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 : SIX SEMESTERS **WITH EFFECT FROM 2012-13**

SEMESTER : THIRD **DURATION : 16 WEEKS**

FULL TIME / PART TIME : FULL TIME **SCHEME : G**

SR. NO	SUBJECT TITLE	abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									SW (17300)
							PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)		
				TH	TU	PR		Max	Min	Max	Min	Max	Min	Max	Min	
1	Applied Mathematics $	AMS	17301	03	--	--	03	100	40	--	--	--	--	--	--	50
2	Basic Electronics (Electrical)	BEE	17321	04	--	02	03	100	40	25#	10	--	--	25@	10	
3	Electrical & Electronic Measurement	EEM	17322	03	--	02	03	100	40	50#	20	--	--	25@	10	
4	Electrical Circuits and Networks	ECN	17323	04	01	02	03	100	40	50#	20	--	--	25@	10	
5	Electrical Power Generation	EPG	17324	03	--	--	03	100	40	--	--	--	--	--	--	
6	Computer Programming	CPR	17022	--	--	04	--	--	--	--	--	--	--	25@	10	
7	Electrical Workshop	EWO	17023	--	--	02	--	--	--	--	--	--	--	25@	10	
8	Professional Practices-I	PPO	17024	--	--	03	--	--	--	--	--	--	--	50@	20	
			Total	**17**	**01**	**15**	**--**	**500**	**--**	**125**	**--**	**--**	**--**	**175**	**--**	**50**

Student Contact Hours Per Week: **33 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 850**

@ - Internal Assessment, # External Assessment, ▭ No Theory Examination, $ - Common to all branches

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/ ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX

Semester : Third

Subject Title : Applied Mathematics

Subject Code : 17301

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	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:

Applied mathematics is designed for its applications in engineering and technology. It includes the topics integration, differential equation, probability distribution. The connection between applied mathematics and its applications in real life can be understood and appreciated.

Derivatives are useful to find slope of the curve, maxima and minima of function, radius of curvature. Integral calculus helps in finding the area. In analog to digital converter and modulation system integration is important. Differential equation is used in finding curve. Probability is used in Metrology and quality control.

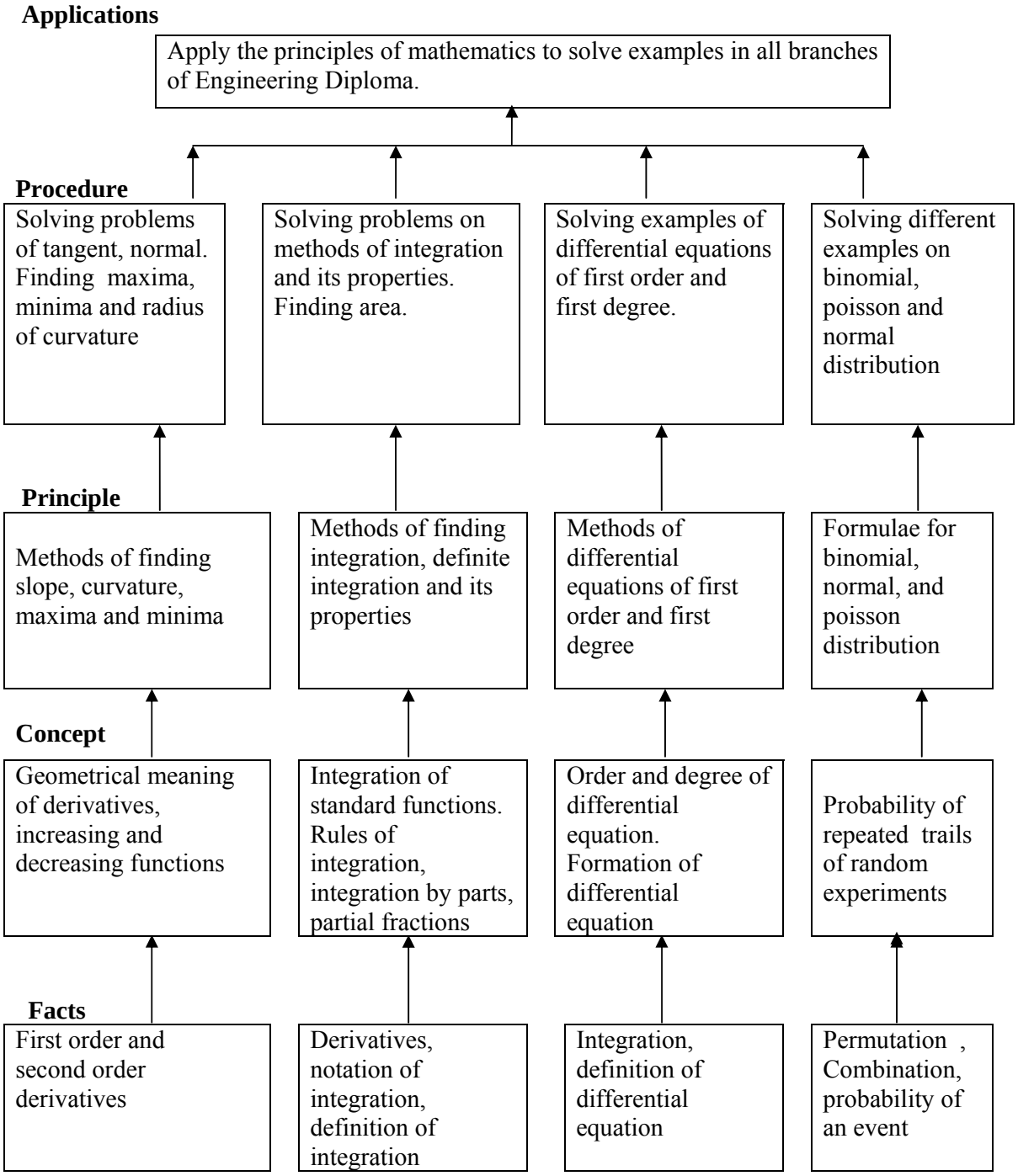
The fundamentals of this topic are directly useful in understanding engineering applications in various fields.

General Objectives:

Students will be able to:

1. Apply derivatives to find slope, maxima, minima and radius of curvature.
2. Apply integral calculus to solve different engineering problems.
3. Apply the concept of integration for finding area.
4. Apply differential equation for solving problems in different engineering fields.
5. Apply the knowledge of probability to solve the examples related to the production process.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic-1 Applications of Derivative **Specific objectives :** ➢ Find slope, curvature, maximum and minimum value of functions related to different engineering applications. • Examples for finding slope , equations of tangent and normal to the curve • Maxima and minima. • Radius of curvature.	06	16
Topic-2 Integral Calculus		
2.1 Integration ---------- 20 **Specific objectives :** ➢ Integrate function using different method. • Definition of integration as anti derivative, rules of integration. • Integration of standard functions • Methods of integration Integration by substitution. Integration by partial fractions. Integration by parts and generalized rule by parts.	14	44
2.2 Definite Integrals ---------- 16 **Specific objectives :** ➢ Solve problems on definite integrals using the properties. • Definite integral- Definition, examples. • Properties of definite integrals without proof and simple examples.	08	
2.3 Application of Definite Integrals ----------08 **Specific objectives :** ➢ Find area. • Area under a curve. • Area between two curves.	04	
Topic 3 - Differential Equation.		
3.1 Differential equation **Specific objectives :** ➢ Solve the differential equation of first order and first degree ➢ Solve different engineering problems using differential equation • Differential equation- Definition, order and degree of a differential equation. Formation of differential equation containing single constant. • Solution of differential equation of first order and first degree for following types Variable separable form, Equation reducible to variable separable form. Linear differential equation. Homogeneous differential equation. Exact differential equation.	10	20

Topic 4 - Probability		
4.1 Probability **Specific objectives : ---------- 08** ➢ Solve different engineering problems related to probability process. • Definition of random experiment, sample space, event, occurrence of event and types of event (impossible, mutually exclusive, exhaustive, equally likely) • Definition of probability, addition and multiplication theorems of probability.	02	20
4.2 Probability Distribution ---------- 12 • Binomial distribution • Poisson's Distribution • Normal distribution	04	
Total	**48**	**100**

Learning Resources:

1) Books:

Sr. No	Title	Authors	Publication
1	Mathematic for Polytechnic	S. P. Deshpande	Pune Vidyarthi Girha Prakashan' Pune
2	Calculus : Single Variable	Robert. T. Smith	Tata McGraw Hill
3	Higher Engineering mathematics	B. V Ramana	Tata McGraw Hill
4	Higher Engineering mathematics	H. K. Dass	S .Chand Publication
5	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Delhi
6	Applied Mathematics	P. N. Wartikar	Pune Vidyarthi Griha Prakashan, pune

2) Websites :

i) www.khan academy

Course Name : Electrical Engineering Group

Course Code : EE/EP

Semester : Third

Subject Title : Basic Electronics (Electrical)

Subject Code : 17321

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	25#	--	25@	150

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:

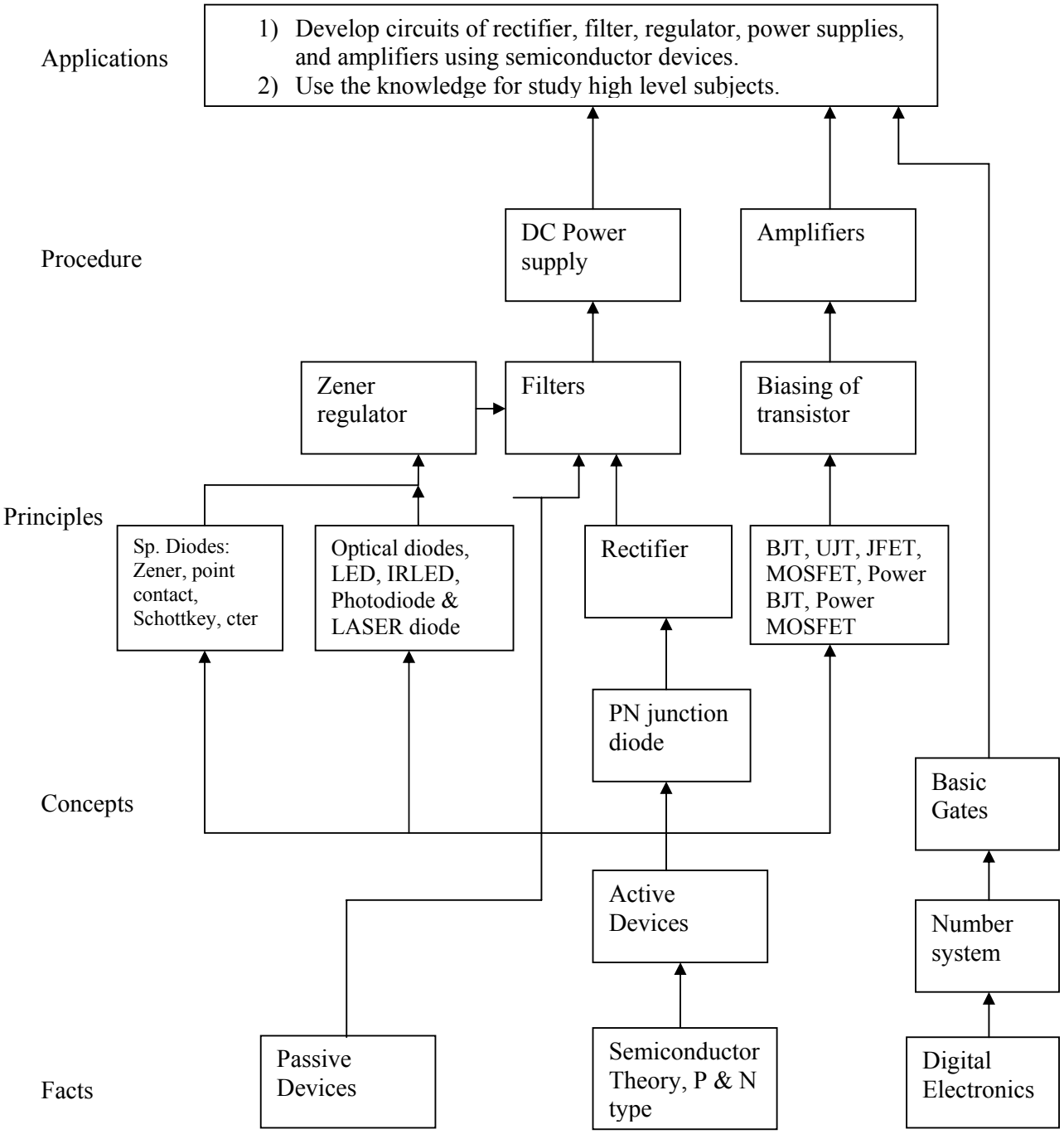
Electronics plays very important role in our day to day life. Basic electronics is the base for all engineering trades. It starts with the semiconductor material. Next the working principle of PN junction will help the students to understand the working of most of the semiconductor devices. Study of optical diodes gives basics for all optical devices such as scanner, Xerox machine, fax machine etc. Students should understand basics of power supply, since most of the electronic devices work on DC power supply. Study of MOSFET is essential since 95% of the semiconductor market is devices are controlled by MOSFETs. Introduction to digital electronics gives the students idea about working of microprocessor.

Objectives:

Students will be able to:

1. Define the scope of electronics.
2. State some applications of electronics in our day-to-day life.
3. State the latest trends in the field of electronics.
4. Draw the symbol, characteristics & applications of some important active devices.
5. Testing of active & passive components.
6. List the specifications of active & passive components.
7. Reading the data sheets of electronic components.

Learning Structure:



Theory:

Topic and Detailed Content	Hours	Marks
Topic 1: Semiconductor Diode **Specific Objectives:** ➢ Select specific diode according to application. ➢ Select the diode with required specification. **Contents:** **1.1 Semiconductor Theory** • Review of semiconductor theory (No questions to be set in Theory Paper) • Intrinsic semiconductor, Extrinsic semiconductor, doping, dopant • Trivalent & pentavalent impurities, P- Type and N- Type semiconductor. **1.2 Semiconductor Diode** • PN Junction. • Junction theory: Barrier voltage, Depletion region, Junction capacitance, Forward and reverse biased junction • V- I characteristics of P-N junction diode. • Circuit diagram for characteristics(Forward & Reverse) **1.3 Specifications of diode** • Forward Voltage Drop, Reverse Saturation Current, Maximum Forward Current, Power Dissipation. • Ideal Diode Model. **1.4 Zener diode** • Construction & symbol • Circuit diagram for characteristics(Forward & Reverse) • Specification of zener diode: zener voltage(VZ), Maximum power dissipation(PD(max)) , Break over current(I_{ZK}), zener resistance. • Special purpose diodes: Schottkey diode, Point-contact diode, Varacter diode (Construction, symbol, Characteristics and applications). • Optical diodes: LED, IRLED, Photodiode and LASER diode (Symbol, operating principle and applications of each)	08	12
Topics 2: Rectifiers and Filters **Specific Objectives:** ➢ Select the specific rectifier & filter according to the requirement ➢ Lists various types of filter circuits with advantages & disadvantages. **Contents:** **2.1 Rectifiers** • Need of rectifier • Types of rectifier: Half wave rectifier, Full wave rectifier(Bridge and Centre tapped) • Working with waveform(IP /OP waveformsfor voltage and current, Average (DC) value of current and voltage (No derivation) • Ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier. • Comparison of three types of rectifiers (HWR. FWR (bridge & centre tapped). **2.2 Filters** • Need of filters • Types of filters: shunt capacitor, series inductor, LC filter, π filter (circuit diagram, operation, DC O/P voltage, ripple factor (formula), ripple	06	08

frequency, Dependence of ripple factor on load. • I/P and O/P waveforms, Limitations and Advantages of all types of filters.		
Topic : 3 Bipolar Junction Transistor **Specific Objectives:** ➢ Identify the transistor configuration according to application. ➢ Lists types of biasing & coupling. ➢ Select the specific amplifier type according to application. **Contents:** **3.1 Transistor 16 Marks** • Transistor definition • Types: NPN, PNP junction transistors (Symbols, operating principle (NPN only) • Transistor configuration: Common emitter (CE), common collector (CC), common base (CB). • Characteristics in CE configuration (Circuit diagram, I/P and O/P characteristics, different points of characteristics (Cut-off, Active and Saturation), input resistance, output resistance, current gain (α and β) Transistor Biasing: • Need of biasing, DC load line, Operating point • Types of biasing circuits**:** Fixed bias circuit, Base biased with emitter feedback, Base biased with collector feedback, Voltage divider bias, Emitter biased **3. 2 Transistor as an amplifier (CE configuration only) 12 Marks** • Graphical representation, Current gain, Voltage gain, Power gain (No derivation), Input output resistance, Phase shift between input and output. • AC Load line • Single Stage CE amplifier: Circuit diagram, Function of each component, Frequency response and bandwidth. **Need of Cascaded amplifier** • Types of coupling : RC couple, Transformer couple, Direct couple (Circuit diagram and function of each component) • Application of each amplifier • Transistor as a switch – (Circuit diagram, operation, application) **3.3 Power amplifier 08 Marks** • Introduction, classification : class A, class B, class AB, class C (Efficiency of each). • Single stage class A power amplifier (Circuit operation, IP/OP waveforms, graphical analysis and efficiency) • Transformer couple resistive load single stage power amplifier. • Class A push pull amplifier. • Class B push pull amplifier. • Class AB push pull amplifier. • Concept of cross over distortion. • Need of heat sink. **UJT** • Symbol, characteristics and working principle of UJT.	24	36
Topic : 4 Field Effect Transistor (Unipolar Transistor) **Specific Objectives:** ➢ Differentiate between BJT & FET. ➢ Identify the type of unipolar transistor to suit the application. **Contents:**	08	12

4.1 FET • Types, Symbols and working principle • Characteristics of FET, Circuit diagram for drain characteristics, Operating regions of characteristics. • Drain resistance, Mutual capacitance, amplification factor and their relation, Pinch off voltage of FET • Comparison of BJT and FET.(Types of carriers, switching speed, Thermal stability, space in case of IC fabrication, control parameter, input impedance, offset voltage, power gain at audio frequencies) **4.2 MOSFET** • Types, symbol, working principle • Application of FET and MOSFET.		
Topic : 5 Regulated Power Supply **Specific Objectives:** ➢ Identify the regulator IC with specification. ➢ Select the regulator IC to meet the application. **Contents:** • Definition of regulator, Need of regulator, Voltage regulation factor, • Concept of load regulation and line regulation • Zener diode as a voltage regulator. • Basic block diagram of DC power supply • Transistorized Series voltage regulator, Transistorized Shunt voltage regulator, (Circuit diagram and operation) **Regulator IC's** • IC's 78XX, 79XX (Functional Pin diagram) • IC 723 as fixed, variable and Dual regulator.	04	12
Topic: 6 Oscillators **Specific Objectives:** ➢ State the concept of feedback & Barkhausen criteria. ➢ Select the specific oscillator circuit according to application. **Contents:** • Definition and block diagram of oscillator. • Concept of feedback, Types of feedback, Positive feedback, Negative feedback, Barkhausen's criterion **Classification of oscillators** • LC oscillators • Hartley oscillators • Colpitt's oscillators • RC oscillator • Crystal Oscillator **(Circuit Diagram & Working)**	08	12
Topic : 7 Digital Electronics **Specific Objectives:** ➢ Identify various gates with truth table. ➢ Describe the basics of Micro Processor. **Contents:** • Digital circuit, Digital signal, Use of digital circuit and signal. • Number System: Introduction to binary, octal decimal and hexadecimal number system **Logic Gates** • Logic symbol, Logical expression and truth table of AND, OR, NOT,	06	08

EX-OR, & EX-NOR gates. • Universal gates : NAND gate and NOR gate • Application of Digital Electronics • Basic block diagram of Microprocessor.		
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:
1. Identification & selection of components.
2. Interpretation of circuits.
3. Understand working of rectifier, filter, amplifier & oscillator circuits.

Motor Skills:
1. Ability to draw the circuits
2. Ability to measure various parameters.
3. Ability to test the components using multimeter.
4. Ability to read data sheets of components.
5. Follow standard test procedures.

List of Practicals:
1. Forward & Reverse characteristics of diode.
2. Forward & Reverse characteristics of zener diode.
3. Study of Rectifiers (Half wave & Full wave) & Filters(Capacitor & Inductor Filter)
4. Input & output characteristics of transistor in CE mode.
5. Characteristics of FET.
6. Characteristics of UJT.
7. Load & Line regulation characteristics of Zener Diode Regulator.
8. Frequency response of single stage RC coupled amplifier.
9. Determine waveforms of LC & RC oscillator circuits.
10. Verifying truth tables of logic gates using ICs.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	N. N. Bhargava, D.C. Kulashreshtha, S.C. Gupta – TTTI Chandigharh	Basic Electronics & Linear Circuits	Tata McGraw Hill
2	Albert Malvino David J Bates	Electronic Principles	Tata McGraw Hill
3	Debashis De	Basic Electronics	Pearson
4	B Basavaraj H N Shivashankar	Basic Electronics	Vikas
5	Vijar Baru Rajendra Kaduskar Sunil T. Gaikwad	Basic Electronics Engineering	Dreamtech
6	J. P. Bandyopadhyay	Basic Electronics Engineering	Vikas
7	David A Bell	Electronic Devices & circuits	Oxford

Course Name : Electrical Engineering Group

Course Code : EE /EP

Semester : Third

Subject Title : Electrical & Electronic Measurement

Subject Code : 17322

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:

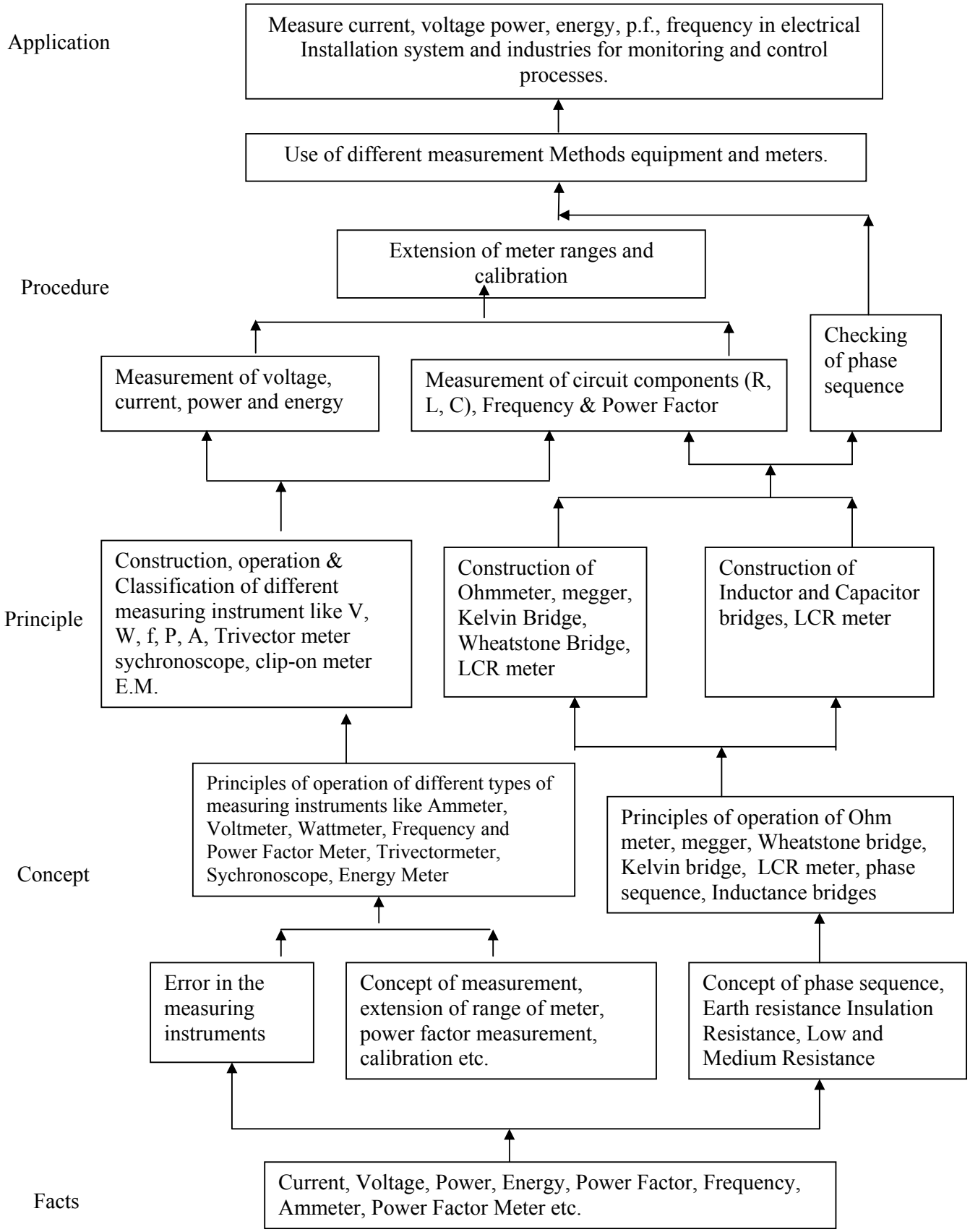
This is the core technology subject. The electrical diploma holder has to work in industry as technical person in middle level management. He has to work as production, maintenance, testing engineer in various industries like power generation, transmission, distribution, traction etc. and has to deal with different electrical machines and equipments. While performing above task he has to measure different electrical parameters and quantities therefore he must require the skills for these measurements and broad idea of different meters and equipments.

General Objectives:

The Students will be able to: -

1. To know the vocabulary of electrical measurement system
2. Identify various measuring instruments
3. To read different meters properly
4. Select proper meter / equipment for particular measurement
5. calibrate various types of meters/ instruments as per ISS

Learning Structure:



Theory:

Topics and contents	Hours	Marks
Topic 1: Fundamentals of Measurements. ➢ Understand different terms in measurement system. ➢ Explain development of different torques in measurement system. **Contents:** • Significance and purpose of electrical measurement systems. • Various electrical effects employed in measuring instruments. • Desirable characteristics of measuring instruments: accuracy, sensitivity, selectivity, reproducibility, precision, errors, drift • Common errors in analog measuring instruments. • Classification of measuring instruments. • Different torques in analog instruments: Deflecting, controlling and damping torque. ➢ Methods of developing these torques	07	14
Topic 2: Measurement of Voltage and Current. ➢ Identify different parts of indicating instruments. ➢ Select proper meter for particular application. **Contents:** • Constructional features and working principles used in PMMC and MI instruments. • Comparison between PMMC and MI instruments. • Basic arrangements of using above instruments for measurement of voltage and current in single phase circuits. • Extension of Range of ammeters and voltmeters. ➢ D. C. Ammeters: Using Shunts: calculations of shunt resistance and simple numerical ➢ D. C. Voltmeters: Using Multipliers: calculations of multiplier resistance and simple numericals ➢ A. C. Ammeters: Using Current transformers: Construction and principle of operation, precautions ➢ A. C. Voltmeters :Using Potential transformers Construction and principle of operation, precautions • Calibration of Ammeter and Voltmeter: Concept of Standard meter, Calibration Procedure	10	24
Topic 3: Concept of Power and Power Measuring Instruments: ➢ Know Significance of power factor in power measurement. ➢ Use appropriate method for power measurements using wattmeter **Contents:** • Concept of impedance triangle in A.C. circuit-R-L,R-C and R-L-C series circuit. • Concept of Power factor and its significance. • Active, Reactive and apparent power, their equations, relations and units. • Power Triangle : concept of lagging and leading power factor • Constructional features of Dynamometer type instruments and its use as a wattmeter for single phase circuits. • Multiplying factor of wattmeter. • Different errors in wattmeter and their compensations.	06	12
Topic 4: Measurement of three phase a. c. Power	06	12

➢ Use appropriate methods for measurement of 3-ph Power ➢ Verify power measured analytically and by using phasor diagrams **Contents:** • One wattmeter method: Measurement of active and reactive power. Advantages and Limitations • Two wattmeter method: Measurement of active and reactive power. Advantages and Limitations • Effect of Power factor on wattmeter reading in two wattmeter method. • Extension of ranges **(Simple numericals on above)**		
Topic 5: Measurement of Electrical Energy ➢ Make connections of single phase energy meter. ➢ Calibrate 1-ph energy meter ➢ Choose energy meter of appropriate rating **Contents:** • Concept of electrical energy • Constructional features and working principle of single phase and three phase induction type energy meter. • Different types of errors and their compensations. • Calibration of single phase induction type energy meter by direct loading. • Digital Energy meter: Working principle, advantages over analog meter	05	10
Topic 5: Measurement of Circuit Parameters. ➢ Measure different resistances by selecting correct method of measurement. ➢ Use LCR meter for measurement of L, C and R. ➢ Classify the resistance Contents: • Classification of resistance.-Low, Medium and High. • Methods of measurement of low and medium resistance by simple V-I method and by using digital multimeter. • Constructional features working principles and applications of megger and earth tester. • Comparison and applications of –analog and digital multimeter. • Working of L-C-R meter for measurement of inductance and capacitance	07	14
Topic 6: Constructional features, working principles and applications of Other meters. ➢ Select a meter for measuring P.F, Frequency and Phase sequence ➢ Use Clip On Meter efficiently **Contents:** • Single phase and three phase power factor meter.(Only dynamometer type) • Frequency meter.(Only Weston type) • Phase sequence indicator(Rotating type only) • Clip on ammeter. • Block diagram of C.R.O. and function generator, function of each block and applications of C.R.O. and function generator in measurement.	07	14
Total	**48**	**100**

Practicals:
Skills to be developed:

Intellectual Skills:

1. Apply different Measuring skill.
2. Select proper equipment.

Motor Skills:

1. Measurement of electrical quantities
2. Connections skill.
3. Handling of meters

List of Practical's:

1. To know measuring instruments on the basis of symbols on dial like, type, class position and scale.
2. To identify the components of PMMC and MI instruments, using working models.
3. To extend range of voltmeter and ammeter by using PT and CT.
4. To measure power in a single phase circuit by electro-dynamic watt-meter.
5. To measure active and reactive power of three phase balanced load using single wattmeter.
6. To measure active power of three-phase balanced load using two watt-meters.
7. To calibrate single phase energy meter by direct loading.
8. To use digital multi-meter and clamp on meter for measurement of AC/DC current, AC/DC voltage and resistance.
9. To use megger for various measurements.
10. To measure supply frequency and power factor in single-phase circuit.

Learning Resources:

1. **Books:**

Sr. No.	Name of the Author	Title of the Book	Name of the Publisher
1.	A.K.Sawhney	Electrical & Electronics Measurements & Instrumentation	Dhanpatrai & sons
2.	N.V. Suryanarayna	Electrical Measurements & Measuring Instruments	S, Chand & co.
3.	C.T. Baldwin	Fundamentals of Electrical Measurements	--
4.	R.K. Rajput	Electrical Measurements & Measuring Instruments	S. Chand & co.

2. **ISO, IS, BS standards, Data Sheets, IE Rules Handbook**
   ISO: 1248, 1765, 6236, 9223, 8945, 2442

3. **Websites**
   www.test-meter.co.uk/
   en.wikipedia.org/wiki/Emerson_Electric_Company
   www.electrical-installation.org
   www.idemi.org/
   www.davis.com/
   www.sensors-research.com/links.htm

Course Name : Electrical Engineering Group

Course Code : EE / EP

Semester : Third

Subject Title : Electrical Circuits and Networks

Subject Code : 17323

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	01	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:

In order to understand electrical machines, power system, controls and measurements, knowledge of electrical circuit and network is very important. Study of electrical network lays the foundation to understand subjects of application level.

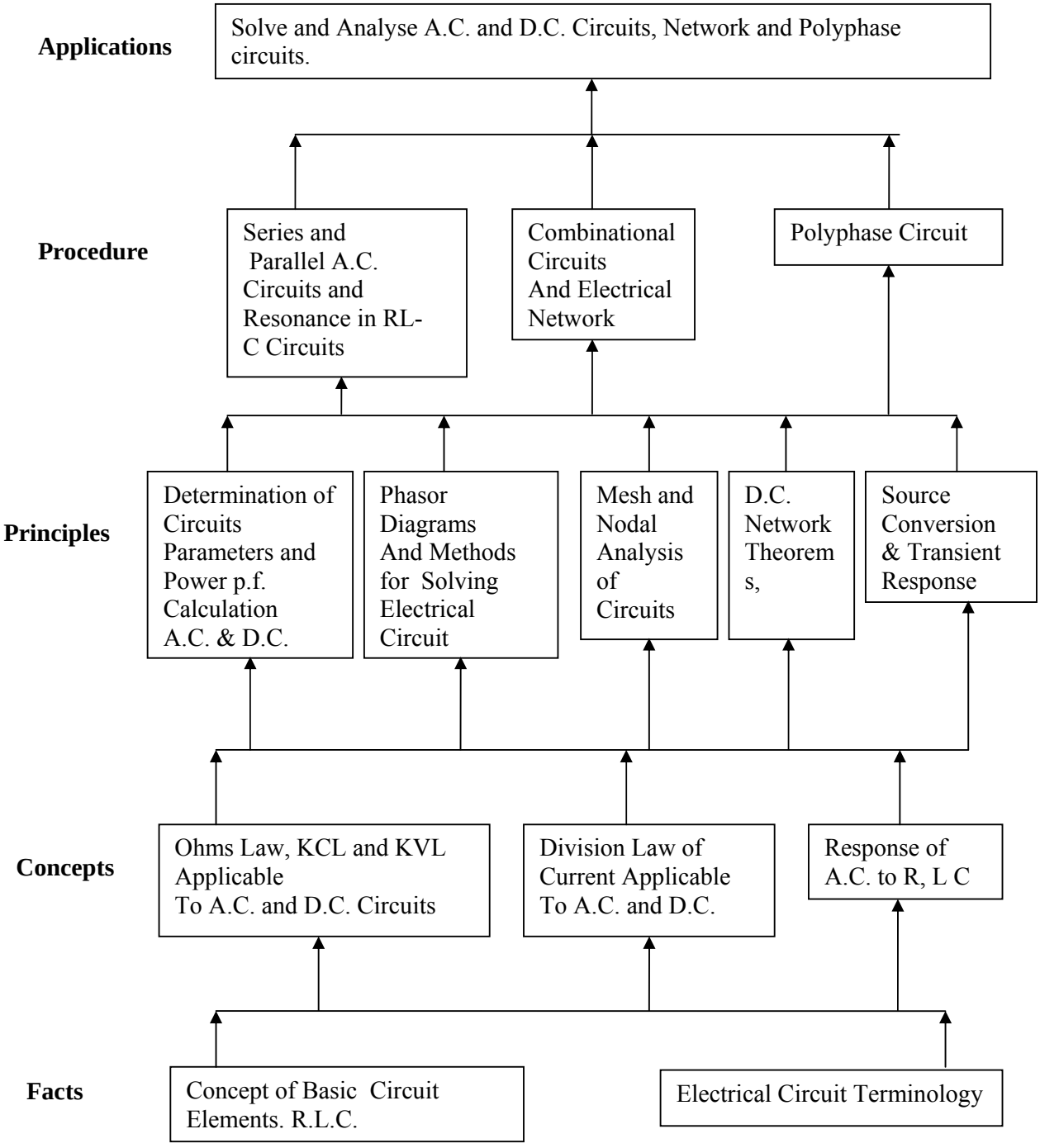
The study of this subject will facilitate student to understand concept and principles of circuits and circuit analysis. It helps also students in fault finding and troubleshooting.

General Objectives:

The student will be able to:

1) Understand basic elements of the circuit, terminology used and various quantities involved.
2) Use network theorems for solution of DC network.
3) Realize the importance of series ac circuit and parallel ac circuit.
4) Know the relations between phase and line values of various quantities in three phase ac circuit.
5) Calculate various parameters of a.c. circuits.

Learning Structure:



Theory:

Note: All Network Theorems should be taught for DC supply & Superposition Theorem should be taught for both AC & DC supply.

Topic and Contents	Hours	Marks
Topic 1. Review Of Basic Concepts Of Electric Circuit: Specific Objectives: ➢ Understand generation of a.c. supply and concept of phasor ➢ Define various terms related with a.c. supply. ➢ Draw sinusoidal a.c. waveform and phasor diagram. ➢ Calculate r.m.s., average ,instantaneous value and amplitude of a.c. supply. **Contents:** 1.1 Basic Electric Circuit Elements R, L, C. 1.2 Simple one loop a.c. generator to produce sinusoidal a.c e.m.f. 1.3 Sinusoidal a.c. waveform and definitions of various terms such as frequency, time-period, cycle, amplitude, average value, r,m,s value, crest factor ,form factor .(**Simple numericals**) 1.4 Concept of phasor. 1.5 Response of pure R, L, and C to sinusoildal a.c. supplies. 1.6 Phasor representation of alternating quantity and concept of phase angle.(Simple numericals)	06	12
Topic 2. Single Phase A.C. Series Circuits : Specific Objectives: ➢ Calculate current, reactance and impedance of series a.c. circuit. ➢ Draw phasor diagram of series a.c. circuit. ➢ Calculate various powers, and p.f. of series a.c. circuit. **Contents:** 2.1 Series a.c. circuits R-L, R-C and R-L-C circuits. Impedance, reactance, phasor diagram, impedance triangle, power factor, active(real) power, apparent power , reactive power, power triangle **(Derivations and Numericals).** 2.2 Series Resonance, quality factor **(Derivations and Numericals).** 2.3 Solution for AC Series circuit by using complex algebra.	12	20

Topic 3. Single Phase A.C. Parallel Circuits: Specific Objectives: The students will be able to : ➢ Calculate current, reactance and impedance of parallel a.c.circuit. ➢ Draw phasor diagram of parallel a.c.circuit. ➢ Calculate various powers, and p.f. of parallel a.c. circuit. **Contents:** 3.1 Parallel AC circuits ➢ Resistance in parallel with pure inductance. ➢ Resistance in parallel with capacitance. ➢ Series combination of resistance and inductance in parallel with capacitance Concept of Admittance, Conductance & Susceptance, Solution by admittance method and impedance method.**(Numericals only)** 3.2 Parallel resonance, quality factor. 3.3 Comparison of series and parallel circuits	08	12
Topic 4. Polyphase A.C. Circuits : Specific Objectives: ➢ Calculate current, reactance and impedance of each phase of polyphase a.c. circuit. ➢ Calculate line quantities. ➢ Draw phasor diagram of polyphase a.c. circuit. ➢ Calculate various powers, and p.f. of polyphase a.c. circuit. **Contents** 4.1 Advantages of polyphase circuits over single phase circuits 4.2Generation of three phase e. m. f. 4.3 Phase sequence, polarity marking. 4.4 Types of three-phase connections. 4.5 Concept of unbalanced load and balanced load. 4.6 Line, phase quantities and power in three phase system with balanced star and Delta connected load & their interrelationship**.(Derivations and numerical)**	10	18
Topic 5 : Principles of Circuit Analysis (<u>ONLY DC Circuits</u>): Specific Objectives: ➢ Realize importance of source transformations and λ /Δ orΔ / λ transformations. ➢ Solve examples of simple d.c. circuits by mesh or node analysis. **Contents:** 5.1Source transformation **(No Numericals).** 5.2Star/delta & Delta/star transformations **(No Numericals).** 5.3Mesh analysis **(Numericals with two equations).** 5.4Node analysis **(Numericals with two equations).**	08	12
Topic 6 : Network Theorems: **Note: Simple Numericals on <u>DC Circuits only with maximum two simultaneous equations</u>** Specific Objectives:	16	20

➢ Calculate the current in a given network by applying proper therom. ➢ Realize importance of maximum power transfer thermo. **Contents:** 6.1 Superposition Theorem for both AC Voltage & DC Source. 6.2 Thevenin's Theorem 6.3 Norton's Theorem 6.4 Maximum Power Transfer Theorem		
Topic 7 : Initial And Final Conditions Of Elements In A Network : Specific Objectives: ➢ Understand importance of initial and final conditions. ➢ Use such initial and final conditions in switching circuits and electronic circuits. **Contents** Concept of initial and final conditions in switching circuits. Meaning of t = 0 -, t = 0+ and t = ∞. R,L, and C at initial conditions R,L, and C at final conditions	04	06
Total	**64**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Distinguish between series and parallel a.c. circuits
2. Interpret electrical circuit diagram.
3. Identify safety equipments required.
4. Decide the procedure for setting experiments.

Motor Skills:

1. Connect as per circuit diagram along with various required proper range meters.
2. Measure electrical current, voltage drop, power etc.
3. Select proper supply for a given experiment.(a.c. or d.c.)
4. Use safety devices while working.

List of Practicals:
All Experiments Are Compulsory.

1. To determine impedance, phase angle and plot phasor diagram of R-L a.c. series circuit. To calculate also active, reactive and apparent power consumed in R-L series circuit
2. To determine impedance, phase angle and plot phasor diagram of R-C a.c. series circuit. To calculate also active, reactive and apparent power consumed in R-C series circuit.
3. To determine impedance, phase angle and plot phasor diagram of R-L-C a.c. series circuit. To calculate also active, reactive and apparent power consumed in R-L-C series circuit.
4. To obtain resonance in R-L-C a.c. series circuit either
   - ➢ By varying L or C or
   - ➢ By using variable frequency supply.
5. a. To measure current of each branch of R-C parallel a. c. circuit

b. To calculate p. f., active, reactive and apparent power taken by same R-C parallel a. c. circuit (Resistor in parallel with capacitor)

6. a. To measure current of each branch of RL-C parallel a. c. circuit
   b. To calculate also p.f., active, reactive and apparent power taken by the a. c. circuit. (series connection of resistor and inductor in parallel with capacitor)
7. To verify line and phase values for balanced three phase load and to calculate all types of power.
   - Star connected
   - Delta connected
8. To verify superposition therom.
9. To verify Thevenin's and Norton's therom.
10. To verify maximum power transfer theorem.

Learning Resources:

1. **Books:**

Sr. No	Author	Title	Edition	Publisher
1	B. L. Theraja A. K. Theraja	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.)	Multicolour Edition 2005 And Subsequent Reprint	S. Chand & Co. Ramnagar New Delhi
2	V. N. Mittle	Basic Electrical Engg.	Any Edition After 2005	Tata McGraw-Hill
3	Edward Hughes	Electrical Technology	Second And Any Subsequent Edition	Pearson Education, New Delhi
4	A. Sudhakar	Circuit and network	Fourth Edition	Tata McGraw Hill
5	R.S. Ananda Murthy	Basic Electrical Engineering	Second Edition	Pearson
6	P.Ramesh Babu	Electric Circuits	First Edition	Scitech
7	Richard C. Dorf and James A. Svoboda	Electric Circuits	Sixth Edition	WILLEY student WILLEY INDIA Edition
8	Sunil T. Gaikwad	Basic Electrical Engineering	First Edition	Dreamtech Press 19-A Daryaganj, N.Delhi
9	David A. Bell	Electric Circuits	Seventh Edition	Oxford Univesity Press
10	K Murugesh Kumar	Elements of Electrical Engg.	First Edition	Vikas Publishing House Pvt Ltd. Noida

2. **Websites:**
   www.wikipedia.com , www.youtube.com , www.norsa.com, www.dreamtechpress.com

Course Name : Electrical Engineering Group

Course Code : EE/EP

Semester : Third

Subject Title : Electrical Power Generation

Subject Code : 17324

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	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:

Electrical energy plays vital role in the development and industrialization of the country. The development of the country is best judged by its power generation capacity and usage. It is a driving force in the development hence it is necessary to understand the basic concepts and principles of energy generation.

The subject content on factors governing selection and location of site, block diagrams or typical layout of various power plants and economics of power generation will be useful in effective and efficient running of power plants.

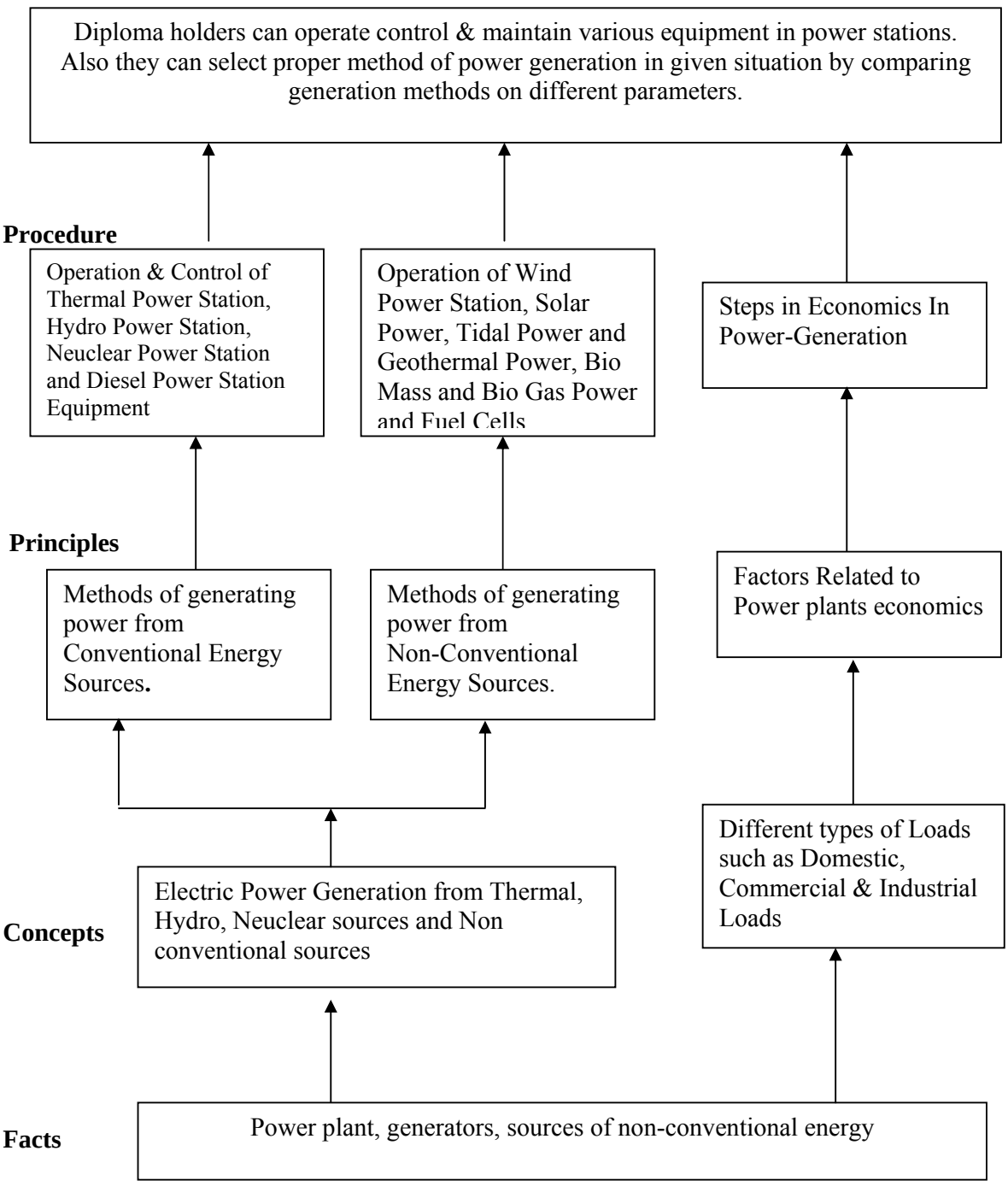
This subject is the building block for further studies in transmission, distribution, utilization and protection of power system for smooth and stable operation.

General Objectives:

The students will be able to:

1. Classify the different sources of electric power generation.
2. Decide the various factors governing selection of site for power plant and list their merits.
3. Describe principle and operation of power generation.
4. Identify and describe the function of each component of power plant.
5. Select the power generation technique based on economy.
6. Compare between various sources of power generation.

Learning Structure:



Theory:

Topics and Contents	Hours	Marks
Topic 1: Basics of Power Generation **Specific objectives:** • State the importance of electrical energy in the growth of a country. • List the various energy sources. **Contents:** o Importance of electrical power in day today life 1.2 Various sources of energy 1.3 Overview of electrical power Generation in India and future perspectives	03	06
Topic 2 : Thermal Power Station **Specific Objectives:** ➢ List various Thermal Power Stations in India. ➢ State the function of various elements of a Thermal Power Plant. **Contents:** 2.1 List of Thermal Power Station in Maharashtra state with their capacity. 2.2 Factors governing selection of site for Thermal station. 2.3 Schematic block diagram of Coal Fired Power Station. 2.4 Constituents of steam power plant and Their function. • Coal handling unit (Various stages in coal handling unit). • Boiler (Fire tube and water tube boilers). • Super-heater and re-heater • Steam prime movers. • Condensers • Spray ponds and cooling towers. • Turbo alternator (salient features). 2.5 Flue gas flow diagram of thermal Power plant with function of each part • Draught Systems: Natural draught, Mechanical draught, Forced , induced and balanced draught: definition and working only • Economizer • Feed water heater • Ash precipitators. 2.6 Ash Disposal and Dust Collection. o Merits and demerits of Steam Power Plant	10	24
Topic 3 : Hydro Electric Power Plants **Specific Objectives:** ➢ List various Hydro Power plants ➢ Describe the process of Hydrology. ➢ Classify Hydro Electric plants on various parameters. **Contents:** 3.1 List of Hydro Electric Power Stations in Maharashtra state with their capacity. 3.2 Factors governing selection of site for Hydro Electric power plant. 3.3 Definition of the terms and their significance in capacity of power plant: Hydrology, surface Runoff, Evaporation and precipitation 3.4 Schematic arrangement of Hydro Electric Power Plant and function of Elements listed below: • Storage Reservoir, Dam, Fore bay, Spillway, Intake, Surge tank, Penstock, Trash rack, Tail Race, Prime movers or water turbines, power house	08	18

3.6 Classification of Hydro Electric power plants • According to water flow regulation • According to load. • According to head. • Pumped storage power plants. 3.7 Advantages and disadvantages of Hydro Electric Power Plant. 3.8 Salient features of Hydro generator		
Topic 4 : Nuclear Power Station **Specific Objectives:** ➢ List various Nuclear Power Stations in India ➢ Identify elements of typical Nuclear Power Plant. **Contents:** 4.1 List of nuclear power stations in Maharashtra state and the Country with their capacities. 4.2 Factors governing Selection of site for the nuclear power plant 4.3 A brief review of atomic physics • Radioactive isotopes, mass energy equivalence, binding energy and mass defect, nuclear chain reaction, multiplication factor, critical size. 4.4 Nuclear fuels: Uranium, thorium, plutonium 4.5 Main parts of reactors and their Function ➢ Fuel, reactor core, moderator, shielding, control rods, reflectors, coolant, reactor vessel. 4.6 Classification of nuclear reactors ➢ Advanced Gas Cooled Reactor (AGC) ➢ Boiling Water Reactor (BWR) ➢ Pressurized water reactor (PWR) ➢ Fast Breeder Reactor (FBR) 4.7 Control of Nuclear Reactor ➢ By using control rods ➢ Control through flow of coolant. 4.8 Disposal of Nuclear waste and Nuclear Shielding. 4.9 Schematic arrangement of typical Nuclear Power Plant. 4.10 Advantages and disadvantages of Nuclear Power Station.	10	20
Topic 5 : Diesel Electric Power Plant **Specific Objectives:** • Identify the elements of medium size Diesel Power Plant. • Use of diesel power plant as Captive Power • Selection of Diesel generating set as uninterrupted power supply or standby unit **Contents:** 5.1 Elements of diesel Electric Power Plant With their functions. Diesel engine, Fuel system, Air Intake System, Exhaust system, Engine Starting system. 5.2 Layout of a medium size Diesel Electric Power Plant 5.3 Different types of engine and their working. 5.4 Applications of diesel power plants. 5.5 Advantages and disadvantages of Diesel Electric Power Plant. 5.6 Captive Power Generation • Advantages and disadvantages • Types of Captive Power Plant	05	12

Topic 6 : Economics Of Power Generation **Specific Objectives:** • State the significance of different load curves in power generation. • Identify the factors affecting cost of generation. • Decide rating and units of generators to meet the given load **Contents:** 6.1 Terms commonly used in system operation: connected load, firm power, cold reserve, hot reserve, spinning reserve. 6.2 Curves used in system operation such as Load-curve, load durationcurve, integrated duration curve. (Simple numerical based on plotting above curves.) 6.3 Factors affecting the cost of Generation: Average demand, Maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor (Simple numerical based on above) 6.4 Choice of Size & number of Generator Units, difficulties involved in it.	08	12
Topic 7 : Interconnected Power Systems **Specific Objectives :** i. Distinguish various types of power plants. ii. State merits of combined operation of power plants. iii. State factors considered for selection of plant. iv. State merits of interconnection of Power systems. **Contents:** 7.1 Combined operation of power stations. 7.2 Comparison of various types of power stations 7.3 Advantages of Interconnection. 7.4 Base load & peak loads, load allocation among various types of power stations 7.5 Inter connection of power stations at state and national level	04	08
Total	**48**	**100**

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	J. B. Gupta	A course in Electrical Power	S. K. Kataria & Sons
2	B. R. Gupta	Generation of Electrical Energy	Eurasia Publishing House Pvt. Ltd
3	Soni, Gupta, Bhatanagar	A course in Electrical Power	Dhanapatrai and Sons
4	S. N. Singh	Electric Power Generation, transmission and distribution	PHI Learning
5	M. V. Deshpande	Elements of Electrical Power Station Design	PHI Learning

Course Name : Electrical Engineering Group

Course Code : EE / EP

Semester : Third

Subject Title : Computer Programming

Subject Code : 17022

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	--	25@	25

Rationale:

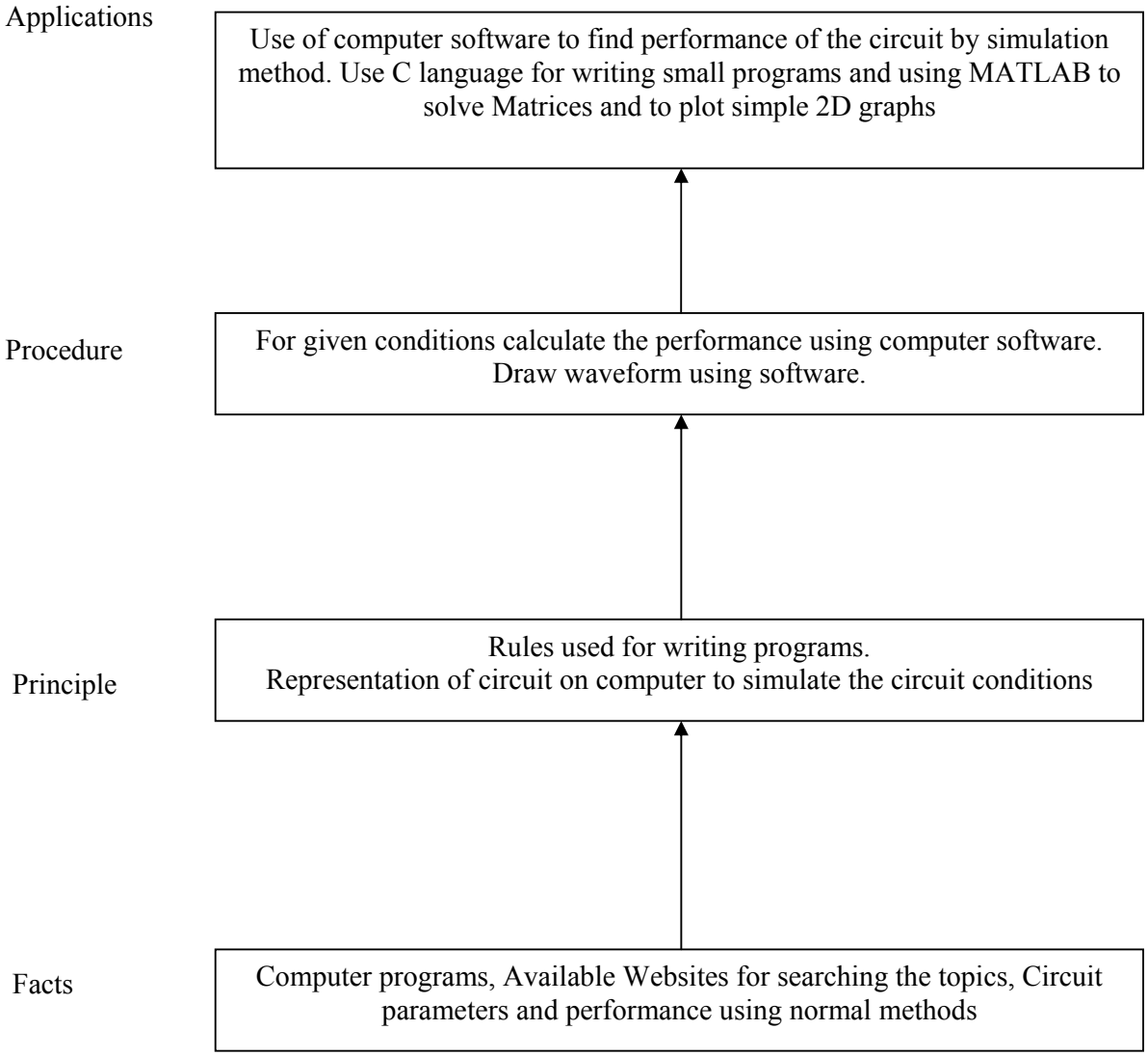
For any engineering, computer software skills are mandatory. Computer has became important part of any learning process. Therefore, it is necessary for any engineering student to have basic idea about computer languages. 'C' is most widely used general purpose powerful, efficient and compact language. This subject covers C as a basic logic development language.

MATLAB is said to be the language of engineers. It is widely used in mathematics, science and engineering. The MATLAB is used in this subject to solve common mathematical problems and to write simple program to plot simple graph.

General Objectives:

1. Describe concepts, variables and constants.
2. Write simple input/output program.
3. Write simple programs related to condition handling.
4. Write a program related to looping.
5. Understand concept of function.
6. MATLAB as a mathematical problem solving tool.
7. To draw 2 D plots using MATLAB.

Learning Structure:



Theory:

Note: Theory to be completed in the allotted practical hours.

Topic and Contents
Topic 1: **Basics of C** ➢ History of C. ➢ C character set, tokens, variable, constant, keywords, data types ➢ Operators (Arithmetic, Relational, Logical). ➢ Formatted input, output statement (printf, scanf).
Topic 2: **Decision Making** ➢ Decision making using If-Else statement, switch case statement,. ➢ Decision making using loop statements like while, do-while, for.
Topic 3: **Arrays** ➢ Declaring one dimensional array, simple programs on arrays such as largest of array, sorting array.
Topic 4: **Functions** ➢ Necessity of functions, defining user defined functions, calling functions, call by value, call by reference
Topic 5: **MATLAB Environment** ➢ Command window, Command history, Workspace, Edit window, Help window ➢ Elementary built in functions.
Topic 6 **Matrices in MATLAB:** ➢ Entering data in Matrices ,Matrix Subscripts /Indices, Some useful commands related to Matrices such as det, rank, trace, inv, norm, transpose, zeros, ones, eye, arithmetic operations on matrices ,arrays, Relational operators
Topic 7 **Programming in MATLAB & Graphics** ➢ MATLAB editor: Creating M Files Function subprograms ➢ 2 D PLOTS : printing labels, grid and axes box, entering text in a plot , axis control ➢ Multiple plots :using plot , hold ,line commands ➢ Specialized 2 D plots using Polar, area, bar, hist, pie, stem function
Topic 8 **Fundamentals of Simulink** ➢ Simulink Modelling : Collecting blocks to create a model , modifying block parameters, labeling blocks, commonly used blocks

Note:

1. **Related theory as mentioned above will be taught while performing the respective practicals.**
2. **The term work will consist of print outs of programs developed by the students in the laboratory.**

(The teacher shall ensure that each student actually performs the practical before taking the print outs.)

Practical:
Skills to be developed:

Intellectual Skills:

1. To understand the output of a program.
2. To understand and use the conditions in a program.
3. To understand the idea of a loop
4. To read and initialize the array
5. To analyze the program

Motor Skills:

1. Ability to operate a keyboard and machine
2. Ability to edit and debug a program
3. Ability to compile and execute the program
4. Ability to write a programs using Library functions

List of Practical:

1. Write a program to display a number in decimal, octal and hexadecimal form by using different format specifies.

2A. Write a program to display largest of three integer numbers.

2B. Write a program to display remarks such as distinction, first class, second class, pass class and fail according to the marks.

3. Write a program for arithmetic operations such as addition, subtraction, multiplication and division of two numbers using switch case statement.

4. Write program to display reverse of a given number using for loop.

5A. Write a program to display multiplication table of a given number using do while loop.

5B. Write a program to display sum of first n numbers using while loop.

6. Write a program to accept one dimensional array and display the array in ascending order.

7. Write a program to swap two numbers using call by value, call by reference.

8. Understand commands in MATLAB. (General, Directory, Workspace, Termination, Help)

9. Use MATLAB to enter a data in matrix and practice the functions such as sum, mean, length, max and min.

10. Understand special matrix functions such as zeros, eye, ones, det, inv and find in MATLAB.

11. Write commands to create two matrices of 3 * 3 size and perform addition, subtraction, multiplication, right division, left division using MATLAB.
11. Write a program in MATLAB to plot a curve given by equation y = sin(x), y=cos(x), $y=x^2$ (Use hold command)
13. Write a program in MATLAB to illustrate the use of subplot command.
14. Create a Simulink model to verify Ohm's Law.

Learning Resources:
1. Books:

Sr. No.	Author	Title	Publisher
1	Balgurusamy	Programming in ANSI C	Tata McGraw Hill
2	Harshal Arolkar Sonal Jain	Simplyfying C	DreamTech
3	Kashi Nath Dey Samir Bandopadhyay	C programming Essentials	Pearson
4	Bansal Goel Sharma	MATLAB & its application in Engineering	Pearson
5	Agam Kumar Tyagi	MATLAB and Simulink	Oxford
6	K K Sharrna	MATLAB Demystified	Vikas
7	Amos Gilat	MATLAB an Introduction with application	Willey India Edition

2. Websites: www.vikaspublishing.com/teachersmanual.aspx

Course Name : Electrical Engineering Group

Course Code : EE / EP

Semester : Third

Subject Title : Electrical Workshop

Subject Code : 17023

Teaching and Examination Scheme:

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

NOTES: Related theory will be taught during practical period.

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.

Skills to be developed:

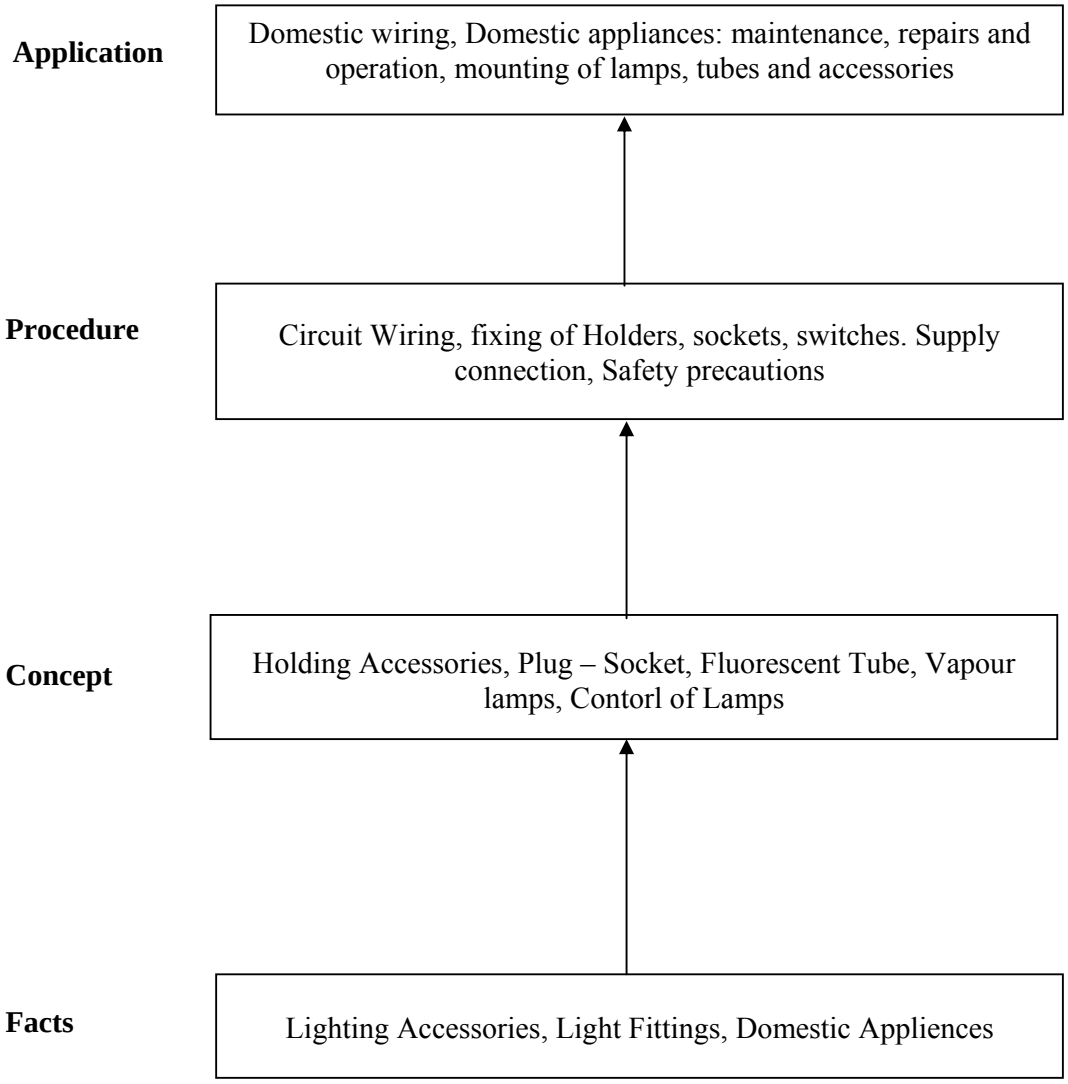
Intellectual Skills:

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

Motor Skills:

- Lay wires/cables for making connections
- Fix the accessories at proper place
- Test the circuit

Learning Structure:



Contents: Practical:

Sr No	Title of Practical & Contents	Hours
1	**Study of different lighting accessory:** Draw label diagram, Typical location function & applications, Specifications for any one accessory from given below categories of accessory. **A] Controlling accessory [Switches] -** Iron clad double pole, Double pole with Indicator, Piano type switch [One way & two way control]. **B] Holding accessory [Holder] -** Batten, Pendant, Angle, Screw type. **C] Outlet accessory [Plug-Socket] –**Two pin, Three pin, Ceiling rose, Adapter. **D] Safety Accessory –** Fuses-ceramic, HRCtype, Circuit breaker - Miniature, Earth leakage **E] Indicators sign-** LED lamp , Neon, coulored lamps[Red , Yellow, Blue] **F] Meters-** Ameter, Voltmeter, Wattmeter, Power Factor meter, Frequency Meter, Multimeter, Megger	06
2	**Study of Different Light Fittings:** Draw label diagram, Typical location working function & applications, Specifications, List of spare parts of an accessory from list given below. **A] Fluorescent Tube Light Fitting -** i] Choke coil ballast type ii] Electronic ballast type iii] Compact fluorescent tube light fitting. **B] Gas Filled Bulb Type Light Fitting -** i] Sodium vapour light fitting ii] Metal halide light fitting. iii] LED type light fitting iv] Incandescent light fitting.	08
3	**Study of Different Domestic Appliances:** Draw label diagram, Typical location & applications, Specifications, List of spare parts Internal connection diagram for any two accessory from list given below. i] Mixer& food processor ii] Water heater-Instant & Storage type. iii] Washing machine iv] Soldering gun & Electric iron. v] Vacuum Cleaner.	08
4	**Mini Project** Draw labeled circuit diagram, List accessory used, Their specifications, &Wiring up of simple electrical circuit on test board with appropriate testing results under guidance of supervisor/Teacher. i] Circuit consists of Mains DP switch, one lamp, one socket, two switches. ii] Circuit consist of Mains DP switch, one call bell, one lamp control from two places, three switches [Two switches are two way controlled]. iii] Circuit consists of Mains DP switch, One power socket of five in one type.	10
	Total	**32**

Resources:

Books:

Sr No.	Title of ref. book	Author	Publication	Edition
1	Electric wiring estimation & costing	S. L. Uppal	Khanna Publ. New Delhi	---
2	Study of electrical appliances	K. B. Bhatia	Khanna Publ. New Delhi	---

Course Name : Electrical Engineering Group

Course Code : EE / EP

Semester : Third

Subject Title : Professional Practices-I

Subject Code : 17024

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

Notes 1: The teachers are encouraged to develop a "Speakers Bank", a list of various experts from Industry and Educational Institutes who can speak on different topics. Similarly they should also prepare a directory of various nearby industries from their branch of Engineering, for the student's visits. Preferably, the students should visit the industries in a batch of not more than 20.Where possible, the polytechnics should encourage the students to visit nearby industries during winter or summer vacations, for a period of 1 to 2 weeks and prepare a detail report and this can be included in the report of "Industrial Visit" in Professional Practice, scheduled for the next semester.

Rationale:

In the changing world scenario, the Diploma Engineers are expected to acquire various skills which include ability to communicate effectively, to present a topic, to share ideas, to prepare reports etc. and shape up their own personality. They are also expected to acquire technical information on various topics related to their branch of study, in addition to the various subjects included in their curriculum.

These acquired skills and enhanced confidence level are going to help them get a good job, based on personal interviews and aptitude tests.

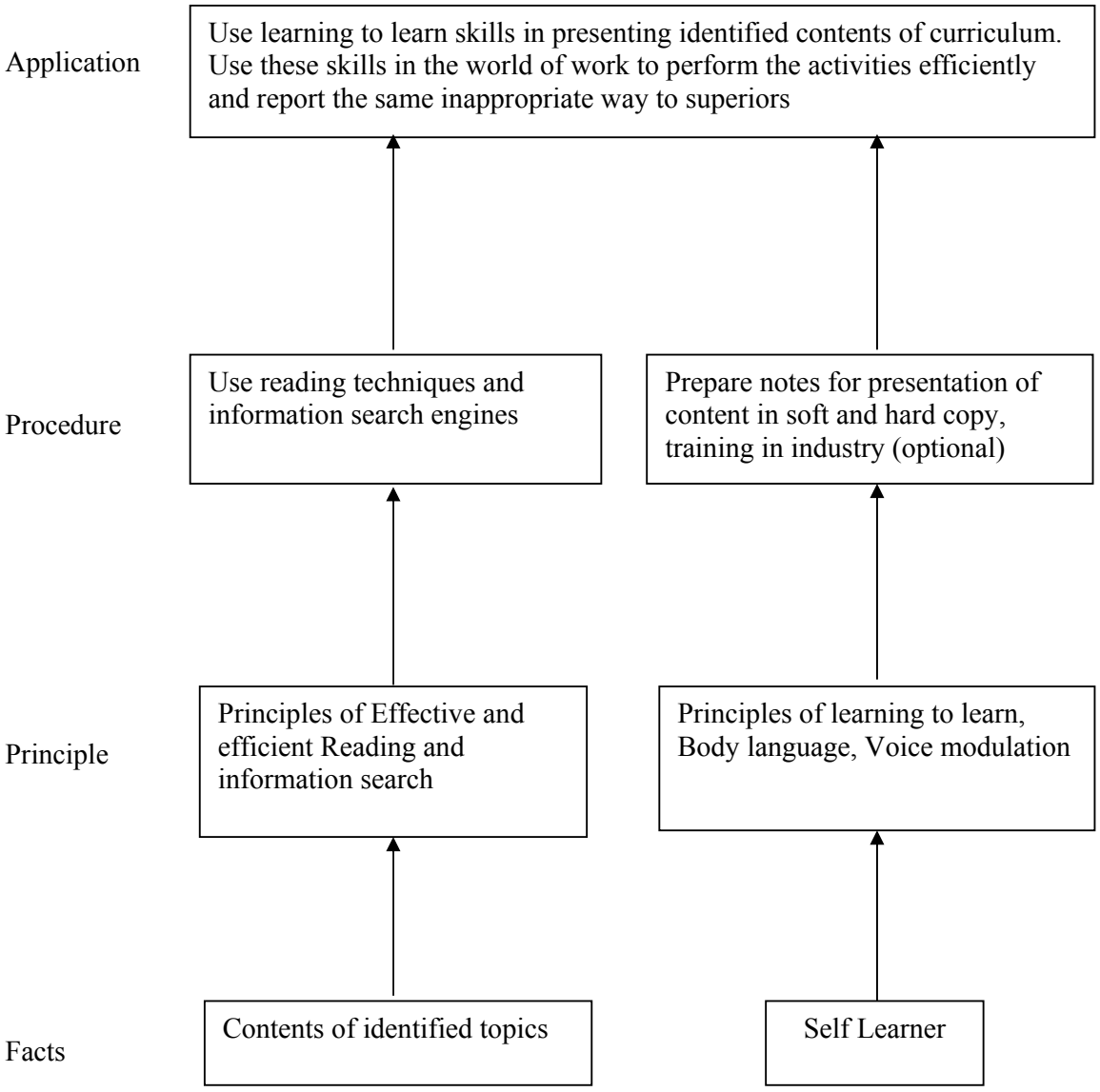
Visits to various nearby industries, lectures on technical subjects by experts, seminars on variety of subjects, group discussion, browsing internet and collection of information, preparing reports are some of the activities suggested under Professional Practice.

General 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:



Topic and Contents	Hours
Topic 1: **Specific Objectives:** ➢ Make student aware about industrial atmosphere ➢ Understand the general working of an industry Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. Following are the suggested type of Industries/ Fields – (Minimum three visits). Contents: 1.1 **Industrial Visits:** i) Visit to 110/33/11kv sub- station (Compulsory) ii) Visit to transformer manufacturing industry. iii) Visit to electronics industry. iv) Visit to hydro-electric/ thermal power plant (Compulsory) v) Visit to non conventional power generation station-wind /solar power. vi) Visit to multi storied building for the study of electrical installations	14
Topics 2: **Specific Objectives:** ➢ Students will get feel of new technology introduced in industry ➢ Get introduced to recent development in technology Contents: **Lectures by Professional / Industrial Expert to be organized on any Two topics of the following suggested areas or any other suitable topics:** i) Role of Power Factor Improvement a tool in reducing cost of generation. ii) New trends to built pollution free environment. iii) Software for drafting. iv) Special purpose wiring in chemical/hazardous industries. v) Non conventional energy sources with special focus on use of biomass, solid vi) waste. vii) Automotive wiring & lightning. viii) viii) Effect of transmission and distribution losses on cost of energy generation.	10
3. Information Search The students should collect information individually and write a report/prepare a note on the any one from below given topics as part of term work. Any other topic for information search may be selected by the faculty members. Some of the suggested topics are - a) Electrical wiring accessories b) Elevators installation and operation c) Street Light accessories and factures d) Alternative fuels and energy options. e) Collection of data for comparison of transformer companies.	06
4. Group Discussion : The students should discuss in group of four to six students and write a brief report on the any one from below given topics as part of term work. Any other topic for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Electrically operated motor cars and scooters/motor bikes. ii) Load shading and remedial measures. iii) Safety in day to day life. iv) Conventional and non-conventional energy sources v) Electrical energy conservation.	**08**

vi) Pollution control (All types).	
5. Seminar: The students should select a topic for **Seminar** based on recent developments & emerging technologies in Electrical &electronics engineering field. Each student shall submit a report of at least 06 pages and deliver a seminar (Presentation time – 10 minutes).	**10**
Total	**48**