

**Electric Circuit & Machines**  
**BEG226EL**

**Year: II**

**Semester: I**

Teaching Schedule Hours/ week			Examination Scheme						Total Marks
			Final				Internal Assessments		
			Theory		Practical		Theory	Practical	
L	T	P	Duration	Marks	Duration	Marks			
3	2	2/2	3	80	-	-	20	25	125

**Course Objective:**

**Course Contents:**

**1.0 Introduction:**

**(2 hrs)**

- 1.1 Energy sources and productions
- 1.2 Generation, transmission and distribution of electrical power

**2.0 Passive Elements and Laws in Electrical Engineering:**

**(7 hrs)**

- 2.1 Electric current and emf
- 2.2 Resistance, resistivity, temperature coefficient of resistance, variation of resistance with temperature
- 2.3 Series and parallel combination of resistor
- 2.4 Ohm's law and its application
- 2.5 Inductor, induction, inductance in series and parallel
- 2.6 Faradays laws of electromagnetic induction
- 2.7 Capacitance, capacitor in series and parallel
- 2.8 Kirchoff's Law and their application using mesh analysis and nodal analysis method

**3.0 Network Theorems:**

**(7 hrs)**

- 3.1 Star-delta transformation and Delta-star transformation
- 3.2 Thevenin's Theorem
- 3.3 Super position theorem
- 3.4 Maximum power transmission theorem

**4.0 AC Fundamentals**

**(8 hrs)**

- 4.1 Generation of AC
- 4.2 Waveform and terms used in AC
- 4.3 Average and r.m.s. values of current and voltage
- 4.4 Phasor representation- resistive, inductive, capacitive circuits, voltage and current waveforms
- 4.5 Series RC, Series RL, Series and parallel RLC circuit and their phasor representation
- 4.6 Resonance in Series and parallel RLC circuit
- 4.7 Power factor

**5.0 Lighting Devices, Wiring System and Protective Devices**

**(2 hrs)**

- 5.1 Different types of lighting system
  - Incandescent

- Tungsten- halogen
  - Compact florescent lamp
  - Tubular Florescent
- 5.2 Types of wiring
- Open wiring
  - Conceal wiring
- 5.3 Grounding/Earthing
- 5.4 System grounding, Equipment Grounding
- 5.5 Types of grounding
- 5.6 Definitions of protection devices
- Fuse
  - MCB
  - Lightning arrestor

**6.0 Transformer: (5 hrs)**

- 6.1 Transformer-Construction, working principle
- 6.2 Emf equation of transformer
- 6.3 Voltage and current transformation ratio of transformer
- 6.4 Losses and efficiency of transformer

**7.0 DC Machines: (7 hrs)**

- 7.1 DC Generators: operating principle of dc generator, method of excitation, armature reaction
- 7.2 DC Motor: Operating principle of dc motor, back emf in dc motor, types of dc motor and their characteristic

**8.0 AC Machines: (7 hrs)**

- 8.1 Induction Motor: Introduction and construction of three phase induction motor, operating principle of three phase induction motor
- 8.2 Synchronous Machine:
- 8.2.1 Synchronous Generator: Construction of synchronous generator, advantages of rotating magnet system and stationary armature system, parallel operation and synchronization
- 8.2.2 Synchronous Motor: Synchronous speed, Construction and operating principle of synchronous motor

**Laboratories:**

Five laboratory exercises will be performed in this course:

- (i) Basic electrical measurement of voltage, current and resistance
- (ii) Verification of Ohm's law in series and parallel connections of resistance and cells ©
- (iii) A.C. measurements of power and power factor
- (iv) Characteristics of D.C. machine
- (v) Synchronous finexter chac

**References:**

- “Basic Electrical Engineering”, A. Kasatkin & M. Perakalin, MIR Publisher, Moscow, 1970
- “Electrical Engineering-An Introduction”, Steven E. Schwarz & William G. Oldhan, Holt, Rinehart & Winston Publishers, New York, 1984
- “A Textbook of Electrical Technology”, B. L. Theraja & A. K. Theraja, S. Chand & Co. Ltd.