

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: APPLIED ELECTRICALS AND ELECTRONICS ENGINEERING.
(Code: 3331905)

Diploma Programme in which this course is offered	Semester in which offered
MECHANICAL/ METALLURGY/MINING	3rd SEM.

1. RATIONALE.

Applications of electrical and electronics engineering fundamentals are widely used in mechanical engineering ranging from industrial wiring to CNC operations. Majority mechanical based industries are in the sector of small and medium scale where electrical engineers are not recruited. For normal electrical and electronics tasks, shop floor mechanical supervisor needs to attend the situation. If electrical personnel are to be called, issues and reasons are primarily required to be known by mechanical engineers. This course focus on development of such abilities.

2. COMPETENCY.

- Develop the ability to identify and attend normal electrical faults.
- Use electrical tools and instruments for normal applications.
- Select and use PCB for simple applications.

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

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

4. COURSE DETAILS.

Unit	Major Learning Outcomes	Topics and Sub-topics
<p>Unit – I</p> <p>Fundamentals of electrical engineering and magnetic circuit.</p>	<p>1a. Explain various terminology associated with electricity generation and magnetic circuit.</p>	<p>1.1 Electricity generation-principle, working setup, elements and their functions.</p> <p>1.2 Concept of AC (Alternating Current) and DC (Direct current).</p> <p>1.3 Magnetic field of permanent magnet and current carrying conductor.</p> <p>1.4 Terminology associated with magnetic circuit- M.M.F, magnetic force, magnetic field strength, permeability, reluctance, magnetic flux, flux density, flux linkage, hysteresis loop.</p> <p>1.5 Rules for finding direction of rotating magnetic field-Right hand rule and Cork Screw rule.</p> <p>1.6 Terminology associated with electrical circuit: concept, definition and units of emf (Electromotive force), current, voltage, resistance, resistivity, conductance, potential difference, electric field, work, power, energy.</p> <p>1.7 OHM's law.</p> <p>1.8 Terminology associated with AC wave- Cycle, Instantaneous value, Amplitude, frequency, Time period, R.M.S value, Mean Value, Phase, Phase difference (Angle), power factor.</p> <p>1.9 Concept and applications of single phase and three phase connections.</p> <p>1.10 Concept, differences and applications of series and parallel connections.</p>
<p>Unit – II</p> <p>Electrical components, tools and instruments</p>	<p>2a. Use electrical components, tools and instruments for simple tasks.</p>	<p>2.1 Types, specifications, materials of construction and applications of components like:</p> <ol style="list-style-type: none"> i. Wires and cables. ii. Switches/plugs/sockets. iii. Fuses. <p>2.2 Types, specifications, materials of construction and applications of tools like:</p> <ol style="list-style-type: none"> i. Pliers. ii. <p>2.3 Types, specifications, materials of construction, connection method and applications of measuring instruments like:</p> <ol style="list-style-type: none"> i. Multimeter.

Unit	Major Learning Outcomes	Topics and Sub-topics
		<ul style="list-style-type: none"> ii. Clip-on meter. iii. Tester. iv. Volt meter. v. Ammeter. vi. Energy meter. vii. CRO
<p>Unit – III</p> <p>Electrical machines, drives and transformers</p>	<p>3a. Use electrical machines and drives.</p> <p>3b. Identify and attend simple electrical faults.</p>	<ul style="list-style-type: none"> 3.1 DC and AC generators- construction, working and applications. 3.2 DC motor.-construction, working and applications, necessity of starter. 3.3 Concept of line value and phase value, line voltage, line current, phase voltage and phase current. 3.4 Three phase supply connections - Star connection and Delta connection-diagrams/circuit, applications. 3.5 Types, specification, construction, working, starting method, applications, common troubles and remedies of : <ul style="list-style-type: none"> i. Single phase motor. ii. Three phase motor. iii. Stepper motor. 3.6 Drives. <ul style="list-style-type: none"> i. Stepper motor Drive. (Number of inputs, Number of outputs and how to connect with motor). ii. Servo Drive. (Number of inputs, Number of outputs and how to connect with motor). iii. Different between servo and stepper drive.(Open loop and Close loop Concept). 3.7 Transformers. <ul style="list-style-type: none"> -Classification of transformer. i. Core and Shell Type transformer. ii. Transformation ratio. iii. Auto transformer (Construction, Working and application) iv. Comparison between Conventional and auto transformer. 3.8
<p>Unit – IV</p> <p>Electrical safety and protection</p>	<p>4a. Follow general electrical safety norms.</p>	<ul style="list-style-type: none"> 4.1 Regulated power supply, Rectifier (Half and Full wave), Uninterruptible power supply. (UPS)-concept and applications. 4.2 Safety and Protection-specification,

Unit	Major Learning Outcomes	Topics and Sub-topics
		<p>working and applications of protective devices such as Fuses, MCBs and ELCBs.</p> <p>4.3 Electrical Safety and earthing.</p> <p>4.4 Opto-isolation for circuit safety</p> <p>4.5</p>
Unit – V Electronic components and circuits	<p>5a. Identify simple electronics components.</p> <p>5b. Use PCBs for simple applications.</p>	<p>5.1 General construction, symbol, types and applications of following device/components.</p> <ol style="list-style-type: none"> H Resistor. Inductor. Capacitor. Diode. Transistor. SCR. DIAC. TRIAC. <p>5.2 PCB-concept and general applications.</p> <p>5.3 PCBs for following applications:</p> <ol style="list-style-type: none"> Movement of stepper motor according to input value. <p>5.4 Concept, general constructional features, types and applications of PLCs, DCS and microcontrollers.</p> <p>5.5</p>

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Fundamentals of electrical engineering and magnetic circuit.	08	06	08	00	14
II	Electrical components, tools and instruments	10	04	04	08	16
III	Electrical machines, drives and transformers	12	08	06	06	20
IV	Electrical safety and protection	04	00	02	04	06
V	Electronic components and circuits	08	06	04	04	14
		42	24	24	22	70

Notes:

- a:** 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.
- b:** If midsem test is part of continuous evaluation, unit numbers I, II (Up to 2.2), IV and V(only 5.1) are to be considered. It is also compulsory for student to complete experiment.no.1 to 5 to eligible for midsem test.
- c:** Ask the questions from each topic as per marks weightage. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to marks allotted to each topic.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL:

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire the competency. Following is the list of experiments guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required
1	I	Demonstrate generation of electricity and explain various terminologies associated with it.	02
2	I	Demonstrate difference between AC and DC.	02
3	I	Verify Ohm's law.	02
4	II	Do electrical wiring for given case/parameters using electrical wires/cables, components and tools. Test the same and measure applicable parameters/variables like resistance, current, power, voltage, power factor, etc.	04
5	III	Perform connections for given electrical motors and drives. Also perform for various load conditions.-Three cases.	04
6	III	Identify common troubles and attend remedies for: a. Electrical wiring. b. Electrical drives and motors.	02
7	III	Demonstrate working of stepper motor for given set of inputs. Measure various parameters.	02
8	III	Demonstrate working of transformers. Measure various parameters.	02
9	IV	Use fuse, MCBs and ELCBs for attending repair tasks.	02
10	V	Use PCB for simple applications.	04
11	V	Demonstrate working of PLC and microcontroller.	02
			28

NOTES:

- a. It is compulsory to prepare log book of exercises. It is also required to get each exercise recorded in logbook, checked and duly dated signed by teacher.
- b. Student activities are compulsory and are also required to be performed and noted in logbook.

- c. Term work report must not include any photocopy/ies, printed manual/pages, lithos, etc. It must be hand written / hand drawn by student only.
- d. For 20 marks ESE, students are to be assessed for competencies achieved.

7. SUGGESTED LIST OF STUDENT ACTIVITIES:

- a. Write the specifications of lamp, CFL bulb, pump motor, fan etc. available at your room/house.
- b. Identify few mechanical situations which require automation.

8. SUGGESTED INSTRUCTIONAL STRATEGIES.

Sr. No.	Unit	Unit Title	Strategies
1	I	Fundamentals of electrical engineering and magnetic circuit.	Demonstration. Movies.
2	II	Electrical components, tools and instruments	Demonstration.
3	III	Electrical machines, drives and transformers	
4	IV	Electrical safety and protection	
5	V	Electronic components and circuits	

9. SUGGESTED LEARNING RESOURCES

(A) List of Books:

Sr. No.	Title of Books	Author	Publication
1.	Managing people at work.	Ahuja, Jain & Chhabra.	Dhanpatrai and Sons.
2.			
3.			
4.			
6.			
7.			
8.			
9.			

(B) List of Software/Learning Websites

8. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. A

Coordinator and Faculty Members from NITTTR Bhopal