GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: D.C. Circuits
(Code: 3320903)

Diploma Programme in which this course is offered	**Semester in which offered**
Electrical Engineering	Second Semester

1. RATIONALE

Students of electrical engineering diploma need to possess a good understanding of concepts and principles of electrical engineering, which is essential to determine the electrical engineering parameters. Further these concepts need to be assimilated by the students to understand concepts of advanced courses and develop skills that are needed by the industry. This will also be needed to analyze the different applications of electrical & electronics engineering circuits.

2. COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Solve basic circuit problems using circuit laws and network theorems.**

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**	
2	2	2	6	70	30	20	30	**150**

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

Note: It is the responsibility of the institute heads that marks for **PA of theory** & **ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit –I **Basics of Electrical Engineering**	1a. Define the various electrical parameters 1b. Identify the commonly used materials and components used in electrical engineering 1c. Define the terms work, power and energy 1d. Convert mechanical energy to electrical energy and vice-versa. 1e. State joules law and its applications.	1.1. Charge, Current, Potential, voltage, power, Energy Electrical Resistance and its Unit, Ohms law: applications and limitations Specific Resistance and its unit. Parameters affecting the resistance, Effect of temperature on resistance and temperature co-efficient, potential difference ; EMF 1.2. Conductors, Insulators, semiconductors, capacitors and inductors. 1.3. Definitions of Work, Power and Energy (both electrical and mechanical); Conversion from Mechanical units into Electrical units 1.4. Joules law of heat and problems on Heating
Unit –II **Electrical circuits**	2a. Calculate voltage and current in the given resistive circuits using KCL and KVL. 2b. Calculate voltage and current of resistive circuits using Mesh and nodal analysis method. 2c. Explain the principle of duality	2.1 Concept of Open circuit, Closed circuit, Short circuits 2.2 Definitions of node, branch, loop, mesh. 2.3 Kirchhoff's laws and simple numerical 2.4 Kirchhoff's Voltage and Current law (KVL and KCL) 2.5 Mesh Analysis and Nodal Analysis of Networks 2.6 Principle of Duality 2.7 Series and Parallel circuits with numerical problems.
Unit –III **Network Theorems**	3a. Classify types of electrical circuits 2a. Use Superposition Theorem to calculate the current in any branch of the circuit. 2b. Use Thevenin's Theorem to calculate V_{th}, R_{th} and load current in the given circuit. 2c. Calculate the load current in the given circuit using Norton's Theorem. 2d. Determine the maximum current in the load of the circuit using the Maximum Power Transfer Theorem 3b. State Reciprocity Theorem 3c. Convert star to delta and delta to star transformations.	3.1. Linear & Nonlinear circuit, Active and Passive Network 3.2. Super Position Theorem, Thevenin's Theorem, Norton's Theorem Maximum Power Transfer Theorem, Reciprocity Theorem 3.3. Star delta transformations with numericals

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit –IV Electrostatics & Capacitors	4a. Define the terms related to electrostatics 4b. Explain the working of capacitor 4c. Identify the different types of capacitors and their applications 4d. Calculate the capacitance in electrical circuits 4e. Calculate the energy stored in capacitors	4.1 Electric charge, Laws of electrostatics, Electric field, Electrostatic induction, Electric flux, Flux Density, Electric field Intensity. 4.2 Capacitance – Effects of Dielectrics, dielectric constant units. 4.3 Types of Capacitors, Capacitors in series and parallel. 4.4 Energy stored in a Capacitor, Rise and Decay of current in R-C Circuit and time constant
Unit –V Electromagnetic Induction& Inductors	5a. Define phenomenon of electromagnetic induction 5b. State and apply Faraday's law, Lenz's law, Fleming's right hand rule, Fleming's left hand rule 5c. Differentiate Statically and dynamically induced EMF, self and mutual inductance 5d. Identify the different types of inductor and explain their applications 5e. Calculate the energy stored in magnetic field	5.1 Electromagnetic Induction. 5.2 Faraday's law, Lenz's law, Fleming's right hand rule for Generators, Fleming's left hand rule for Motors. 5.3 Statically and dynamically induced EMF. 5.4 Inductance: Self and Mutual inductance. 5.5 Types of Inductor 5.6 Energy stored in Magnetic field

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I	Introduction to electrical energy	09	06	06	06	18
II	Electrical circuits	05	03	04	08	15
III	Network Theorems	05	03	04	08	15
IV	Electrostatics & Capacitors	04	05	03	02	10
V	Electromagnetic Induction & Inductors	05	05	05	02	12
	Total	**28**	**22**	**22**	**26**	**70**

Legends: R=Remembrance; U =Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned competency

S. No.	Unit No.	Practical/Exercises	Hours Required
1	I	Measure voltage and current in a given linear electrical circuit.	02
2	II	Calculate temperature co-efficient of a given resistor.	02
3	II	Connect resistances in series to get required effective resistance and verify	02
4	II	Connect resistances in parallel to get required effective resistance and verify	02
5	II	Connect resistances in parallel and series to get required effective resistance and verify	02
6	II	Measure current in a particular branch of the given electrical circuit using Kirchoff's Current Law	02
7	II	Measure voltage drop in a closed loop of the given electrical circuit using Kirchoff's Voltage Law	02
8	III	Measure current in a particular branch of the given electrical circuit having two input sources using Superposition theorem	02
9	III	Verify Thevinin's theorem for a given circuit	04
10	III	Convert star connected resistances to its equivalent delta connected resistances	02
11	III	Convert delta connected resistances to its equivalent Star connected resistances	04
12	IV	Verify equivalent capacitance by connecting given capacitors in Series and Parallel	02
		Total	28

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- Assignments on solving numerical
- Identify and select various measuring instruments as per required range
- Identify and select resistors based on color code
- Identify and select capacitors based on color code
- Calculate RC Time constant for given R-C series circuit

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Theraja, B. L.	Electrical Technology Vol-1	S. Chand & Co. Ltd., 2011 or latest edition
2	Gupta, B.R.	Principles of Electrical Engineering	S.K. Kataria,2012 or latest edition
3	Rao, Uma. K.	Basic Electrical Engineering	Pearson Education, India, 2012 or latest edition
4	Ananda Murthy, R. S.	Basic Electrical Engineering	Pearson Education, India,2011 or latest edition
5	Gupta ,J.B.	A Course in Electrical Technology Vol. I	S.K. Kataria & Sons, 2012 or latest edition
6	Singh, Tarlok	Fundamentals of Electrical Engineering	S.K. Kataria & Sons,2012 or latest edition

B. List of Major Equipment/ Components

i. Ammeter
ii. Voltmeter
iii. Wattmeter
iv. Multimeter
v. Stop watch
vi. Thermometer
vii. Rheostats
viii. Capacitors
ix. Inductors

C. List of Software/Learning Websites

i. www.allaboutcircuits.com/vol_1/chpt_1/1.html
ii. http://openbookproject.net/electricCircuits/DC/DC_5.html
iii. www.kpsec.freeuk.com
iv. www.howstuffworks.com/

COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S.S.Mehta,** Lecturer, Electrical Engg.Dept. , B&B Institute of Technology, Vallabhvidyanagar
- **Prof. B. R. Shrotriya**, Lecturer,Electrical engg.Dept. , Govt. Polytechnic, Junagad
- **Prof. V. R. Kotdawala**, Lecturer, Electrical engg. Dept., Govt. Polytechnic, Himmatnagar.
- **Prof. A.A. Parmar**, Lecturer, Electrical engg.Dept., B&B Institute of Technology, Vallabhvidyanagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Joshua Earnest**, Professor & Head, Dept. of Electrical & Electronics Engg.
- **Prof. A.S. Walkey**, Associate Professor, Dept. of Electrical & Electronics Engg.