GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	**:**	**DIPLOMA IN EC, CM, IT**
LEVEL NAME	**:**	**ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES**
COURSE CODE	**:**	**EE303E**
COURSE TITLE	**:**	**ELECTRICAL ENGINEERING**
PREREQUISITE	**:**	**NIL**
TEACHING SCHEME	**:**	**TH: 04; TU: 00; PR: 02(CLOCK HRs.)**
TOTAL CREDITS	**:**	**05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**
TH. TEE EXAM	**:**	**03 HRs**
PR. TEE EXAM	**:**	**02 HRs (Internal)**
PT. EXAM	**:**	**01 HR**

❖ RATIONALE:

Knowledge of electrical engineering is essential for the students of Electronics/ Computer/ Information technology. Students should know the facts, concepts, principles and procedures in electrical engineering. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to electrical area. It is very useful course for Solving &understanding the different electronic circuits.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Follow the electrical safety precautions.
2. Solve the electrical circuits by using principle and basic laws.
3. Select transformers and motors for particular applications.
4. Connect electrical measuring instruments in the circuit
5. Use different machines for different application.
6. Operate electrical machines/equipment.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Electrical Safety	1. Recall electrical safety rules. 2. Remove the electrocuted person from live conductor 3. Interpret electrical safety signs and symbols 4. Carry out different methods of artificial respiration on electrocuted person 5. Use fire-fighting equipment on different types of fires. 6. Classify various types of earthing. 7. State the need of earthing.	1.1 Electrical Safety, Causes of accidents, General safety rules, Concept of electrical shock, Effect of electric shock, Method of removing electrocuted person, Safety signs and symbols. 1.2 Artificial respiration-Schaefer's method, Silvestre's method, mouth to mouth respiration. 1.3 First Aid 1.4Fire, Causes of Fire, Basic ways of extinguishing the fire Classification of fire, Class A, B,C, D, Fire fighting equipments, fire extinguishers, and their types . 1.5Earthing-Nessesity of earthing, methods of reducing earth resistance.	**7**
2. Fundamentals of electricity	1. Define the various electrical Parameters, work , power and energy 2. State different effects of electric Current 3. State various law and its applications. 4. Calculate the temperature coefficient of resistance 5. Identify and draw different electrical engineering symbols 6. Describe line diagram of power system 7. Solve series, parallel and series- parallel resistive circuits	2.1 Concept of electric charge, current, voltage drop, EMF, potential difference, Direction of current and their SI units. 2.2 Types of material-conductor, insulator and semiconductor, properties and application. 2.3Resistance, unit of resistance, Law of resistance (Factors affecting resistance), Effect of temperature on resistance, Ohms law (simple numerical on 2.3). 2.4Resistance in series, properties of series circuit, voltage distribution in series circuit, equivalent resistance of series circuit, Applications of series circuits, 2.5 Resistance in parallel, properties of parallel circuit, current distribution in parallel circuit, equivalent resistance of parallel circuit, Applications of	**9**

		parallel circuits, (Numerical problems based on 2.4,2.5) 2.6 Kirchhoff's current and voltage law(no numerical) 2.7 Work, power, energy and their SI units, Relation between H.P and watts, Kwh and Kcal. 2.8 Connection of ammeter, voltmeter and wattmeter in single phase AC circuit. and its measurement. 2.9Comparison between AC and DC	
3. AC Fundamentals	1. Define terms related to AC fundamentals 2. Compare terms time period and frequency, angular velocity and frequency, frequency and speed. 3. Solve problems related to pure resistive, inductive and capacitive circuit 4. Understand the concept of of reactance, I impedance and power factor. 5. State and compare types of electrical loads	3.1 Generation of alternating voltage- single phase and three-phase. 3.2 Equation of sinusoidal alternating voltage and current, important terminology such as-waveform, instantaneous value, cycle, time period, frequency, amplitude, Relation between time period and frequency, angular velocity and frequency, frequency and speed. 3. 3 Maximum, average and R.M.S. value of sinusoidal waveform, form factor and peak factor.(No derivation) 3.4 A.C. Voltage applied to pure resistor, pure inductor, and pure capacitor. Concept of reactance, Impedance and power factor, power in single-phase circuits. ((Simple Numerical problem based on 5.4 topic). 3.5 Types of loads.	**12**
4 Electrostatics& Electromagnetism	1. State Coulombs law of Electrostatics 2. Define terms related to electrostatics 3. Solve series, parallel capacitive circuits 4. Apply laws of electromagnetism	4.1 Coulombs law of Electrostatics, Absolute and relative permittivity, Concept of electric field, electric flux, electric intensity, electric flux density, and electric potential, potential gradient, dielectric strength. 4.2 Capacitance, dielectric constant, capacitance of parallel plate capacitor, capacitance in series and parallel and source of capacitance in electrical systems. Charging &	**12**

		discharging of capacitor, Dielectric loss. (Numerical problems based on 3.2) 4.3 Types of capacitor and their application 4.4 Faraday's Laws of electromagnetic induction. Direction of induced EMF and current, Lenz's Law, Fleming's right hand rule, Induced EMF, Dynamically induced EMF, statically induced EMF, self-Inductance (L), Mutual Inductance. 4.5 Energy stored in inductor, rise and decay of current through inductor	
5 Transformer	1. State meaning of transformer. 2. Describe the concept of transformation ratio, KVA rating of transformer, voltage regulation and efficiency 3. Classify the different types of transformer	5.1 Definition, principle of operation, types of transformer, 5.2 EMF equation (No derivation), transformation ratio, KVA rating of transformer, voltage regulation and efficiency.(Simple Numerical problem based on 4.2 topic). 5.3 Current Transformer and Potential Transformer- Special features and its applications. 5.4Auto-transformer –Special features, Schematic diagram and its applications	**12**
6. Drives	1. Classify different types of AC & DC motors. 2. Select the particular motor for particular application. 3. Describe construction and working of DC machines and AC machines. 4. Understand the need of starter. 5. Control the speed of motor. 6. Describe construction and working of Stepper motor.	6.1 Broad classification of A.C & D.C Drives. 6.2DC Drives- General working principle of D. C. motor. Types-shunt, series and compound motor. Application and selection for different applications need of starter, 3 point starters, reversal of rotation. 6.3AC Drives-Single-phase induction motors, their types, application and selection for different applications, reversal of rotation. 6.4 Principle of operation of Stepper Motor and its application. (No Numerical on topic 6)	**12**
		Total Hrs.	**64**

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify electrical measuring instruments, sources, ICDP/ITDP, switches, loads, wires and execute safety precautions in laboratory.	Electrical Safety	2
2	Connect voltmeter, ammeter and wattmeter in electrical circuit.	Fundamentals of Electricity	2
3	Measure the current, voltage and resistance with the help of multi-meter or tong tester.		2
4	Calculate the unknown resistance in an electric circuit using ohms law.		2
5	Calculate the temperature coefficient of resistance of conductors		2
6	Measure the total resistance of series circuit & parallel circuit		2
7	Find the branch current and mesh voltage using Kirchhoff's laws. (KCL & KVL)		2
8	Use test lamps for testing single-phase and three – phase supply. Use of tester on single-phase supply.		2
9	Test capacitor. Plot chagrining and discharging curve of capacitor.	Electrostatics& Electromagnetism	2
10	Measure the inductance of a given coil.		2
11	Connect voltage & current ratio of single- phase transformer.	Transformer	2
12	Operate CRO and Observe the current & voltage wave form for purely R,L& C ac circuit &interpret the phasor relationship.	AC Fundamentals	2
13	Reverse the directions of rotation of DC shunt motor.	Drives	2
14	Reverse the directions of rotation of single-phase capacitor start motor		2
15	Identify different parts of Stepper motor at fixed angular step.		2
		Skill Assessment	**2**
		Total Hrs	**32**

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Electrical Safety	02(00)	04(04)	00(00)	**06(04)**
02	Fundamentals of electricity	02(00)	04(06)	06(00)	**12(06)**
03	AC Fundamentals	06(04)	10(00)	00(06)	**16(10)**
04	Electrostatics& Electromagnetism	00(02)	04(04)	06(00)	**10(06)**
05	Transformer	02(02)	04(04)	06(00)	**12(06)**
06	Drives	06(04)	08(04)	00(00)	**14(04)**
	Total	**18(12)**	**34(22)**	**18 (06)**	**70 (40)**

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	2	R	2	3	R	2	5	R	2	6	R	2	4	R	2	
	5	R	2																
02	3	R	4	1	U	4	2	U	4	1	U	4	4	U	4				
03	3	U	4	4	U	4	5	U	4	3	R	4	5	U	4				
04	6	R	4	6	U	4	6	U	4	6	R	4	6	R	4				
05	3	U	6	2	A	6	3	A	6										
06	4	A	6	5	A	6	2	U	6										

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	**CA** (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**70**	**28**	Theory Answer Sheets	1, 2, 3
				Total	**100**	**40**		
Direct Assessment Practical	**CA** (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	**25**	**10**		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**50**	**20**	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment's. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	**50**

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	2	-	1	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-
4	3	-	2	2	-	-	-	2	-	2	-	-
5	3	-	2	2	-	-	-	2	-	2	-	-
6	3	-	2	2	-	-	-	2	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Principle of Electrical Engineering and Electronics	V. K. Mehta, S. Chand & Company Ltd., Reprint, 1996	81-219-1053-6
2.	A Text Book Of Electrical Technology Vol-I	B. L. Theraja, A. K. Theraja, S.Chand& Co Ltd., Reprint,2006	81-219-2440-5
3.	Basic Electrical Engineering	V. N. Mittle, Arvind Mittal, The McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 978-0-07-059357-2
4.	Experiments in Basic Electrical Engineering	S. K. Bhattacharya and K. M. Rastogi., New Age International Publisher, Reprint, 2009.	978-81-224-1042-6
5.	A Text Book on laboratory courses in Electrical Engineering	S. G.Tarrekar and P. K. Kharbanda, S. Chand& Company Ltd., Third, 1990	13: 978-8121901048

❖ E-REFERENCES:

- http://nptel.ac.in/courses/108108076/1 , assessed on 18th January 2016
- http://www.electrical4u.com , assessed on 18th January 2016
- https://www.youtube.com/watch?v=A9KSGAnjo2U, assessed on 18th January 2016
- www.learnerstv.com/Free-engineering-Video-lectures-ltv059-Page1.htmassessed on 28th Feb 2016
- www.studyyaar.com/index.../11-basic-electrical-a-electronics-engineerinassessed on 28th Feb 2016
- *www.faadooengineers.com/.../448-BASIC-ELECTRICAL-ENGINEERIN* assessed on 28th Feb 2016.
- https://www.scribd.com/.../Lecture-Notes-Basic-Electrical-and-Electronicassessed on 28th Feb 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Meters: Ammeter MI 0-5-10 A,Voltmeter MI 0-150-300,Wattmeter 0-3000 W, Digital Multi-meter, Tong tester, Megger 500V/1000V Hand driven.
2. Rheostat assorted sizes, Variable Inductor, Capacitor
3. Single phase induction motor, 230 V, 50 Hz, 1 kw
4. Single phase transformer, 230/115 V, 50 Hz., 1 KVA
5. CRO, duel trace
6. DC Shunt Motor, 220 V, 3 HP

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr.C.S.Thorat	Principal	Government Polytechnic, Nagpur.
2.	Mrs. K. M. Gaidhane	I/C, Head of Electrical Engineering	Government Polytechnic, Nagpur.
3.	Mr. R. I. Kamble	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
4.	Mrs. S. P. Thote	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
5.	Dr. R. S. Surjuse	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
6	Mr. G. V. Gotmare	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
7	Mr. H, N. Kharkar	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
8	Mr. N. H. Adkine	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
9	Mrs. A.P. Gandhi	Lecturer in Electrical Engineering	Government Polytechnic, Nagpur.
10	Mr. R. Y. Ghormade	HOD,Electrical Engineering	Dharampeth Polytechnic, Nagpur
11	Mr. B. P. Bale	Dy. Engineer.	MSDCL, Nagpur
12	Dr. S. S. Bharatkar	Lecturer in Electrical Engineering	Government Polytechnic, Amravati

(Member Secretary PBOS) **(Chairman PBOS)**