

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES

COURSE NAME: *DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)*

COURSE CODE : *EEPS*

DURATION OF COURSE : 6 SEMESTER

SEMESTER: *SIXTH SEMESTER*

Sl. No.	SUBJECT THEORY	PERIODS			EVALUATION SCHEME							CREDITS
		L	T	P	SESSIONAL EXAM			ESE	PRACTICAL (SESSIONAL)		TOTAL MARKS	
					TA		TOTAL		(INT.)	(EXT.)		
1	Power system Operation & Load Dispatch	4	--	3	10	20	30	70	25	25	150	4
2	Electrical Design Estimation & Costing	4	--	3	10	20	30	70	25	25	150	4
3	Electrical Installation, Maintenance, Testing & repairing	4	--	--	10	20	30	70			100	3
4	Industrial Management	3	--	--	10	20	30	70			100	3
5	<i>Elective - II</i> (Any One)	3	--	2	10	20	30	70	25	25	150	4
	1) Control of Electrical Machines.											
	2) Industrial Automation											
	3) Computer Aided Power System Analysis & Operation.											
6	Industrial Project	--	--	4					50	50	100	2
7	Professional Practices - IV	--	--	3					50		50	2
8	General Viva Voce	--	--	--					100		100	2
	TOTAL	18	0	15	50	100	150	350	275	125	900	24
								500	400			

STUDENT CONTACT HOURS PER WEEK: **33 HRS**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH

ABBREVIATIONS: L - Lecture, T - Tutorial, P - Practical, TA - Teachers Assessment, CT- Class Test, ESE - End Semester Exam, INT-Internal, EXT-External

TA: Attendance & surprise quizzes = 6 marks. Assignment & group discussion = 4 marks.

Total Marks : 900

Minimum passing marks for sessional is 40%, and for theory subject 40%.

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Power System Operation & Load Dispatch	
Course Code: EEPS/S-6/PSOLD	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory : 4 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: 3 hrs./week	End Semester Exam.: 70 Marks
Credit: 4	Practical: 50 Marks

Aim

To develop the basic knowledge on power system Controls and Operations.

Objectives:

1. Understand the basics of power system operating principles and controls.
2. Understand how to obtain optimum performance of the existing power system.
3. Know various power system controls such as excitation and voltage control, automatic generation control, VAR flow and its compensation methods etc.
4. Understand economic operation of power system, develop the ability to analyze the load curve and make forecast of the loads based on load curve.
5. Know to form Y bus and solve numerical for a three bus system.

Pre-requisite

1. Fundamental of Power System.
2. Relation between different types of power.

Units	CONTENTS	HOURS	Marks
1	<p>Concept of Complex Power Flow (Real and Reactive Power) in Power System.</p> <ul style="list-style-type: none"> ❖ Concept and significance of bus, classification ❖ Concept of Real power flow in Power System. ❖ Relation between Real power and frequency of the system. <ul style="list-style-type: none"> ✓ Derive relation for a simple two bus system. ✓ Effect of change in frequency on various consumers and Utilities. ❖ 1.3 Relation between Reactive power and voltage of the system. <ul style="list-style-type: none"> ✓ Effect of change in voltage ✓ Concept of reactive power compensation <ul style="list-style-type: none"> • Load and line compensation. ✓ Types of Compensation (method of providing compensation and explanation and advantages). <ul style="list-style-type: none"> • Shunt compensation • Series compensation • Synchronous Compensation <p>(Simple numerical on the above topic)</p> 	10	11
2	<p>Load Flow Studies</p> <ul style="list-style-type: none"> ❖ Need of load flow analysis <ul style="list-style-type: none"> ✓ Data required for load flow studies ✓ Derivation of static load flow equation(S.L.F.E) for simple two bus system. ✓ Information obtained from load flow studies. ❖ Formation of Y bus. <ul style="list-style-type: none"> ✓ Power system equations <ul style="list-style-type: none"> • Bus loading and line flow equations. 	14	15

Units	CONTENTS	HOURS	Marks
	<ul style="list-style-type: none"> • SLFE in general form ✓ Numerical for 3 bus system including reference bus 		
3	<p>Power System Stability</p> <ul style="list-style-type: none"> ❖ Definition and illustration of terms: <ul style="list-style-type: none"> • Power system stability and instability. • Stability limit • Transient stability and its limit • Steady state stability and its limit. • Dynamic state stability. • Overall stability. ✓ A simple two machine power system for stability studies.(model , concept and complete explanation). ✓ Adverse effects of instability ❖ Swing equation (no derivation) and the significance of power angle. <ul style="list-style-type: none"> ✓ Transient stability. <ul style="list-style-type: none"> • Factors affecting transient stability • Methods of improving transient stability. ✓ Steady state stability <ul style="list-style-type: none"> • Derivation of maximum power flow under steady state condition. <p>(Simple numerical on the above topic)</p>	14	15
4	<p>Automatic generation and Voltage control</p> <ul style="list-style-type: none"> ❖ Schematic diagram of load frequency and excitation voltage regulators of a turbo generator and describe the function of each block <ul style="list-style-type: none"> ✓ Load frequency control (single area case) <ul style="list-style-type: none"> • Turbine speed governing system. ✓ Automatic voltage control <ul style="list-style-type: none"> • Schematic diagram of alternator voltage regulator scheme and its explanation. ✓ The automatic load frequency and voltage regulator control loops of a synchronous generator and its explanation and advantages. ❖ Methods of voltage control <ul style="list-style-type: none"> • Reactive power injection. • Control by transformers (Explain in detail). <p>(Simple numerical on the above topic)</p>	13	14
5	<p>Load Dispatching</p> <ul style="list-style-type: none"> ❖ Load forecasting <ul style="list-style-type: none"> ✓ Need of forecasting. ✓ Forecasting based on load curve. ✓ Environmental and social factors in load forecasting. ✓ Planning tools ❖ Load shedding and its governing factors ❖ Functions of load dispatch centre. ❖ Types of LDC and their significance. ❖ Economic and Optimum load dispatch <ul style="list-style-type: none"> ✓ Input output curve ✓ Incremental fuel rate ✓ Incremental efficiency ✓ Economic dispatch neglecting losses. ✓ Optimum load dispatch including transmission losses <p>(Simple numerical on economic dispatch neglecting losses.)</p>	13	15

Units	CONTENTS	HOURS	Marks
		TOTAL	64
			70

List of Practicals :

1. To collect data from any two types of industrial consumers (HT / LT/ Processing/ Manufacturing) related to change in their operating supply frequency and voltage and the impact created on real power and reactive power of their loads respectively.
2. Simulation of a simple two bus system model and feeding the input data for the system and then obtaining sending and receiving powers, sending end power factor and transmission efficiency using MATLAB.
3. Simulation of a turbine speed governing system of a turbo generator and observe and record the effective change in frequency of a system by changing the speed of the governor using MATLAB.
4. Simulation of a voltage regulator scheme of a synchronous generator and observe and record the effect of changing the excitation on the generated voltage of the generator using MATLAB.
5. Formation of a Y bus using MATLAB and feeding the values of line impedances and write the [Y bus] matrix.
6. To visit power plant / substation and make a report writing about the different controls used for frequency and voltage in the station.
7. To visit industries where the reactive power compensating equipments are installed and draw line diagram of the same and learn the working of the equipments.
8. To study about the methods followed for the improvement of power factor for the reactive loads of industries.
9. To collect magazines / journals / seminar report (published by expert) on any topic related to the subject and read and understand thoroughly and make a brief report about it.

BOOKS:

SL. No.	Author	Title	Publisher
1	I. J. Nagrath & D. P. Kothari	Modern Power System Analysis (IV th Edition)	Tata McGraw Hill
2	K. A. Gangadhar	Electric Power Systems (Analysis , Stability and Protection)	Khanna Publishers
3	William Stevenson	Elements of Power System Analysis	McGraw Hill Series
4	Olle L. Elgerd	Electrical Energy System Theory	Tata McGraw Hill
5	B. R. Gupta	Power System Analysis and Design	S. Chand and Co.
6	C. L. Wadhava	Electrical Power System	New age international publishers
7	Abhijit Chakrabarty	Power System Analysis, operation and control	PHI

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2,3,	15	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10X5 = 50
B	4,5	10				FOUR			

EXAMINATION SCHEME (SESSIONAL)

Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Sixth Semester. **Distribution of marks: Performance of Job - 15, Notebook - 10.**

External Assessment of 25 marks shall be held at the end of the Sixth Semester. Distribution of marks: **On the basis of Experiment Reports - 15, Viva-voce - 10.**

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Electrical Design, Estimation & Costing	
Course Code: EEPS/S6/EDEC	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory : 4 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: 3 hrs./week	End Semester Exam.: 70 Marks
Credit: 4	Practical: 50

Aim:

Sl. No.	
1.	Electrical Diploma holders have to work as Technicians & Supervisors for Electrical Installations of various companies, commercial and Industrial electrification schemes and prepares estimates for these schemes.
2.	Knowledge of electrical engineering drawing, IE rules, NEC, different types of electrical Installation their design considerations equips the students with the capability to design and Prepare working drawing of different Installation projects.
3.	Understanding of the methods and procedure of estimating the material is also required.

Objective:

Sl. No.	Student will be able to:
1.	State IE rules, NEC related to Electrical Installation and testing
2.	Interpret the Electrical Engineering Drawing
3.	State and describe the basic terms, general rules, circuit design procedure, wiring design and design considerations of Residential Electrical Installations,
4.	Explain the sequence to be followed in carrying out the estimate of Residential Electrical Installations.
5.	Design of main dimensions of rotating machines.
6.	Design of core and winding of a 3-phase transformer up to 200KVA
7.	Understand the concept of contracts, contractors, tender and tender document and its related procedures.

Pre-Requisite:

Sl. No.	
1.	Basic Electrical Engineering
2.	Engineering Graphics

Contents (Theory)

Unit	Contents (Theory)	Hrs./Unit	Marks
1	<p>Standard Norms and Specifications: Importance of Design-Estimation-Costing of electrical equipments & installations, Concept of I.E. Rules, Importance of Standards & Specifications for electrical installation and equipments.</p> <p>Indian Electricity Rules (1956): Rule 28 : Voltage level definitions. Rule 30: Service lines & apparatus on consumer premises. Rule 31: Cut-out on consumer's premises. Rule46: Periodical inspection & testing of consumer's installation. Rule 47: Testing of consumer's installation. Rule 54: Declared voltage of supply to consumer. Rule 55: Declared frequency of supply to consumer. Rule 56: Sealing of meters & cut-outs. Rule 77: Clearances above ground of the lowest conductor. Rule 79: Clearances between conductors & trolley wires.</p>	04	06

Unit	Contents (Theory)	Hrs./Unit	Marks
	Rule 87: Lines crossing or approaching each other. Rule 88: Guarding.		
2	Design of Lighting circuits: <ul style="list-style-type: none"> • Illumination level required for various applications, • Factors considered for good lighting design, • Determination of number of lamps & selection of lamp type, • Design for placement of lamps in a room for proper & uniform illumination. 	4	6
3	Service Connection <ul style="list-style-type: none"> • Concept of service connection. • Types of service connection & their features. • Methods of Installation of service connection. • Estimates of underground & overhead service connections. 	6	8
4	Residential Building Electrification <ul style="list-style-type: none"> • General rules guidelines for wiring of Residential Installation and positioning of equipments. • 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 & cables. • Load calculations and selection of size of conductor. • Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories. • Earthing of Residential Installation. • Sequence to be followed for preparing Estimate • Preparation of detailed estimates and costing (approx.) of electrification of Residential Installation. 	10	10
5	Electrification of commercial Installation <ul style="list-style-type: none"> • Concept of commercial Installation. • Differentiate between electrification of Residential and commercial Installation. • Fundamental considerations for planning of an electrical Installation system for commercial building. • Design considerations of electrical Installation system for commercial building. • Load calculations & selection of size of service connection and nature of supply. • Deciding the size of cables, busbar and busbar chambers. • Mounting arrangements and positioning of switchboards, distribution boards main switch etc. • Earthing of the electrical Installation • Installation of an 11 KV indoor sub-station • Selection of type wire, wiring system & layout. • Sequence to be followed to prepare estimate. • Preparation of detailed estimate and costing(approx.) of electrification of commercial Installation. 	12	12
6	Electrification of factory unit Installation <ul style="list-style-type: none"> • Concept of Industrial load. • Concept of Motor wiring circuit and single line diagram. • Important guidelines about power wiring and Motor wiring. • Design consideration of Electrical Installation in small Industry/Factory/workshop. • Motor current calculations. • Selection and rating of wire, cable size. 	10	10

Unit	Contents (Theory)	Hrs./Unit	Marks
	<ul style="list-style-type: none"> Deciding fuse rating, starter, distribution boards main switch etc. Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. Sequence to be followed to prepare estimate. Preparations of detailed estimate and costing of small factory unit/workshop. 		
7	Design of Electrical Transformer: <ul style="list-style-type: none"> Single phase transformer up to 1 KVACore Design, Selection of stamping, winding design, window area calculation. (Numerical) 3-phase transformer up to 250 KVA -Basic design principles and approaches, Specification, Magnetic circuit, Output equations and Output Co-efficient, Core construction and design, Window design, Winding design, Size of tank, Winding temperature rise, Insulation classes, Cooling methods. (Numericals) 	10	10
8	Contracts, Tenders and Execution <ul style="list-style-type: none"> Concept of contracts and Tenders Contracts, types of contracts, contractors. Valid Contracts, Contract documents. Tender and tender notices. Procedure for submission and opening tenders. Comparative statements, criteria for selecting contractors, General conditions in order form. Principles of Execution of works Administrative approval, Technical sanctions. Billing of executed work. 	8	8
TOTAL		64	70

Contents (Practical)

SI. No.	Skills to be developed
1.	Intellectual Skills: i) Analytical Skill ii) Identification skill
2.	Motor Skills: i) Operate various parts of computer properly, ii) Problem solving skill.

Suggested list of Laboratory Experiments:

SI. No.	Laboratory Experiments
1.	A newly constructed workshop is required to be fitted with a 10 H.P. Squirrel cage induction motor. 1) Draw Installation plan showing location of main control board, motor control board, motor etc, (using CAD) ii) Draw single line wiring diagram, (using CAD) iii) Draw wiring diagram starting from energy meter upto electric motor, (using CAD)
2.	Draw Single line diagram and layout plan of 11KV indoor & outdoor Substation (using CAD)
3.	Draw Sectional Drawing of different types of cables, overhead conductors (using CAD)
4.	Draw Sectional Drawing of different types of insulators (using CAD)
5.	Draw Core construction, H.T. & L.T. winding, other accessories of 3 phase transformer (using CAD).
6.	Draw pole, yoke, field coils, commutator and its details of D.C. Machine (using CAD).
7.	Draw transmission line structure (using CAD)

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
K.B. Raina S.K.Bhattacharya	Electrical Design; Estimating and costing	New Age International (p) Limited, New Delhi
Surjit Singh	Electrical Estimating and costing	Dhanpat Rai and company, New Delhi
N. Alagappan S. Ekambaram	Electrical Estimating and costing	Tata Me Graw Hill Publication, New Delhi
S.L. Uappal	Electrical wiring Estimating and costing	Khanna Publication.

B.D.Arora	Electrical wiring, Estimating and costing	R.B. Publication, New Delhi
Surjit Singh	Electrical Engineering Drawing	S.K.Kataria & Sons

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3,4,5	12	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	6,7,8	11				FOUR			

EXAMINATION SCHEME (SESSIONAL)

1. **Continuous Internal Assessment of 25 marks** is to be carried out by the teachers throughout the Sixth Semester. **Distribution of marks: Performance of Job - 15, Notebook(Drawing Sheet)- 10.**
2. External Assessment of 25 marks shall be held at the end of the Sixth Semester on the entire Sessional syllabus. One Drawing sheet from any one of the above is to be drawn. **Distribution of marks: On spot job - 15, Viva-voce -10.**

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Electrical Installation , Maintenance , Testing	
Course Code: EEPS/S6/EIMT	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory : 4 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: -- hrs./week	End Semester Exam.: 70 Marks
Credit: 3	Practical: NIL

Aim:

SI. No.	
1.	This is technology level subject with application in Industry, commercial, public utility departments such as PWD, Electricity Board etc.
2.	After studying this subject student will be able to inspect, test, install & commission electrical machines as per IS .

Objective:

SI. No.	The student will be able to:
1.	• Know safety measures & state safety precautions.
2.	• Test single phase, three phase transformer, DC & AC machine as per IS.
3.	• Identify / Locate common troubles in electrical machines & switch gear.
4.	• Plan & carry out routine & preventive maintenance.
5.	• Install LV switchgear & maintain it.
6.	• Ascertain the condition of insulation & varnishing if necessary.
7.	• Identify faults & measures to repair faults.

Pre-Requisite:

SI. No.	
1.	Knowledge of electrical equipments

Contents (Theory)

Unit	Contents (Theory)	Hrs./Unit	Marks
1	Safety & Prevention of Accidents: 1.1. Definition of terminology used in safety 1.2. I.E. Act & statutory regulations for safety of persons & equipments working with electrical installation 1.3. Dos & don'ts for substation operators as listed in IS. 1.4. Meaning & causes of electrical accidents factors on which severity of shock depends, 1.5. Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, 1.6. Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers	5	5
2	General Introduction: 2.1. Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. 2.2. Methods of testing a) Direct, b) Indirect, c) Regenerative. 2.3. Classification and need of maintenance 2.4. Advantages of preventive maintenance, procedure for developing preventive maintenance schedule, 2.5. Factors affecting preventive maintenance schedule. 2.6. Introduction to total productive maintenance.	5	5
3	Testing & maintenance of rotating machines 3.1. Type tests, routine tests & special tests of 1 & 3 phase Induction motors, 3.2. Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992	10	10

Unit	Contents (Theory)	Hrs./Unit	Marks
	3.3. Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968 3.4. Brake test on DC Series motor.		
4	Testing & maintenance of Transformers: 4.1. Listing type test, routine test & special test as per I.S. 2026-1981 4.2. Procedure for conducting following tests: Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise-back to back test, open delta (delta – delta) test. 4.3. Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981	10	10
5	Testing & maintenance of Insulation: 5.1. Classification of insulating materials as per I.S. 8504(part III) 1994. 5.2. Factors affecting life of insulating materials. 5.3. Methods of measuring temperature of internal parts of windings/ machines & applying the correction factor when the machine is hot. 5.4. Properties of good transformer oil. List the agents which contaminates the insulating oil. 5.5. Understand the procedure of following tests on oil as per I.S. 1692-1978 a) acidity test b) sludge test c) crackle test d) flash point test. 5.6. Filtration of insulating oil 5.7. Protection of electrical insulation during the period of inactivity. 5.8. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & revarnishing. 5.9. Methods of internal heating & vacuum impregnation.	8	10
6	Trouble shooting of Electrical Machines & Switch gear: 6.1. Significance of trouble shooting of various electrical machines and describes the procedure for the same. 6.2. Various types of faults (mechanical, electrical & magnetic) in electrical machines and reason for their occurrence. 6.3. Use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, growler. 6.4. Trouble shooting charts for Single & 3-phase induction motor, Single & 3- phase transformer. 6.5. List the common troubles in HV and LV switchgear, contactors & batteries.	8	10
7	Installation: 7.1. Inspection procedure of Machine Installation. 7.2. Factors involved in designing the machine foundation, 7.3. Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. 7.4. Installation of rotating machines as per I.S. 900-1992. 7.5. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment. 7.6. Method of drying out of Machines. 7.7. Classification of transmission tower 7.8. Installation of Transmission Tower (From foundation to complete erection).	12	10
8	Earthing: 8.1. Introduction & importance. 8.2. Step potential & Touch potential. 8.3. Factors affecting Earth Resistance. 8.4. Methods of earthing	6	10

Unit	Contents (Theory)	Hrs./Unit	Marks
	8.5. Substation and Transmission Tower earthing 8.6. Transformer Neutral Earthing.		
	TOTAL	64	70

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
Tarlok Sibgh	Installation, Commissioning & Maintenance of Electrical Equipment	S.K.Kataria & Sons
B.V.S.Rao	Operatin & Maintenance of Electrical Machines Vol I & II	Media Promoters & Publisher Ltd. Mumbai

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3,4,5	12	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	6,7,8	11				FOUR			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Industrial Management	
Course Code: EEPS/S6/IM	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory : 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: -- hrs./week	End Semester Exam.: 70 Marks
Credit: 3	Practical: NIL

Aim:

Sl. No.	
1.	To study the techniques for improvement in productivity of the people and equipment, to plan the production schedule accordingly organize material supply for the manufacturing activities. To minimize the direct and indirect cost by optimizing the use of resources available. To learn accounting process, inventory control and process planning. Modern manufacturing system employ techniques such as JIT, TPM , FMS, 5'S', kaizen which should be known to the technician.

Objective:

Sl. No.	The student will able to
1.	Familiarize environment in the world of work
2.	Explain the importance of management process in Business.
3.	Identify various components of management
4.	Describe Role & Responsibilities of a Technician in an Organizational Structure.
5.	Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician

Pre-Requisite: NIL

Contents (Theory)

Unit	Contents (Theory)	Hrs./Unit
	GROUP A	
1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	04
2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management Levels of management Administration & management • Scientific management by F.W.Taylor 	05

Unit	Contents (Theory)	Hrs./Unit
	2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management Planning <ul style="list-style-type: none"> • Organizing • Directing • Controlling 2.4 Social responsibility and Environmental dimension of management]	
GROUP - B		
3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ol style="list-style-type: none"> 1. Line 2. Line & staff 3. Functional 4. Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	6
4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Objectives • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel- Training & Development <ul style="list-style-type: none"> • Types of training • Induction • Skill Enhancement 4.4 Grievance handling 4.5 Leadership & Motivation <ul style="list-style-type: none"> • Maslow's Theory of Motivation 4.6 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.7 Introduction to - <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	10
GROUP - C		
5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals 	9

Unit	Contents (Theory)	Hrs./Unit
	<ul style="list-style-type: none"> Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> Types of Budgets Production Budget (including Variance Report) Labour Budget Different financial ratios, Introduction to Profit & Loss Account (only concepts); Balance Sheet 5.4 Introduction to- <ul style="list-style-type: none"> Excise Tax. Service Tax Income Tax VAT Custom Duty 	
6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity (EOQ) 6.4 Stores function, Stores system, BIN card, Materials issue request (MIR), Pricing of materials <ul style="list-style-type: none"> Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> Objects of Purchasing Functions of Purchase Dept. Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> Introductory treatment to JIT / SAP / ERP 	9
7	Safety Engineering 7.1 Accidents-causes of accidents, Welfare measures. 7.2 Need for safety 7.3 Organization for safety 7.4 Safety committee 7.5 Safety programmes 7.6 Safety measures	5

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpat Rai & sons New Delhi
V. Arun Viswanath, Anoop. S. Nair, S.L. Sabu	Industrial Engineering and Management	SCITECH Publication(s) Pvt. Ltd
A. Bhat & A. Kumar	Management Principles, Processes & Practices	Oxford University Press
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman, E. Kirby Warren, Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication, Pune

Suggested List of Assignments/Tutorial :-

1. Preparation of financial budget of any organization.
2. Preparation of chart for fire safety.
3. Preparation of chart for personal, Tools & Equipments and products safety.
4. Preparation of chart to avoid accident.
5. Preparation of chart to show the different financial ratios.
6. Preparation of chart to show the different types of organization.

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2	7	TWENTY	ONE	1X20 = 20	THREE	FIVE, TAKING AT LEAST ONE FROM EACH GROUP	TEN	10X5 = 50
B	3, 4	7				THREE			
C	5, 6, 7	11				FOUR			

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Name of the subject: Control of Electrical Machines (Elective)	
Subject Code : EEPS/S6/CEM(EL)	Semester: Sixth
Duration : One Semester	Maximum Marks : 150
Teaching scheme :	Examination scheme :
Theory: 3 Hrs./ Week	Mid Semester Exam: 20 Marks
Practical: 2 Hrs./Week	Assignment & Quiz: 10 Marks
	End Semester Exam: 70 Marks
	Practical: 50 Marks
Credit: 04	

Aim:	
SI. No.	
1.	This subject is the combination of Electrical machine and Control system. Most of the motor control circuits are based on these systems.
2.	Understanding of the subject will provide skill to the students of different motor control systems and their applications in industry.
Objective:	
SI. No.	Student will be able to:
1.	Interpret the basics of the motor control systems.
2.	Demonstrate the solid state control of motor.
3.	Describe the implementation of PLC in control systems.
Pre-Requisite:	
1.	Knowledge of Electrical machine.
2.	Knowledge of Control system.

Contents (Theory):		Hrs./ Unit	Marks
Unit: 1	1. Control Systems : 1.1 Concept of Automatic control system. 1.2 Illustration of Open loop and closed loop control system. 1.3 Need for feed back system. 1.4 Basic elements of a servo mechanism. 1.5 Examples of Automatic control system. 1.6 Introduction to solid state control. 1.7 Advantages of solid state control of machines.	08	12
Unit: 2	2. Magnetic Control Systems: 2.1 Operation & Applications of Contactor control circuit components - (i) Switches - Push button type, Selector type, Limit switch. Pressure, Float type, Proximity, Thermostat (Temperature) (ii) Fuses - Kit-kat type, Cartridge type. HRC type (iii) MCCB, MCB. (iv) Electromagnetic Contactor. (v) Overload relays - Voltage operated, Current operated, Thermal overload relay, Magnetic overload relay, (vi) Time delay relays (OFF delay, ON delay). (vii) Timer - Pneumatic type, Electronic type. (viii) Relays - Frequency response relay, Latching relay, Phase failure relay (single phase preventer), Solid state relay. (ix) Solenoid valve. 2.2 Principles of design of motor control circuits and power circuits.	10	14

Contents (Theory):		Hrs./ Unit	Marks
Unit: 3	<p>3. MAGNETIC CONTROL OF DC MOTOR:</p> <p>3.1 Operation of Control circuit & Power circuits of -</p> <p>(i) Jogging operation of DC motor in one and two directions.</p> <p>(ii) Starters of DC motor - Current limit acceleration starter, Series relay & Counter emf starter, Definite time acceleration starter.</p> <p>(iii) Braking of DC motor - Dynamic braking , Reversing & plugging.</p> <p>(iv) Protection of DC motor - Field failure protection circuit, Field acceleration protection circuit, Field deceleration circuit.</p> <p>3.2 Solid State Control of DC Motor:</p> <p>(i) Speed control of DC motor using chopper circuit.</p> <p>(ii) Speed control of DC shunt motor using thyristor- Half-wave drives & Full-wave drives.</p>	10	14
Unit: 4	<p>4. MAGNETIC CONTROL OF AC MOTOR:</p> <p>4.1 Operation of Control circuit & Power circuits of -</p> <p>(i) Reversing the direction of rotation of induction motor with Interlocking systems</p> <p>(ii) Simple ON-OFF motor control circuit,</p> <p>(iii) Automatic Sequential control of motor.</p> <p>(iv) DOL starter,</p> <p>(v) Automatic Auto-transformer starter,</p> <p>(vi) Automatic Star-Delta starter.</p> <p>(vii) Starter for multispeed operation of motor.</p> <p>(viii) Plugging & Dynamic braking of AC motor.</p> <p>(ix) Protection of AC motor - Overload, Short circuit and Over temperature protection of high rating motors.</p> <p>4.2 Solid State Control of AC Motor:</p> <p>(i) Speed control of three phase induction motor using variable voltage frequency control,</p> <p>(ii) Speed control of slip-ring induction motor using variable rotor circuit resistance.</p> <p>(iii) Speed control of single phase induction motor using thyristor.</p> <p>(iv) Speed control of synchronous motor.</p> <p>(v) Speed control of universal motor.</p>	10	14
Unit: 5	<p>5. Use of Programmable Logic Control (PLC):</p> <p>5.1 Introduction & Advantages of PLC.</p> <p>5.2 Function of each part of PLC.</p> <p>5.3 Hardware of PLC.</p> <p>5.4 Concept of Ladder diagram in PLC programming.</p> <p>5.5 Ladder logic diagram for -</p> <p>(i) DOL starter of Induction motor,</p> <p>(ii) Automatic Star-Delta starter of Induction motor,</p> <p>(iii) Sequential operation of three motors with a time gap,</p> <p>(iv) Fluid filling operation.</p> <p>5.6 Use of PLC in closed loop control, Proportional control, Integral control, Derivative control & PID control with illustration.</p> <p>5.7 DC motor speed control using PLC programming.</p>	10	16
TOTAL		48	70

Practical:

Skills to be developed:

Intellectual Skills:

1. To select appropriate component and equipment.
2. Apply different designing skills.

Motor Skills:
1. Ability to draw the control & power circuit diagrams.
2. Ability to interpret the circuits and waveforms.
List of Practical: (At least Eight experiments are to be performed)
1. To study control components - Electromagnetic contactor, Thermal overload relay, Timer (OFF delay, On delay), Push button Switches, Solenoid valve, MCB.
2. To make & test the control and power circuit for Jogging operation, forward & reverse rotation of Sq.cage induction motor using contactor control.
3. To make & test the control and power circuit for fully-automatic star-delta starter operation of cage induction motor using contactor control.
4. To make & test the control circuit for dynamic braking operation of induction motor using contactor control.
5. To make & test the working of single phase preventer using contactor control.
6. To control speed of DC shunt motor using SCR drive.
7. To make & test the control circuit operation of DOL starter of induction motor using PLC.
8. To make & test the control circuit operation of automatic star-delta starter of induction motor using PLC.
9. To study the Speed control of DC shunt motor with PID control using PLC.
10. To make & test the control circuit operation of three sequential motor operations using PLC.

List of Text Books:			
Sl. No.	Name of Author	Title of the Books	Name of Publisher
1.	S.K.Bhattacharya	Industrial Electronics and Control	T.M.H.
2.	Dr. S.K.Sen	Electrical Machine	Khanna Publisher
3.	V. Subrahmanyam	Electric Drives - concepts & applications	T.M.Hill
4	Petruzella	Programmable Logic Controller	T.M.Hill

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2,3	12	TWENTY	ONE	1X20 = 20	FIVE	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10X5 = 50
B	4,5	11				FOUR			

Note: Paper-setter should take into account the marks which have been allotted in each unit and set the paper accordingly so that all units get the importance as allotted.

EXAMINATION SCHEME (SESSIONAL)

1. Continuous **Internal Assessment** of 25 marks is to be carried out by the teachers throughout the Sixth Semester. Distribution of marks: Performance of Job - 15. Laboratory Notebook - 10.
2. **External Assessment** of 25 marks shall be held at the end of the Sixth Semester on the entire Sessional syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. Distribution of marks: On spot job - 15, Viva-voce - 10.

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : INDUSTRIAL AUTOMATION (ELECTIVE)	
Course Code: EEPS/S6/IA(EL)	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory : 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: 2 hrs./week	End Semester Exam.: 70 Marks
Credit: 4	Practical: 50 Marks

Aim:

The contents aim to develop the knowledge of the student in the field of automation in industries. This will be comprising knowledge of PLC, DCS and SCADA Systems. They will also get familiar with different industrial standard protocols.

Objective:

Sl. No.	The students will be able to:
1.	Know what automation is and what are the tools used in achieving automation.
2.	Program PLC.
3.	Know about the function of DCS, SCADA.
4.	Get acquainted with different standard protocols used in industries.

Pre-requisite:

Sl. No.	
1.	Idea on basic control system, basic electronics, digital electronics.
2.	Basic Concept in programming

Theory:

Unit	Contents	Hours	Marks
01	Control Systems and Automation Strategy: Evolution of instrumentation and control. Role of automation in industries, Benefits of automation. Introduction to automation tools PLC. DCS. SCADA, Hybrid DCS/PLC, Automation strategy evolution. Control system audit, performance criteria, Safety Systems.	6	8
02	Programmable logic controllers (PLC): Introduction, architecture, definition of discrete state process control, PLC Vs PC. PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, PLC design. Study of at least one industrial PLC.	10	16
03	Advance Applications of PLC and SCADA: PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC. PLC interface to SCADA/DCS using communication links (RS232. RS485) and protocols (Modbus ASCII RTU)	8	11
04	Instrumentation Standard Protocols: HART Protocol introduction, frame structure, programming, implementation examples. Benefits. Advantages and Limitations. Foundation Fieldbus HI introduction, structure, programming, FDS configuration, implementation examples. Benefits, Advantages and Limitations, Comparison with other fieldbus standards including Device net. Profibus. Controlnet. CAN. Industrial Ethernet etc.	8	11
05	Distributed Control Systems: DCS introduction, functions, advantages and limitations. DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control. Batch application. Historical Data Management, OPC support, Security and Access Control etc.	10	16
06	Automation for following industries - Power. Water and Waste Water Treatment, Food and Beverages. Cement, Pharmaceuticals, Automobile and Building Automation.	6	8
TOTAL :		48	70

Contents (Practical)	
Sl. No.	Skills to be developed
1.	Intellectual Skills: i) Analytical Skill ii) Identification skill
2.	Motor Skills: i) Operate different software used in industries used in automation, ii) Problem solving skill. iii) Proper Handling of PLC/DCS/SCADA system.

PRACTICAL:

01	Study of Various types of PLCs
02	Case study of Industrial PLC/PLC trainer.
03	Ladder diagram implementation of basic logic gates.
04	Ladder diagram implementation using timers.
05	Ladder diagram implementation using counters.
06	Ladder diagram implementation using relay sequencer.
07	Ladder diagram implementation for any one automation system.
08	Experiment on SCADA System.
09	Case study of Industrial DCS/DCS trainer.
10	Experiment on DCS Trainer for batch application, database management, and communication.
11	Interface of DCS with SCADA/PLC, using protocol/field bus.

BOOKS

Sl. No.	Title	Author	Publication
01	Distributed Computer Control for Industrial Automation	Poppovik Bhatkar	Dekkar Publications
02	Programmable Logic Controllers: Principles and Applications	Webb and Reis	PHI
03	Computer Aided Process Control	S.K. Singh	PHI
04	Introduction to Programmable Logic Controllers	Garry Dunning	Thomson Learning
05	The Management of Control System: Justification and Technical Auditing	N.E.Battikha	ISA
06	Computer Based Process Control	Krishna Kant	PHI

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	12	TWENTY	ONE	1 X 20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	10 (TEN)	10 X 5 = 50
B	4, 5, 6	11				FIVE			

EXAMINATION SCHEME (SESSIONAL)

1.	Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Fifth Semester. Distribution of marks: Performance of Job - 15, Notebook - 10.
2.	External Assessment of 25 marks shall be held at the end of the Fifth Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. Distribution of marks: On spot job - 15, Viva-voce - 10.

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Computer Aided Power System Analysis & Operation(Elective)	
Course Code: EEPS/S6/CAPSAO(EL)	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 150
Teaching Scheme	Examination Scheme
Theory : 3 hrs./week	Mid Semester Exam.: 20 Marks
Tutorial: -- hrs./week	Attendance, Assignment & interaction: 10 Marks
Practical: 2 hrs./week	End Semester Exam.: 70 Marks
Credit: 4	Practical: 50 Marks

Aim

Modern power systems use computer as a tool to perform real time analysis and operation. The knowledge of use of computer in power industry is obvious. The study of this subject would certainly build up confidence in the students who would like to join the power industry.

Objectives

SI. No.	Student will be able to:
1	Analyze power flow using computer.
2	Perform short circuit studies using computer.
3	Perform transient stability studies using computer.

Pre-requisite

SI. No.	
1	Fundamental knowledge of Power System
2	Knowledge of basic computer operations
3	Knowledge in C-programming/Matlab.

Contents (Theory)

Unit	Contents (Theory)	Hours	Marks
1	Introduction <ul style="list-style-type: none"> Modern power system operation and control different types of power system analysis. Single line diagram of power system modeling of synchronous machines, transformer loads, transmission line etc, per unit representation of power system. 	6	8
2	Power Flow Analysis <ul style="list-style-type: none"> Formation of Z-bus &Y-bus matrices in the presence of mutually coupled elements power flow problem. Basic power flow equations and Basic power flow solution by Gauss- Siedel method. Basic power flow solution by Newton-Raphson method and fast decoupled methods. Sparse matrix techniques. Control of Power Flow and A.C.-D.C. load flow technique. 	12	18
3	Short Circuit Analysis <ul style="list-style-type: none"> Symmetrical Fault analysis & introduction to symmetrical components: positive sequence, negative sequence and zero sequence impedances of electrical appliances and power system inter connection of sequence. Sequence networks of power system components. LG, LL, LLG fault analysis using sequence networks. Unbalance fault analysis using of ZBUS matrix. Fault calculations for three- phase and LG faults. Fault calculations for LL and LLG faults. Open conductor fault analysis. 	15	22

Unit	Contents (Theory)	Hours	Marks
4	Transient Stability Analysis <ul style="list-style-type: none"> • Classification of power system stability. • The swing equation. • Simplified synchronous machine model and system equivalents. • The equal area criterion, numerical integration of swing equation, multi-machine stability, methods for enhancement & transient stability. • Fundamentals of voltage stability. 	15	22
TOTAL		48	70

LIST OF PRACTICALS

1. Formation of Z-bus matrix from the data of 3-bus system and 5-bus system using Matlab or C-language.
2. Formation of Y-bus matrix from the data of 3-bus system and 5-bus system using Matlab or C-language.
3. Matlab or C-program to solve basic load flow equations by numerical iterative technique using Gauss-Siedel method.
4. Matlab or C-program to solve basic load flow equations by numerical iterative technique using Newton-raphson method.
5. Matlab or C-program to solve basic load flow equations by numerical iterative technique using fast decoupled methods.
6. Matlab or C-program to solve Swing equation using Runge-Kutta method.
7. Determination of positive, negative and zero sequence components of a three phase unbalance voltage or current using Matlab or C-program.

Books

1. Computer Modelling of Electrical Power Systems – J. Arrillaga and N. R. Watson (Second Edition) John Wiley & Sons.
2. Computational Methods for Electric Power Systems – Mariesa Crow, CRC Press.
3. Power System Analysis and design – J. D Glover & M. S. Sarma (3rd Ed.) Books/Cole.
4. Power System Analysis – J. J. Grainger & W. D Stevenson, Jr. (Int. Ed.) McGraw Hill.
5. Modern Power System Analysis – D. P. Kothari & I. J. Nagrath (3rd Ed.) Tata McGraw Hill.
6. Power System Stability and Control – P. Kundur, Tata McGraw Hill.

EXAMINATION SCHEME (THEORITICAL)

GROUP	UNIT	ONE OR TWO SENTENCE ANSWER QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2	11	TWENTY	ONE	1X20 = 20	FOUR	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	TEN	10 X 5 = 50
B	3, 4	12				FIVE			

EXAMINATION SCHEME (SESSIONAL)

1.	Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Sixth Semester. Distribution of marks: Performance of Job - 15, Notebook - 10.
2.	External Assessment of 25 marks shall be held at the end of the Sixth Semester on the entire syllabus. One Experiment per student from any one of the above is to be performed. Experiment is to be set by lottery system. Distribution of marks: On spot job - 15, Viva-voce - 10.

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Industrial Project	
Course Code: EEPS/S6/IP	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory : -- hrs./week	Mid Semester Exam.: NIL
Tutorial: -- hrs./week	Attendance, Assignment & interaction: NIL
Practical: 4 hrs./week	End Semester Exam.: NIL
Credit: 2	Practical: 100 Marks

Aim:

Sl. No.	
1.	This subject is intended to teach students to understand facts, concepts and techniques of electrical equipments, its repairs, fault finding and testing, estimation of cost and procurement of material, fabrication and manufacturing of various items used in electrical field
2.	This will help the students to acquire skills and attitudes so as to discharge the function of supervisor in industry and can start his own small-scale enterprise

Objective:

Sl. No.	
1.	• Develop leadership qualities.
2.	• Analyze the different types of Case studies.
3.	• Develop Innovative ideas.
4.	• Develop basic technical Skills by hands on experience.
5.	• Write project report.
6.	• Develop skills to use latest technology in Electrical field.

Pre-Requisite:

Sl. No.	
1.	Knowledge of subjects up to 5 th Semester of Electrical Engineering
2.	

Contents

This subject is the continuation of the part of Industrial Project of subject "**INDUSTRIAL PROJECT AND ENTREPRENEURSHIP DEVELOPMENT**" studied in 5th Semester. Following activities related to project

are required to be dealt with, during this semester.

- 1) Each project batch should carry out the actual Project works which have been approved in Fifth Semester.
- 2) At the end of this semester each project batch should prepare the detailed project report & submit the same to respective guide.

The lists of projects are same as in 5th semester which are as follows:

Group	Projects
I	<ol style="list-style-type: none"> 1. Design of Illumination Scheme (Up to 20 KW) for Hospital / Shopping Mall / Cinema Theatre / Commercial Complex / Educational Institute / Industrial Complex. 2. Design of Rural Electrification Scheme for small Village, Colony. 3. Energy Conservation and Audit. 4. Substation Model (Scaled) 5. Wind Turbine Model (Scaled) 6. Pole Mounted Substation Model (Scaled) 7. Conduct load survey to ascertain the total load requirements of a locality/olytechnic. 8. Any other items as may be assigned by the teacher concerned.
II	<ol style="list-style-type: none"> (1) Rewinding of Three Phase/Single Phase Induction Motor. (2) Rewinding of Single Phase Transformer. (3) Fabrication of Inverter up to 1000 VA. (4) Fabrication of Battery Charger.

Group	Projects
	(5) Fabrication of Small Wind Energy System for Battery Charging. (6) Fabrication of Solar Panel System for Battery Charging. (7) Fabrication of Water level controller. (8) Fabrication of DC motor speed control circuit by SCRs. (9) Microprocessor/ Micro controller Based Projects. (10) Simulation Projects using Matlab. (11) Any other items as may be assigned by the teacher concerned.

Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the semesters. **Distribution of marks: Project Work - 25, Project Report Presentation - 15, Viva-voce - 10.**

External assessment of 50 marks shall be held at the end of the Sixth Semester on the entire Project Work. The external examiner is to be from Industry / Engineering College / University / Government Organization. **Distribution of marks: Project Work - 25, Project Report Presentation - 15, Viva-voce - 10.**

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : Professional Practices IV	
Course Code: EEPS/S6/PF IV	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 50
Teaching Scheme	Examination Scheme
Theory : -- hrs./week	Mid Semester Exam.: NIL
Tutorial: -- hrs./week	Attendance, Assignment & interaction: NIL
Practical: 3 hrs./week	End Semester Exam.: NIL
Credit: 2	Practical: 50 Marks

Aim:

SI. No.	
1.	To acquire information from different sources
2.	To present a given topic in a seminar, discuss in a group discussion
3	To prepare report on industrial visit, expert lecture.

Objective:

SI. No.	The student will be able to
1.	Acquire information from different sources
2.	Prepare notes for given topic
3.	Present given topic in a seminar
4	Interact with peers to share thoughts
5	Prepare a report on industrial visit, expert lecture

Pre-Requisite:

SI. No.	
1.	Knowledge of studying 5 semesters in Diploma Engineering

Activities

Sr. No.	Activities	Hours
1.	<p>Industrial / Field Visit: Structured Field visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to any ONE from the list below (should not have completed in earlier semester):</p> <ol style="list-style-type: none"> i. Multistoried building for power distribution ii. Any industry with process control and automation iii. District Industries Centre (to know administrative set up, activities, various schemes etc) iv. Railway / metro railway signaling system v. Motor rewinding in a motor rewinding shop vi. Visit warehouse / Rail yard / port and observe Material Handling Management & documentation. vii. A thermal / Hydel power generating station viii. A Wind mill and / or Hybrid power station of wind and solar ix. An electrical substation x. A switchgear manufacturing / repair industry xi. Protection system in a large industry. xii. Visit to maintenance dept of a large industry. xiii. A large industry to study protection system xiv. Industry of power electronics devices xv. Transmission tower project area xvi. Any contemporary industry under MSME sector to understand detail of operation and starting of a new venture. xvii. A large industry to study protection system xviii. Industry of power electronics devices xix. Transmission tower project area 	12

Sr. No.	Activities	Hours
	xx. Any contemporary industry under MSME sector to understand detail of operation and starting of a new venture. xxi. Any other technical field area as may be found suitable alternative to above list.	
2	<p><i>Guest Lecture by professional / industrial expert:</i> The guest lecture (s) any three of two hours duration each from the field /industry experts, professionals or from experienced faculty members(from own department or other departments) will be encouraged) are to be arranged from the following or alike topics. A brief report to be submitted on the guest lecture by each student as a part of term work.</p> <p>Group A (at least one)</p> <ol style="list-style-type: none"> i. Career opportunities for diploma engineers ii. ii)Industrial Dispute and Labour Laws iii. Challenges in industrial working environment for diploma engineers iv. Scope for diploma electrical engineers v. Working in shopfloor. vi. Oppurtunities in the service sector vii. Any other topic of relevance as may be deemed fit for fresh engineers as he starts his career in industry. viii. <p>Group B (at least one)</p> <ol style="list-style-type: none"> i. Eco friendly air conditioning / refrigeration. ii. Modern trends in AC machine iii. Testing of switchgear iv. Biomedical instruments – working, calibration etc. v. Automobile pollution, norms of pollution control. vi. Nanotechnology vii. Modern techniques in Power Generation viii. New trends in power electronics devices ix. TQM x. Recent modification in IE rules xi. standardization / ISO certification xii. Role of micro, small and mediun enterprise. In Indian economy. xiii. Entrepreneurship development and oppurtunities xiv. Interview techniques xv. Any topic that could not be covered in earlier semesters and having relevance to technical knowledge gathered in all semesters. 	12
3	<p><i>Information search</i> Information search can be done through manufacturers, catalogue, internet, magazines, books etc and a report need to be submitted. Can be done in a group of 2/3 students Topic suggested (any two)Teachers may assign work on any other cross disciplinary subjects for enrichment of knowledge outside course work of Electrical discipline)</p> <ol style="list-style-type: none"> 1. Blue tooth technology 2. Artificial technology 3. Data warehousing 4. Cryptography 5. Digital signal processing 6. Bio-informatics 7. Magnetic levitation system 8. Recent development in electrically operated vehicles for mass transport 9. Comparative study of metro railway in Kolkata and Delhi 10. Alternative fuel and energy options 11. Comparison of transformer companies 12. Latest trends in classification of insulating materials 13. Design consideration for dry type transformers 14. State and national statistics of power generation 	12

Sr. No.	Activities	Hours
	15. Market survey of contactors, relays and their comparative analysis. 16. Market survey of any other electrical product which must include among other things various manufacturers, cost, specification, application areas etc.	
4	<p>Group Discussion The students should discuss in a group of six to eight students. Each group to perform any TWO group discussions. Topics and time duration of the group discussion to be decided by concerned teacher. Concerned teacher may modulate the discussion so as to make the discussion a fruitful one. At the end of each discussion each group will write a brief report on the topic as discussed in the group discussion. Some of the suggested topics are –</p> <ol style="list-style-type: none"> i. Scope of outsourcing of electrical Engineering services. ii. Pollution Control iii. Rain water harvesting iv. Trends in energy conservation v. Safety in day to day life vi. Use of plastic carry bag (social & domestic Hazard) vii. Pollution control viii. Any other common topic related to electrical field as directed by concerned teacher. 	14
5	<p>Seminar / Poster presentation: Students should select a topic for seminar based on recent development in Electrical Engineering fields, emerging technology etc. Concerned Teachers will guide students in selecting topic.</p>	14

EXAMINATION SCHEME (SESSIONAL)

Continuous internal assessment of 50 marks is to be carried out by the teachers throughout the sixth semester. **Distribution of marks: Information search = 10, seminar = 10, Group discussion = 5, field visit = 10, guest lecture attendance and report = 15**

Name of the Course: DIPLOMA IN ELECTRICAL ENGINEERING (POWER SYSTEM)	
Subject : General Viva Voce	
Course Code: EEPS/S6/GVV	Semester: SIXTH
Duration: ONE SEMESTER	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory : -- hrs./week	Mid Semester Exam.: NIL
Tutorial: -- hrs./week	Attendance, Assignment & interaction: NIL
Practical: -- hrs./week	End Semester Exam.: NIL
Credit: 2	Practical: 100 Marks

Aim:

SI. No.	
1.	It is required to revisit the contents of the departmental subjects learnt by the students up to sixth semester.
2.	As a diploma holder of Electrical Engineering, students should be able to co relate the various ideas and concepts learnt from various subjects throughout the course duration.
3.	Student should equip themselves to face various types of technical questions during various competitive examinations/ Interview Board.

Contents (Theory)

The syllabi of all the theoretical and sessional subjects taught in the three years of diploma education

EXAMINATION SCHEME (SESSIONAL)

The Final Viva-Voce Examination shall take place at the end of Sixth Semester. It is to be taken by Faculty members of the Institute concerned.