GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

INTRODUCTION TO ELECTRICAL & ELECTRONICS ENGINEERING (CODE: 3340105)

Diploma Programme in which this course is offered	Semester in which offered
Aeronautical Engineering	Fourth

1. RATIONALE

Aeronautical Engineering, being a multi-disciplinary field there are many technical aspects related to Electrical Engineering that need to be understood. This course is therefore aimed to provide the basic understanding of electrical engineering.

2. LIST OF COMPETENCIES

The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies.

i. **Measure basic electrical quantities/parameters.**
ii. **Use major electrical/electronic machines//instrument/equipment.**

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
04	00	02	06	70	30	20	30	

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Topics and Sub-topics	Outcomes (in cognitive domain)
UNIT– I FUNDAMENTALS OF ELECTRIC AND MAGNETIC CIRCUITS	• Explain concepts of electric and magnetic parameters • Differentiate electric and magnetic circuits • Apply Faraday's laws in different circuits • Differentiate Statically and dynamically induced EMFs	1.1 Concepts of EMF, Current, Potential Difference, Power and Energy. 1.2 Concepts of M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor etc. 1.3 Concepts of magnetic and electric circuits. 1.4 Faraday's laws of electromagnetic induction. 1.5 Dynamically induced emf. 1.6 Statically induced emf.-(a) Self induced emf (b) Mutually induced

		emf. 1.7 Equations of self & mutual inductance.
UNIT– II **A.C. CIRCUITS**	• Explain the various basic parameters of AC fundamental Solve simple numericals related to AC circuits. • Derive the current and voltage relationship in star and delta connections. • Find currents and voltages in series and parallel AC circuits.	2.1 A.C. circuit parameter: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, current, RMS value, Average value, Form Factor & Peak Factor, impedance, phase angle, and power factor. 2.2 Vector representation of emf and current. 2.3 Mathematical representation of an alternating emf and current 2.4 A.C. through pure a) resistors, b) Inductors and c) capacitors 2.5 A.C. through R-L series, R-C series, and R-LC series & parallel circuit 2.6 Power in A. C. Circuits. Concept of power triangle. 2.7 Voltage and Current relationship in Star and Delta connections.
UNIT– III **TRANSFORMER**	• Explain the construction and working of a single phase transformer. • Calculate transformer performance parameters. • Describe working principle of auto transformer.	3.1 General construction and principle of transformers. 3.2 Emf equation and transformation ratio of transformers. 3.3 Various losses in transformers and efficiency equation. 3.4 Auto transformers.
UNIT– IV **ELECTRICAL MACHINES**	• Describe the construction of a typical single phase motor. • Explain working principle of single phase induction motors. • Explain the working of induction motor starters.	4.1 Construction and Working principle of single phase A.C. motor. 4.2 Various types of single phase motors 4.3 Starting methods for induction motors 4.4 Applications of single phase motors
UNIT– V **PROTECTION**	• Justify the need for protection and the use of MCB, MCCB and ELCB. • List the different types of electrical related personal protective equipment. • State the need for electrical Earthing. • Describe the type of Earthing used in domestic and industrial applications.	5.1 Different protective devices such as fuse, MCB, MCCB and ELCB. 5.2 Electrical related Personal Protective Equipment. 5.3 Earthing systems: purpose, material used for Earthing, types of Earthing system.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	FUNDAMENTALS OF ELECTRIC AND MAGNETIC CIRCUITS.	08	08	05	02	15
II	A.C. CIRCUITS	09	08	05	04	17
III	TRANSFORMER	06	05	04	02	11
IV	ELECTRICAL MACHINES	06	05	05	03	14
V	PROTECTION	05	04	05	04	12
TOTAL		**34**	**30**	**24**	**16**	**70**

Legends: **R** = Remember **U**= Understand; **A**= Apply and above levels (Bloom's revised taxonomy).

6. SUGGESTED LIST OF EXERCISES/PRACTICALS.

The tutorial exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned competencies.

SR. NO.	UNIT NO.	EXPERIMENT
1	II	Measure voltage ,current and power in 1-phase circuit.(with resistive load)
2	II	Measure voltage, current and power in R-L series circuit.
3	III	Measure transformation ratio K of 1-phase transformer.
4	III	Connect single phase transformer and measure input & output quantities.
5	IV	Make Star & Delta connection in induction motor starters and measure the line and phase values
6	V	Identify switches, switch fuse and fuse switch units, MCB, MCCB & ELCB.
7	V	Measure voltage, current and power using analog and digital instruments.

7. SUGGESTED LIST OF STUDENT ACTIVITIES.

Following is the list of proposed student activities like:

SR.NO.	ACTIVITY
1	Interpret the name plate ratings and identify the parts of an induction motor
2	Connect the various types of meters to measure the current and voltage of induction motor.
3.	Interpret the name plate ratings and identify the parts of a transformer.
4.	Make star delta connections of transformer.
5.	Study of various electrical Earthing systems.
6.	Study of various safety equipments used for preventing electrical hazards.

8. SUGGESTED LEARNING RESOURCES.

A. List of Books:

SR. NO.	TITLE OF BOOK	AUTHOR	PUBLICATION
1.	Electrical Engineering: Concepts and Applications	Prasad P.V and Sivanagaraju S.	Cengage Learning India, New Delhi, 2012
2.	Electrical Machine	Bhattacharya S.K	Tata McGraw Hill; New Delhi, 2010
3.	Electrical Technology	Thereja B.L.	S. Chand & Company Ltd; New Delhi 2010

B. List of Major Equipment/ Instrument

1. Voltmeter, Ammeter, Multimeter, Magger, Energy meter, Watt meter, Frequency meter
2. Single phase Transformer, Auto transformer.
3. Single phase AC Motors
4. Different types of starters

C. List of Software/Learning Websites

i. http://www.animations.physics.unsw.edu.au//jw/AC.html
ii. http://en.wikipedia.org/wiki/Transformer
iii. http://www.alpharubicon.com/altenergy/understandingAC.htm

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnic.

- **Prof. ANKIT PATEL**, H.O.D., Aeronautical Dept. Parul institute of engg. & tech-Diploma studies\
- **Prof. KARNAIL SAINI**, Lecturer, Aeronautical Dept. Parul institute of engg. & tech-Diploma studies
- **Prof. PIRMAHAMMAD VASOVALA,** Lecturer, Electrical Dept. Parul institute of engg. & tech-Diploma studies

Coordinator and Faculty Members from NITTTR Bhopal.