transformed over time by the emerging Smart Grid.
CO2	Understand the impacts of renewable resources to the grid and the various issues associated with integrating such resources to the grid.
CO3	Be introduced to communication, networking, and sensing technologies involved with the smart grid
CO4	Understand the concepts and principles of Smart Grid, technology enabling, and demand participation.
CO5	Gain appreciation for the technology and processes needed to deliver power reliably 24/7.

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Introduction to smart grids	10	20	2	40%	40%	20%
	1.1 Smart grid concept						
	1.2 Representative Architecture						
	1.3 Smart Grid components and technologies at transmission systems						
	1.4 Functions of smart grid components and technologies at distribution level						
2	Smart Grid Communications And Measurement Technology	07	10	2&3	40%	30%	30%
	2.1 Communication and Measurement						
	2.2 Monitoring, PMU, Smart Meters, and Measurements Technologies						
	2.3 GIS and Google Mapping Tools						
	2.4 Multiagent Systems (MAS) Technology						
	2.5 Microgrid and Smart Grid Comparison						
3	Smart Metering	10	20	1	40%	40%	20%
	3.1 Evolution of electricity metering						
	3.2 Key components of smart metering						
	3.3 Overview of the hardware used in smart metering						
	3.4 Communications infrastructure and protocols for smart metering						
	3.5 Demand-side integration						
SECTION-II							
Unit & Sub-Unit	Topics/Sub-topics						
4	Electric Vehicle	07	10	1	40%	40%	20%
	4.1 Electric vehicle technologies						
	4.2 Electric vehicle components						
	4.3 International and Indian standards						
	4.4 Vehicle Grid Integration (VGI)						
	4.5 Motivation of VGI						
	4.6 Challenges and opportunities in VGI						
	4.7 Smart grid role in VGI						
5	Smart grid – Energy Efficiency and Demand Response (DR)	07	10	2	40%	40%	20%
	5.1 History of energy efficiency in India						
	5.2 Acts and regulations related to energy efficiency						
	5.3 Regulatory approach for energy efficiency						
	5.4 Demand Side Management						

	5.5	Technological components of DR programs						
	5.6	DR processes, DR pricing as an ancillary service						
6		Case Studies and Testbeds for smart grid						
	6.1	Introduction						
	6.2	Demonstration Projects						
	6.3	Smart grid project: smart microgrid village in Odisha, India - location, functionality, time period	07	10	3,4	40%	30%	30%
	6.4	Smart grid project: smart microgrid village in Odisha, India - brief description, background, implementation and outcomes						
	6.5	Challenges of Smart Transmission						
	6.6	Benefits of Smart Transmission						

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	India Smart Grid Forum (ISGF)	Smart Grid Handbook For Regular And Policy Makers	
2	A Keyhani, M Marwali	Smart power grids	Springer

Reference books and Websites:

Sr. No.	Author	Title	Publisher And Edition
1	Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkin	Smart Grid Technology And Applications	A John Wiley & Sons, Ltd., Publication
2	James Momoh	Smart Grid Fundamentals Of Design And Analysis	A John Wiley & Sons, Inc., Publication

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: SUBSTATION PRACTICES
COURSE CODE	: 172EE64E4

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IS T	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
3	2	-	5	3	80	32	20	100	40	-	-	25*	10	25@	10	150

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

The students will be able to:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following **industry oriented skills**.

Course Outcomes:

Student should be able to

CO1	Consider safety rules for Substation practices.
CO2	Maintain substation earthing and neutral grounding.
CO3	Operate & Maintain the Sub-station Equipments and Bus bar layout.
CO4	Use maintenance steps in substation.
CO5	Operate and maintain Gas insulated Substation.

Course Content:

SECTION-I

Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1.	Sub- stations and its Safety	6	4	1	30%	30%	40%
	1.1 Definition of substation. 1.2 Switching Sub-stations. 1.3 Typical sub-stations in distribution system. 1.4 Classification of sub-station. 1.5 Requirements of Electrical safety. 1.6 Temperature class (Ignition Group). 1.7 Weather protection. 1.8 Explosion protection techniques						
2.	Sub- Station Earthing & Neutral Grounding (Earthing	12	26	2	30%	30%	40%
	2.1 Equipment earthing 2.2 Functions of Sub-stations earthing system. 2.3 Connection of electrical equipment to station earthing system. 2.4 Sub-station earthing system. 2.5 Earth electrodes. 2.6 Integrated earthing systems for two or more installations. 2.7 Step potentials and touch potentials. 2.8 Earth resistance of earthing systems. 2.9 Earth resistance measurement. 2.10 Earth screen. 2.11 Definition of neutral grounding. 2.12 Disadvantages of ungrounded systems. 2.13 Advantages of neutral grounding. 2.14 Types of grounding. 2.15 Reactance in neutral connection. 2.16 Connection of arc suppression coil. 2.17 Neutral point earthing of transformer L.V. circuits. 2.18 Neutral grounding practice. 2.19 Earthing transformer. 2.20 Ratings of neutral devices.						
3	Sub- station Equipments and Bus bar layout	8	10	3	40%	30%	30%

	<p>3.1 Requirements of isolators & its rating.</p> <p>3.2 Ratings of relays.</p> <p>3.3 Layout the switch yard equipments</p> <p>3.4 Location of Relays, C.B., C.T. &P.T.</p> <p>3.5 Bus bar arrangements in switch yards.</p> <p>3.6 Bus bar systems recommended for large important sub-stations.</p> <p>3.7 Maintenance zoning.</p> <p>3.8 Used a load break switches.</p> <p>3.9 Isolated phase Bus systems.</p> <p>3.10 Continuous housing types isolated phase basis.</p>						
SECTION II							
4	Maintenance procedure in substation	10	24	4	30%	30%	40%
	<p>4.1 Break Down Maintenance versus preventive maintenance.</p> <p>4.2 Inspections, servicing, overhaul.</p> <p>4.3 Guidelines of maintenance of switch gear.</p> <p>4.4 Field quality plans.</p> <p>4.5 Maintenance of SF6 circuit breaker.</p> <p>Relays & Isolators</p> <p>4.6 Typical maintenance of record card.</p> <p>4.7 Insulation resistance measurement at site.</p> <p>4.8 Likely troubles and essential periodic checks.</p> <p>4.9 Installation of Draw out metal clad switch gear.</p> <p>4.10 Installation of outdoor circuit</p>						

	breaker and relays						
5	Gas Insulated sub-station	8	16	5	40%	30%	30%
	5.1 Gas Insulated Substation (GIS). 5.2 Single line diagrams of sub-station. 5.3 SF6 insulated switch gear. 5.4 Partial discharge monitoring. 5.5 Loss measurement and temperature rise tests 5.6 Installation and maintenance of GIS.						
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

Text Books:

1	Principles Of Power System	V.K. Mehta	S.Chand & Co.Ltd, Reprint, 1996. ISBN : 81-219-0594-X
2	A Course in Electrical Power	M. L.Soni, P.V.Gupta , U.S. Bhatnagar	Dhanpat Rai & Co. (P) Ltd., First Edition ,1997-98 ISBN : 10: 8177000209 / 13: 9788177000207
3	Switchgear Protection and Power Systems	Sunil S. Rao	Khanna Publisher, 13th Edition, 2008 ISBN :10: 8174092323

Websites:

a) <http://nptel.iitm.ac.in>


b) <http://iitm.vlab.co.in/?sub=46&brch=144&sim=1056&c=4>

c) <http://www.edumedia-sciences.com>

Subject Coordinator



Curriculum Coordinator



Head

Diploma in Electrical Engineering



Dean – Diploma



COURSE NAME :	DIPLOMA IN ELECTRICAL ENGINEERING
COURSE CODE :	DEE
SEMESTER :	SIXTH
SUBJECT TITLE :	MANAGEMENT PRINCIPLES
SUBJECT CODE :	172EE65

TEACHING AND EXAMINATION SCHEME:-

Teaching Scheme				Paper Hours	Examination Scheme										Total Marks	
L	T	P	CR		Theory		IST	Total		PR		OR		TW		
					Max	Min		Max	Min	Max	Min	Max	Min	Max		Min
3	-	-	3	3	80	32	20	100	40	-	-	-	-	25@	10	125

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

- 1) Students of diploma courses on completion of the course join industry in supervisory positions, where they are responsible for decision making, leading, motivating and controlling the subordinates.
- 2) This subject aims at exposing them to theory and practice related to these through lectures, seminars and case studies.

Course Outcomes:

CO1	Classify different management & planning processes in the work environment.
CO2	Describe Role & Responsibilities of a Technician in an Organizational Structure.
CO3	Apply various rules and regulations to lead and control the group of technicians to fulfill Business & Social responsibilities.

Course Content:

Unit & Sub-Unit	Topics/Sub-topics	Hours	CO	R Level	U Level	A Level
1	OVERVIEW OF MANAGEMENT: Definition ,	2	1	40%	40%	20%

	Management, Role of managers , Evolution of Management thought , Organization and the environmental factors , Trends and Challenges of Management in Global Scenario					
2	PLANNING: Nature and purpose of planning - Planning process - Types of plans – Objectives - - Managing by objective (MBO) Strategies - Types of strategies - Policies - Decision Making - Types of decision - Decision Making Process - Rational Decision Making	4	1	30%	50%	20%
3	ORGANIZING : Nature and purpose of organizing - Organization structure - Formal and informal groups organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - - Performance Appraisal.	4	2	30%	30%	40%
4	DIRECTING: Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.	8	1	30%	50%	20%
5	CONTROLLING : Process of controlling - Types of control - Budgetary and non-budgetary control Q techniques - Managing Productivity - Cost Control - Purchase Control – Maintenance Control - Quality Control - Planning operations.	4	2	20%	40%	40%
6	Motivation: Maslow’s and Herzberg’s theories. Incentives. Leadership: Autocratic and democratic styles, Situational leadership. Leadership continuum and managerial grid. Controlling: Controlling process. Requirements of a good control system.	4	3	20%	40%	40%

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).

List of Practical/Assignments/Tutorials:

- 1) Six groups and individual assignments
- 2) 3 to 4 case studies,
- 3) 1 seminar
- 4) 1 role plays/group discussion on the above topics.

Text Book:

Sr. No.	Author	Title	Publisher and Edition
1	Telsang M.T	Industrial and business management,	2007 Edition, S Chand Publishers.

Reference Books:

Sr. No.	Author	Title	Publisher and Edition
1	By Koontz	Essentials for Management: An International Perspective,	8 th Edition, Mhe Publisher.
2	Dr P N Reddy, Prof H R Appannaiah, Prof V Surendar	Industrial Organisation and Management,	3 rd Edition, Himalaya Publishers.

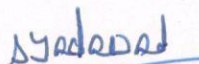
Websites:

- 1) [https://corporatefinanceinstitute.com/resources/careers/soft skills/management-skills/](https://corporatefinanceinstitute.com/resources/careers/soft-skills/management-skills/)
- 2) https://www.mindtools.com/pages/article/newTMM_28.htm
- 3) <https://blog.sodexoengage.com/maslow-herzberg-and-pinks-theories-in-the-workplace>
- 4) https://www.researchgate.net/publication/326380787_A_Comparative_Study_on_Motivation_Theory_with_Maslow's_Hierarchy_theory_and_Two_factor_theory_in_Organization
- 5) <https://keydifferences.com/difference-between-maslow-and-herzberg-theories-of-motivation.html>
- 6) <https://www.toppr.com/guides/business-studies/directing/communication/>
- 7) <https://study.com/academy/lesson/downward-communication-definition-advantages-disadvantages.html>
- 8) <https://www.managementstudyhq.com/types-of-communication.html>

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: PROJECT (MAJOR PROJECT)
COURSE CODE	: 172EE66

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IS T	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
-	-	6	6	-	-	-	-	-	-	-	-	50*	20	100	40	150
												*		@		

Course Objectives: To develop problem solving ability through scientific and systematic way using technical knowledge and skills gained during the program

Course Outcomes: Student should be able to

CO1	Work in a team, plan and coordinate the work
CO2	Analyze the project requirements and review the available literature
CO3	Formulate the methodology to solve the identified problem
CO4	Apply the principles, tools and techniques from the acquired knowledge to solve the problem
CO5	Develop technical writing skills with effective communication

Project Topic Selection : The project topic can be selected from any of the broad areas listed below related to electrical discipline:

- Fabrication of small machines, devices, demonstration models, etc.
- Design and fabrication of mechanisms, machines, devices, etc.
- Development of computer programming for designing of machine components, simulation of movements and operations, 3D modeling, etc.
- Industry supported projects: Solving problem faced by industry

- Investigative projects: Causes for change in performance or structure under different constraints through experimentation and data analysis
- Maintenance based projects: Systematic maintenance of a machine/equipment/ system lying idle due to lack of maintenance, repair it and bring it to working condition
- Industrial engineering based projects: Projects based on work study, method study, method improvement or productivity improvement
- Low cost automation projects
- Innovative/ creative projects: Design, development and implementation of new concepts
- Environment based projects: Pollution control, waste management, waste recycling, energy conservation, etc.
- Market survey project: Identification of demand, sales forecasting, marketing strategies, distribution channels, etc.
- Project based on recent developments
- Technology application for rural areas

Activity Planning

1. Group formation (Maximum students 3 per group)
2. Literature survey and searching of topic
3. Project topic selection
4. Define problem statement for project work
5. Submission of synopsis of proposed work (2 to 5 pages)
6. Project planning and methodology
7. Allocation of work responsibility to team members
8. Procurement of raw material / collection of data/ survey/ Analysis
9. Project execution
10. Implementation of modules / Testing
11. Progressive presentation of work

Report Writing

- Each group shall submit one soft and one hard copy of project report to the department apart from individual copy.
- The project report shall be of 50 to 70 pages.
- The structure of the report shall be as follows:
 - Title page
 - Certificate

- Abstract
- Acknowledgement
- Table of contents
- List of tables and figures (if applicable)
- Introduction
- Objective of project
- Methodology used: Design, Drawing Assembly, Testing, Costing
- Results
- Conclusions
- Scope for future work
- References
- Annexure
- The format shall be as below:
 - Font type – Times new roman
 - Font size: Heading – 14 font (bold), content – 12 font
 - Alignment – Justified
 - Line spacing – 1.5
 - Header content – left side – name of department, right side – name of project
 - Footer – Page number (Center)
 - Numbering of chapters, sections and subsections: Decimal form e.g. Chapter 2, section 2.1, 2.2, etc and subsection 2.2.1, 2.2.2, etc.
 - Numbering of tables and figures: Chapter wise e.g. Chapter 2, Table No. 2.1, 2.2, etc. and Figure No. 2.1, 2.2, etc.

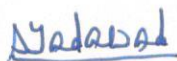
Project Assessment

Continuous evaluation of individual team member shall be followed. Each student shall maintain a project diary giving details of planning, work execution, information collected, etc. on weekly basis assessed regularly by project guide. Attendance of the student shall also be taken into account during assessment. The project presentation and oral shall be jointly evaluated by external examiner and guide.

Subject Coordinator



Curriculum Coordinator



Head



Dean – Diploma

Diploma in Electrical Engineering



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRICAL ENGINEERING
PROGRAMME CODE	: DEE
SEMESTER	: SIXTH
COURSE TITLE	: NEW TRENDS IN INDUSTRIES
COURSE CODE	: 172EE67

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IS T	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min			
2	-	-	2	-	-	-	-	-	-	-	-	-	-	25@	10	25

*Assessment by Internal Examiner **Assessment by External and Internal Examiner @TW Assessment by Internal Examiner

Course Objectives:

After studying this subject, students will be able to

- 1) Identify the new devices, drives, equipment's, machines, gadgets with specifications.
- 2) Collect the information about new trends and technologies.
- 3) Familiarization of new technology with various new devices and drives, etc.

Course Outcomes:

Student should be able to

CO1	Acquire information regarding various new devices, derives, machines, etc from different sources.
CO2	Interpret the data acquired from various sources.
CO3	Hands on practice on various new devices, gadgets, etc
CO4	Prepare a market survey report and procure the equipment as and when needed.

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	Market Survey:A group of four or six students	10		1			

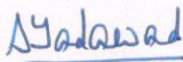
	should collect information from the market and/or industries regarding specifications, technologies, utility, applications, cost of any three manufactures/ industries devices, gadgets, machines, drives, etc.						
2	Product Report: Report is to be prepared by each group based on the survey done in the market industries and submit it as team work. Seminar: Individual student from each group has to prepare for power point presentation on their surveyed product and submit the report.	08		1,2			
SECTION 2							
3	Hands on Practice: New equipments present in various labs are to be utilized for doing practice for its operation and working. Acquire the knowledge about that new equipment used in industry.	12		3			
4	Procurement new equipment: In the survey any equipment is new in technology and utilized in the electrical field procure it for practice and study.	10		4			
Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

Note: Special arrangement for industrial visit and new equipments around Rs.50,000 /- should be sanction from the departmental budget.

Subject Coordinator



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Head



Dean – Diploma

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