
 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : DIPLOMA IN ELECTRICAL ENGINEERING																	
COURSE CODE : EC																	
DURATION OF COURSE : EIGHT SEMESTERS										WITH EFFECT FROM 2013-14							
SEMESTER : EIGHT										DURATION : 16 WEEKS							
PATTERN : CORRESPONDANCE - SEMESTER										SCHEME : G							
SR. NO	SUBJECT TITLE	abbrevi ation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17908)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Management	MAN	21030	06	01	--	1&½	50#*	20	--	--	--	--	--	--	--	50
2	Power Electronics	PEL	21035	07	01	24	03	100	40	--	--	--	--	25@	10		
3	Power System Operation & Control	PSO	21036	07	01	24	03	100	40	--	--	--	--	25@	10		
4	Project	PRO	21037	--	--	32	--	--	--	--	--	50#	20	50@	20		
Total				20	03	80	--	250	--	--	--	50	--	100	--	50	
TOTAL CONTACT HOURS DURING RESIDENT SESSION: 103 HRS [15 days * 8 hrs per day]																	
Total Marks : 450																	
@ - Internal Assessment, # External Assessment, No Theory Examination, #* Online Examination.																	
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work																	
NOTE:																	
1. HOURS MARKED BY * FOR INTERNAL PRACTICAL EXAMINATION TO BE CONDUCTED AT RESSIDENT SESSION.																	
2. ONE TEST OF 25 MARKS TO BE CONDUCTED AT RESIDENT SESSION AND MARKS TO BE SUBMITTED TO GPDL PUNE.																	
3. 240 HOURS FOR SELF STUDY AT HOME.																	
4. ALL PRACTICALS/ORAL EXAMS [EXTERNAL ASSESSMENT INDICATED BY #] TO BE CONDUCTED AT EXAM CENTRE.																	
5. ORAL EXAMINATION [INTERNAL ASSESSMENT @] TO BE CONDUCTED AT EXAM CENTRE.																	
6. INTERNAL ASSESSMENT @ OF TERM WORK WILL BE DONE AT RESIDENT SESSION.																	

 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																	
COURSE NAME : DIPLOMA IN ELECTRICAL ENGINEERING GROUP																	
COURSE CODE : EG																	
DURATION OF COURSE : EIGHT SEMESTERS										WITH EFFECT FROM 2013-14							
SEMESTER : EIGHT										DURATION : 16 WEEKS							
PATTERN : PART TIME - SEMESTER										SCHEME : G							
SR. NO	SUBJECT TITLE	abbrevi- ation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (17908)
				TH	TU	PR	PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)			
								Max	Min	Max	Min	Max	Min	Max	Min		
1	Management	MAN	21030	03	--	--	1&½	50#*	20	--	--	--	--	--	--		
2	Power Electronics	PEL	21035	04	--	02	03	100	40	--	--	--	--	25@	10	50	
3	Power System Operation & Control	PSO	21036	03	--	02	03	100	40	--	--	--	--	25@	10		
4	Project	PRO	21037	--	--	04	--	--	--	--	--	50#	20	50@	20		
Total				10	--	08	--	250	--	--	--	50	--	100	--		50
Student Contact Hours Per Week: 18 Hrs. THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH. Total Marks : 450 @ - Internal Assessment, # External Assessment, No Theory Examination, #* Online Examination.																	
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work ➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW). ➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms ➤ Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.																	

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : CI/CC/EG/EC/CL/GC/MG/MC/IL/XC

Semester : Eight

Subject Title : Management

Subject Code : 21030

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	1&½	50#*	--	--	--	50

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Management concepts are universal and it is a multidisciplinary subject. They are equally applicable to different types industries like Manufacturing, Service and Trade as well as different kind of business activities like industry, army, school, hospital, retail shops etc. Also, at the end of diploma course polytechnic students are expected to enter in to the Industrial Environment. This environment is altogether different and new to the students. A proper introduction and understanding of management fundamentals is therefore essential for all these students.

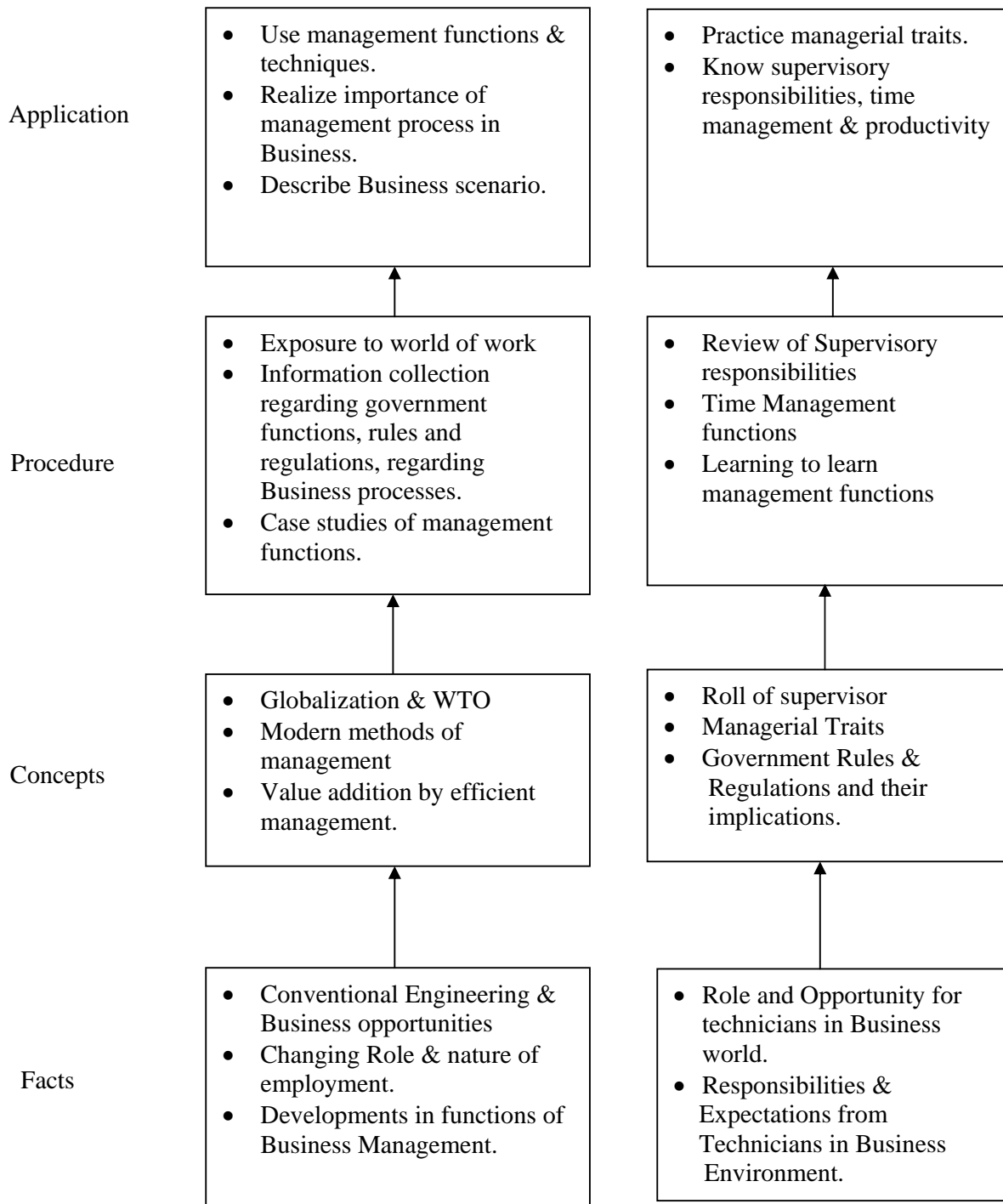
Contents of the this subject will enable the students to address various issues related to human resource, finance, materials, legislations etc. by use of basic principles of management. This will ensure that students will play their role effectively to enhance the quality of business output in total.

Objective:

The students will able to:

1. Get familiarized with environment related to business processes.
2. Know the management aspects of the organisations.
3. Understand Role & Responsibilities of a Diploma engineer.
4. Understand importance of quality improvement techniques.
5. Appreciate need and importance of safety in industries.
6. Understand process of Industrial finance and its management.
7. Know the latest trends in industrial management.

Learning Structure:



Contents: Theory

Topic and contents	Hours	Marks
<p>Topic 1: Overview of Business</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State various business types and sectors ➤ Describe importance of globalisation <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry • IT industry • Banking, Insurance, Retail, Hospitality, Health Care <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages with respect to India 	02	04
<p>Topic 2: Management Process</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State various management principles ➤ Describe different management functions <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions of management • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling • Decision Making 	08	08
<p>Topic 3: Organisational Management</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Compare different forms of organisation , ownership for a specific business ➤ Describe types of departmentation <p>3.1 Organization :</p> <ul style="list-style-type: none"> • Definition 	08	08

<ul style="list-style-type: none"> • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Departmentation</p> <ul style="list-style-type: none"> • By product • By process • By function <p>3.4 Principles of Organisation</p> <ul style="list-style-type: none"> • Authority & Responsibility • Span of Control • Effective Delegation • Balance ,stability and flexibility • Communication <p>3.5 Forms of ownership</p> <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 		
<p>Topic 4: Industrial Safety and Legislative Acts</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Describe types of accidents & safety measures ➤ State provisions of industrial acts. <p>4.1 Safety Management</p> <ul style="list-style-type: none"> • Causes of accidents • Types of Industrial Accidents • Preventive measures • Safety procedures <p>4.2 Industrial Legislation - Necessity of Acts</p> <p>Important Definitions & Main Provisions of following acts:</p> <ul style="list-style-type: none"> • Indian Factory Act • Workman Compensation Act • Minimum Wages Act 	08	06
<p>Topic 5: Financial Management (No Numerical)</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Explain functions of financial management ➤ State the sources of finance & types of budgets. ➤ Describe concepts of direct & indirect taxes. <p>5.1 Financial Management- Objectives & Functions</p> <p>5.2 Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals - Fixed & Working • Sources of raising Capital - Features of Short term, Medium Term & Long Term Sources <p>5.3 Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets 	08	08

<ul style="list-style-type: none"> • Fixed & Variable Budget - Concept • Production Budget - Sample format • Labour Budget - Sample format • Profit & Loss Account & Balance Sheet - Meaning, sample format, meaning of different terms involved. <p>5.4 Meaning & Examples of -</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • Value Added Tax • Custom Duty 		
<p>Topic 6: Materials Management (No Numerical)</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Describe concept of inventory, ABC analysis & EOQ. ➤ Describe purchase functions & procedures ➤ State features of ERP & MRP <p>6.1 Inventory Concept, its classification, functions of inventory</p> <p>6.2 ABC Analysis - Necessity & Steps</p> <p>6.3 Economic Order Quantity Concept, graphical representation, determination of EOQ</p> <p>6.4 Standard steps in Purchasing</p> <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP • Enterprise Resource Planning (ERP) - Concept, list of modules, advantages & disadvantages of ERP 	08	08
<p>Topic 7: Quality Management</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State Principles of Quality Management ➤ Describe Modern Technique & Systems of Quality Management <p>7.1 Meaning of Quality</p> <p>Quality Management System – Activities, Benefits</p> <p>Quality Control - Objectives, Functions, Advantages</p> <p>Quality Circle - Concept, Characteristics & Objectives</p> <p>Quality Assurance – Concept, Quality Assurance System</p> <p>7.2 Meaning of Total Quality and TQM</p> <p>Components of TQM – Concept, Elements of TQM, Benefits</p> <p>7.3 Modern Technique & Systems of Quality Management like Kaizen, 5'S, 6 Sigma</p> <p>7.4 ISO 9001:2000 - Benefits, Main clauses.</p>	06	08
Total	48	50

Learning Resources:**Books:**

Sr. No	Author	Name of Book	Publisher
01	Dr. O.P. Khanna	Industrial Engineering & Management	Dhanpat Rai & Sons New Delhi
02	Banga & Sharma	Industrial Engineering & Management	Khanna Publication
03	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
04	W.H. Newman E. Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall

E Source:

nptel.iitm.ac.in

<http://iete-elan.ac.in/subjects/amIndustrialMgmt.htm>

Course Name : Diploma in Electrical Engineering**Course Code : EG / EC****Semester : Eight****Subject Title : Power Electronics****Subject Code : 21035****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	50#	--	25@	175

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Power electronics is a branch of engineering that combines the fields of electrical power, electronics and control. As an electrical engineer it is necessary to exercise control on power given to the machines to control its speed, voltage and current to suit its load.

The invention of thyristor as a power device led to development of compact, reliable and maintenance free drive circuits. The utility of power devices spread to industrial applications such as UPS, induction heating, high voltage DC transmission, Electrical welding etc.

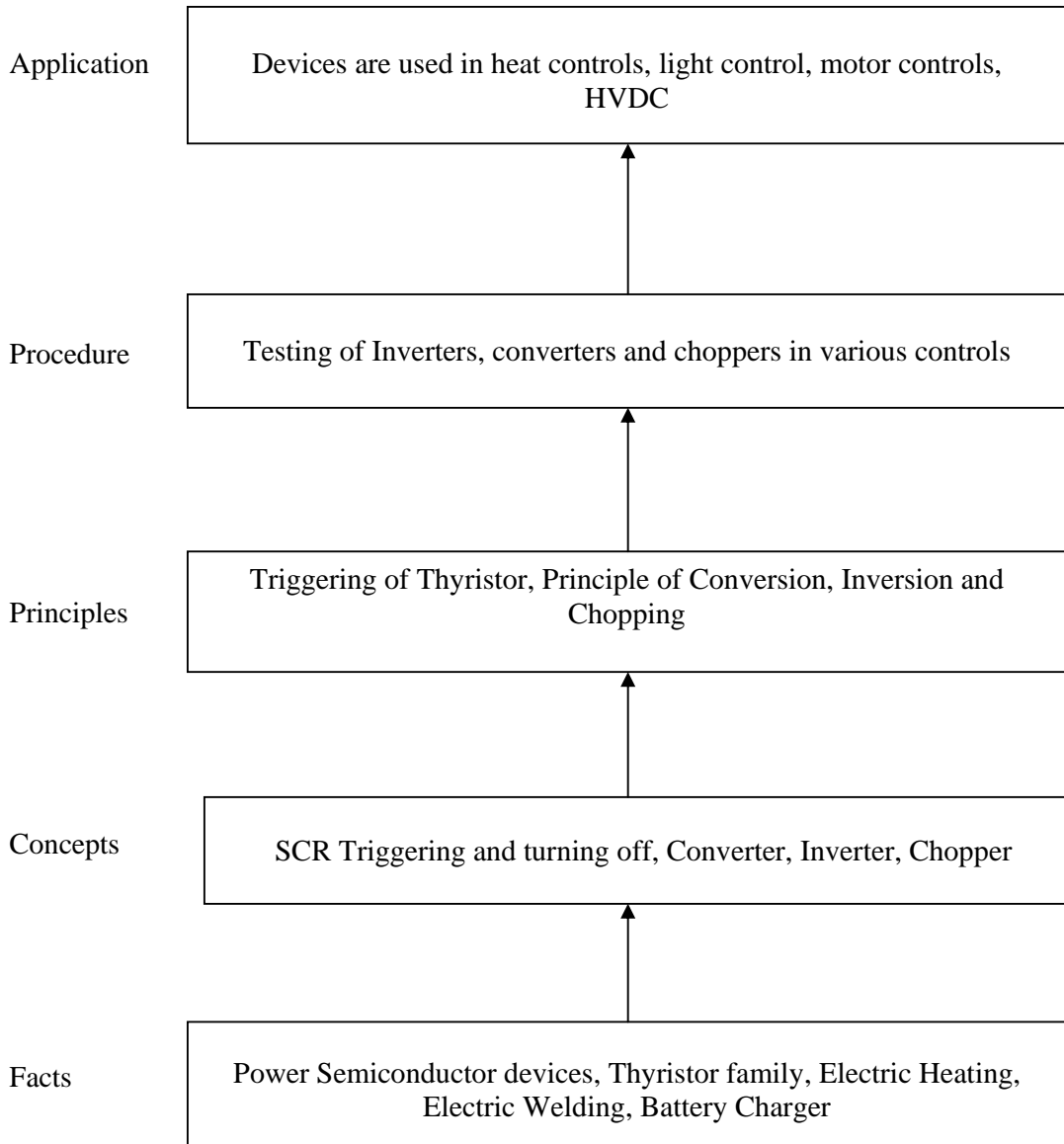
Microprocessors and microcomputers have made their impact on power electronics based industrial equipment. Their application for control of electric devices is used as a brain and the power semiconductors are considered as muscles of the equipment.

With rapid development in modern technology, power electronic equipments are integral part of control system.

General Objectives:**The students will be able to:**

1. Understand the physical processes for the switching of a thyristor.
2. Know the various methods of triggering a thyristor and different gate turn-on methods.
3. Develop logic about the turning off mechanism of a thyristor and get acquainted with some methods of turning a thyristor off.
4. Become familiar with other members of the thyristor family as well as other power electronic devices.
5. Know the characteristics of different power electronic devices.
6. Know the working of rectifiers, choppers, inverters and industrial applications of the thyristor.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to Power Electronics</p> <p><u>Specific Objectives:</u></p> <ul style="list-style-type: none"> ➤ State purpose of power conversion. ➤ List application areas of Power Electronics. ➤ Select specific Thyristor device for required application. <p><u>Contents:</u></p> <ul style="list-style-type: none"> • Necessity of Power conversion using solid state devices • Applications of Power Electronics • Thyristor family <ul style="list-style-type: none"> ❖ Characteristics and symbolic representation of SCR, DIAC, TRIAC, GTO, SUS, LASCR, IGBT. • SCR: Construction, operation, Two transistor analogy • Triggering methods of SCR <ul style="list-style-type: none"> ❖ Voltage triggering. ❖ dv/dt triggering. ❖ Light triggering. ❖ Gate triggering <ul style="list-style-type: none"> ✓DC gate triggering ✓AC gate triggering. ✓Pulse gate triggering. • SCR Turn-off process with waveforms of Voltage and Current • SCR Specifications/Ratings: Voltage , Current , Power , Temperature • SCR selection factors • SCR testing 	10	20
<p>Topic 2 : Converters</p> <p><u>Specific Objectives:</u></p> <ul style="list-style-type: none"> ➤ Operation of controlled converters ➤ Classification of Controlled converters. ➤ Identify different types of converters for required applications <p><u>Contents:</u></p> <ul style="list-style-type: none"> • Necessity of Convertors • Concept of firing angle and conduction angle • Single phase fully controlled half wave converter <ul style="list-style-type: none"> - With resistive load - RL load without freewheeling diode. - RL load with freewheeling diode. • Single phase full wave controlled converter <ul style="list-style-type: none"> - With resistive load - With RL load • Single phase fully controlled bridge converter <ul style="list-style-type: none"> - With resistive load - With RL load • Three phase fully controlled bridge converter <ul style="list-style-type: none"> - With R load • Comparison of 3Ø and 1Ø converters on the basis of efficiency, ripple factor , RMS Values and average values 	12	20

<ul style="list-style-type: none"> • Effect of source impedance on converter operation. • Cycloconverters: 1\emptyset - Principle of operation, input and output waveforms. 		
<p>Topic 3 : Inverters Specific Objectives:</p> <ul style="list-style-type: none"> ➤ List different types of inverters and applications. ➤ Selection of 1\emptyset or 3\emptyset inverters for required application. <p>contents:</p> <ul style="list-style-type: none"> • Need of Inverter • Classification : <ul style="list-style-type: none"> - 1\emptyset and 3\emptyset inverters. - Line (Natural) commutated Inverters - Forced commutated inverters: Series, parallel and bridge inverters.(circuit, description and waveforms) • Series inverters: Operation of basic series inverter , Modified series inverter, Three phase series inverter. • Parallel inverters: Operation of basic parallel inverter circuit. • Single Phase Bridge Inverter <ul style="list-style-type: none"> - Half bridge inverter - Full bridge inverter • Voltage and frequency control of 1\emptyset inverter <ul style="list-style-type: none"> - Necessity of control of output voltage. - Methods for output voltage control: External control of DC voltage, External control of AC voltage and internal control. - Pulse width modulation (PWM) method: Single pulse width modulation, multiple pulse width modulation, Sinusoidal pulse width modulation. • Waveform control (Harmonic Reduction): Single pulse width modulation, transformer connections, using filter (LC, Resonant) • Concept of MOSFET Inverter and comparison with thyristor based inverter 	14	20
<p>Topic 4 : Choppers Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Necessity of chopper. ➤ Selection of chopper as per the requirement of application. <p>contents:</p> <ul style="list-style-type: none"> • Chopper principle • Control techniques: Constant Frequency System, Variable Frequency System. • Classification of choppers :Class A, class B, class C, class D, class E • Commutation methods for choppers: Auxiliary commutation, load commutation. • Jones chopper • Step up chopper. 	10	16
<p>Topic 5 : Applications of Power Electronics Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State basic principles of AC and DC Machines. ➤ Selection of SCR control circuit as per the requirement of application. <p>contents:</p>	18	

5.1 DC Drives		16
<ul style="list-style-type: none"> • Speed control of DC series motor with 1\emptyset half and full control converter, step up and step down chopper 		
5.2 AC Drives		08
<ul style="list-style-type: none"> • Speed control of 3\emptyset induction motor <ul style="list-style-type: none"> - Variable frequency control : Voltage source inverter, current source inverter, cycloconverter • Other applications: Circuit diagram, operation <ul style="list-style-type: none"> - Static circuit breaker(DC and AC) - Induction heating control - Dielectric heating control - Electric welding control - Battery charger control - Automatic street lighting circuit using SCR - Static VAR compensation system - Close loop speed control method for D C and AC servo moto 		
Total	64	100

Practical:**Skills to be developed:**

- **Intellectual Skills**

1. Select appropriate circuits and instruments
2. Testing and troubleshooting

- **Motor Skills**

1. Accuracy of measurement
2. Proper connection
3. Draw characteristics

List of Practical:

1. Plot V-I characteristics of SCR and find latching current (IL), holding current (IH) and the forward break over voltage (VFBO).
2. Observe the output waveforms of single phase full wave controlled rectifier with resistive load, inductive load with and without freewheeling diode. Measure the load voltage with variations in firing angle.
3. Observe the output waveform of three phase full wave controlled rectifier with resistive load, inductive load without and with freewheeling diode.
4. Understand single phase series inverter and to measure the output signal resonance frequency and voltage.
5. Understand current commutated step down chopper and observe the change in output voltage.
6. Understand operation of battery charger using SCR and observe change in charging voltage and current.
7. Understand the speed control of DC series motor using SCR phase control and plot speed Vs. armature voltage characteristics.
8. Understand the speed control of three phase induction motor using PWM inverter and plot speed Vs. torque characteristics.

9. Visit to traction system/coal handling in thermal power station/process industry/oil extraction plant or any other similar industry and prepare a report .Deliver seminar on the small topic related to visit or any other topic allotted by the teacher.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
1	M. D. Singh K. B. Khanchnadani	Power Electronics	Tata Mcgraw Hill
2	S. K. Bhattacharya S. Chattarjee Ttti Chandigad	Industrial Electronics & control	Tata Mcgraw Hill
3	P. C. Sen	Power Electronics	Tata Mcgraw Hill
4	M. D. Rashid	Power Electronics	Pearson
5	V. R. Moorthi	Power Electronics	OXFORD
6	Mohan, Undeland Riobbins	Power Electronics	Willey Student Edition
7	S. K. Bhattacharya	Fundamentals of Power Electronics	Vikas Publication
8	V. Jagannathan	Power Electronics Devices & Circuits	PHI
9	--	SCR Manual	General Electric Co.

Websites:

- freevideolectures.com/Course/2351/Power-Electronics
- freevideolectures.com/.../Industrial-Drives-and-Power-...
- www.learnerstv.com/Free-Engineering-Video-lectures-ltv127
- www.circuitstoday.com/scr-characteristics
- en.wikipedia.org/wiki/Thyristor
- www.freepatentsonline.com/5216683.html
- [en.wikipedia.org/wiki/Inverter_\(electrical\)](http://en.wikipedia.org/wiki/Inverter_(electrical))

Course Name : Diploma in Electrical Engineering**Course Code : EG / EC****Semester : Eight****Subject Title : Power System Operation & Control****Subject Code : 21036****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

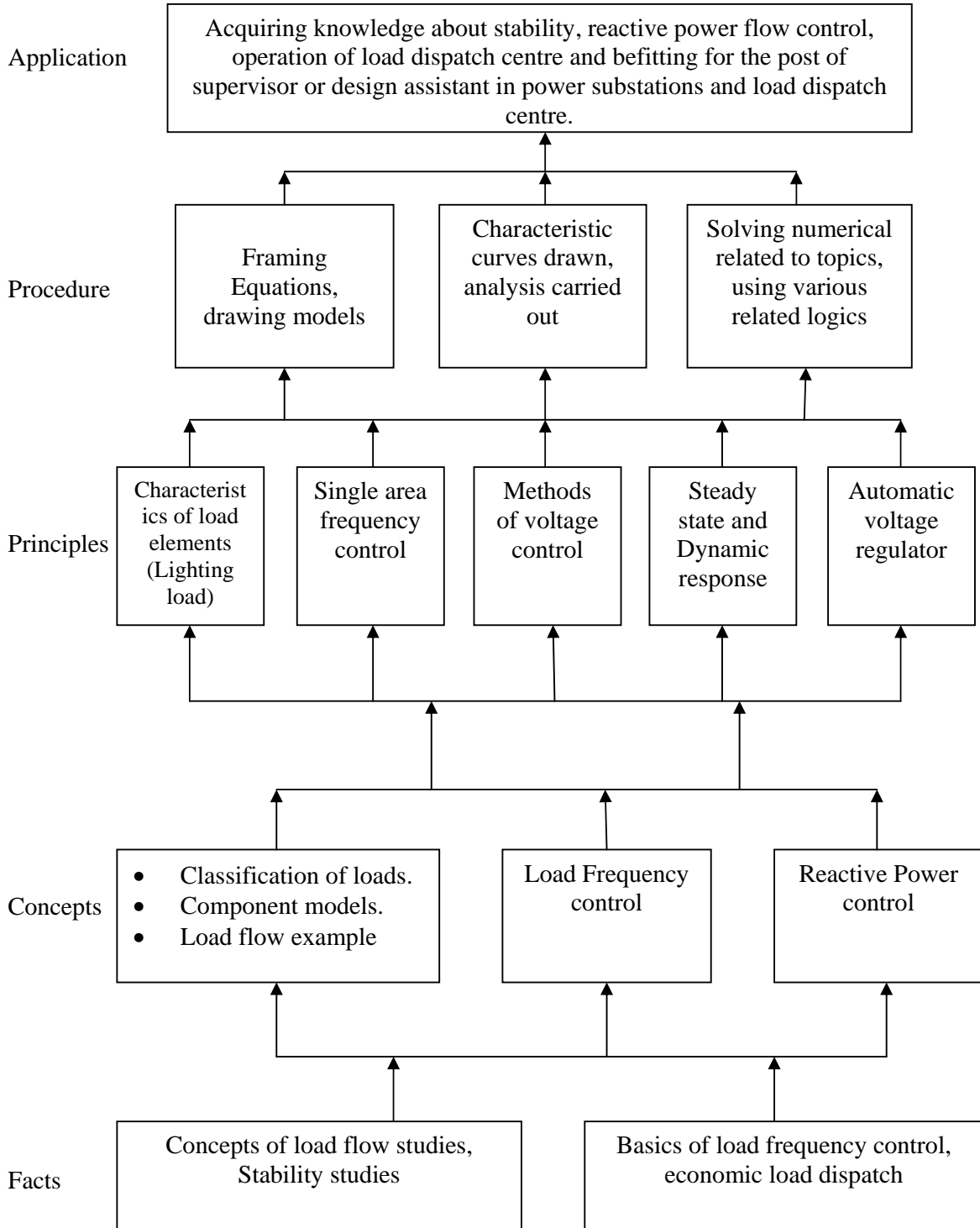
Electrical power system is an advanced, sophisticated and highly significant field in an Electrical engineering course. Knowledge about the operation, control and stability of power systems, load flow and dispatching, reactive power control etc. will be required for effective power system operation and control.

The topics on real and reactive power flow control, effect of change in frequency and excitation, reactive power compensation, steady state and transient state stability, load forecasting, Automatic Generation Control (AGC) and voltage control, solving numerical related to three bus system and deriving static load flow equation etc. are vital to learn and understand about the field of operation and control of power system. The student will be able to join as a supervisor or an assistant in design of power control equipments of substations and receiving stations.

General 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.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
<p>Topic 1: Concept of Complex Power Flow (Real and Reactive Power) in Power System.</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Interpret relation between real power and frequency / Reactive power and voltage ➤ Use methods of compensation for reactive power control <p>Contents:</p> <p>1.1 Concept and significance of bus, classification</p> <p>1.2 Concept of Real power flow in Power System.</p> <p>1.3 Relation between Real power and frequency of the system.</p> <ul style="list-style-type: none"> • Derive relation for a simple two bus system. • Effect of change in frequency on various consumers and Utilities. <p>1.4 Relation between Reactive power and voltage of the system.</p> <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>(No numerical on the above topic)</p>	08	16
<p>Topic 2: Load Flow Studies</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Develop static load flow equation for a two bus system and learn about load flow studies. ➤ Formation of Y bus. <p>Contents:</p> <p>2.1 Need of load flow analysis</p> <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. <p>2.2 Formation of Y bus.</p> <ul style="list-style-type: none"> • Power system equations <ul style="list-style-type: none"> ▪ Bus loading and line flow equations. ▪ SLFE in general form • Numericals for 3 bus system including reference bus 	05 05	12 12
<p>Topic 3: Power System Stability</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Derive the maximum power flow and the steady state condition. ➤ Use of swing equation and Power angle curve for study of stability of a given system ➤ Select methods of improving transient stability. 		

<p>Contents:</p> <p>3.1 Definition and illustration of terms:</p> <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. <ul style="list-style-type: none"> • A simple two machine power system for stability studies. (Model, concept and complete explanation). • Adverse effects of instability <p>3.2 Swing equation (no derivation) and the significance of power angle.</p> <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>(No numerical on the above topic)</p>	04	08
<p>Topic 4: Automatic Generation and Voltage Control</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ To describe the method followed for control of load frequency of a turbine speed governing system. ➤ To learn about the methods of control of voltage of a synchronous generator. <p>Contents:</p> <p>4.1 Schematic diagram of load frequency and excitation voltage regulators of a turbo generator and describe the function of each block</p> <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. <p>4.2 Methods of voltage control</p> <ul style="list-style-type: none"> • Reactive power injection. • Control by transformers (Explain in detail). <p>(No numerical on the above topic)</p>	06	12
<p>Topic 5 : Load Dispatching</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Work as assistant engineer in LDC. ➤ Assist in deciding economic and optimum load dispatch. <p>Contents:</p> <p>5.1 Load forecasting</p> <ul style="list-style-type: none"> • Need of forecasting. • Forecasting based on load curve. • Environmental and social factors in load forecasting. • Planning tools <p>5.2 Load shedding and its governing factors</p>	08	16
	02	04
	06	12

5.3 Functions of load dispatch centre. 5.4 Types of LDC and their significance. 5.5 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 (Simple numerical on economic dispatch neglecting losses.) 	04	08
Total	48	100

Practicals:**Skills to be developed:****Intellectual Skills:**

1. Understand the concept of real and reactive power
2. Collection of data about load flow studies.
3. Identify and understand reactive power compensating equipments.

Motor Skills:

1. To carry out the simulation of a system. (Frequency Control and Voltage Control) using MATLAB.
2. Drawing the various power system control equipments.

List of Practicals:

1. Develop a MATLAB program for analysis of two bus system model.
2. Understand different methods of reactive power compensation for improvement of power factor
3. Develop a MATLAB program to form admittance matrix of a three bus system.
4. Develop a SIMULINK Model of a turbine speed governing system of a turbo generator and record the effect of change in speed on frequency.
5. Develop a SIMULINK model of automatic voltage regulator for a synchronous generator and record the effect of change in excitation on generated voltage.
6. Develop a MATLAB program on Economic load dispatch neglecting losses.
7. Visit a generating/co-generation/ load dispatch station and make report on different controls used for frequency and voltage
8. Visit a nearby industry/ station and prepare a report on reactive power compensation equipment used.

Learning Resources:**Books:**

Sr. 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

Websites:

- www.mahagenco.in
- www.mahatransco.in
- www.mahadisco.in
- www.mahasldc.org.in
- www.tatapower.com

Course Name : Diploma in Electrical Engineering**Course Code : EC / EG****Semester : Eight****Subject Title : Project****Subject Code : 21037****Teaching and Examination Scheme**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	50#	50@	100

Rationale:

Diploma holders need to be capable of doing self study throughout their life as the technology is developing with fast rate. Student will be able to find out various sources of technical information and develop self-study techniques to prepare a project and write a project report.

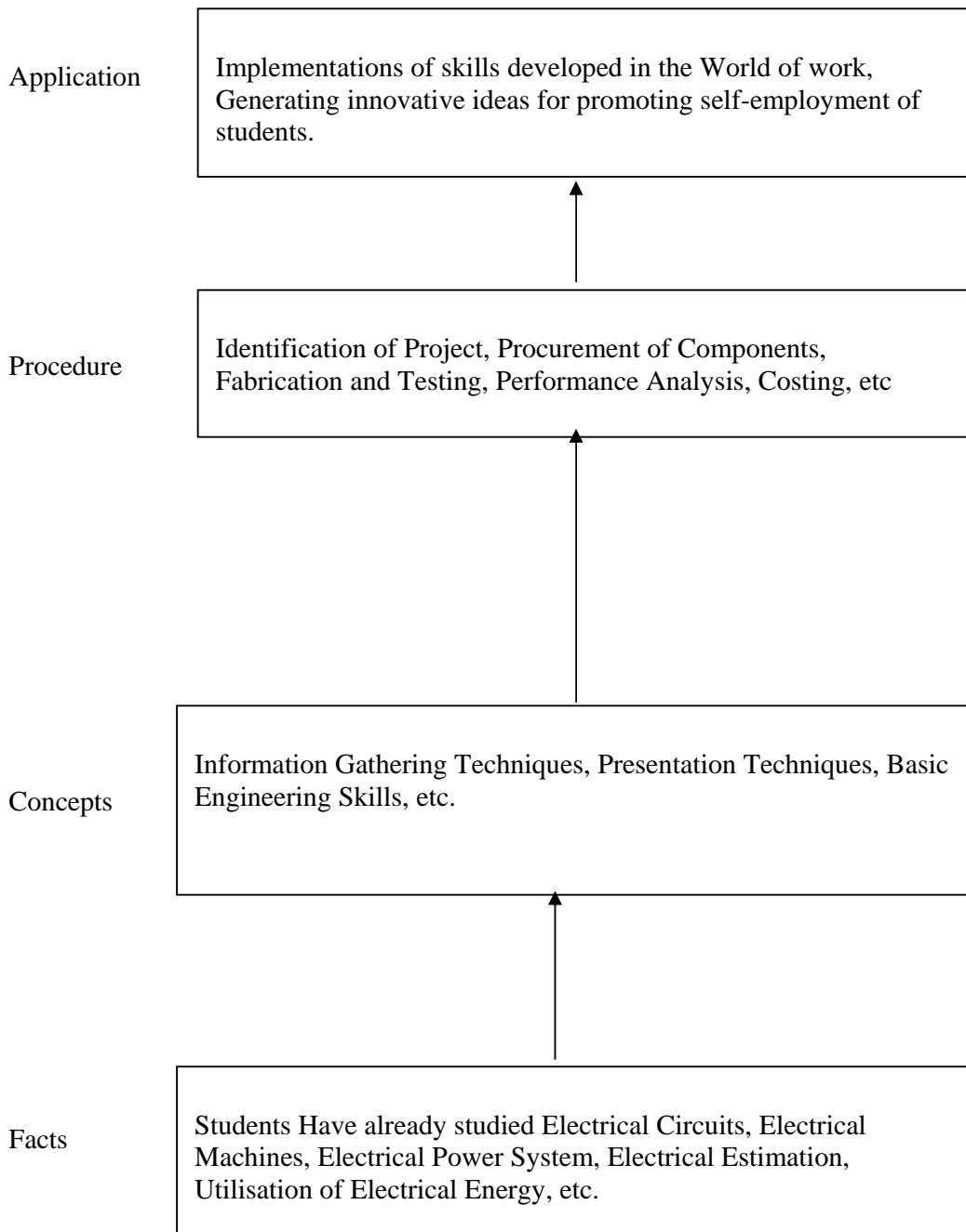
This subject is intended to teach students to understand facts, concepts and techniques of electrical equipments, its repairs, fault finding and testing, estimation of cost and procurement of material, fabrication and manufacturing of various items used in electrical field. This will help the students to acquire skills and attitudes to work in industry and can start his own enterprise.

Objectives:

The students will be able to,

1. Work in Groups, Plan the work, and Coordinate the work.
2. Develop leadership qualities
3. Analyse the different types of Case studies.
4. Develop basic technical Skills by hands on experience
5. Write project report.
6. Develop skills to use latest technology in Electrical field.

Learning Structure:



Contents:

Projects	
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.	Case Studies Related to Industries – Operation / Maintenance / Repair and Fault Finding. (Refer Guideline Document).
4.	Energy Conservation and Audit.
5.	Substation Model (Scaled)
6.	Wind Turbine Model (Scaled)
7.	Pole Mounted Substation Model (Scaled)
8.	Rewinding of Three Phase/Single Phase Induction Motor.
9.	Rewinding of Single Phase Transformer.
10.	Fabrication of Inverter up to 1000 VA, Battery Charger.
11.	Fabrication of Small Wind Energy System for Battery Charging.
12.	Fabrication of Solar Panel System for Battery Charging.
13.	Microprocessor/ Micro controller Based Projects.
14.	PC Based Projects and Simulation Projects.
Seminar	
A group seminar to be conducted after completion of Project work and marks to be allotted separately under head Seminar in CIAAN format of Project	

Note: Out of Four hours two hours should be allotted for giving the Instructions for preparing a Project Report. (Refer Guideline Document for Format of Project Report)

Learning Resources:**1. Books/Magazines:**

Sr. No.	Name of the Magazine
1.	IEEE Transactions/Journals
2.	Electrical India
3.	IEEMA Journal
4.	Elecrama
5.	Technorama
6.	Urja
7.	Industrial Automation
8.	Electronics for You
9.	Electronics Projects
10.	Computer World
11.	Chip

12.	Any Journal Related to Electrical Engg. / Electronics / Computer / Information Technology
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Components of Project Report:

1. Synopsis- Project Summary (One page summary of entire project)
2. Action Plan of Project for both Semesters
3. Introduction (Promoters, Market Scope/ requirement)
4. Project Concept & Product (Details of product)
5. Manufacturing Process & Technology
6. Material and Machinery Required
7. Raw materials, Consumables & Utilities
8. Estimation (Assumptions, requirements)
9. Market (Survey, Demand & Supply)
10. Cost of Project,
11. Future Scope/ Benefit to Society
12. Conclusion.
13. References