

Course Name : Computer Engineering Group

Course Code : CO/CM/IF/CD

Semester : Second

Subject Title : Electrical Technology

Subject Code : 9015

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	80	--	--	25@	125

Rationale:

This subject is restricted to second year diploma in electronics & telecommunication, computer engineering and information technology. Technicians / supervisors from all branches of engineering are expected to have some basic knowledge of electrical engineering. Also the technicians working in different engineering fields have to deal with various types of electrical drives and equipment. Hence, it is necessary to study electric circuits, different types of electrical drives, their principles and working characteristics.

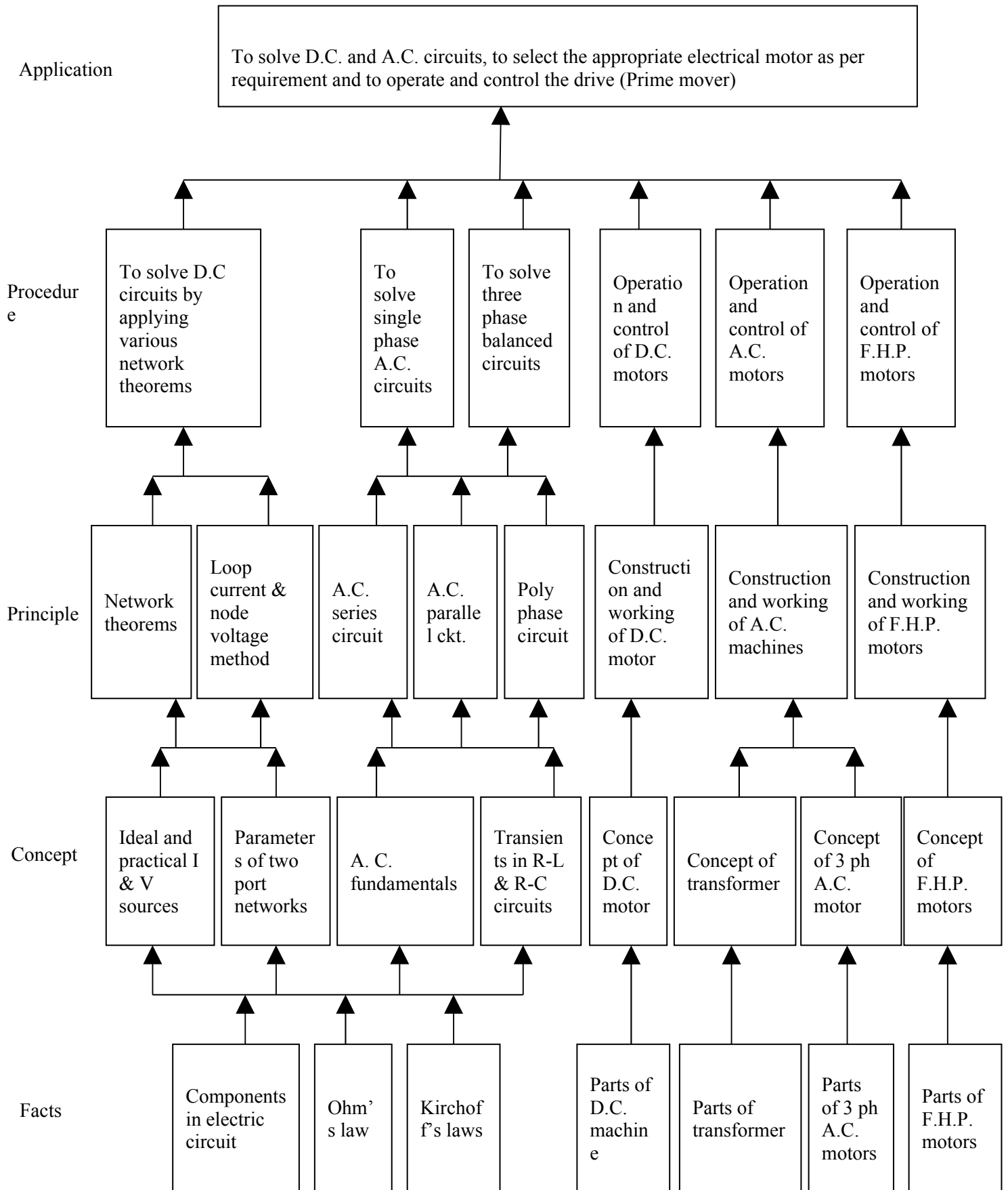
This subject covers analysis of ac and dc networks, working principles of commonly used ac and dc motors and their characteristics. The basic concepts studied in this subject will be very useful for understanding of other higher level subjects in further study.

Objectives:

The student will be able to:

- Solve dc circuits by using different techniques and network theorems
- Understand the importance, equations and definitions of two port networks and attenuators
- State mathematical equations for transients in R-L and R-C circuit
- Solve series and parallel ac circuits with R, L and C
- Know importance, working and construction of single phase transformer
- Explain construction, working, performance and applications of various types of ac and dc machines

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1.	D. C. Circuits 1.1 Review of introduction to electricity - current, resistance, emf and potential difference, Ohm's law, D.C. sources, series and parallel circuit. 1.2 Concept of open and short circuit 1.3 Kirchoff's current and voltage law 1.4 Maxwell's loop current method 1.5 Node analysis 1.6 Concept of ideal and practical current and voltage sources, Source conversion. 1.7 Star / Delta and Delta / star conversion (no derivation) (Numerical on above)	08	10
2.	Network Theorems 2.1 Network terminology – active, passive, linear, non-linear, bilateral, unilateral networks. 2.2 Statement, explanation and application of the following network theorems (DC circuits only) - Superposition theorem - Thevenin's theorem - Norton's theorem - Maximum power transfer theorem 2.3 Concept of duality and construction of dual network.	16	20
3.	Two Port Networks 3.1 Concept of two port network 3.2 Open circuit parameters 3.3 Short circuit parameters 3.4 Hybrid parameters Equations, definitions and equivalent circuit only. (No numerical)	05	06

4.	<p>A.C. Fundamentals</p> <p>4.1 Difference between A.C. and D.C. quantity</p> <p>4.2 Advantages of A.C. over D.C.</p> <p>4.3 waveform of sinusoidal A.C. cycle</p> <p>4.4 Generation of single phase A.C. by elementary alternator</p> <p>4.5 Definitions: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, Average value for sinusoidal waveform, Form factor, Peak factor (no derivation but simple numerical on it)</p> <p>4.6 Vector representation of sinusoidal A.C. quantity, review of phasor algebra, representation of A.C. quantity in rectangular and polar form.</p> <p>4.7 Phase angle, phase difference, concept of lagging and leading – by waveforms, mathematical equations and phasors.</p> <p>4.8 Pure resistance in A.C. circuit – waveforms, equations and vector diagram (no derivation)</p> <p>4.9 Pure inductance in A.C. circuit – waveforms, equations and vector diagram (no derivation)</p> <p>4.10 Pure capacitance in A.C. circuit – waveforms, equations and vector diagram (no derivation)</p> <p>4.11 Concept of impedance and impedance triangle.</p> <p>4.12 Power – active, reactive and apparent, power triangle.</p> <p>4.13 Power factor and its significance.</p> <p>4.14 R-L series circuit – vector diagram, voltage and current equations.</p> <p>4.15 Q factor of a coil</p> <p>4.16 R-C series circuit – vector diagram, voltage and current equations.</p> <p>4.17 R-L-C series circuit – vector diagram, voltage and current equations.</p> <p>4.18 Simple numerical on R-L, R-C and R-L-C series circuit.</p> <p>4.19 Concept of parallel A.C. circuit</p> <p>4.20 Concept of admittance, conductance and susceptance (no numerical on parallel A.C. circuits)</p>	13	16
5.	<p>Poly phase Circuits</p> <p>5.1 Advantages of 3 phase system over 1 phase system</p> <p>5.2 Principle of 3-phase e. m. f. generation and its wave form</p> <p>5.3 Concept of phase sequence and balanced and unbalanced load</p> <p>5.4 Relation between phase and line current, phase and line voltage in Star connected and Delta connected balanced system. (no derivation)</p> <p>5.5 Calculation of current, power, power factor in a 3 phase balanced system (simple numerical)</p>	05	06

6.	Transformer 6.1 Working principle of transformer, classification, brief description of each part its function and material used. 6.2 Emf equation (no derivation) 6.3 Voltage ratio, current ratio and transformation ratio. 6.4 kVA rating of a transformer 6.5 Losses in a transformer 6.6 Efficiency and regulation of transformer- definition, equation and simple numerical on it) 6.7 Condition for maximum efficiency (no derivation) 6.8 Auto transformer – comparison with two winding transformer, applications. 6.9 Polarity markings	06	08
7.	D.C. Motors 7.1 Review of force on current carrying conductor, Flemings left hand rule 7.2 Construction - brief description of each part its function and material used. 7.3 Principle of operation 7.4 Significance of back emf 7.5 Types of D.C. motors 7.6 Torque equation expression only (no derivation) 7.7 Schematic diagram, characteristics and applications of dc shunt, series and compound motors. 7.8 Necessity of starter 7.9 Reversal of rotation of D.C. motor	05	06
8.	Fractional Horse Power (FHP) motors 8.1 Universal motor – principle of operation, reversal of rotation and applications 8.2 Stepper motor – types, principle of working and applications 8.3 Servo motor – types, principle of working and applications	06	08
Total		64	80

Practical:

Skills to be developed:

Intellectual skills:

identify and select suitable electrical instruments for measurement

1. identify and give specifications of electrical motors and transformers
2. interpret wiring diagrams for various applications.
3. identify safety equipments required.
4. decide the procedure for setting experiments.

Motor skills:

1. draw wiring diagram
2. make wiring connections to connect electrical equipments and instruments.
3. measure electrical power, earthing resistance and other electrical quantities.
4. calibrate electrical instruments.
5. use of safety devices while working.
6. prepare energy consumption bill with present tariff structure.

List of Practical:

1. Verification of Kirchoff's laws.
2. Verification of any one of the following network theorems
 - I. Superposition theorem
 - II. Thevenin's theorem
 - III. Norton's theorem
 - IV. Maximum power transfer theorem(Note – Select different theorem for different groups of students)
3. To determine open circuit Z parameters or short circuit Y parameters of a given two port network.
4. To plot charging curve of capacitor through resistance and to determine the time constant.
5. To observe sinusoidal A.C. waveform of any frequency on C.R.O. and to determine its frequency, time period, peak value, rms value, peak factor and form factor.
6. To determine the resistance, impedance and inductance of a choke coil. (Use of D.C. source for measurement of resistance and A.C. source for measurement of inductance is expected)
7. To draw vector diagram and to determine power factor of R-L-C series circuit.
8. To determine the relationship between line and phase values in three phase balanced star or delta connected load.
9. To determine transformation ratio of single phase transformer and to perform polarity test on single phase transformer.
10. To determine % efficiency and % regulation of a single phase transformer by direct loading.
11. Study of any one D.C. motor in your laboratory. Write a report based on the following points.
 - Rating (Specification)
 - Foundation arrangement
 - Supply arrangement
 - Continuity and insulation test
 - Identification of its terminals
 - Sketch different parts and state the function of each part in brief Observe the direction of rotation reverse it.

Note: All the above 11 experiments are compulsory.

Learning Resources:**Books:**

Sr. No.	Authors	Title	Publisher
01	Mittle and Mittal	Basic Electrical Engineering	Tata McGraw Hill
02	B. L. Theraja	Electrical Technology Vol – I and II	S. Chand
03	Soni, Gupta	Circuit Analysis	Dhanpat Rai and Sons