MAPPING OF PROGRAMME OUTCOMES (POs) AND PROGRAMME SPECIFIC OUTCOMES (PSOs) WITH COURSE OUTCOMES (COs)

S. No	Course Outcome	POs										PSOs	
		1	2	3	4	5	6	7	8	9	10	01	02
CO1	Calculate voltage and current in the given resistive circuits using KCL and KVL.	3	3	2	1	1							
CO2	Calculate electricity bill & equivalent capacitance in electrical circuits.	3	3	2									
CO3	Apply Faraday's law, Lenz's law, Fleming's right hand rule to find magnetic properties	3	3	3									
CO4	Highlight difference between Statically and dynamically induced EMF.	1	1	1	1	1							
CO5	Derive the current & voltage relationship in star - delta connections.	2	2	2	2	2							
CO6	Select a motor according to application.	1	1	1	1	1							

Course Curriculum Design Committee

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HOD ET (Chairman PBOS)

Coordinator CDIC(Member Secretary PBOS)

GOVERNMENT POLYTECHNIC शासकीय तंत्रनिकेतन औरंगाबाद AURANGABAD

COURSE TITLE- **ELECTRICAL TECHNOLOGY**
COURSE CODE **6X202**

PROGRAMME & SEMESTER

Diploma Programme in which this course is offered	Semester in which offered
Electronics & Telecommunication Engineering	Second

1. RATIONALE

This basic technology course aims at development of basic principles of electrical engineering used in design of various electrical circuits which are essential in developing electronics systems. It is therefore necessary for diploma graduates in electronics engineering to understand and apply fundamentals of electrical engineering.

2. COMPETENCY

At the end of studying this course students will be able to
"Apply basic principle of electrical engineering to develop electronics system."

3. TEACHING AND EXAMNATION SCHEME

Teaching Scheme (Hours/ Credits)			Total Credits (L+T+P)	Examination Scheme (Marks)				
				Theory		Practical		Total
L	T	P	C	ESE	PT	ESE @ (PR)	PA (TW)	150
4	-	2	6	80	20	25	25	
Duration of the Examination (Hrs)				03	01	--	--	

Legends : L-Lecture; **T-**Tutorial/Teacher Guided Theory Practice ; **P-** Practical; C- Credits; **ESE-** End Semester Examination; **PT – Progressive Test, PA-** Progressive Assessment, OR – Oral Examination, TW - Term Work, # External, @ Internal.

4. COURSE OUTCOMES

I Calculate voltage and current in the given resistive circuits using KCL and KVL.
II Calculate electricity bill & equivalent capacitance in electrical circuits.
III Apply Faraday's law, Lenz's law, Fleming's right hand rule to find magnetic properties.
IV Highlight difference between Statically and dynamically induced EMF.
V Derive the current & voltage relationship in star - delta connections.
VI Select a motor according to application.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Cognitive Domain Only)	Topics And Sub-Topics
Unit –I Fundamentals	1a. Understand the various electrical parameters 1b Identify the commonly used components in electrical engineering 1c Understand the terms work, Power and energy 1d Calculate voltage and current in the given resistive circuits using KCL and KVL 1e Calculate electricity bill 1f Calculate the equivalent capacitance in electrical circuits	1.1 Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. 1.2 Laws of resistance, resistivity, effect of temperature on resistance, RTC (simple numerical) Types of resistance and their applications. 1.3 Concept of AC and DC 1.4 Ohms law: applications and limitations. Series and parallel combination of resistance, current division rule, voltage and current source, ideal and practical (simple numerical) 1.5 Definitions of node, branch, loop, mesh. Kirchhoff's laws (simple numerical). 1.6 Specifications of commonly used electrical appliances, calculation of electricity bill. (simple numerical).
Unit– II Magnetism & Electromagnetic Induction	2a. Select a material having lowest hysteresis loss 2b. Understand phenomenon of electromagnetic induction 2c. Apply Faraday's law, Lenz's law, Fleming's right hand rule, Fleming's left hand rule 2d. Differentiate between Statically and dynamically induced EMF, self and mutual inductance	2.1 Flux, flux density, magnetic field strength, mmf, reluctance, permeability 2.2 Comparison between electric and magnetic circuits. 2.3 Magnetization curve, magnetic hysteresis, hysteresis loop, hysteresis loss and methods to minimize it. 2.4 Faraday's laws of electromagnetic induction, Lenz's law, Fleming's right hand rule for Generators, Fleming's left hand rule for Motors. 2.5 Statically and dynamically induced EMF. 2.6 Self and Mutual inductance.

10. SUGGESTED LEARNING RESOURCE

S.N.	Name of Book	Author	Publication
1	Electrical Technology Vol-1	Theraja, B. L.	S. Chand & Co. Ltd., 2011 or latest edition
2	Basic Electrical Engineering	Mittle, V.N.	Tata McGraw-Hill latest edition.
3	Principles of Electrical Engineering	Gupta, B.R.	S.K. Kataria,2012 or latest edition
4	Basic Electrical Engineering	Rao, Uma. K.	Pearson Education, India, 2012 or latest edition
5	Basic Electrical Engineering	Ananda Murthy, R. S.	Pearson Education, India,2011 or latest edition
6	A Course in Electrical Technology Vol. I	Gupta, J.B.	S.K. Kataria & Sons, 2012 or latest edition
7	Electrical Technology Vol-2	Theraja, D. L.	S. Chand & Co. Ltd., 2011 or latest edition

11. LIST OF MAJOR EQUIPMENTS AND MATERIALS REQUIRED :

S. No.	Name of equipment	Brief specification
1	Motor – Generator Set	
2	AC / DC Motors	
3	Ammeters, Voltmeters, Wattmeters, Rheostats	0-5A, 0-150/300V

12. LEARNING WEBSITE & SOFTWARE

1 www.allaboutcircuits.com/vol_1/chpt_ml
2 http://openbookproject.net/electricCircml
3 www.kpsec.freeuk.com
4 www.howstuffwork/
5 www.nptel/electrical.com

6.	I	Make a switch board using indicator, fuse, switches, plug pin socket and regulator. Then operate lamp and fan load.	04
7.	II	Use B-H curve for selection of magnetic material.	02
8.	III	Use CRO to measure peak value, RMS value, Period and frequency of alternating quantity.	02
9.	III	Calculate power factor of R-L series circuit, and draw phasor diagram	02
10.	III	Measure line and phase values of voltages and currents in three phase balanced star and delta connected load.	02
11.	IV	Calculate transformation ratio of given transformer.	02
12.	V	Start and reverse three phase induction motor.	02
13.	V	Start and reverse DC shunt /series motor	02
14.		Micro-Projects: : [Industry application, Field, Internet, Workshop, Laboratory based applications] 1. Presentation of various methods of Testing of Transformers 2. Prepare a Switchboard of given specifications 3. Use LCR-Q Meter to find power factor of a R-L –C circuit 4. Install an Electric meter and show the units consumed for various loads 5. Report on Hydro/ Wind/ Solar/Thermal Electric Power System.	02
		Total	32

Note: 1st to 11th Practicals are compulsory.

8. **SUGGESTED STUDENTS ACTIVITIES**

1. Identify and select various measuring instruments as per required range.
2. Identify and select resistors based on color code.
3. Calculate electricity bill for student's hostel.
4. Write the specifications of appliances used at home.
5. See the videos showing working of different electrical machines and power generation.
6. Collect data of any generating station.
7. Assignments on solving numerical.

9. SUGGESTED SPECIFIC INSTRUCTIONAL STRATERGIES

1. Arrange visit to power station / Generating plant.
2. Motivate students to observe different types of electrical loads around them.
3. Students must be encouraged for self directed learning to improve LOs/ Cos.

Unit– III AC Fundamentals	3a. Explain generation of alternating EMF 3b. Understand various Electrical parameters 3c. Determine RMS and average value of sinusoidal wave 3d. Derive the current and voltage relationship in star and delta connections	3.1 Principle of generating an alternating voltage 3.2 Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, Form factor, Peak Factor and Power Factor. (simple numerical) 3.3 Vector representation of emf and current. 3.4 Mathematical representation of an Alternating emf and current 3.5 A.C. through pure a) resistors, b) Inductors and c) capacitors 3.6 A.C. through R-L series, R-C series, and R-L-C series & parallel circuit 3.7 Power in A. C. Circuits. Concept of power Triangle (simple numerical) 3.8 Advantages of three phase over single phase, phase sequence. 3.9 Voltage and Current relationship in Star and Delta connections. (No numerical)
Unit– IV Transformer	4a. Explain the construction and working of a single phase transformer 4b. Describe working Principle of Auto transformer 4c. Calculate transformer Performance parameters 4d. Select suitable type of transformer for a circuit	4.1 Construction and working of transformer, classification , brief description of each part, its function :(power transformer, audio frequency transformer, radio frequency transformer, isolating transformer, pulse transformer, intermediate frequency transformer) 4.2 Significance of EMF equation (no derivation) Voltage ratio, current ratio and transformation ratio (simple numerical) 4.3 Various losses in transformers. 4.4 Autotransformers.

UNIT – V Electrical Machines	5a. Describe the construction of a typical three phase induction motor 5b. Explain working principle of single phase induction motors 5c. Select a motor according to application	5.1 D.C. Machines: Construction, types, principle of working and applications. 5.2 Three phase induction motor: Construction, types, principle of working and applications 5.3 Single phase Induction motors: Construction, Types, principle of operation and applications. 5.4 Universal motor: Construction, principle of operation and applications. 5.5 Stepper motor: Construction, types, principle of working and applications. 5.6 Servo motor: Construction, types, principle of working and applications
UNIT - VI Electrical Power System	6a. Identify different stages of power system. 6b.Relate electricity generation, transmission and distribution.	6.1 Single line diagram of electrical power system showing voltage level 6.2 Generation: energy sources, conventional and non-conventional, types of generating stations. 6.2 Transmission: classification on the basis of voltage Level, length and supply voltage. 6.3 Distribution: primary and secondary, voltage level and number of conductor, different types of load connected to distribution system.

6. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No	Title Of Unit	Teaching Hours	Distribution Of Theory Marks			
			R level	U Level	A Level	TOTAL
1	Fundamentals	14	06	05	06	17
2	Magnetism & Electromagnetic Induction	12	04	06	04	14
3	AC Fundamentals	13	03	06	07	16
4	Transformer	06	02	02	04	08
5	Electrical machines	13	05	05	07	17
6	Electrical power system	06	03	03	02	08
	Total	**64**	**23**	**27**	**30**	**80**

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

7. LIST OF PRACTICAL / LABORATORY EXPERIENCES/ TUTORIALS

Sr. No.	Unit	Title Practical/ Lab. Work/ Assignments/ Tutorials	Hours
1.	I	A) Prepare layout of electrical laboratory (mentioning, labeling all major equipment with their specification).	02
		B) Prepare charts of electrical safety and understand operation of fire extinguisher.	02
		C) Select appropriate electrical tools such as pliers, screw driver, insulation cutter, and tester etc. for different purpose.	02
2.	I	Prepare a circuit using rheostat, ammeter, voltmeter & wattmeter and to measure different electrical quantities and verify ohms law.	02
3.	I	Use Rheostat to regulate current and divide potential.	02
4.	I	Measure current using Kirchoff's Current Law in a given electrical circuit.	02
5.	I	Measure voltage drop in a closed loop of the given electrical circuit using Kirchoff's Voltage Law.	02