

 MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES																
COURSE NAME : ELECTRICAL ENGINEERING GROUP																
COURSE CODE : EE/EP																
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2009-10						
SEMESTER : FOURTH										DURATION: 16 WEEKS						
PATTERN : FULL TIME										SCHEME : E						
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		SW (16004)
								MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	
1	Transmission & Distribution of Electric Power	TDE	12102	03	01	--	03	100	40	--	--	--	--	--	--	
2	D. C. Machines & Transformers	DCM	12103	03	--	02	03	100	40	50#	20	--	--	25@	10	
3	Instrumentation	INS	12104	03	--	02	03	100	40	--	--	--	--	25@	10	
4	Electrical Estimation & Costing	EEC	12105	02	01	02	03	100	40	--	--	25@	10	--	--	50
5	Applied Electronics	AEL	12106	03	--	02	03	100	40	50#	20	--	--	25@	10	
6	Electrical Drawing	EDA	12107	--	--	04	--	--	--	--	--	--	--	50@	20	
7	Development of Life Skills-II	DLS	12041	01	--	02	--	--	--	--	--	25#	10	25@	10	
8	Professional Practices-IV	PPR	12108	--	--	04	--	--	--	--	--	--	--	50@	20	
TOTAL				15	02	18	--	500	--	100	--	50	--	200	--	50

Student Contact Hours Per Week: **35 Hrs.**
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.
Total Marks : **900**
@ Internal Assessment, # External Assessment, [] No Theory Examination.
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, []-Oral, TW- Termwork, 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 and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Electrical Engineering Group
Course Code : EE / EP
Semester : Fourth
Subject Title : Transmission & Distribution of Electric Power.
Subject Code : 12102

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	--	03	100	--	--	--	100

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:

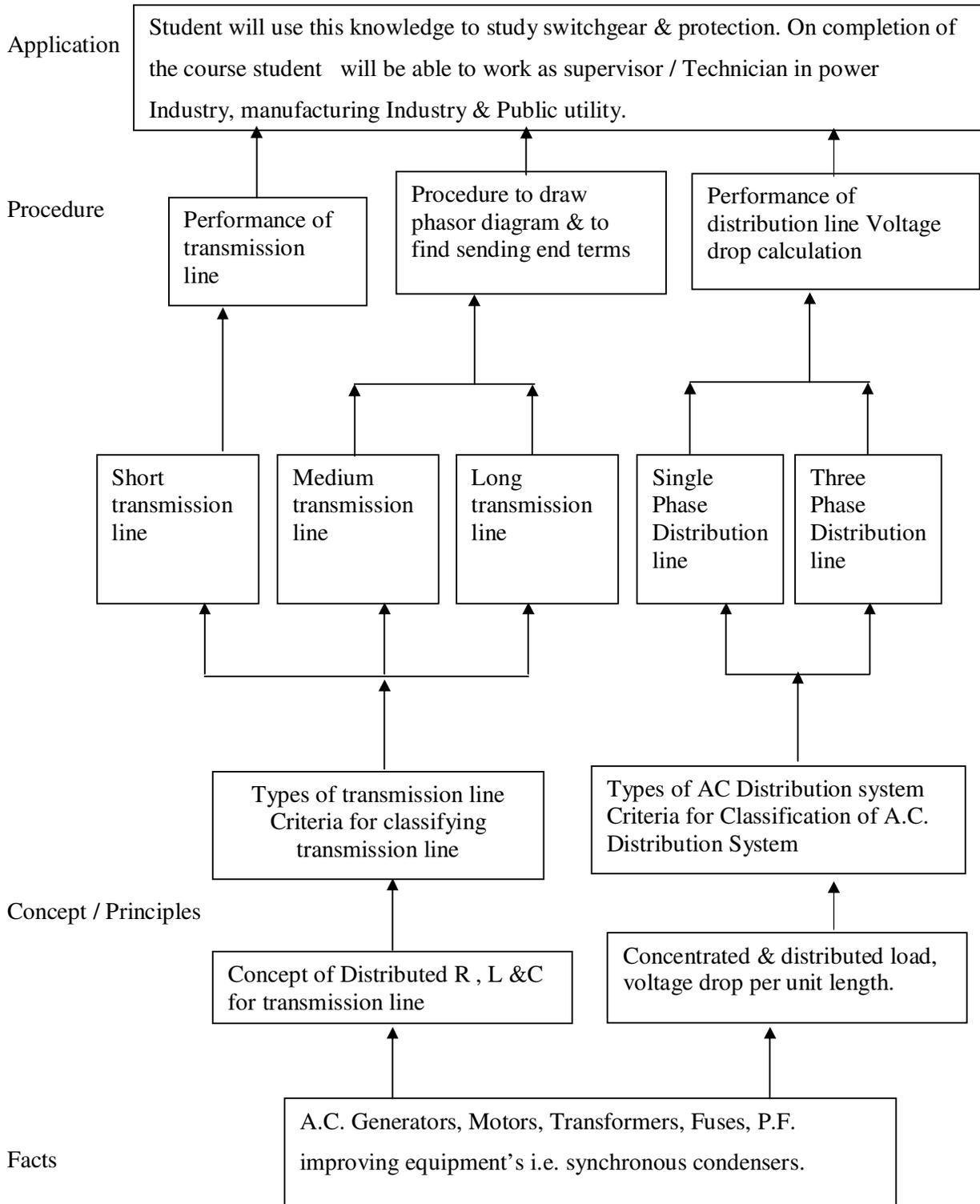
Electrical diploma pass outs should know systems for electrical energy transmission & distribution. They also will be able to identify various components & their functions. They will be able to measure system performance. They will use this knowledge in studying switchgear & protection. On completing the study of generation, transmission & distribution, he/she will be able to work as technician/supervisor in power industry, manufacturing industry & public utilities.

Objective:

The student will be able to:

1. Know various types of transmission & distribution systems.
2. Identify various components & Know their functions.
3. Draw substation layout as per the requirements.
4. Calculate voltage regulation & efficiency of transmission system.
5. Calculate voltage drop of distribution system.

Learning Structure:



Contents: Theory

Chapter	Contents	Hours	Marks
1	Basics of Transmission 1.1 Introduction to transmission. 1.2 Necessity of transmission of electricity. 1.3 Classification & comparison of different transmission systems.	02	04
2	Transmission Line Components 2.1 Introduction to line components. 2.2 types of conductors-Copper, Aluminum & state their trade names. 2.3 Solid, Stranded & bundled conductors. 2.4 Line supports – requirements, types, and field of applications. 2.5 Line insulators – requirements, types, and field of applications. 2.6 Failure of insulator & reasons of Failure. 2.7 Distribution of potential over a string of suspension insulators. 2.8 Concept of string efficiency, Methods of improving string efficiency. 2.9 Corona – corona formation, advantages & disadvantages, factors affecting corona, important terms related to corona. 2.10 Spacing between Conductors. 2.11 Calculation of Span length & sag Calculation (Numerical based on 2.7 , 2.8 & 2.11)	10	18
3	Transmission Line Parameters 3.1 R,L & C of 1-ph & 3-ph transmission line & their effects on line. 3.2 Skin effect, proximity effect & Ferranti effect. 3.3 Concept of transposition of conductors & necessity.	03	06
4	Performance of Transmission Line 4.1 Classification of transmission lines. 4.2 Losses, Efficiency & Regulation of line. 4.3 Performance of single phase short transmission line (Numerical based on it) 4.4 Effect of load power factor on performance. 4.5 Medium transmission lines-End condenser, Nominal T & Nominal π Network with vector diagram. 4.6 General circuit & Generalized Circuit Constants (A, B, C, D)	10	20
5	Extra High Voltage Transmission 5.1 Introduction & Requirement. 5.2 EHVAC Transmission, 5.3 Reasons for adoption & limitations. 5.4 HVDC Transmission – Advantages, Limitations.	03	08
6	Components of Distribution System 6.1 Introduction. 6.2 Classification of distribution system. 6.3 A.C distribution. 6.4 Connection schemes of distribution system. 6.5 Requirements of Distribution systems. 6.6 Design consideration. 6.7 A.C. distribution calculations.	10	20

	6.8 Methods of solving A.C.-1 phase & 3 – phase (balanced) distribution system. (Numerical based on 1-ph & 3-ph balanced distribution system)		
7	Underground Cables 7.1 Introduction & requirements. 7.2 Classification of cables. 7.3 Cable conductors. 7.4 Cable construction. 7.5 Cable insulation, Metallic sheathing & mechanical protection. 7.6 Comparison with overhead lines 7.7 Cable laying 7.8 Causes of failure of cables	05	12
8	Substations 8.1 Introduction. 8.2 Classification of indoor & outdoor sub-stations. 8.3 Advantages & Disadvantages. 8.4 Selection & location of site. 8.5 Main connection schemes. 8.6 Equipment's circuit element of substations. 8.6.1 In coming & outgoing lines, Transformers, CT&PT, Relays, CB's, fuses, Isolators, batteries, lightning arresters. Insulators. 8.6.2 Bus bar's material, types in detail. 8.7 Connection diagram and layout of sub-stations.	05	12
Total		48	100

Learning Resources:**Books:**

Sr. No.	Name of Book	Author	Publication
1	A Course in electrical power	Soni-Gupta-Bhatnagar.	Dhanpat Rai
2	Principals of power system	V. K. Mehta	S. Chand & Company
3	A Course in electrical power	S. L. Uppal.	S. K. Khanna
4	Transmission & distribution of electrical energy	J. B. Gupta	S. K. Khanna
5	Generation & transmission of electrical energy	A. T. Star	Pitman

Course Name : Electrical Engineering Group
Course Code : EE/EP
Semester : Fourth
Subject Title : D.C. Machines & Transformers
Subject Code : 12103

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	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:

This subject is classified under core technology group which intends to teach facts, concepts, principles & procedure for operation & testing of electrical machines, such as DC generators, DC motors and single & three phase transformers. Student will be able to analyze the characteristics of DC motors, Transformers & Qualitative Parameters of these machines.

These machines are used in transmission, distribution & utilization systems. Knowledge gained by the students will be helpful in the study of technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes & testing & maintenance of electrical machines.

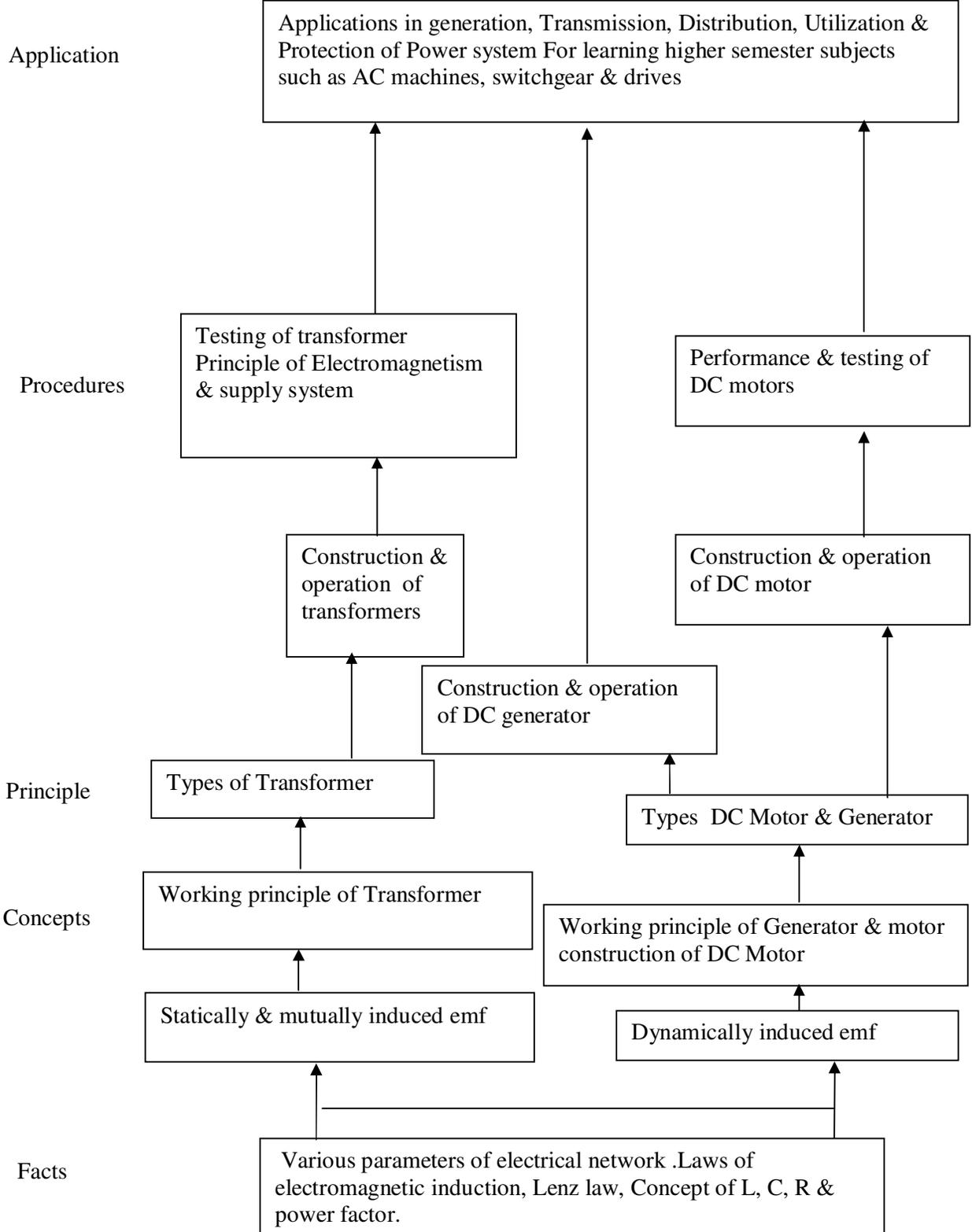
The knowledge & the skills obtained will be helpful in discharging duties such as supervisor, controller & R & D technician.

Objectives:

Student will be able to

1. Know the constructional details & working principles of dc machines & transformers.
2. Test motors & transformers.
3. Evaluate the performance of dc motors & transformers by conducting various tests.
4. Decide the suitability of dc generator motor & transformer for particular purpose.
5. Write the specifications of dc machines & transformers as per requirement.
6. Operate any machine properly.

Learning Structure:



Contents: Theory

Chapter	Contents	Hours	Marks
01	DC MACHINES General 1.1 definition 1.2 construction & types of DC machines 1.3 armature winding types : lap & wave. 1.4 emf equation 1.5 armature reaction 1.6 commutation – concept of reactance voltage 1.7 methods of improving commutation – emf commutation Numericals on e.m.f. equation	08	12
02	DC Motors 2.1 working, principle, back emf, torque equation 2.2 characteristics & application of series, shunt & compound motors 2.3 speed control of dc motor & numerical based on 2.1 to 2.3 2.4 starting of dc motor – 3 point starter 2.5 applications of above motors	08	16
03	Single phase transformer: 3.1 ----- 12 3.1.1 Introduction 3.1.2 Principle of operation 3.1.3 Emf equation, transformation ratio, kva rating 3.1.4 Types & construction of transformer 3.1.5 Concept of ideal transformer 3.1.6 Transformer on no load – vector diagram & numerical 3.1.7 Transformer on load – phasor diagram of loaded transformer Numericals on 3.1.3, 3.1.6 & 3.1.7 3.2 ----- 16 3.2.1 Equivalent circuit 3.2.2 Direct method of finding performance of transformer, 3.2.3 Finding the performance of 1 phase transformer by indirect method using oc& sc test. 3.2.4 All day efficiency– numerical based on 3.2.3 & 3.2.4 3.3 ----- 12 3.3.1 Polarity of transformer & polarity test 3.3.2 Applications 3.3.3 Single phase auto transformer – principle , advantages & disadvantages 3.3.4 Comparison with 2 winding transformer & potential divider 3.4 Design of Transformer: Main Dimensions, No. of turns for Primary and secondary, Conductor cross section ----- 08	20	48
04	Three phase Transformer 4.1 construction 4.2 connections 4.3 voltage & current ratio 4.4 vector groups 4.5 3 phase auto transformer 4.6 application of 3 phase auto transformer	08	16

Chapter	Contents	Hours	Marks
05	Special purpose transformer	04	08
	5.1 current transformer		
	5.2 potential transformer		
	5.3 isolation transformer		
	5.4 welding transformer		
Total		48	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Analytical Skills.
2. Identification skills.

Motor Skills:

1. Measurement Skills.
2. Connection Skills.

List of Practicals:

- 1) a) To identify the constructional parts of D. C. machine.
b) To plot the O.C.C. of a given d. c. machine and to find critical resistance.
- 2) To find the performance of d. c. series & shunt motor by conducting load test
- 3) a) To control the speed of d. c. shunt motor above and below normal speed.
b) To reverse the direction of rotation of d. c. motor.
- 4) a) To identify the constructional details of 1-phase and 3-phase transformer.
b) Visit to maintenance and repair workshop of a transformer and prepare a report.
- 5) To measure the performance of single phase transformer by direct loading and to find transformation ratio.
- 6) To measure the performance of single phase transformer by conducting O.C. and S.C. test.
- 7) To identify terminal polarity of corresponding phases of 3-phase transformer & to calculate transformation ratio.
- 8) To compare 1-phase auto transformer with two winding transformer by collecting literature from local dealer/manufacturer & compare the data on following points.
Weight of iron, weight of copper, turns ratio, efficiency & percentage regulation.
- 9) To observe the phase difference between primary & secondary voltage of 3-phase transformer for various vector groups.

Learning Resources:**Books:**

Sr.No	Title	Author	Publisher & Address
1	Electrical Technology	E. Hughes	Logmans, London
2	Electrical Technology	H. Cotton	C. B. S. Publisher New Delhi
3.	Electrical Technology Vol. II	B. L. Theraja	S. Chand & CO Delhi
4.	Electrical Machine Design	A. K. Sohawney	Dhanpatrai & Sons, New Delhi

Course name : Electrical Engineering Group

Course Code : EE/EP

Semester : Fourth

Subject Title : Instrumentation

Subject Code : 12104

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. Curriculum for first test and second test shall be approximately 40% and 60% respectively. Question paper for test: Q1: 3 bits of 3 marks each, option $\frac{3}{4}$, Q.2 : 3 bits of 4 marks each, option $\frac{2}{3}$, Q3: 3 bits of 4 marks each or 2 bits of 8 marks each, option $\frac{2}{3}$ or $\frac{1}{2}$.**
- **Total of test 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:

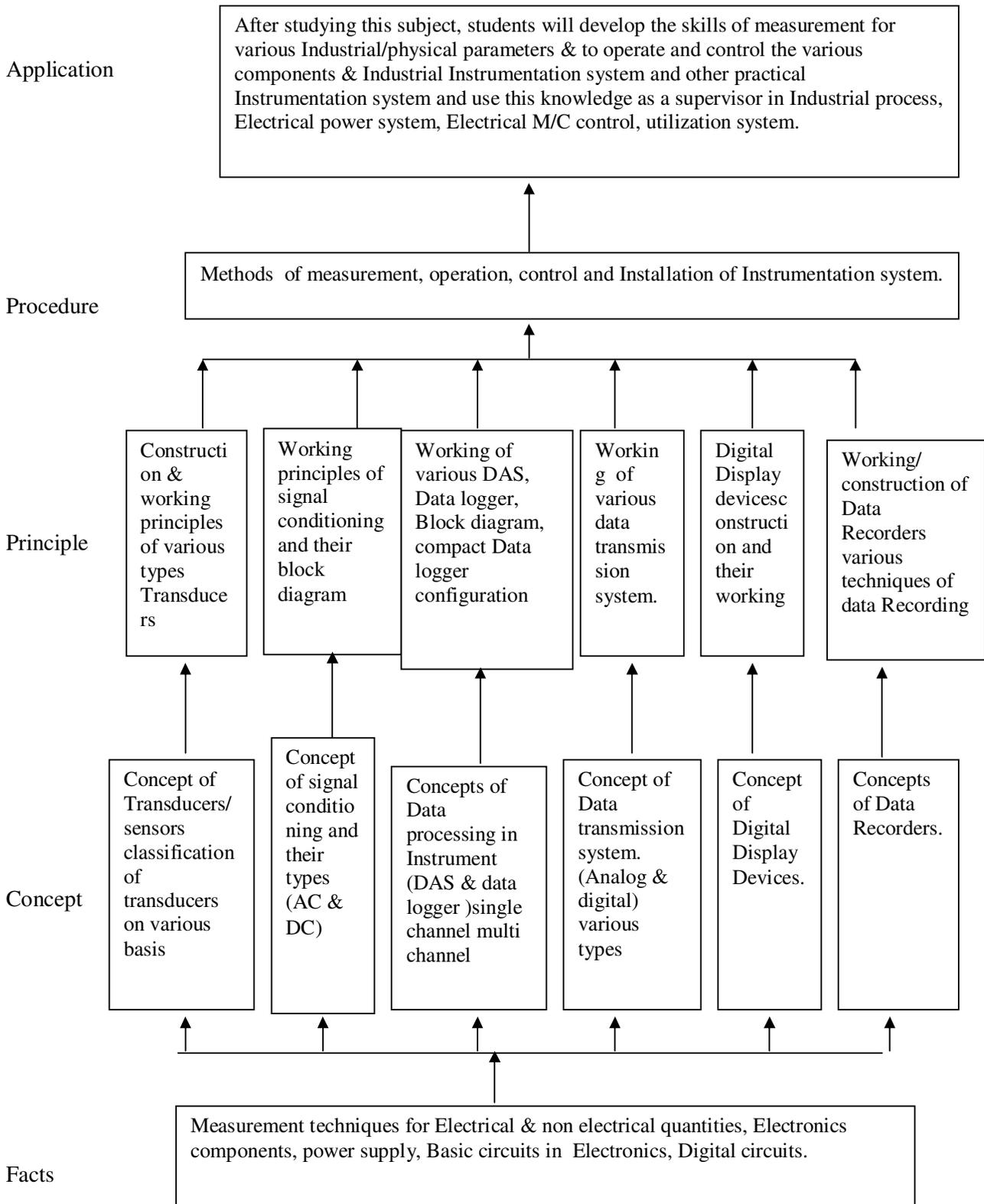
This is classified under Technology Group in electrical power system, Electrical machine control, Industrial process control and many other systems such as Biomedical, environmental, defense etc. Nowadays sophisticated Instruments and their related systems are developed for fast, accurate and reliable measurements, operations and control. Being Electrical Diploma Holders has a role of supervisor, Maintenance engineer and to assist in carrying out testing and R & D work in electrical, Industrial, Electronics and communication field. He must understand the basics, facts, concepts and principles of Instrumentation, various modern Instruments.

Objectives:

The Students will be able to:

1. Identify the components of Instrumentation system for processing given Input to get desired Output.
2. Identify appropriate transducers/sensors for given application.
3. Identify signal conditioning circuit for Instrumentation system in Industrial process, Electrical power system, Electrical machine operation, Measurement and control.
4. Select data processors for given Instrumentation system.
5. Select appropriate data transmission system.
6. Identify the digital display devices and recorders for various applications.
7. Select the appropriate transducers/sensor for various applications of Measurement of non-electrical quantity in Industrial process, Electrical Power system, Electrical machines, utilization system.

Learning Structure:



Contents: Theory

Chapter	Topics	Hours	Marks
01	Introduction to Instrumentation system Facts and concept of Instrumentation Basic block diagram of Instrumentation system & its function Static and dynamic characteristics Accuracy and precision Sensitivity and Resolution Linearity and nonlinearity Repeatability and reproductivity Hysteresis and Drift Speed of Response, lag, fidelity, dynamic error	03	06
02	Transducers 2.1 Concept of Transducers 2.2 Classification of Transducers 2.2.1 Primary and Secondary Transducers 2.2.2 Electrical and Mechanical Transducers 2.2.3 Analog and Digital Transducers 2.2.4 Active and passive Transducers 2.3 Construction and working principles of Transducers 2.3.1 Resistive, Inductive and capacitive transducers 2.3.2 Strain gauge (No derivation only formula) 2.3.3 Types of strain gauges:- unbounded, bounded, Semiconductor 2.3.4 Bourden tube, Bellows, Diaphragm. 2.3.5 LVDT and RVDT. 2.3.6 Piezoelectric transducer, photoconductive cell, photovoltaic cells, load cell. 2.3.7 RTD, Thermistor, Thermocouple. 2.3.8 Pyrometers (Radiation, optical, photoelectric), ultrasonic temperature Transducers. 2.3.9 Contacting and non contacting Transducers, Digital tachometer 2.3.10 Accelerometer, 2.3.11 Electromagnetic and turbine flow meter, ultrasonic flow meter 2.3.12 Digital encoders disc type, frequency output type transducer, and Reluctance pulse pick-ups.	12	18
03	Signal conditioning 3.1 Concept of signal conditioning 3.2 Block diagram of AC and DC signal conditioning and working 3.3 Operational Amplifiers, OP AMP - 741, signal conditioning circuits using OPAMP, its working and function 3.3.1 Integrator, Differentiator, adder, subtractor, Inverter etc. 3.3.2 V to I converter, I to V converter , V to F converter 3.3.3 Instrumentation Amplifier, Differential amplifier 3.4 Filters:- Types and frequency response (Only passive, active first order analog filters) (No derivations)	05	16

	3.5 Multiplexing 3.6 Use of signal conditioning circuit for Instrumentation system for Industrial applications.		
04	Data Processors & Data transmission 4.1 Necessity of data processing in Instrumentation. 4.2 Generalized Data acquisition system: Block diagram. & explanation 4.3 Objectives of DAS 4.4 Signal conditioning in DAS, Ratiometric conversion, Logarithmic conversion 4.5 Single channel and multi channel Data acquisition system only block diagram 4.6 A/D and D/A converters using OPAMPS only working principle 4.7 Data loggers, its characteristics, Basic operation of data logger 4.8 Block diagram of data logger and explanation 4.9 Comparison between DAS and data logger. 4.10 Concept of Data transmission 4.11 Block diagram of data transmission system & explanation 4.12 Advantages and disadvantages of digital data transmission over analog transmission 4.13 Time Division multiplexing (TDM), Frequency division multiplexing. 4.14 Digital Modulation, pulse code format, Modem.	08	16
05	Display Devices and Recorders 5.1 Digital display devices (LED, seven segment only) 5.2 Concept of 3 ½, 4 ½ digit 5.3 Necessity of Recorder in Instrumentation 5.4 Classification of Recorders. 5.5 Block diagram and working principles of strip-chart, X-Y recorder, Magnetic tape recorder & their applications. 5.6 Frequency Modulation Recording (FM), Modified Frequency Modulation (MFM) 5.7 Digital Data Recording, Techniques of Digital data Recording (RZ & NRZ techniques) 5.8 Advantages and disadvantages of digital data recording 5.9 Comparison between analog and digital Recording techniques 5.10 Recorders selection for particular applications.	08	18
06	Operation of Instrumentation system 6.1 Points to be considered while selecting a transducer for its intended applications. 6.2 Diagram, explanation and working of Instrumentation system for:- 6.2.1 Temperature Measurement by RTD, Thermistor, Thermocouple 6.2.2 Pressure Measurement by Mechanical devices, Photoelectric, piezoelectric, Bourden tube, LVDT 6.2.3 Speed measurement by contacting and non contacting methods 6.2.4 Displacement measurement by LVDT, RVDT.	08	22

	6.2.5 Flow measurement by electromagnetic & turbine flow meter. 6.2.6 Liquid level measurement by Resistive, Inductive, capacitive and ultrasonic methods, digital methods 6.2.7 Humidity Measurement.		
07	Pilot Devices 7.1 – Pilot Devices : - What are pilot devices? - Function of pilot devices. - List of different pilot devices. 7.2 – Construction, working and applications of: Push Button, Limit Switches, Float Switches, Electromagnetic Relay, Pressure Switches, Thermostat.	04	04
Total		48	100

PRACTICAL:

Skills to be developed:

Intellectual skills:

1. Selection of equipment.
2. selection of transducers.

Motor Skills:

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

List of Practical:

Sr.No	Name of Experiment
01	To measure linear displacement by LVDT and plot characteristics.
02	To measure strain/force using strain gauge/load cell.
03	To measure temperature by pt-100,thermistor and thermocouple along with simple resistance bridge.
04	To measure pressure by using Bourdon tube.
05	To study the following signal conditioning circuits using OP-Amp 741 and observe and plot the output-Adder, Subtractor ,Differentiator and Integrator.
06	To study V to I converter and I to V converter using OP-Amp 741 and observe the output.
07	To measure speed by contacting non-contacting and digital tachometer.
08	To measure PH value by digital PH meter of 1)Water 2)Chemical solution.
09	Demonstration of D/A converter using OP-Amp.
10	To plot frequency response of active filters. Low pass filter and high pass filter.
11	To demonstrate pilot devises like push button switches limit switches selectors switches pressure switches, float switches etc.

Learning Resources:**Books:**

Sr. No.	Author	Book	Publication
1.	H.S.Kalsi	Electronic Instrumentation	Tata McGraw Hill
2.	D.Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill
3.	A.K.Sawhney	Electrical and Electronics Measurement and Instrumentation	Dhanpat Rai & co.
4.	Alan s. morris	Principles of Measurement & Instrumentation	Prentice Hall India
5.	Donald P. Eckman	Industrial Instrumentation	Wiley Eastern Ltd.
6.	S.K. Bhattachrya Brijinder Singh	Control of Electrical Machines	New Age International

Course name : Electrical Engineering Group
Course Code : EE/EP
Semester : Fourth
Subject Title : Electrical Estimation & Costing
Subject Code : 12105

Teaching and Examination Scheme: 'E' Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	01	02	03	100	--	25@	--	125

NOTE:

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE. Curriculum for first test and second test shall be approximately 40% and 60% respectively. Question paper for test: Q1: 3 bits of 3 marks each, option $\frac{3}{4}$, Q.2 : 3 bits of 4 marks each, option $\frac{2}{3}$, Q3: 3 bits of 4 marks each or 2 bits of 8 marks each, option $\frac{2}{3}$ or $\frac{1}{2}$.
- Total of test 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:

This subject is classified under Technology subject. Electrical Diploma holders have to work as Technicians & Supervisors for Electrical Installations of various companies, commercial and Industrial electrification schemes and prepare estimates for these schemes. They also work as Independent electrical contractors and execute illumination and electrification schemes.

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.

Similarly understanding of the methods and procedure of estimating the material required; developed the skill of preparing schedule of material; detailed estimates; costing of different types of Installation which leads to preparing of the tender documents, procedure for tendering, evaluation and billing of executed work of different types of electrical Installation Project.

Objectives:

Student will be able to:

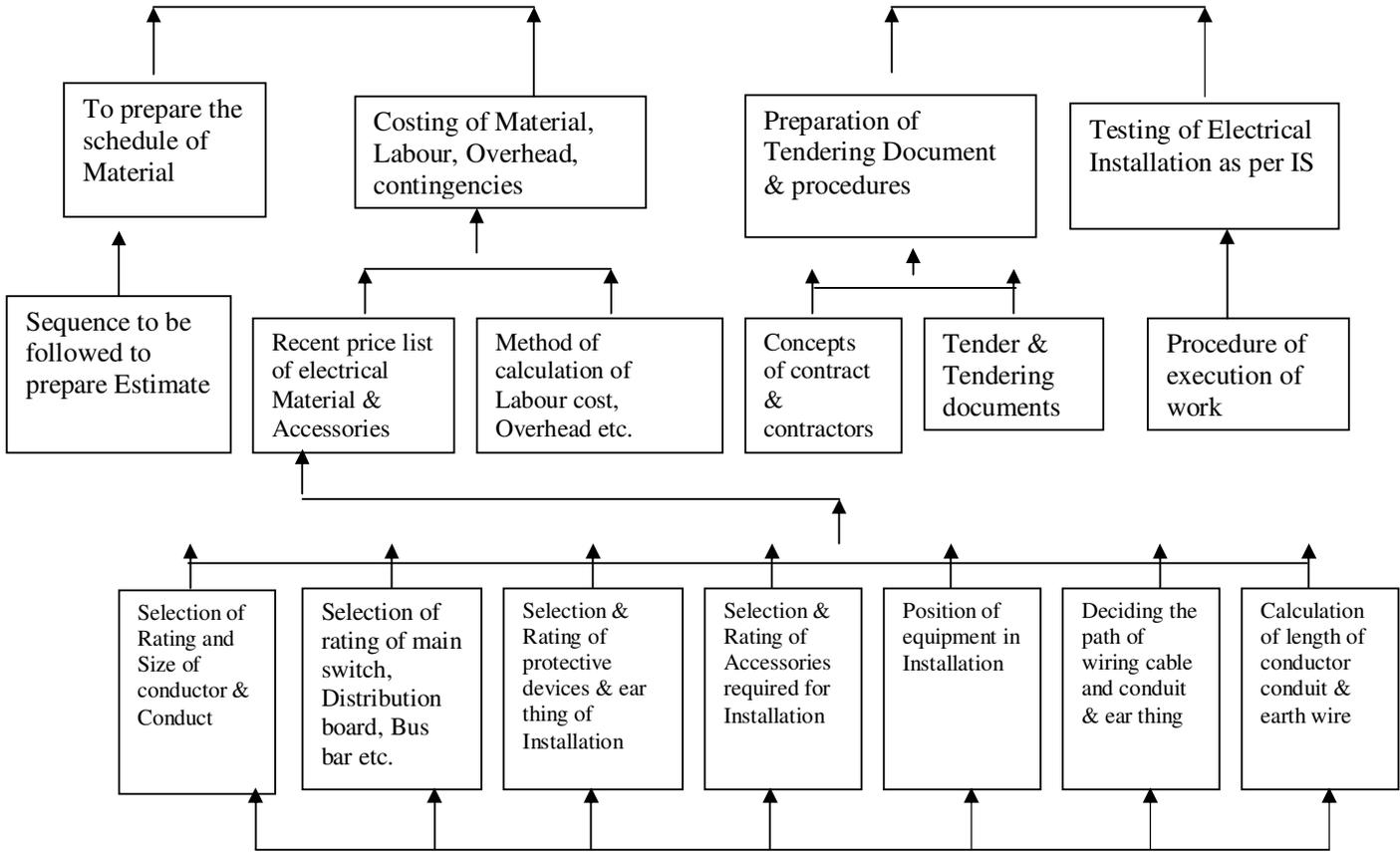
- 1) Define different types of Electrical Installation
- 2) Interpret the Electrical Engineering Drawing
- 3) State IE rules, NEC related to Electrical Installation and testing.
- 4) State and describe the basic terms, general rules, circuit design procedure, wiring design and design considerations of Residential Electrical Installations.
- 5) Explain the sequence to be followed in carrying out the estimate of Residential Installations.
- 6) Prepare detail estimate and costing of Residential Electrical Installations.
- 7) Test Industrial Electrical Installation.
- 8) Understand the concept of contracts, contractors, tender and tender document and its related procedures.

Learning Structure:

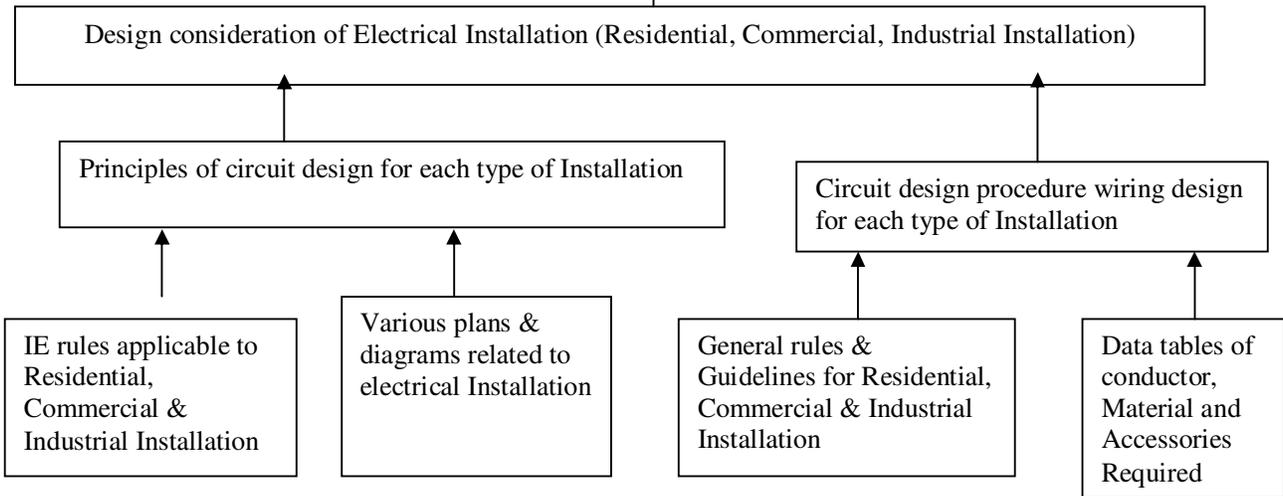
Application:

Estimating & costing of Residential, Commercial & Industrial Electrical Installation and prepare tendering documents, Testing of Electrical Installation and Evaluation & billing of executed work

Procedure:



Concepts:



Contents: Theory

Chapter	Topics	Hours	Marks
01	Drawing and IE rules 1.1 Classification of Electrical Installation. 1.2 General requirement of Electrical Installation. 1.3 Reading and Interpretation of Electrical Engineering Drawings. 1.3.1. Various diagrams, plans and layout 1.3.2. Important definitions related to Installation 1.4 IE rules related to Electrical Installation & Testing.	02	08
02	Service Connection 2.1 Concept of service connection. 2.2 Types of service connection & their features. 2.3 Methods of Installation of service connection. 2.4 Estimates of under ground & overhead service connections.	02	08
03	Residential Building Electrification 3.1 General rules guidelines for wiring of Residential Installation and positioning of equipments. 3.2 Principles of circuit design in lighting and power circuits. 3.3 Procedures for designing the circuits and deciding the number of circuits. 3.4 Method of drawing single line diagram. 3.5 Selection of type of wiring and rating of wires & cables. 3.6 Load calculations and selection of size of conductor. 3.7 Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories. 3.8 Earthing of Residential Installation. 3.9 Sequence to be followed for preparing Estimate 3.10 Preparation of detailed estimates and costing of Residential Installation.	08	24
04	Electrification of commercial Installation 4.1 Concept of commercial Installation. 4.2 Differentiate between electrification of Residential and commercial Installation. 4.3 Fundamental considerations for planning of an electrical Installation system for commercial building. 4.4 Design considerations of electrical Installation system for commercial building. 4.4.1 Load calculations & selection of size of service connection and nature of supply. 4.4.2 Deciding the size of cables, busbar and busbar chambers. 4.4.3 Mounting arrangements and positioning of switchboards, distribution boards main switch etc. 4.4.4 Earthing of the electrical Installation 4.5 Selection of type wire, wiring system & layout. 4.6 Sequence to be followed to prepare estimate. 4.7 Preparation of detailed estimate and costing of commercial Installation.	08	20

Chapter	Topics	Hours	Marks
05	Electrification of factory unit Installation 5.1 Concept of Industrial load. 5.2 Concept of Motor wiring circuit and single line diagram. 5.3 Important guidelines about power wiring and Motor wiring. 5.4 Design consideration of Electrical Installation in small Industry/Factory/workshop. 5.4.1. Motor current calculations. 5.4.2. Selection and rating of wire, cable size & conduct. 5.4.3 Deciding fuse rating, starter, distribution boards main switch etc. 5.4.4. Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. 5.5 Sequence to be followed to prepare estimate. 5.6 Preparations of detailed estimate and costing of small factory unit/ workshop.	08	24
06	Testing of Installation Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS	02	04
07	Contracts, Tenders and Execution 7.1 Concept of contracts and Tenders 7.1.1 Contracts, types of contracts, contractors. 7.1.2 Valid Contracts, Contract documents. 7.1.3 Tender and tender notices. 7.1.4 Procedure for submission and opening tenders. 7.1.5 Comparative statements, criteria for selecting contractors, General conditions in order form. 7.2 Principles of Execution of works 7.3.1 Administrative approval, Technical sanctions. 7.3.2. Billing of executed work.	02	12
Total		32	100

Tutorials:**Problems on estimation and costing:**

1. Electrical Installation scheme for single flat, independent bungalow and small house. Draw wiring diagram and prepare detailed estimate and its costing
2. Electrical Installation scheme for commercial buildings. Draw wiring diagram and prepare detailed estimate and its costing.
3. Electrical Installation scheme for small factory unit. Draw single line layout and prepare detailed estimate and its costing
 1) Small factory unit 2) Workshop 3) Agriculture pump and floor mills etc.

Assignments:**Note: Use half imperial drawing sheets**

- 1) Design electrical Installation scheme for a flat scheme/ Independent bungalow/House. Draw detail wiring diagrams also prepare material schedule and detailed estimate and costing. Prepare report and Drawing sheets. (Minimum 2 Drawing sheets).

- 2) Design electrical Installation scheme for any one commercial complex having minimum 20KW load requirements. Draw detailed wiring diagram; prepare material schedule and detailed estimate and costing, prepare report and Drawing sheet (one Drawing sheet).
- 3) Design Electrical Installation scheme for agriculture pump/floor mill. Draw wiring diagram, prepare material schedule and detailed estimate and costing. Prepare report and Drawing sheet. (One Drawing sheet).
- 4) Design electrical Installation scheme for any two-factory/small unit/workshop having aggregate load of 30 KW. Draw wiring diagrams prepare material schedule & detail estimate and costing. Prepare report and Drawing sheet. (Two Drawing sheet).

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher & Address
1.	K.B. Raina S.K.Bhattacharya	Electrical Design; Estimating and costing	New Age International (p) Limited, New Delhi
2.	Surjit Singh	Electrical Estimating and costing	Dhanpat Rai and company, New Delhi
3.	N. Alagappan S. Ekambaram	Electrical Estimating and costing	Tata Mc Graw Hill Publication, New Delhi
4.	S.L. Uappal	Electrical wiring Estimating and costing	Khanna Publication.
5.	B.D.Arora	Electrical wiring, Estimating and costing	R.B. Publication, New Delhi

2. IS/International Codes : IS- 5909, 7733, 2174, 732,4648

Course Name : Electrical and Electronics Engineering Group

Course Code : EE/EP/ET/EJ/EN/EX/IE/IS/IC/DE

Semester : Fourth

Subject Title : Applied Electronics

Subject Code : 12106

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	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)**

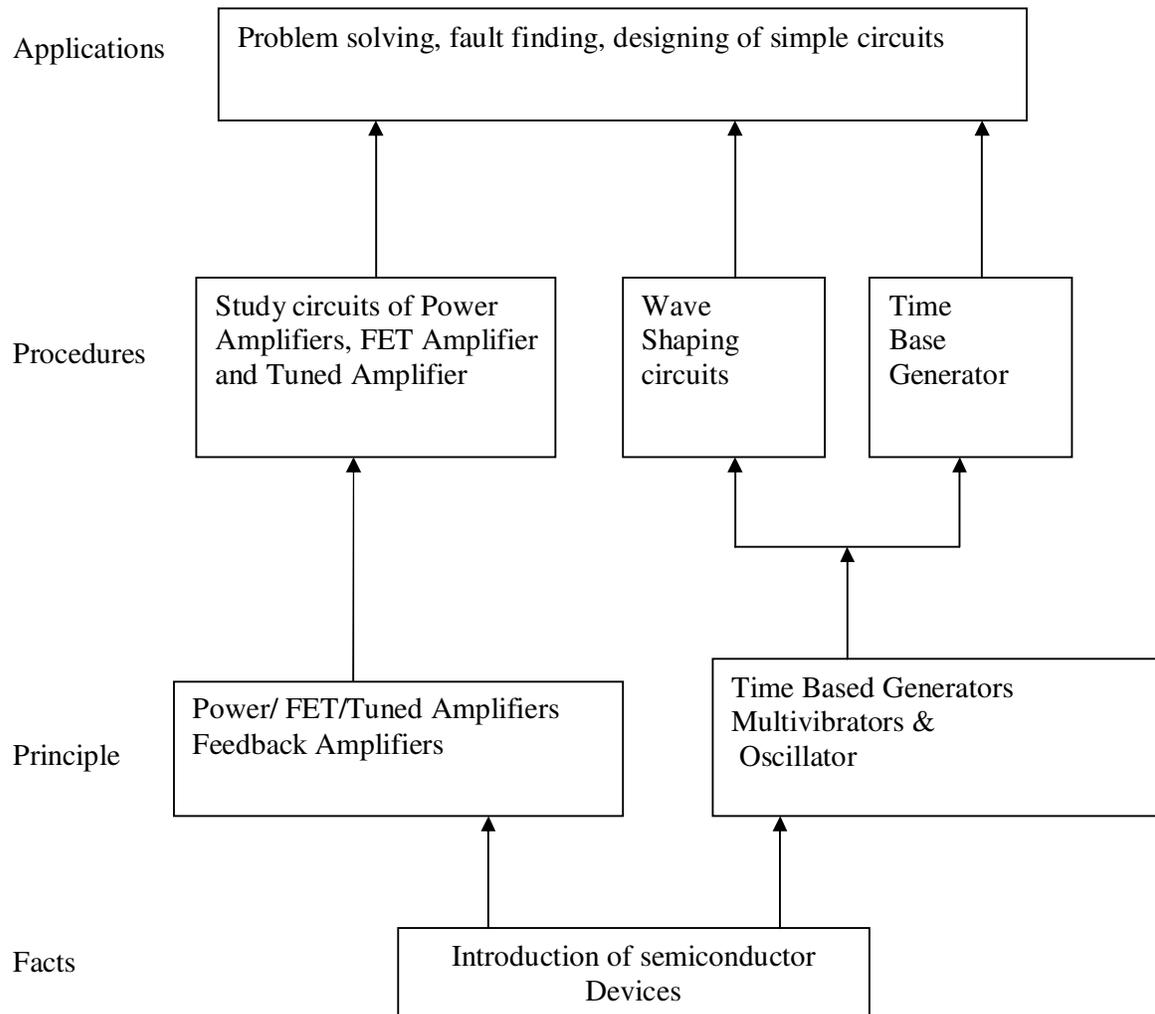
Rationale:

As a core technology subject, it intends to teach operating principle and application of electronic circuits and devices like amplifiers, oscillators, switching circuits, wave shaping circuits. The subject knowledge is required in Industrial electronics, Instrumentation and Communication system. Understanding of the subject will provide skill to the students for trouble shooting & testing of some of circuits & devices.

Objectives:

- 1] Classify various amplifiers & oscillator circuits based on their characteristics.
- 2] Classify different wave shaping circuits & multivibrators.
- 3] Configure regulated power supply using IC's.
- 4] Test and repair various devices.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	<p>AMPLIFIERS</p> <p>1.1) Power Amplifiers</p> <p>1.1.1 Introduction, Classification – Class A, Class B, Class AB & Class C, efficiency of each.</p> <p>1.1.2 Single stage class A power amplifier: Circuit operation, input & output waveforms , graphical Analysis and efficiency of</p> <p>1.1.2.i] Transformer couple resistive load single stage power amplifier</p> <p>1.1.2. ii] Class A push pull amplifier</p> <p>1.1.2.iii] Class B push pull amplifier</p> <p>1.1.2.iv] Class AB push pull amplifier</p> <p>1.1.3 Concept of cross over distortion</p> <p>1.1.4. Advantages of push pull amplifier, collector power dissipation requirement & specifications of power transistor, need of heat sink.</p> <p>1.2 FET Amplifier</p> <p>1.2.1 Biasing of FET: Source Self Bias, Drain to source Bias Application of FET as V V R</p> <p>1.2.2 Common Source Amplifier: Working & Applications</p> <p>1.2.3 Introduction to MOSFET:Types, Construction, Working & Applications</p> <p>1.3 Tuned Amplifiers</p> <p>1.3.1 Introduction & necessity of tuned amplifier. Basic tuned circuits, series & parallel resonance in tuned circuits.</p> <p>1.3.2 Operating principle, circuit working, resonance frequency of single tuned, double tuned amplifiers.</p>	16	26
02	<p>2.1 Feedback Amplifiers & oscillators</p> <p>2.1.1 General theory of feedback: Types of feedback – negative & positive feedback.</p> <p>2.1.2 Types of negative feedback – voltage shunt, voltage series, current shunt & current series.</p> <p>2.1.3 Advantages of negative feedback on voltage gain, bandwidth, input impedance, output impedance, stability, noise , distortion in amplifiers.</p> <p>2.2 Introduction to oscillator , block diagram of sine wave oscillator , requirement of oscillation.</p> <p>2.2.1 Barkhausen criterion , operating principles of RC & LC oscillators</p> <p>2.2.2 RC oscillators – RC phase shift, Wien bridge</p> <p>2.2.3 LC oscillators – Colpitts, Hartley, Crystal oscillators Circuit diagram, equation for frequency of oscillation & frequency stability.</p>	10	22
03	<p>3.1 Wave shaping circuits</p> <p>3.1.1 Necessity of wave shaping circuits.</p> <p>3.1.2 Linear circuits – RC integrator & differentiator – input / output waveforms & frequency response.</p> <p>3.1.3 Non-linear circuits - Clipper, diode series & shunt, positive</p>	06	16

	& negative biased & unbiased & combinational clipper. 3.1.4 Clampers – positive & negative clampers		
04	4.1 Multivibrators 4.2 Transistor as switch. Definition & graphical representation of different time periods. 4.3 Multivibrator classification, circuit working & frequency with specific application. MMV, AMV, BMV & Schmitt trigger	06	16
05	5.1 Time base generator – 5.2 Voltage time base generator, exponential sweep generator UJT Relaxation Oscillator, negative resistance generator. working principle & operation . 5.3 Current time base generator , bootstrap & miller sweep generator, applications in TV & CRO	06	14
06	Trouble shooting & Testing 6.1 Need for trouble shooting , Important steps for testing 6.2 Visible testing – Observing circuits for visible faults like broken component, open contacts etc. 6.3 Active testing – Voltage analysis, Resistance analysis, signal analysis. 6.4 Trouble shootings of multivibrators, phase shift oscillators, transistorised sweep generator, clipping & clamping circuits.	04	06
Total		48	100

Practical:**Intellectual Skills:**

1. To locate faults in circuits.
2. Interpret the waveforms.

Motor Skill:

1. Ability to Sketch circuit/block diagram.
2. Ability to interpret the circuit.

List of Practicals:

1. To Plot Frequency response of FET amplifier.
2. To Plot Frequency response & bandwidth of negative feedback amplifier.
3. To Study the Colpitt's oscillator.
4. To Study RC Phase shift oscillator.
5. To Study RC integrator and differentiator & draw i/p & o/p waveforms.
6. To Study Clipping and clamping circuits.
7. To Study function of Astable Multivibrator.
8. To Study Monostable Multivibrator.
9. To Study Bistable Multivibrator.

10. To Study UJT relaxation oscillator.

Learning Resources:**Books:**

Sr. No	Author	Title	Publication
01	Paul Malvino	Electronic Principles	Tata McGraw-Hill
02	R.S.Sedha	Applied Electronics	S.Chand & Co.
03	Allen Mottershed	Electronics Devices & Circuits	Prantice Hall India LTD.
04	J.Millman and H.Taub	Pulse Digital & Switching Waveforms	Tata McGraw-Hill
05	G.K.Mittal and A.R.Vanvasai	Pulse & Digital Electronics	Khanna Publication

Course Name : Electrical Engineering Group
Course Code : EE/EP
Semester : Fourth
Subject Title : Electrical Drawing
Subject Code : 12107

Teaching and Examination Scheme:

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

Rationale:

This is a core subject and has importance in operation and Maintenance of Electrical Systems. Electrical Drawing indicates the symbolic representation and position of components. It also shows the power flow thorough them for a given systems.

Electrical Drawing symbolically represents the circuit configuration and enables to identify the sequential flow of current, power and measure voltage at various stages of the system.

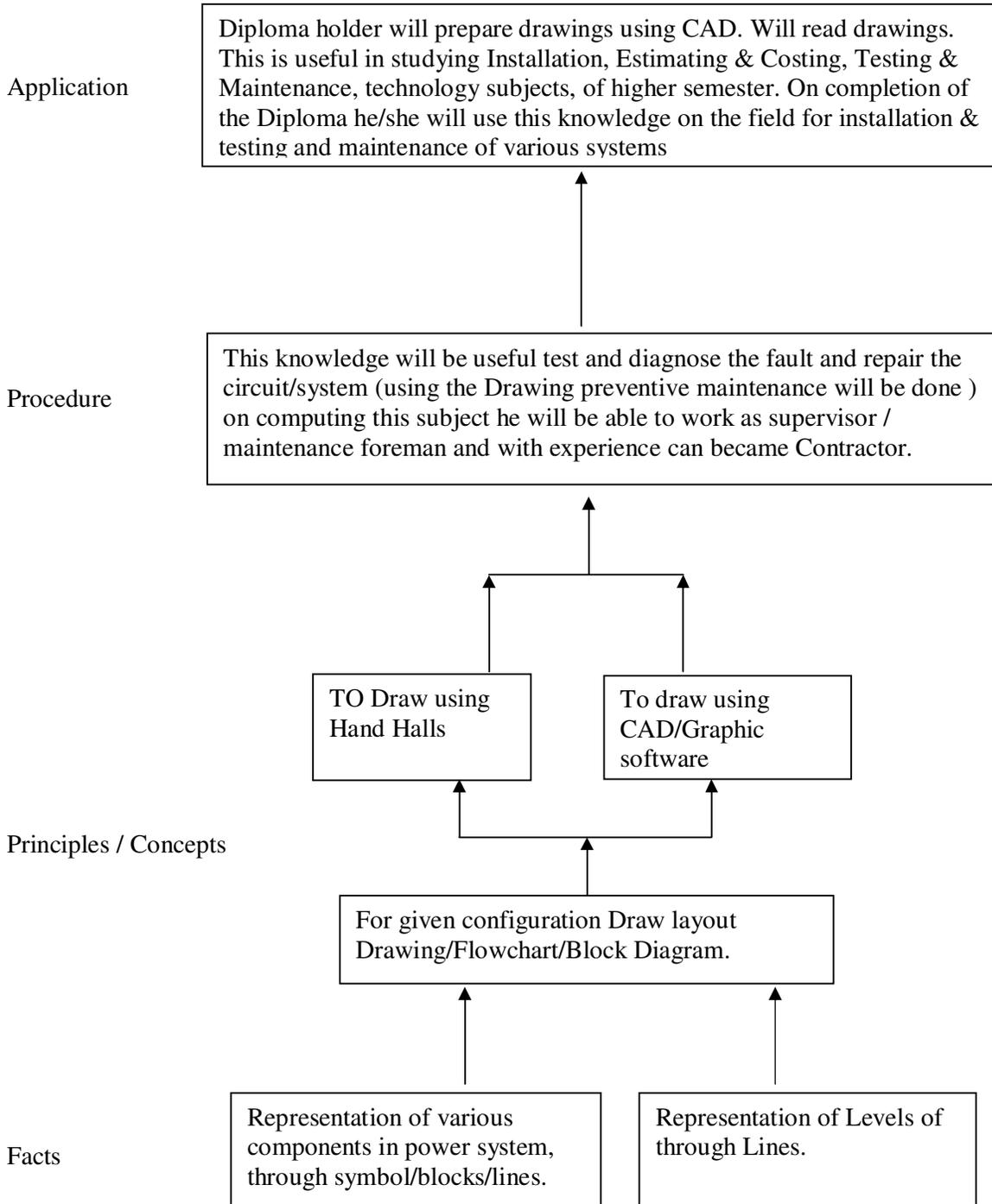
Ability to read and understand the drawing will facilitate the visualization of the complete installation which makes it easy to troubleshooting, maintenance of the system.

Objectives:

The students will be able to,

1. Read electrical drawing for any system to understand the working of the system and its components.
2. Find the important points in the circuit diagrams or layout for troubleshooting and maintenance.
3. Use these drawings effectively to measure various quantities (continuity also) in the actual circuits or systems and based on the readings (output) at these points can diagnose the fault.
4. Use graphic software to draw the circuit or block diagrams or flowchart for various types of electrical systems.

Learning Structure:



Contents: Theory

Chapter	Topics	Hours
01	Study of symbols for representation of machines, Electrical Accessories Equipment switching and protection units as per IS 2032, 8270, 3722	2*
02	Study of various methods of representing circuits/systems through layouts, Block Diagrams, wiring diagrams.	1*
03	Study any Engineering Graphic package (preferably CAD) for preparing layout, Block Diagrams, wiring Diagrams of substations, Machine shop, Illumination systems etc.	1*
04	How to read and interpret, various types of electrical drawings based on the knowledge & Information given while studying the above 3 chapters.	4*

* Eight Clock Hours of practical / drawing will be used for teaching theory

Drawing Sheets: (HALF IMPERIAL)

- (A) Draw a sheet for symbolic representation of various electrical equipment's/machines
(B) Read the given circuits identify the components & trace the path of flow of current.
- Draw a sheet of wires & wiring accessories
- Prepare a drawing sheet showing details of domestic appliances such as Electric iron, electric Geyser, Electric Bell, Hot plate.
- Draw a sheet of electrical symbols for various electrical devices using CAD.
- Draw circuit diagrams for Staircase & Godown wiring using CAD.
- Draw (a) circuit diagram (b) Vector diagram for conducting direct loading test on transformer using CAD.
- Draw control and power circuit diagrams for DOL and Star/Delta Starter.

Mini Project:

- Visit electrical Machine lab/workshop & trace the electrical installation. Draw Layout diagram & single line diagram.

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
01	Dr. S. K. Bhattacharya	Electrical Engineering Drawing	New Age International Publishers
02	Mr. Ajit Singh	Working with Auto CAD	Tata McGraw Hill

2. IS/International Codes : IS 2032, 8270, 3722

Course Name : Diploma in Engineering and Technology

Course Code : (All Branches)

Semester : Fourth

Subject Title : Development of Life Skills - II

Subject Code : 12041

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPERH RS.	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25#	25@	50

Rationale:

In today's competitive world, the nature of organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. He will be a part of a team in the organization. As such the individual skills are not sufficient to work at his best.

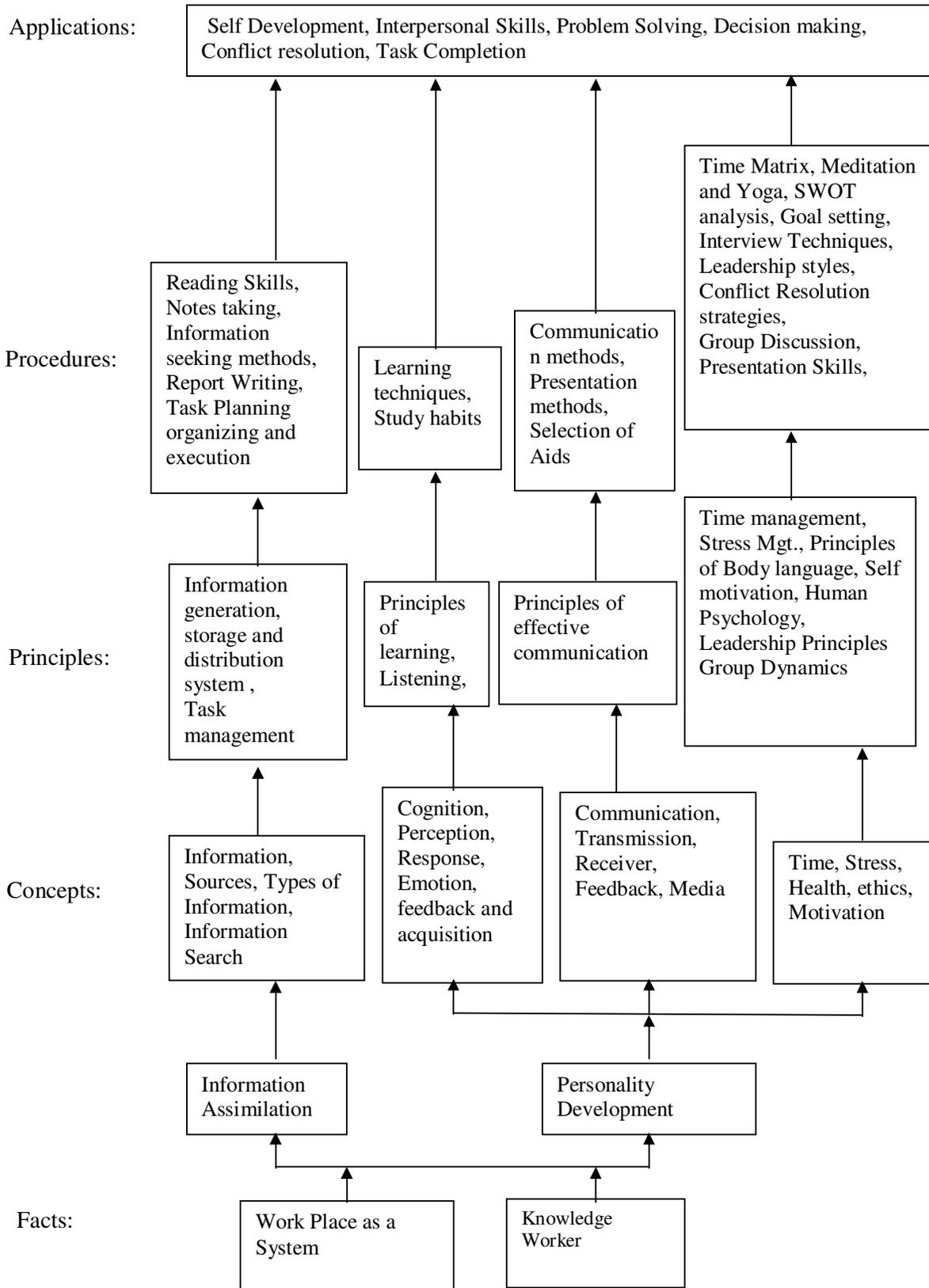
This subject will develop the student as an effective member of the team. It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems .

THE SUBJECT IS CLASSIFIED UNDER HUMAN SCIENCE.

OBJECTIVES: THE STUDENTS WILL BE ABLE TO:

1. Develop attitude for working in teams.
2. Apply problem solving techniques for a given situation.
3. Use effective presentation techniques.
4. Apply techniques of effective time management.
5. Apply task management techniques for given projects.
6. Enhance leadership traits.
7. Resolve conflict by appropriate method.
8. Survive self in today's competitive world.
9. Face interview without fear.
10. Follow moral and ethics.
11. Convince people to avoid frustration.

LEARNING STRUCTURE:



Contents: Theory

Topic No	CONTENTS	HOURS
1	SOCIAL SKILLS SOCIETY, SOCIAL STRUCTURE, DEVELOP SYMPATHY AND EMPATHY.	01
2	SWOT Analysis – Concept , How to make use of SWOT Analysis	01
3	Inter personal Relation Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.	02
4	Problem Solving I)STEPS IN PROBLEM SOLVING, 1)IDENTIFY AND CLARIFY THE PROBLEM, 2)INFORMATION GATHERING RELATED TO PROBLEM, 3)EVALUATE THE EVIDENCE, 4)CONSIDER ALTERNATIVE SOLUTIONS AND THEIR IMPLICATIONS, 5)CHOOSE AND IMPLEMENT THE BEST ALTERNATIVE, 6)REVIEW II)Problem solving technique. (any one technique may be considered) 1) Trial and error, 2) Brain storming, 3) Lateral thinking	02
5	Presentation Skills Body language -- Dress like the audience Posture, Gestures, Eye contact and facial expression. PRESENTATION SKILL – STAGE FRIGHT, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board	03
6	Group discussion and Interview technique – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making INTERVIEW TECHNIQUE NECESSITY, TIPS FOR HANDLING COMMON QUESTIONS.	03
7	Working in Teams UNDERSTAND AND WORK WITHIN THE DYNAMICS OF A GROUPS. TIPS TO WORK EFFECTIVELY IN TEAMS, ESTABLISH GOOD RAPPOR, INTEREST WITH OTHERS AND WORK EFFECTIVELY WITH THEM TO MEET COMMON OBJECTIVES, TIPS TO PROVIDE AND ACCEPT FEEDBACK IN A CONSTRUCTIVE AND CONSIDERATE WAY , LEADERSHIP IN TEAMS, HANDLING FRUSTRATIONS IN GROUP.	02

8	Task Management INTRODUCTION, TASK IDENTIFICATION, TASK PLANNING ,ORGANIZING AND EXECUTION, CLOSING THE TASK	02
TOTAL		16

CONTENTS: PRACTICAL

List of Assignments: (any eight assignments)

- 1) SWOT analysis:- Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.
 - a) Your past experiences,
 - b) Achievements,
 - c) Failures,
 - d) Feedback from others etc.
- 2) Undergo a test on reading skill/memory skill administered by your teacher.
- 3) Solve the puzzles.
- 4) Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slump area, social activities like giving cloths to poor etc.(One activity per group)
- 5) Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.
- 6) Watch/listen an informative session on social activities. Make a report on topic of your interest using audio/visual aids. Make a report on the programme
- 7) Conduct an interview of a personality and write a report on it.
- 8) Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed
- 9) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Note: - Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic. The **term work** will consist of any eight assignments.

Mini Project: On Task Management. Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management.

Learning Resources:**1. Books:**

Sr. No	Title of the Book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India, Pvt Ltd.
3	Body Language	Allen Pease	Sudha Publications Pvt. Ltd.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi
11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

2. Internet Assistance:

1. <http://www.mindtools.com>
2. <http://www.stress.org>
3. <http://www.ethics.com>
4. <http://www.coopcomm.org/workbook.htm>
5. <http://www.mapforprofits.org/>
6. <http://www.learningmeditation.com> <http://bbc.co.uk/learning/courses/>
7. <http://eqi.org/>
8. <http://www.abacon.com/commstudies/interpersonal/indisclosure.html>
9. <http://www.mapnp.org/library/ethics/ethxgde.htm>
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. <http://members.aol.com/nonverbal2/diction1.htm>
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. <http://snow.utoronto.ca/Learn2/modules.html>
14. <http://www.quickmba.com/strategy/swot/>

Course Name : Electrical Engineering Group

Course Code : EE/EP

Semester : Fourth

Subject Title : Professional Practices- IV

Subject Code : 12108

Teaching and Examination Scheme:

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

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

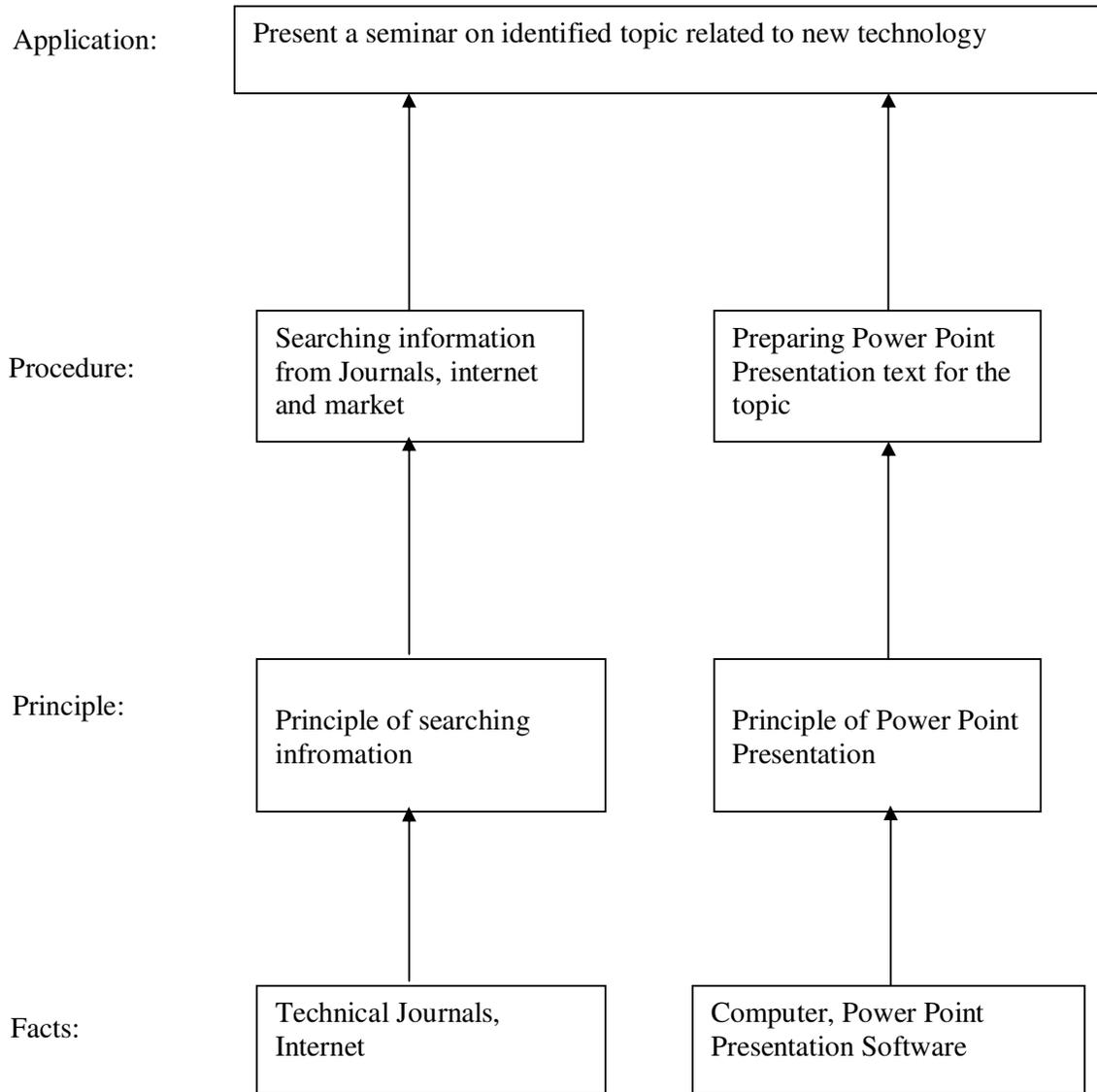
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

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.

Learning Structure:



Activity	Contents	Hours
01	<p>Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, as part of the term work. The industrial visits may be arranged in the following areas / industries :</p> <ul style="list-style-type: none"> i) Visit to HT Sub Station ii) Visit to Transformer Manufacturing Industry iii) Visit to Electronics Industry iv) Visit to Design Office of MSEB v) Visit to Industry to observe:- <ul style="list-style-type: none"> a)Function of DAS and Data logger b) Electrical quantities, non-electrical quantities by recorder. vi) Adarsh Gram 	20
02	<p>Lectures by Professional / Industrial Expert / Student Seminars based on information search, expert lectures to be organized from any of the following areas:</p> <ul style="list-style-type: none"> i) Interview Techniques. ii) Effect of Transmission and Distribution Losses on cost of Energy Generation iii) Recent Trends in Transformer Manufacturing iv) Electrical Safety in Industry v) Applications of D. C. Motors : Present and Future Trends vi) Any other suitable topic 	12
03	<p>Information Search : Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report. Following topics are suggested :</p> <ul style="list-style-type: none"> i) Recent Trends in Insulation Material and Insulators ii) Electrical Wiring Accessories iii) Non Conventional Energy Sources with focus on solar energy iv) Elevators installation and maintenance v) Any other suitable areas 	10
04	<p>Seminar : Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)</p>	12
05	<p>Mini Projects: A group of 6to8 students be formed for group discussion; 1. Prepare a report on Electrification of multi storied building 2. Market Survey of Power Converters on the basis of Rating, Cost, Efficiency, Battery quality</p>	10
Total		64