



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 : THIRD

DURATION : 16 WEEKS

FULL TIME / PART TIME : FULL TIME

SCHEME : E

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									
				TH	TU	PR	PAPER HRS	TH (1)		PR (4)		OR (8)		TW (8)		SW (16003)
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Applied Mathematics	AMS	12054	03	--	--	03	100	40	--	--	--	--	--	--	50
2	Electrical Circuits and Network	ECN	12055	04	--	02	03	100	40	50#	20	--	--	25@	10	
3	Electrical Measurements	ELM	12056	03	--	02	03	100	40	50#	20	--	--	25@	10	
4	Electrical Power Generation	EPG	12057	03	--	--	03	100	40	--	--	--	--	--	--	
5	Basic Electronics	BEX	12058	04	--	02	03	100	40	50#	20	--	--	25@	10	
6	Electrical Workshop	EWP	12059	--	--	04	--	--	--	--	--	--	--	50@	20	
7	Elements of Mechanical and Civil Engineering	EMC	12060	01	--	02	--	--	--	--	--	--	--	25@	10	
8	Professional Practices-III	PPS	12061	--	--	05	--	--	--	--	--	--	--	50@	20	
TOTAL				18	--	17	--	500	--	150	--	--	--	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, OR-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 and Electronics Engineering Group

Course code : EE/EP/ET/EJ/EN/EX/IE/IS/IC/IU/DE/EV/MU/ED/EI

Semester : Third

Subject Title : Applied Mathematics

Subject Code : 12054

Teaching and Examination Scheme:

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

The study of mathematics is necessary to develop the skills essential for studying new technological development. This subject introduces some applications of engineering, through which the student can understand the link of mathematics with engineering principles.

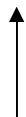
Objective: The Student will be able to:

1. Apply Mathematical term, concept, principles, and different methods
2. Apply Mathematical methods to solve technical problems,
3. Execute management plans with precision.
4. Use Mathematical techniques necessary for daily and practical problems.

LEARNING STRUCTURE:

Applications

Apply the principles of Mathematics to solve problems in Electrical and Electronics Field



Procedure

Methods of finding integration, definite integration and its properties..	Methods of solving differential equation of first order and first degree.	Use of Laplace transform for solving problems of Differential Equations	Use of Fourier series for expansion of function at the given intervals	Methods for finding approximate roots by using bisection, Regula-falsi, Newton-raphson method, Gauss elimination, Jacobi and Gauss-seidal methods
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Concept

Integration of standard functions. Rules of integration. Integration by parts, partial fractions.	Order, degree of differential equation.	Laplace Transform of standard functions, properties. Inverse L. T. Convolution theorem.	Eular's formula for Fourier series expansion.	Higher order algebraic equations. Upper and lower triangular matrix, iterative methods.
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Facts

First order differentiation. Definition of integration as anti derivative.	Integration. Definition of differential equation	Definition of Laplace transform and Inverse Laplace transform.	Definition of periodic, even and odd functions.	Relation between degree of equation and roots. Relation between no. of unknowns and equations
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Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Integration: 1.1 Definition of integration as anti-derivative. Integration of standard function. 1.2 Rules of integration (Integrals of sum, difference, scalar multiplication). 1.3 Methods of Integration. 1.3.1 Integration by substitution 1.3.2 Integration of rational functions. 1.3.3 Integration by partial fractions. 1.3.4 Integration by trigonometric transformation. 1.3.5 Integration by parts.	10	16
	1.4 Definite Integration. 1.4.1 Definition of definite integral. 1.4.2 Properties of definite integral with simple problems.	04	08
	1.5 Applications of definite integrals. 1.5.1 Area under the curve. 1.5.2 Area between two curves. 1.5.3 Mean and RMS values	02	08
02	Differential Equation 2.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant. 2.2 Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, Nonhomogeneous, Exact, Linear and Bernoulli equations.	08	16
	2.3 Applications of Differential equations. 2.3.1 Laws of voltage and current related to LC, RC, and LRC Circuits.	02	04
03	Laplace Transform 3.1 Definition of Laplace transform, Laplace transform of standard functions. 3.2 Properties of Laplace transform such as Linearity, first shifting, second shifting, multiplication by t^n , division by t . 3.3 Inverse Laplace transforms. Properties- linearly first shifting, second shifting. Method of partial fractions, 3.4 Convolution theorem. 3.5 Laplace transform of derivatives, 3.6 Solution of differential equation using Laplace transform (up to second order equation)	08	20
04	Fourier Series 4.1 Definition of Fourier series (Euler's formula). 4.2 Series expansion of continuous functions in the intervals $(0, 2l)$, $(-l, l)$, $(0, 2\pi)$, $(-\pi, \pi)$ 4.3 Series expansions of even and odd functions. 4.4 Half range series.	06	12

05	Numerical Methods 4.1 Solution of algebraic equations Bisection method. Regularfalsi method. Newton – Raphson method.	04	08
	4.2 Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss seidal and Jacobi's methods.	04	08
Total		48	100

Learning Resources:**Books:**

Sr. No.	Title	Authors	Publications
1	Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
2	Calculus: single variable	Robert T. Smith	Tata McGraw Hill
3	Laplace Transform	Lipschutz	Schaum outline series.
4	Fourier series and boundary value problems	Brown	Tata McGraw Hill
5	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Dehli
6	Introductory Methods of Numerical analysis	S. S. Sastry	Prentice Hall Of India, New Dehli
7	Numerical methods for scientific & engineering computations	M. K. Jain & others	Wiley Eastern Publication.

Course Name : Electrical Engineering Group.

Course Code : EE/EP

Semester : Third

Subject Title : Electrical Circuits & Network

Subject Code : 12055

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. 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 3/4 , Q.2 : 3 bits of 4 marks each, option 2/3, Q3: 3 bits of 4 marks each or 2 bits of 8 marks each, option 2/3 or 1/2**
- **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:

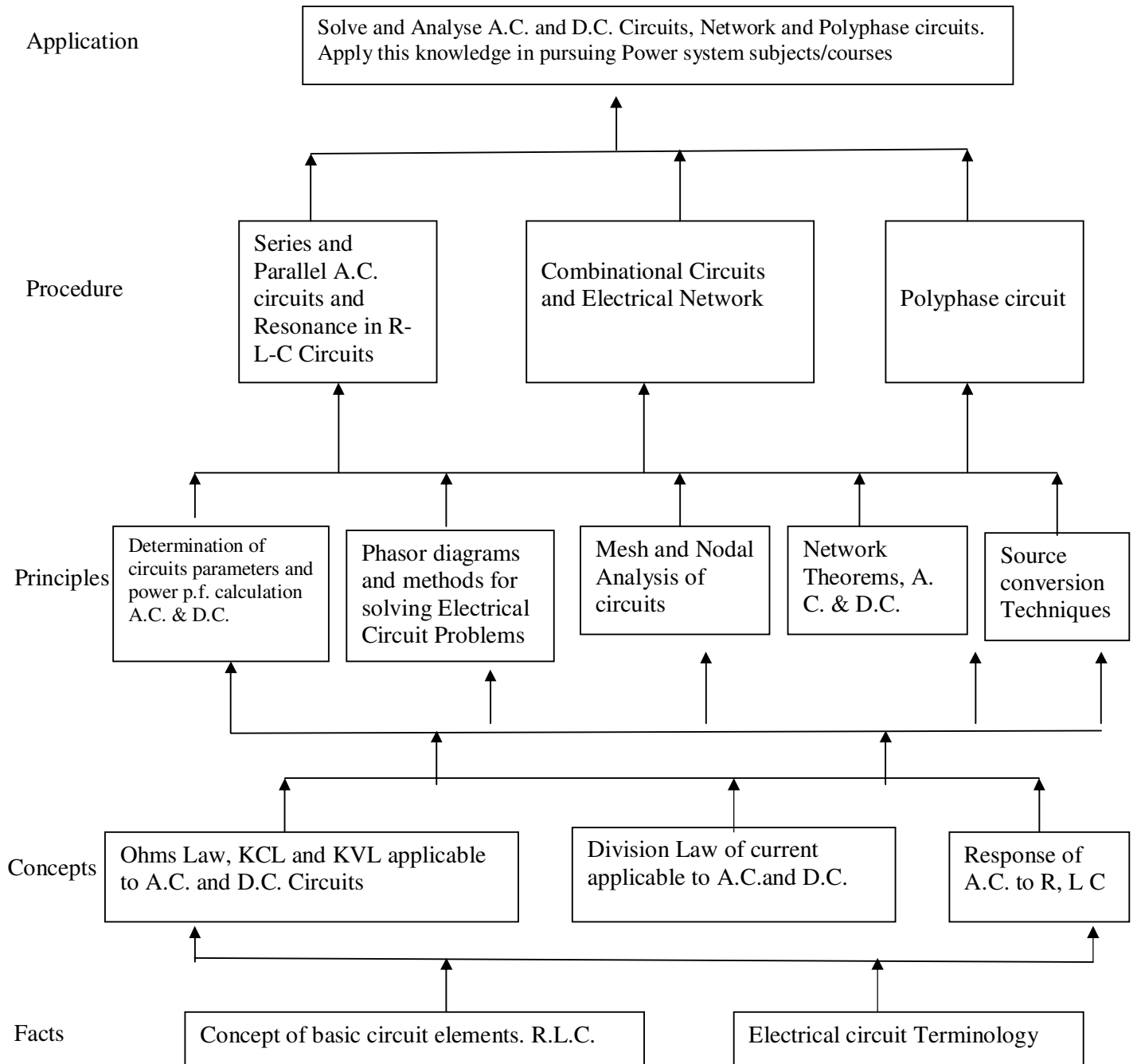
Electrical Circuits and Network subject is categorized under engineering science group. Mainly this subject includes the concept and principles of circuits and circuit analysis. Diploma holders have to play the role as supervisor in Electrical Technology areas and also to assist in carrying out the analysis and investigation work.

This subject finds utility in understanding the concepts in other electrical subjects such as Electrical Power System, Electrical Measurement and Instrumentation, & Electrical Machines etc.

Objectives: The students will be able to:

1. Know and define the basic elements; electric circuit terminology; energy sources used in electric circuit and also AC waveform and its various quantities.
2. Interpret the response of R,L,C elements to AC supply
3. Calculate various parameters of AC Circuits.
4. Interpret performance of AC Series and Parallel Circuits.
5. Know relationship between phase & line values of various quantities in three phase circuits.
6. Use network theorems for solutions of DC Networks.

Learning Structure:



Contents: Theory

Note: - All Network Theorems should be taught only for DC supply. Superposition Theorem should be taught for AC supply also. However numerical should not be asked on AC supply.

Chapter	Name of the Topic	Hours	Marks
01	Review of Basic concepts of electrical Circuit	06	10
	1.1 Electric Circuit Elements R,L,C		
	1.2 Energy Sources		
	1.3 A.C. waveform and definition of various terms associated with it		
	1.4 Response of pure R, L, and C to AC supplies. Vector Representation of alternating quantity.		
02	Single phase AC Circuits	20	32
	2.1 Series AC circuits R-L, R-C and R-L-C circuits. Impedance, reactance, phasor diagram, impedance triangle, power factor, Average power, Apparent power, Reactive power, Power triangle (Numerical)		
	2.2 Series Resonance, quality factor (Numerical)		
	2.3 Parallel AC circuits R-L, R-C and R-L-C circuits. Admittance, Susceptance, Solution by admittance method, phasor diagram and complex Algebra method. (Numerical)		
	2.4 Parallel resonance, quality factor.		
	2.5 Comparison of series and Parallel circuits.		
03	Poly phase AC Circuits	12	22
	3.1 Generation of three phase e. m. f.		
	3.2 Phase sequence, polarity marking		
	3.3 Types of three-phase connections.		
	3.4 Concept of unbalanced load and balanced load.		
	3.5 Line, phase quantities and power in three phase system with balanced star and Delta connected load & their interrelationship		
	3.6 Advantages of polyphase circuits over single phase circuits		
04	Principles of circuit Analysis (ONLY DC circuits)	10	16
	1.1 Mesh analysis.(Numerical)		
	1.2 Node analysis with voltage current source (Numericals) Star/delta & Delta/star transformations.(Simple Numericals)		
05	Network Theorems (Statement, procedure, applications and areas of applications, Simple Numerical on DC Circuits)	16	20
	5.1 Superposition Theorem (for also AC but no numericals on AC)		
	5.2 Thevenin's Theorem		
	5.3 Norton's Theorem		
	5.4 Source conversion /ideal voltage and current source		
	5.5 Maximum power transfer Theorem		
Total		64	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Interpret results
2. Calculate values of various components for given circuits
3. Select instruments

Motor Skills:

1. Connect the instruments properly.
2. Take accurate readings.
3. Draw phasor diagrams and graphs.

List of Practical:

- 1) To observe A.C. waveform on C.R.O. and calculate average & R.M.S. Values, frequency, and observe the response of 'Resistance' to AC
- 2) To observe response of 'Inductor' and 'Capacitor' to AC
- 3) To determine impedance & Plot the phasor diagram of R-L series circuit.
- 4) To determine the current and P.F. of R.C. series circuit.
- 5) To determine the current and P.F. in R.L.C. series circuit.
- 6) To obtain resonance in R-L-C series circuit.
- 7) To determine the current and P.F. in R.L. Parallel circuit.
- 8) To determine the current and P.F. in R.C. Parallel circuit.
- 9) To determine the current and P.F. in R.L.C. Parallel circuit.
- 10) To obtain resonance in R-L-C parallel circuit.
- 11) To verify the line and phase values for star connected balanced load.
- 12) To verify the line and phase values for delta connected balanced load.
- 13) To verify the Superposition theorem.
- 14) To verify Thevenin's theorem and Norton's theorem.
- 15) To verify the maximum power transfer Theorem.

LIST OF PRACTICE ORIENTED PROJECTS:

- 1) To observe Response of R; L; and C to A.C. supply. Observe the current and voltage wave forms on C. R. O. and determine magnitude and phase angle of voltage and current.
- 2) To obtain Resonance in R-L-C series circuit and study the quality factor and bandwidth. Give applications of series resonance circuit and Draw the curve showing variation of R, XL, XC, I with F.

- 3) To verify KCL, KVL, Superposition theorem, Thevenin's theorem and maximum power transfer theorem applicable to A.C. circuits.

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
1.	Boylested R.L.	Introductory circuit Analysis.	Wheeler, New Delhi
2.	Edminister	Schaum online series Theory and problems of Electric circuits	T. M. G. H. , Newyork
3.	A. Sudhakar	Circuit and network	Tata McGraw Hill
4.	V.N. Mittle	Basic Electrical Engineering.	Tata McGraw Hill
5.	B. L. Theraja	Electrical Technology Volume-I	S. Chand & Co.

Course name : Electrical Engineering Group

Course Code : EE/EP

Semester : Third

Subject Title : Electrical Measurements

Subject Code : 12056

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. 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 core technology. The Diploma holder has to work as Technical supervisor, maintenance engineer, production engineer in industries, electrical power generation, transmission and distribution system, traction installation system, machine operation etc.

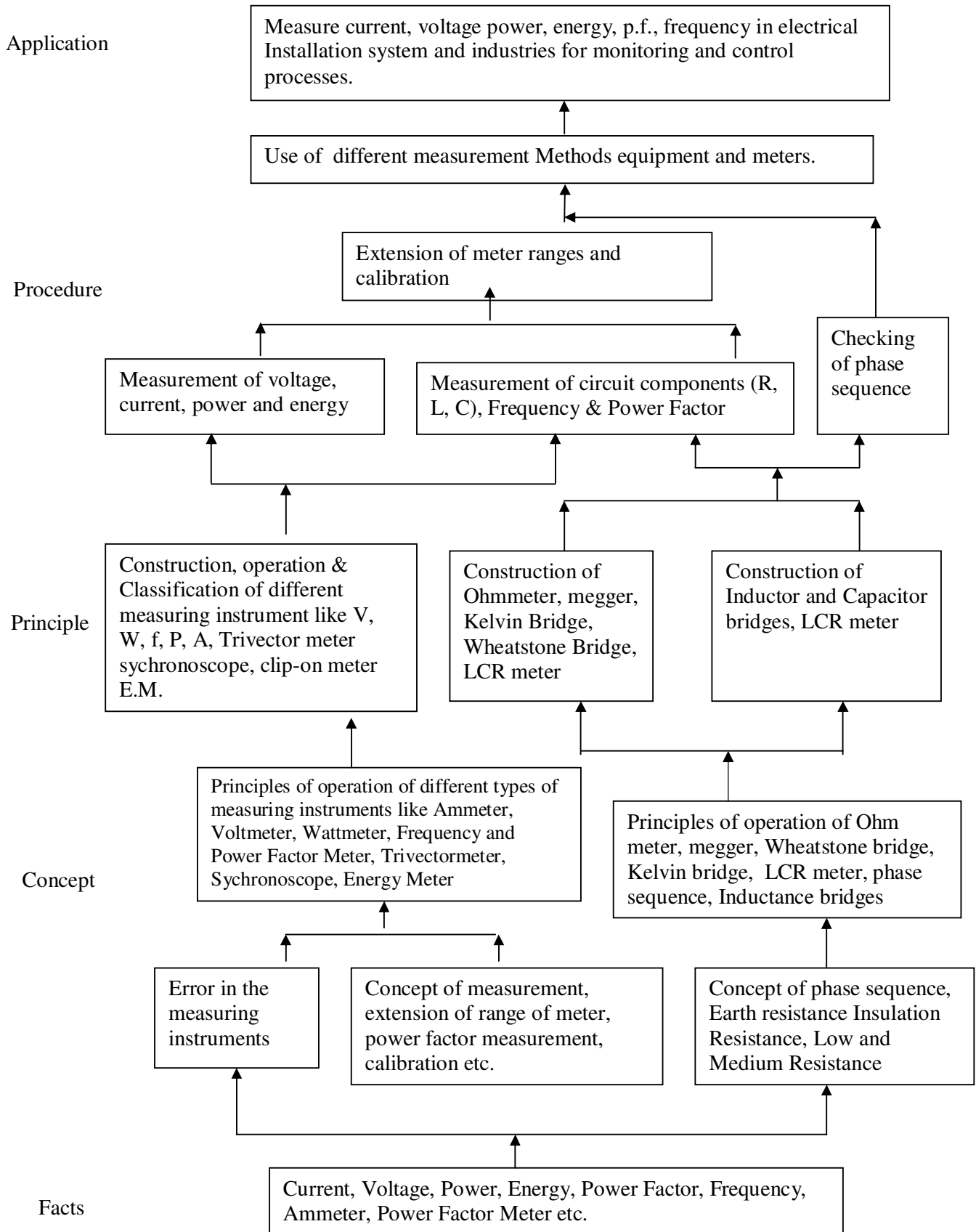
For above job responsibilities he has to take the measurements of various electrical quantities power & energy for testing, monitoring, maintenance, and controlling the process. In addition to this he must know the calibration techniques and extension of meter ranges. Therefore Electrical Measurement skills are very important. Accuracy of measurement is one of the main parameters in industrial processes as ability of control depends upon ability to measure.

Objectives:

The Students will be able to:

1. Identify the measuring instruments used for measuring electrical quantities.
2. Select appropriate measuring instrument with range for measurement of various electrical quantities. select and use range multiplier if required.
3. Select appropriate instrument for measurement of power, energy.
4. Classify measuring instruments based on construction, principle of operation and quantity to be measured, types of errors.
5. Calibrate various types of instruments as per is.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Fundamentals of Measurement		
	1.1 06 <ul style="list-style-type: none"> • Purpose of measurement and significance of measurement • Various effects of electricity employed in measuring instruments. 	05	12
1.2 06 <ul style="list-style-type: none"> • Desirable qualities of measuring instruments. • Classification of Instruments. • Classification of errors, their Causes and remedies. • Types of torque in Analog Instruments 			
02	Measurement of Current and Voltage		
	2.1 10 <ul style="list-style-type: none"> • Construction and principle of PMMC, MI & Dynamometer type Instruments. • Production of torque: methods. 	10	22
2.2 12 <ul style="list-style-type: none"> • Principles of Voltage and Current measurement. • Range Extension of Ammeter and Voltmeter • Different Methods of range extension of Ammeter and Voltmeter. (Simple numerical) • Calibration of Ammeter and Voltmeter. • Instrument transformers (CT & PT): Their use in extension of ranges 			
03	Measurement of Power		
	3.1 10 <ul style="list-style-type: none"> • Concept of power in A.C. Circuit • Principle and Construction of dynamometer type wattmeter. • Errors and their compensation. • Polyphase wattmeter: Construction and applications. • Multiplying factor of wattmeter. 	10	20
3.2 10 <ul style="list-style-type: none"> • Measurements of power in 3 phase circuit for balanced and unbalanced load by one wattmeter method, two wattmeter method. • Effect of power factor variation on wattmeter readings in two wattmeter method. • Measurement of reactive power in three phase balance load by one wattmeter method and two wattmeter method. • Concept of Digital Wattmeter. (Simple numerical on 3.2) 			
04	Measurement of Electrical Energy		
	4.1 06 <ul style="list-style-type: none"> • Concept of electrical energy. 	07	14

	<ul style="list-style-type: none"> • Constructional feature & principle of working of single phase and three-phase induction type energy meter. <p>4.2 08</p> <ul style="list-style-type: none"> • Different types of errors and their compensation. • Calibration of energy meter. • Concept of Electronic energy meter. 		
05	<p>Constructional features and working principles of other Meters</p> <p>5.1 08</p> <ul style="list-style-type: none"> • Single phase and three phase Power Factor Meter (Only dynamometer type). • Frequency meter (Weston and Ferro dynamic type). • Sychronoscope. <p>5.2 08</p> <ul style="list-style-type: none"> • Phase sequence Indicator.(Rotating type only) • Clip-on-ammeter. • Q-meter. 	08	16
06	<p>Measurement of Circuit Parameters</p> <p>6.1 10</p> <ul style="list-style-type: none"> • Classification of Resistance: Low, Medium and High. • Methods of Measurements of Low, Medium and High Resistance (Kelvin Double bridge, Wheatstone bridge and Megger) • Measurement of Earth resistance- Earth tester (Analog & Digital) <p>6.2 Construction, working principle and operation of: 06</p> <ul style="list-style-type: none"> • Digital Multimeter. • A.C. Bridges. • L.C.R. Meter. 	08	16
Total		48	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Identification of instruments
2. Selection of instruments and equipment for measurement

Motor Skills:

1. Accuracy in measurement
2. Making proper connections

List of Practicals:

1. Measurement of Current and Voltages by Low range ammeter and voltmeter respectively with shunt and multiplier.

2. Measurement of Current and Voltages by Low range ammeter and voltmeter respectively by Using Current Transformer and potential Transformer.
3. Measurement of active and reactive power in three phase balanced load by single wattmeter method.
4. Measurement of active and reactive power in three phase balanced load by two wattmeter method and observe the effect of Power Factor variation on Wattmeter reading.
5. Calibration of Energy meter at various power factor by standard energy meter.
6. Measurement of energy in single phase & three phase balanced load using Electronic Energy Meter.
7. Measurement of Low resistance by Kelvin's Double Bridge.
8. Measurement of Medium resistance by Wheatstone bridge.
9. Measurement of Insulation Resistance by Megger.
10. a) Measurement of Resistance, Voltage, Current, Voltage, Current in A.C & D. C. Circuit by using digital multimeter.
b) Measurement of A.C. Current by Clip-on ammeter
11. Measurement of Earth Resistance by Earth Tester.
12. Measurement of Circuit Parameters by LCR meter.
13. Measurement of power factor of single phase and three phase load by PF meter and verifying through I, V and P measurement.
14. Observe the phase sequence of three phase circuit Using Rotating type phase sequence Indicator.
15. Measurement of Frequency of A.C. Supply Using Weston or Ferro dynamic type Frequency meter.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
1	A.K. Sawhney	Electric & Electronic Measurement and Instrumentation	Dhanpatrai & Sons
2	Copper & Heltrick	Electronic Instrumentation & measurement Techniques	Prentice Hall of India
3	Rangan Mani & Sarma	Instrumentation Devices and System	Tata McGraw Hill
4	Kalsi	Electronic Instrumentation	Tata McGraw Hill
5	S.K.Singh	Industrial Instrumentation & control	Tata McGraw Hill
6	Golding	Electrical Measurement & measuring Instrument	Wheeler
7	N.V.Suryanaryan	Electrical Measurement & measuring Instrument,	S. Chand & Co.
8	C.T. Baldwin	Fundamental of Electrical measurement	--

- IS/International Codes :IS 1248, 1765, 6236, 9223, 8945, 2442

Course Name : Electrical Engineering Group

Course Code : EE/EP

Semester : Third

Subject Title : Electrical Power Generation

Subject Code : 12057

Teaching and Examination Scheme:

Teaching Scheme			Exam Scheme & Maximum Marks					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	00	03	100	--	--	--	100

NOTE:

- Two test 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 $\frac{3}{4}$, Q2 : 3 bits of 4 marks each , option $\frac{2}{3}$. Q3: 3 bits of 4 marks or 2 bits of 8 marks each or 2 bits of 8 marks each, option $\frac{2}{3}$ or $\frac{1}{2}$.

Rationale:

This is a core technology subject. Electrical diploma pass outs should know the principle of generation of electricity, methods of generation of electricity & recent trends in generation of electricity.

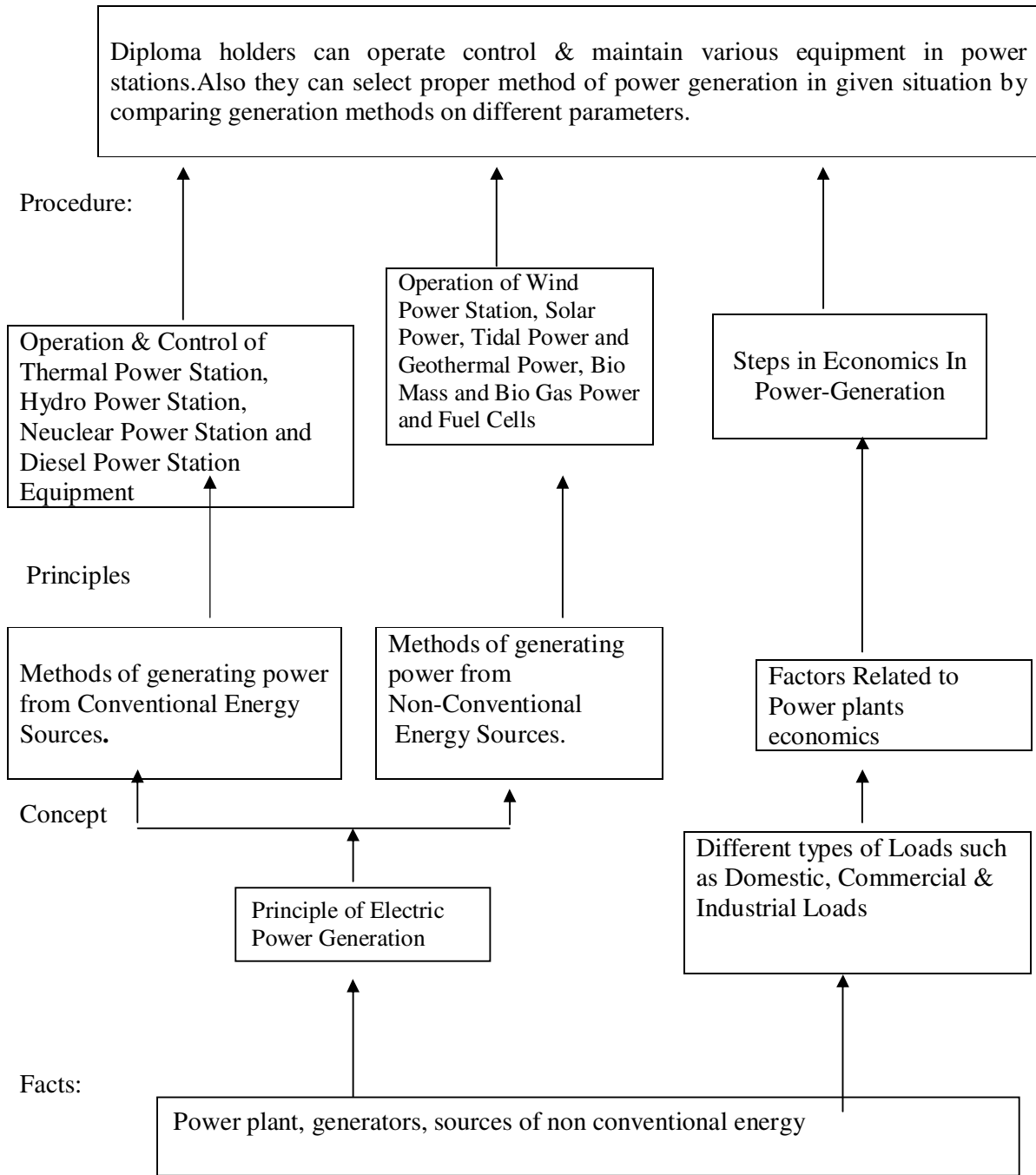
This subject will provide the basis for further studies in transmission, distribution and power system operation. Also the subject will provide the knowledge about the recent trends in non-conventional energy sources & their working principles.

Objectives: The student will be able to:

- 1) Explain the working of different power plants
- 2) Identify different components for various systems in generating stations
- 3) Select suitable sites for different power stations
- 4) Define the terms used in economics of power generation and explain their relation
- 5) Select alternative energy sources for given conditions
- 6) Explain the working of wind mills and solar systems
- 7) Explain working of domestic & commercial D. G. Set

Learning Structure:

Applications:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Basics of Power Generation 1.1 Importance of electrical power in day today life 1.2 Various sources of energy 1.3 Overview of method of electrical power generation 1.4 Comparison of Sources of power.	02	08
02	Thermal Power Stations 2.1 List of thermal power station in state and country with their capacities 2.2 Selection of site for thermal power stations. 2.3 Main parts, block diagram of thermal power stations. 2.4 Quality of fuel and its effect on quality of power generation 2.5 Operation of following components: ➤ Boiler ➤ Economizer. ➤ Air pre heater ➤ Super-heaters & re-heaters. ➤ Steam prime movers. ➤ Condensers. ➤ Spray ponds & cooling towers. (Block diagrams & description in brief)	07	12
03	Nuclear Power Stations 3.1 Block diagram and working of Neuclear Power Station 3.2 Construction and working of Nuclear Reactor 3. 3 Fuels used in Nuclear Power Station 3. 4 Economics of Nuclear Power Station 3. 5 List of Nuclear power stations in state & county with their capacities.	05	12
04	Hydro Power Stations 4.1 List of Hydro Power stations with their capacities & number of units in state & country. 4.2 Selection of site and Classification 4.3 Layout of hydro Power stations 4.4 Types Turbines & generators used 4.5 Selection of turbine and alternator according to water head and capacity	05	12
05	Diesel Power Stations 5.1 Applications of diesel power stations 5.2 Diesel electric plant- Main components (Block Diagram) 5.3 Different types of engines & their working. Operation, maintenance & trouble shooting chart of diesel plant.	05	10
06	Non-Conventional Energy Sources 6.1 Types of non-conventional energy sources. 6.2 Solar Energy ➤ Potential of solar energy. ➤ Photovoltaic effect – for solar energy.	09	20

	<ul style="list-style-type: none"> ➤ Construction & materials used in solar photo-voltaic cells. ➤ Working & applications of solar energy. <p>6.3 Wind Energy.</p> <ul style="list-style-type: none"> ➤ Selection of site for wind mills ➤ Principle of electricity generation with the help of wind energy ➤ Block diagram and working of Wind energy plant and its applications ➤ List of major wind plants in the state with their approximate capacities <p>6.3 Bio-mass & Bio-gas energy.</p> <ul style="list-style-type: none"> ➤ Composition of Bio-gas & its calorific value. ➤ Traditional; non-traditional Biogas plants ➤ Bio-mass based power generation plants & their capacities. <p>6.5 Geo-thermal Energy and its Applications.</p> <p>6.6 Ocean energy.</p> <ul style="list-style-type: none"> ➤ Ocean thermal Electric conversion. ➤ Energy from tides ➤ Site requirements ➤ Advantages and Limitations of Tidal power generation. <p>6.7 Fuel Cells: Construction, working and applications</p>		
07	<p>Economics Of Power Generation</p> <p>7.1 Terms commonly used in system operation: connected load, firm power, cold reserve, hot reserve, spinning reserve.</p> <p>7.2 Curves used in system operation such as Load-curve, load duration curve, integrated duration curve. (Simple numerical based on plotting above curves.)</p> <p>7.3 Factors affecting the cost of Generation: Average demand, Maximum demand, plant capacity factor& plant use factor, Diversity factor& load factor. (Simple numerical based on above)</p> <p>7.4 Choice of Size & number of Generator Units, difficulties involved in it.</p>	09	14
08	<p>Interconnected Power Systems</p> <p>8.1 Combined operation of power stations.</p> <p>8.2 Comparison of various types of power stations</p> <p>8.3 Advantages of Interconnection.</p> <p>8.4 Base load & peak loads, load allocation among various types of power stations</p> <p>8.5 Economic loading of interconnected stations.</p> <p>8.6 Load sharing and transfer of load between power stations.</p> <p>8.7 Inter connection of power stations at state and national level</p>	06	12
Total		48	100

Learning Resources:**1. Books:**

Sr. No.	Author	Title
1	Dr. S. L. Uppal	Electrical Power
2	Soni – Gupta - Bhatnagar	A course in Electrical Power
3	Prof. G. D. Rai	Non conventional Energy sources
4	Prof. Arrora and Dr. V. M. Domkundwar	A course in Power Plant Engineering

2. Journals:

1. Electrical India - Journal for recent trends & development in Electrical Engineering
2. Transparencies of different power plants must be used & should be placed on the notice board for drawing the diagrams.
3. O.H.P. is to be used in the classroom.

Course Name : Electrical & Electronics Engineering Group

Course Code : EE/EP/ET/EJ/EN/EX/IE/IS/IC/DE/MU/IU/ED/EI/MR

Semester : Third

Subject Title : Basic Electronics

Subject Code : 12058

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)**

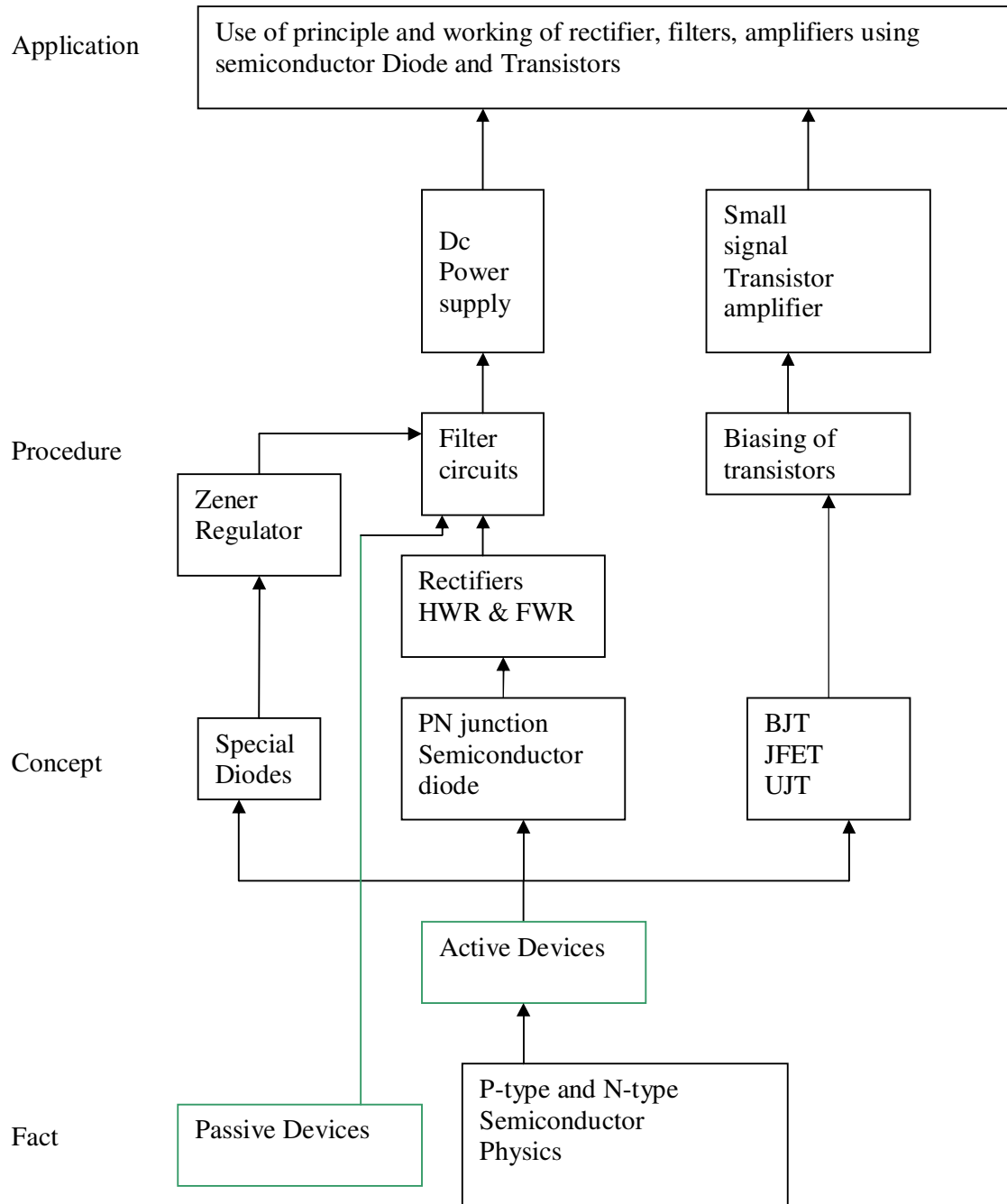
Rationale:

Electronics is a major part of our day to day life. In each and every field electronic systems are used. Basic electronics is one of the subject which is the base of all advance electronics. It starts with PN junction which makes the student to follow the functioning of all semiconductor based electronics. This is a core group subject and it develops cognitive and psychomotor skills.

Objectives: Student will be able to:

- 1) Describe the formation of PN junction.
- 2) Draw the characteristics of basic components like diode, transistor etc.
- 3) Draw and describe the basic circuits of rectifier, filter, regulator and amplifiers.
- 4) Know voltage amplifiers.
- 5) Test diode and transistors.
- 6) Read the data sheets of diode and transistors.

Learning Structure



Content: Theory

Chapter	Name of the Topic	Hours	Marks
1	<p>Semiconductor diode Rectifying diode Review of P-type and N-type semiconductor Junction of P-type & N-type i.e. PN junction Barrier voltage , depletion region ,Junction Capacitance Forward biased & reversed biased junction Diode symbol , circuit diagram for characteristics (forward & reversed) Characteristics of PN junction diode Specifications:- Forward voltage drop , Reversed saturation current, maximum forward current , power dissipation Package view of diodes of different power ratings (to be shown during practical hours)</p> <p>Zener diode construction (reference to doping level) Symbol , circuit diagram for characteristics (forward & reversed) Avalanche & zener breakdown Specifications:- Zener voltage , power dissipation , break over current, dynamic resistance & maximum reverse current</p> <p>Special diodes Point contact diode , Schottky diode</p> <p>Optical Diodes LED, IRLED, photo diode, and laser diode. Symbol, operating principle & applications of each.</p> <p>PASSIVE COMPONENTS Resistor: definition, symbol, unit. Types of resistors : fixed, variable, LDR, Thermistor (symbol and list of application only) Resistor colour code, wattage (w.r to size) 2) Capacitor : definition, symbol, unit Types of capacitor(to be shown in practical, no theory) Fixed : mica, paper, ceramic, electrolytic Variable : Gang capacitor 3) Inductor : definition, symbol, unit Types of Inductors : fixed ,variable Transformer :symbol, types (step up and step down), application.</p> <p>NOTE:The above topic(PASSIVE COMPONENTS)is to be covered in practical for Electrical engineering students only.No questions will be set on this topic in theory examination.</p>	12	20

2	<p>Rectifiers & Filters Need of rectifier , definition Types of rectifier – Half wave rectifier, Full wave rectifier, (Bridge & centre tapped) Circuit operation Input/output waveforms for voltage & current Average (dc) value of current & voltage (no derivation) Ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier. Comparison of three types of rectifier Need of filters Types of filters A] shunt capacitor B] Series inductor C] LC filter D] π filter Circuit operation, dc output voltage , ripple factor (formula), ripple frequency, Dependence of ripple factor on load . Input/output waveforms , limitations & advantages</p>	10	14
3	<p>Transistors Introduction , Basic concept Types of transistors , structure & symbols Transistor operation Conventional current flow , relation between different currents in transistor Transistor amplifying action Transistor configurations:- CB , CE & CC Circuit diagram to find the characteristics Input/output characteristics Transistor parameters- input resistance, output resistance, α , β & relation between them. Comparison between three configurations Transistor specifications:- $V_{CE\text{ Sat}}$, $I_{C\text{ Max}}$, V_{CEO} , I_{CEO} , α , β , $V_{CE\text{ Breakdown}}$, Power dissipation (to be explained during practical using data sheets) Testing of transistor using multimeter (To be shown during practical) Construction, working principle, characteristics of Photo transistor Introduction to opto-coupler 1] Bipolar junction transistor(BJT) 2] Unipolar transistor (JFET) Construction, working principle & characteristics. 3] Unijunction Transistor(UJT) Construction, working principle& characteristics <u>Biasing of BJT</u> Introduction , need of biasing , concept of dc load line , selection of operating point (Q point), Need of stabilization of Q Point (Thermal run away concept)</p>	12	22

4	<p>Types of biasing circuits A] Fixed biased circuit B] Base biased with emitter feed back C] Base biased with collector feed back D] Voltage divider E] Emitter biased</p> <p>Circuit operation of each circuit. Introduction to two port n/w Hybrid model for CE.</p>	10	12
5	<p>Regulated power supply What is regulator? Need of regulators , voltage regulation factor Concept of load regulation & line regulation Basic Zener diode voltage regulator</p> <p>Linear Regulators Basic block diagram of dc power supply</p> <p>Transistorised series & shunt regulator – circuit diagram & operation. Regulator IC's – 78xx, 79xx, 723 as fixed, variable & dual regulator.</p>	08	12
6	<p>Small signal amplifiers Concept of amplification Small signal amplifier using BJT Graphical analysis Determination of current , voltage & power gain , Input & output resistance , phase shift between input & output. AC Load Line Function of input & output coupling capacitors & criteria for the value selection. Function of emitter bypass capacitor & its value selection. AC equivalent circuit of transistor CE amplifier. Single stage CE amplifier with voltage divider bias. Its explanation. Frequency response of single stage CE Amplifier, Bell, Decibel unit. Bandwidth & its significance. Effect of coupling & emitter bypass capacitor on bandwidth. Introduction to CB & CC amplifier & List of applications. Cascade Amplifiers (Multistage Amplifier) Need of Multistage Amplifiers, Gain of amplifier. Types of amplifier coupling – RC, transformer & Direct coupling. Two stage amplifier circuit diagram , working, frequency Response, merits & demerits & applications of each.</p>	12	20
Total		64	100

Practical:

Skills to be developed:

Intellectual Skills:

1. Identification and selection of components.
2. Interpretation of circuits.
3. Understand working of Regulated dc power supply.

Motor skills:

1. Ability to draw the circuits.
2. Ability to measure various parameters.
3. Ability to test the components using multimeter.
4. Follow standard test procedures.

List of Practical:

- 1] Forward & Reverse characteristics of diode
- 2] Forward & Reverse characteristics of Zener diode
- 3] Study of Rectifiers a) Half wave b) Full wave
- 4] Study of filter circuits. a) Capacitor Filter b) Inductor filter.
- 5] Input & output characteristics of transistor in CE mode
- 6] Input & output characteristics of transistor in CB mode
- 7] Characteristics of FET
- 9] Characteristics of UJT
- 10] Zener Diode Regulator
- 11] Transistor series and shunt regulator
- 11] Single stage common emitter amplifier
- 12] Two stage RC coupled amplifier [Frequency response]
- 13] Study of various Passive components.(To be conducted for only Electrical Engineering Students.)

Learning Resources:**Books:**

Sr. No.	Author	Title	Publisher
01	N.N.Bhargava, D.C. Kulashreshtha, S.C. Gupta - TTTI Chandigarh	Basic Electronics & Linear Circuits	Tata McGraw Hill
02	Alberrr Malvino David J.Bates	Electronic Principles	Tata McGraw Hill
03	Allen. Mottershead	Electronic Devices & Components'	Prentice Hall of India
04	NIIT	Basic Electronics & Devices	Prentice Hall of India
05	Grob Bernard	Basic Electronics	Tata McGraw Hill
06	David J. Bell	Electronics Devices & Circuits	Prentice Hall of India

Course Name : Electrical Engineering Group
Course Code : EE/EP
Semester : Third
Subject Title : Electrical Workshop
Subject Code : 12059

Teaching and Examination Scheme:

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

Rationale:

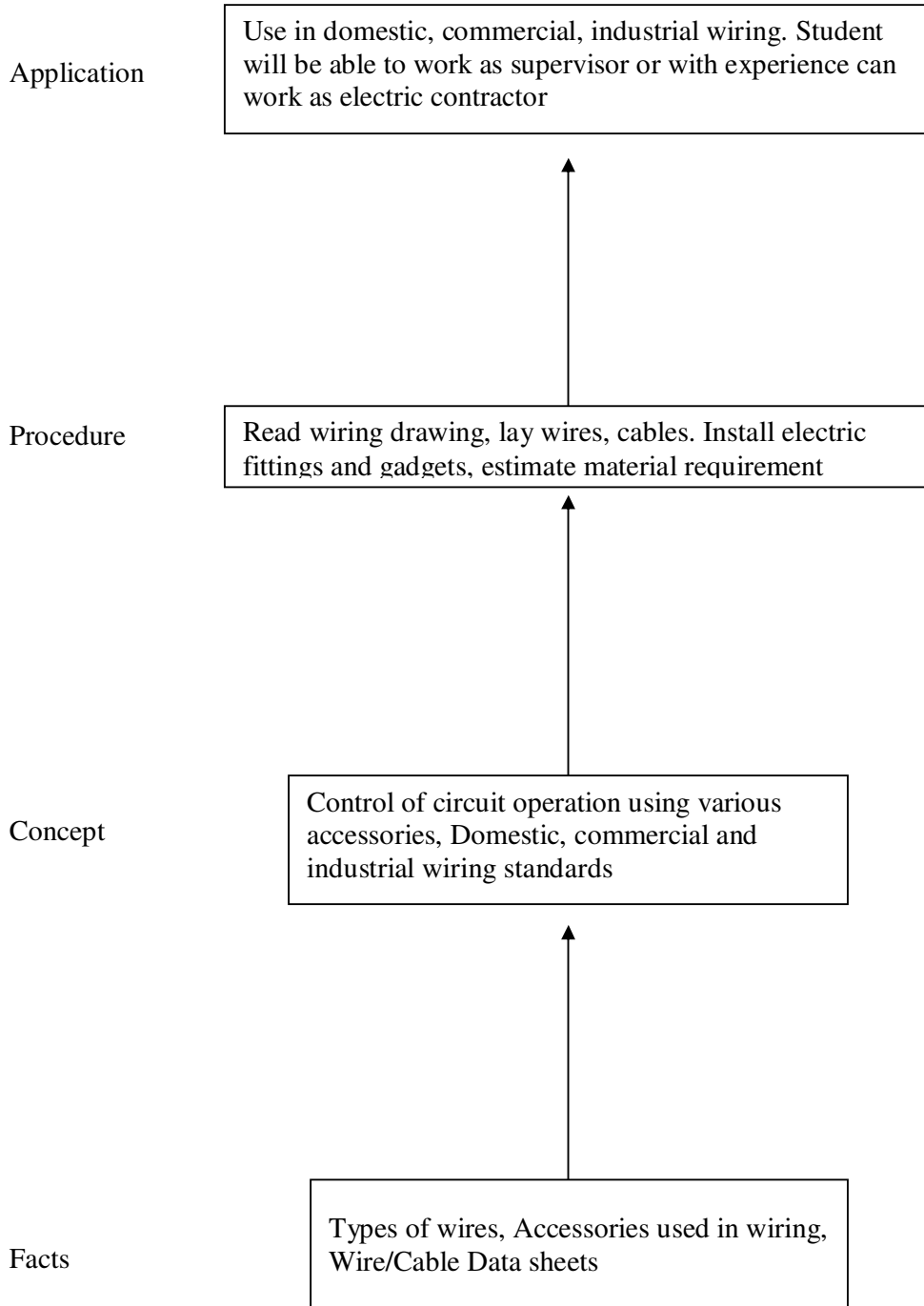
A technician should also have the practical skills regarding wiring, in order to provide him/her the various ways, techniques of fault finding while working on the shop floor. These skills will be developed when he/she actually performs the work.

Objectives:

Students will be able to:

- Identify various electrical accessories.
- Draw & understand the wiring diagrams.
- Prepare schedule of material.
- Use methods of wiring.

Learning Structure:



Contents: Practical:

Note: All the experiments will be performed by using casing capping or conduit wiring, prepare schedule of material for each wiring work.

- | | |
|--|---------|
| 1. Identify, dismantle, sketch & assemble different electrical accessories | 10 Hrs. |
| 2. Wire up one lamp controlled by one SPT switch | 06 Hrs. |
| 3. Wire up two lamps controlled by two independent SPT switches | 06 Hrs. |
| 4. Wire up a call bell/ buzzer | 06 Hrs. |
| 5. Wire up four power sockets controlled independently | 06 Hrs. |
| 6. Wire up a test board | 06 Hrs. |
| 7. Wire lighting circuit for a go down wiring | 08 Hrs. |
| 8. Prepare & mount the energy meter board | 08 Hrs. |
| 9. Wire up consumer's main board with ICDP & distribution fuse box & 08 Hrs.
With LCB / MCB | |

Course Name : Electrical Engineering Group
Course Code : EE/EP
Semester : Third
Subject Title : Elements of Mechanical & Civil Engineering
Subject Code : 12060

Teaching and Examination Scheme:

Teaching Scheme			Exam Scheme & Maximum Marks					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	--	25@	25

Rationale:

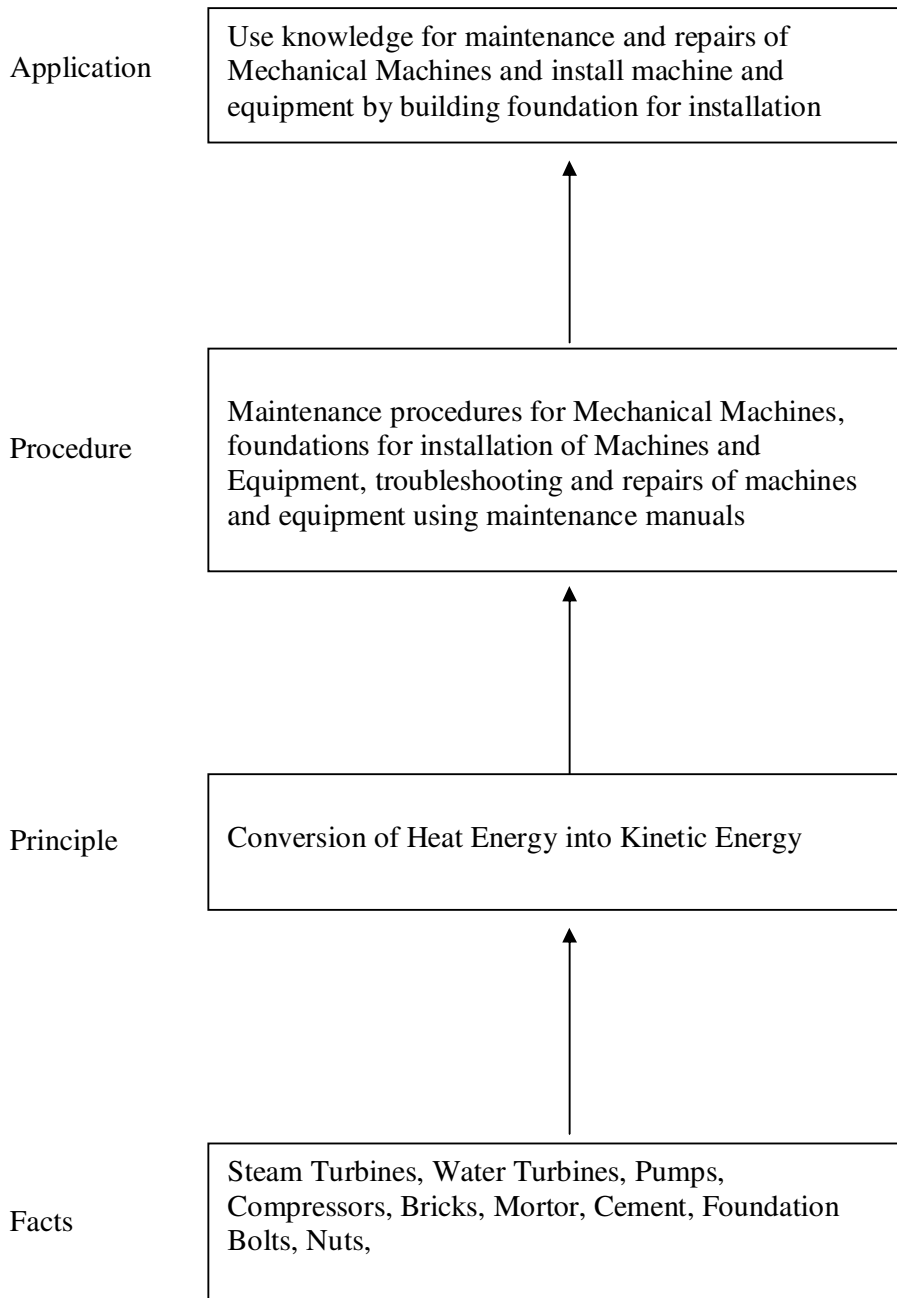
Diploma in Electrical Engineering passouts, work as Maintenance Engineers in industry. They have to look after maintenance of Mechanical Machines also. Similarly they have to install electrical machinery. For completing these tasks they need knowledge of Mechanical Machinery related to maintenance and Civil Engineering related to foundation work.

Objectives:

Student will be able to:

1. Supervise routine maintenance of Machinery such as Boilers, Turbines, Pumps, Steam Turbines
2. Supervise foundation work for installation of machinery and equipment
3. Identify faults, mal functioning of machines and equipment
4. Decide the size and type of foundation for machines

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours
01	Boilers, Steam Turbines, Steam Engines: 1.1 Construction & working of Cochran & Babcock & Wilcox Boilers. 1.2 Construction & working of impulse & reaction turbines. 1.3 Construction & working of steam engine 1.4 Reasons for Malfunctioning, and remedial measures for boilers and steam turbines	04
02	I.C. Engines: 2.1 Construction & working of two stroke & four stroke petrol & diesel engines 2.2 Reasons for Malfunctioning, and remedial measures for I. C. Engines	04
03	Air Compressors: 3.1 Uses of compressed air. 3.2 Construction & working of single stage & two stage reciprocating compressor. 3.3 Screw compressor & centrifugal compressor- construction, working & applications. 3.4 Reasons for Malfunctioning and remedial measures	03
04	Pumps: 4.1 Types of Pumps and their working 4.2 Reasons for malfunctioning and remedial measures	03
05	Foundation for Machines: 5.1 Need for foundation 5.2 Material required for foundation 5.3 Foundation Bolts: Types and Sizes 5.4 Criteria for Design of foundation	02
Total		16

Practicals:

Skills to be developed:

Intellectual Skills:

- Know working of boilers, steam turbine, I.C. Engines, compressors and pumps
- Diagnose faults/malfunctioning
- Select proper tools and equipment for repairs

Motor Skills:

- Disassembling and assembling of machines
- Start and run various machines

List of Practical:

1. Trace the flue gas path and water – steam circuit with help of boiler model.
2. Identify the possible location of fault/malfunctioning and decide how to repair them
3. Dismantling & assembly of Petrol/Diesel Engine.
4. Trial on single / multi cylinder petrol/ diesel engine.

5. Observe operation of Air Compressor and identify locations of fault and decide how to repair
6. Observe operation of a Centrifugal Pump and locations of fault and decide how to repair
7. Visit a thermal power station and observe functioning of Steam Turbine
8. Using Maintenance manuals prepare a maintenance schedule for a centrifugal Pump or Compressor

Learning Resources:**Books:**

Sr. No.	Author	Title	Publication
01	P.L. Ballaney	A Course in Thermal Engineering	Khanna Publishers
02	R. S. Khurmi	A test book of Thermal Engineering	S. Chand & Co. Ltd.
03	R. K. Rajput	Thermal Engineering	Laxmi Publication, New Delhi
04	Patel, Karmchandani	Heat Engine Vol. I & II	Achrya publication
05	P.K. Nag	Engineering Thermodynamics	Tata McGraw Hill

Course Name : Electrical Engineering Group

Course Code : EE/EP

Semester : Third

Subject Title : Professional Practices - III

Subject Code : 12061

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	05	--	--	--	--	50@	50

Rational:

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.

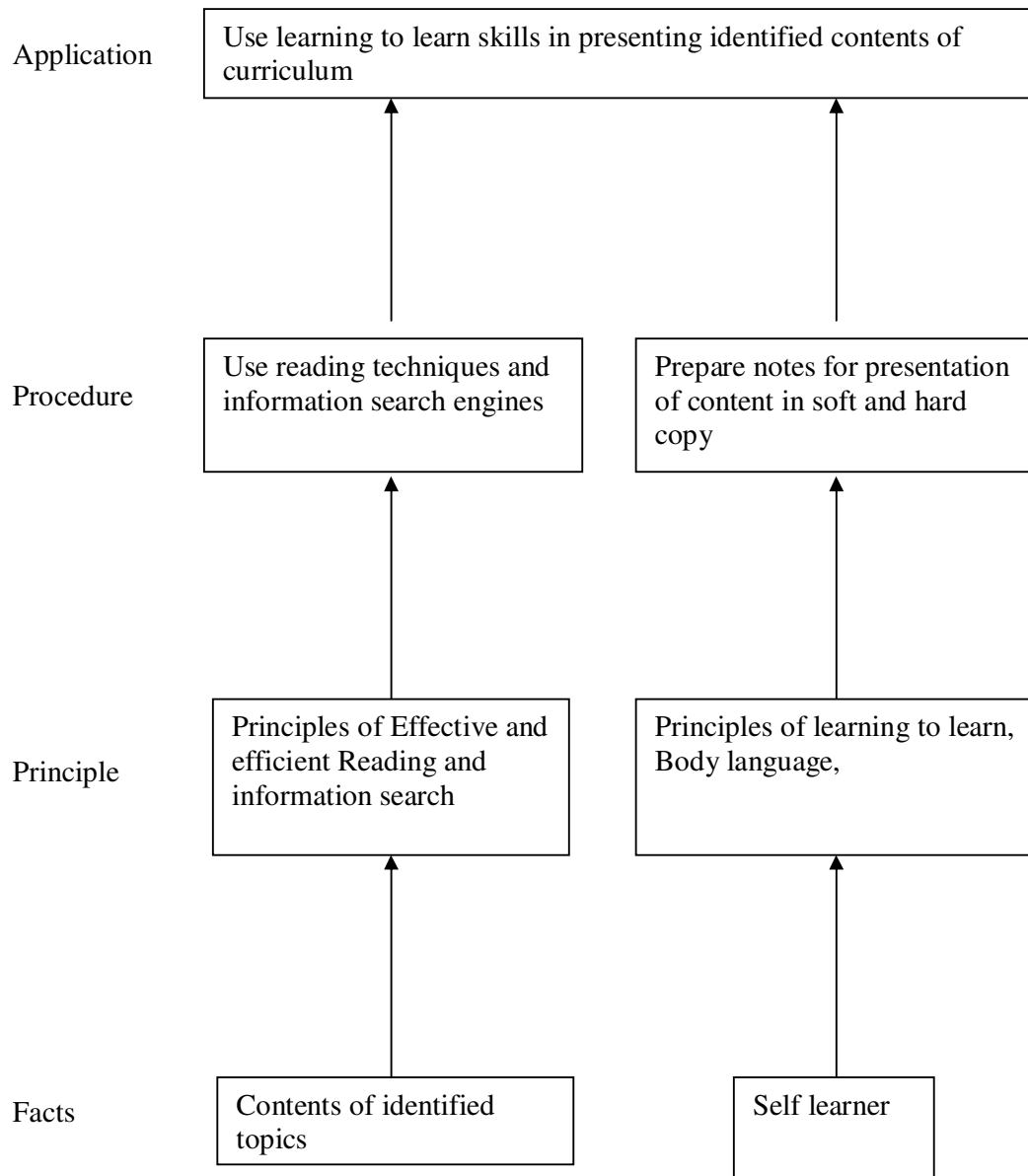
The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation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

Objectives:

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

Learning Structure:



Activity	Name of the Activity	Hours
01	<p>Field Visits Structured field visits (minimum three) be arranged and report of the same should be submitted by the student, as part of the term work. The field visits may be arranged in the following areas / industries :</p> <ul style="list-style-type: none"> i) Visit to Electric Power Generation Station ii) Visit to Wind Mill and/or Hybrid Power Station of Wind and Solar iii) Multi Storied Building for Power Distribution Scheme iv) Visit to a Multi Plex v) Visit to a Captive Power Plant (Thermal) 	30
02	<p>Lectures by Professional / Industrial Expert to be organized from of the following areas (any four)</p> <ul style="list-style-type: none"> i) Modern Techniques in Power Generation ii) Role of Power Factor Improvement a tool in reducing cost of generation iii) New trends for built environment iv) Software for drafting v) Digital Metering vi) Various government schemes such as EGS, vii) Industrial hygiene. viii) Hydro power generation ix) Special purpose wiring in chemical/hazardous industries 	18
03	<p>Seminar : Any one seminar on the topics suggested below: Students (Group of 4 to 5 students) has to search /collect information about the topic through literature survey, visits and discussions with experts/concerned persons: Students will have to submit a report of about 10 pages and deliver a seminar for 10 minutes.</p> <ul style="list-style-type: none"> 1. Water supply schemes/Problems of drinking water in rural area 2. Role of Traffic Signals in smooth flow of vehicles 3. Gram Swaraj Yojana 4. Schemes of power of generation in coming five years 5. Impact of load shading on rural population 6. Any other suitable topic 	20
04	<p>Market Survey: A group of four students is expected to collect information from the market regarding specifications and cost of any four items, used in Electrical wiring for domestic, commercial and industrial use</p>	12
Total		80