

Course code	Course Name	L-T-P -Credits	Year of Introduction
EE212	ELECTRICAL TECHNOLOGY AND SAFETY	3-0-0-3	2016
Prerequisite: Nil			
Course Objectives			
<ul style="list-style-type: none"> To understand the concepts in the working of electrical generator, motor, and transformer . To learn the basic function of electrical switch gear. To make the students acquire a sound knowledge in fundamentals of electrical safety To impart some fundamentals about the safety provisions in Indian Electricity Act and Rules. 			
Syllabus			
Construction and Principle of operation of DC Generator - Dc motor - Induction motor – Alternator - Synchronous motor –Transformer - Protective Relays -Types -Circuit breaker - Arc phenomenon - Protection against over voltages –Lightning –Grounding -Types. Electric shock - effects and its prevention - Safety during installation of plant and equipment - Hazardous zone - Electrical safety in Residential, Commercial and Agricultural Installations - Hazards of static electricity - Safety provisions in Indian Electricity act and Rules.			
Expected outcome			
<ul style="list-style-type: none"> At the end of this course, the students will have exposed to fundamentals of electrical machines and gained idea about electrical safety. 			
References			
<ul style="list-style-type: none"> V.K Mehta, Rohit Mehta. “Principles of Electrical Machines”. S Chand Publishers W.Fordham Cooper. “Electrical safety Engineering” Butterworth and company London S.L. Uppal : A Textbook of Electrical Engineering, Khanna Publishers, Delhi H. Cotton : Electrical Technology, Wheeler Publishing Company Indian Electricity Act and Rules, Government of India. S. Rao, and H.L. Saluja : Electrical Safety, Fire Engineering and Safety Management, Khanna Publishers, Delhi M.G. Say : Electrical Earthing and Accident prevention, Newnes, London, 1954 V.K Mehta, Rohit Mehta. “Principles of Power System”.S Chand Publishers <i>Accident Prevention Manual for Industrial Operations</i> : National Safety Council, Chicago. www.osha.gov 			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Construction and Principle of operation of d.c machines – e.m.f equation of a generator – Types of dc generator – losses – Condition for maximum efficiency–Armature Reaction–Compensating winding-characteristics of shunt, series and compound generators –Critical field resistance and critical speed–Parallel operation. Dc Motor Characteristics–speed control.	6	15%
II	Synchronous machines – types – e.m.f equation – winding factors – armature reaction and leakage resistance. Synchronous motor – methods of starting – applications. Induction Motors –		15%

	Construction and principle of operation – equivalent circuit – Torque – slip characteristics – method of starting – applications.	7	
FIRST INTERNAL EXAMINATION			
III	Construction and Principle of operation of single phase transformers – e.m.f equation – phase diagrams – equivalent circuit–Tests–regulation – losses and efficiency. Protective relays – Requirement of relay – types of protection – classification – distance relay, differential relay, state relays.	7	15%
IV	Circuit breakers – function of switch gear – arc phenomenon – initialization of an arc– Methods of Arc Extinction–Types–Arc voltage –restriking voltage and recovery voltage. Fuses – Characteristics– types –selection – advantages and disadvantages – MCB and ELCB. Faults in power systems – causes – types. Protection against over voltages– causes–Lightning–Lightning arrester.	7	15%
SECOND INTERNAL EXAMINATION			
V	Grounding – neutral grounding – solid grounding – resistance grounding – arc suppression coil grounding. Equipment grounding for safety – Human safety aspects – effect of current and voltage on human beings – typical V-I characteristics of skin – Electric shocks and their prevention– Medical Analysis of shock. Insulation – classes of insulation – FRLS insulation – continuity test.	7	20%
VI	Safety during installation of plant and equipment. Safe sequences in installation – risk during installation. Safety during testing and commissioning. Test on relays – protection and interlock systems for safety. Hazardous zones – classification of hazardous zones. Fire prevention and fire fighting in power stations, Substations-causes of initiation of fire-Fire Extinguishing Techniques. Electrical safety in Residential, Commercial and Agricultural Installations – Case study. Hazards of static electricity. Safety provisions in Indian Electricity Act & Rules.	8	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100

Duration: 3 Hours

Part – A: 5 MARK QUESTIONS

There will be two questions from module 2 and module 3 and one question each from remaining modules (8x5 = 40 marks)

PART B: 10 MARK QUESTIONS

5 questions uniformly covering the first four modules. Each question can have maximum of three sub questions, if needed. Student has to answer any 3 questions (3 x10 = 30 marks)

PART C: 15 MARK QUESTIONS

4 questions uniformly covering the last two modules. Each question can have maximum of four sub questions, if needed. Student has to answer any two questions

(2 x15 = 30 marks)