

GUJARAT TECHNOLOGICAL UNIVERSITY

AERONAUTICAL ENGINEERING (01) ELECTRICAL MACHINES AND ELECTRONICS SUBJECT CODE: 2130105 B.E. 3RD SEMESTER

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Understanding the basic principles of Electrical machines and electronics is required in aeronautical field.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
			PA		ALA	ESE	OEP			
3	1	0	4	70	20	10	30	0	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Generating Equipments : Classification, 2 wire D C Generators, working principles of DC Generator, construction of DC Generator. Open circuit characteristic, internal and external characteristic of DC Generators	05	10
2	DC Motors Types of DC Motors, Principle of operation, torque equation, DC Shunt motor starter, Speed control of DC shunt and series motors.	04	25
3	Phase Induction Motor Production of rotating magnetic field, Principle of operation, torque of an induction motor, torque of an induction motor, torque slip curve, Losses and efficiency, Starters for 3phase induction motor, speed control.	03	
4	Single phase induction motor Production of magnetic field, operation, starting of single phase induction motor by capacitor, shaded pole motor, Universal motors.	02	
5	Alternator Introduction, details, exciters, operation on load, voltage regulation, losses and efficiency, parallel operation of alternators, synchronization procedure, cooling of alternators.	03	10
6	Transformers: General aspects, Basic definition, working principle of transformer, Types of transformers. Cooling, Oil conservators and breather, 3phase transformers, Instrument Transformers.	03	
7	Supply Systems Electric Power Supply system, typical ac power supply system, comparison of DC and AC transmission. Advantages of high transmission voltage, comparison of conductor material in over head	05	25

	systems, underground supply system, economic choice of transmission voltage.		
8	Tariff and Power Factor Improvement Types of tariff, power factor, importance of power factor improvement, methods, most economic power factor.	02	
9	Substation Classification of substations, comparison between indoor and outdoor substation, transformer and pole mounted sub stations. Key diagram of 66/11 KV substations, 1100KV/400 Volt indoor substation, Bus bar arrangement.	03	
10	Diode, Transistor and OPAMP Circuits Half wave rectifiers, Full wave rectifiers, Bridge rectifiers, Three phase rectifiers. Transistor amplifiers, various types of transistor amplifier configurations, Operation and pin diagram of IC 741 OPAMP, Inverting, non inverting, differential and comparator configurations.	04	30
11	Logic Gates and Boolean Algebra Basic logic gates circuits, Gates OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR, their truth table. Boolean Algebra, De-Morgan's Theorem.	03	
12	Introduction to 8085 Microprocessor Architecture of 8085 microprocessor, Pin diagram. Data Transfer instructions, Arithmetic instructions, I/O interfacing.	02	

Reference Books:

1. A Text book of Power Plant Engineering by R. K Rajput, Laxmi publications
2. Principles of power systems by V.K. Mehta, S.Chand publication, 4th edition
3. Electrical Technology- Vol. II, by B.L.Theraja
4. Industrial Electronics by Bishwanath Paul -PHI Publication

Course Outcome:

After learning the course the students should be able to

1. Understand working principle of Electrical Machines like Motors and Generators .
2. To analyse load characteristics and calculate efficiency.
3. Backed by in depth knowledge, to analyse performance of various types of 3 phase and single phase transformers.
4. To compare merits and demerits of various Tarrif systems and Process of depreciation and their application in industry.
5. Attempt design of simple Electronic devices using discrete components like OPAMP and operate microprocessor based systems.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.