Ramgarhia Polytechnic College, Phagwara

Electrical Engineering Department

Head of Department:	S. Jasvir Singh
Name of the Faculty:	Er. Rahul Bahl
Discipline:	Electrical Engineering Department
Semester:	3rd
Subject:	Fundamental ELECTRICAL ENGINEERING
Lesson Plan Duration:	16 Weeks

RATIONALE

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide acquaintance with various terms knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

Learning Outcomes

After undergoing this course, the students will be able to:

CO1. Verify the laws related to basics of electrical engineering.

CO2. Solve electrical and electronics networks by applying various network theorems

CO3. Use various batteries and their care, maintenance

CO4. Develop a relation between electric current and magnetism and vice-versa.

CO5. Convert mechanical energy to electrical energy.

CO6. Apply electromagnetic induction principles in various electrical equipment

CO7. Connect AC circuits.

PO ⇨ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	✓						
CO2		✓					
CO3		✓					
CO4		✓					
CO5	✓						
CO6		✓	✓				
CO7	✓	✓					
CO8		✓	✓				
CO9	✓		✓				

Syllabus

Units	Details	Hours
1.	Introduction to Fundamental of Electrical Engg. 1.1Application and Advantages of Electrical Energy 1.2Different forms of energy 1.3 Advantages of electrical energy Uses of electrical energy) 1.4 Basic Electrical Quantities Basic concept of charge 1.5 current, voltage, resistance, power, energy and their units 1.6 Conversion of units of work, power and energy from one form to another	(04 hrs)
2.	DC Circuits 2.1 Ohm's law, resistances in series and parallel 2.2 Kirchhoff's laws and their applications in solving electrical network proble 2.3 Network theorems such as Thevenin's theorem, superposition theorem Maximum power and transfer theorem and Norton's theorem 2.4 Star-delta transformation	(10 hrs)
3.	Batteries 3.1 Basic idea about primary and secondary cells 3.2 Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells 3.3 Charging methods used for lead acid accumulator 3.4 Care and maintenance of a lead acid battery 3.5 Grouping of cells in series and parallel (simple numerical problems).	(06 hrs)
4.	Magnetism and Electromagnetism 4.1 Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors. 4.2 Force on a conductor placed in the magnetic field 4.3 Series magnetic circuits, simple problems 4.4 Concept of hysteresis, loop and hysteresis loss	(08 hrs)
5.	Electromagnetic Induction 5.1. Faraday's Laws of electromagnetic induction 5.2. Lenz's law 5.3. Fleming's Right and Left Hand Rule 5.4. Principle of self and mutual induction 5.5. Principle of self and mutually induced e.m.f. and simple problems 5.6. Inductances in series and parallel 5.7. Energy stored in a magnetic field 5.8. Concept of eddy currents, eddy current loss	(09 hrs)
6.	AC Fundamentals 6.1. Concept of A.C. generation (single phase and three phase) 6.2. Difference between A.C and D.C	(10 hrs)

	6.3. Concept of alternating current and voltage, equation of instantaneous values, average value, r.m.s value, form factor, power factor etc. 6.4. Concept of phasor and phase difference. 6.5. Representation of alternating sinusoidal quantities by vectors 6.6. Phasor algebra (addition, subtraction, multiplication and division of complex quantities)	
7.	AC Circuits 7.1. AC through pure resistance, inductance and capacitance 7.2. Alternating voltage applied to RL,RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions) 7.3. Introduction to susceptance, conductance and admittance 7.4. Power in pure resistance, inductance, capacitance, RL, RC, RLC circuits 7.5. Active and reactive components of current and their significance 7.6. Power factor and its practical significance	(16 hrs)

Reference Books:

1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar

2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi

3. Electrical Science by VK Mehta, S Chand and Co., New Delhi

4. Electrical Engineering by DR Arora, Ishan Publications, Ambala

5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi

6. Electrical Technology by BL Theraja, S Chand & Co., New Delhi

7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi

8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi

9. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi

10. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1st	1st	Application and Advantages of Electrical Energy Different forms of energy	1.	1.Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law) **Group I**
	2nd	Advantages of electrical energy Uses of electrical energy Basic Electrical Quantities Basic concept of charge		
	3rd	Basic concept of charge, current, voltage, resistance, power, energy and their units		
	4th	Conversion of units of work, power and energy from one form to another.		
2nd	5th	Ohm's law, resistances in series and parallel Kirchhoff's laws and their applications in solving electrical network problems	2.	Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law) **Group II**
	6th			
	7th	Network theorems such as Thevenin's theorem		
	8th			

		superposition theorem		
3rd	9th	Maximum power and transfer theorem and Norton's theorem	3.	2. Filament lamp Measure the resistance of a cold lamp filament with the help of calculations. Measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage **Group I**
	10th			
	11th			
	12th	Star-delta transformation		
4th	13th		4.	2. Filament lamp Measure the resistance of a cold lamp filament with the help of calculations. Measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage **Group II**
	14th	Basic idea about primary and secondary cells Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells		
	15th			
	16th	Charging methods used for lead acid accumulator Care and maintenance of a lead acid battery Grouping of cells in series and parallel (simple numerical problems).		
5th	17th	Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors	5.	3. (a) To verify that Rt = R1+R2+…. where R1, R2 etc. are resistances connected in series (b) To verify 1 1 1 1 -- = -- + -- + - - - - - - + -- Rt R1 R2 Rm Where R1, R2 etc. are resistances connected in parallel **Group I**
	18th	Force on a conductor placed in the magnetic field		
	19th			

	20th	Series magnetic circuits, simple problems Concept of hysteresis, loop and hysteresis loss		
6th	21st 22nd	Faraday's Laws of electromagnetic induction. Lenz's law. Fleming's Right and Left Hand Rule	6.	3. (a) To verify that Rt = R1+R2+…. where R1, R2 etc. are resistances connected in series (b) To verify 1 1 1 1 -- = -- + -- + - - - - - - + -- Rt R1 R2 Rm Where R1, R2 etc. are resistances connected in parallel **Group II**
	23rd	**REVISION**		
	24th	**1st Sessional Test (Tentative)**		
7th	25th 26th 27th	Principle of self and mutual induction Principle of self and mutually induced e.m.f. and simple problems Inductances in series and parallel	7.	4. Verification of Kirchhoff's current and voltage laws applied to DC circuits a) to construct a circuit arrangement consisting of resistances in series, parallel combination b) identification of node points in the circuit c) to see that algebraic sum of currents at node point is zero d) to see that algebraic sum of emfs and voltage drops in a closed loop is zero **Group I**
	28th	Energy stored in a magnetic field		
8th	29th 30th	Concept of eddy currents eddy current loss	8.	4. Verification of Kirchhoff's current and voltage laws applied to DC circuits a) to construct a circuit arrangement consisting of resistances in series, parallel combination b) identification of node points in the circuit c) to see that algebraic sum of currents at node point is zero d) to see that algebraic sum of emfs and voltage drops in a closed loop is zero **Group II**
	31st 32nd	Concept of A.C. generation (single phase and three phase) Difference between A.C and D.C		

9th	33rd	Concept of alternating current and voltage, equation of instantaneous values, average value, r.m.s value, form factor, power factor etc.	9.	5. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance **Group I**
	34th			
	35th	Concept of phasor and phase difference. Representation of alternating sinusoidal quantities by vectors		
	36th			
10th	37th	Phasor algebra (addition, subtraction, multiplication and division of complex quantities)	10.	5. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance **Group II**
	38th	AC through pure resistance, inductance and capacitance. Alternating voltage applied to RL,RC		
	39th			
	40th			
11th	41st		11.	6. To construct an RL and RC circuit and to measure a) their impedance b) phase angle between voltage and current c) construct impedance triangle **Group I**
	42nd	RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions)		
	43rd			
	44th	**REVISION**		
12th	45th	**PTM**	12.	6. To construct an RL and RC circuit and to measure a) their impedance b) phase angle between voltage and current c) construct impedance triangle **Group II**
	46th	**2nd Sessional Test (Tentative)**		
	47th	Introduction to susceptance, conductance and admittance Power in pure resistance		
	48th			

13th	49th	Power in inductance, capacitance, RL, RC, RLC circuits	13.	7. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR **Group I**
	50th			
	51st			
	52nd			
14th	53rd	Active and reactive components of current and their significance	14	7. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR **Group II**
	54th			
	55th			
	56th	Introduction of Power factor		
15th	57th		15.	8. Testing a battery for its charged condition and to charge it **Group I**
	58th	practical significance of power factor		
	59th			
	60th	Simple numerical realted to RLC circuit		
16th	61st		16.	8. Testing a battery for its charged condition and to charge it **Group II**
	62nd	**PTM**		
	63rd	**REVISION**		
	64th	**3rd Sessional Test (Tentative)**		

NBA has defined the following seven POs for an Engineering diploma graduate:

i) **Basic and Discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

ii) **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.

iii**)** **Design/ development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

iv) **Engineering Tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

v) **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

vi) **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

vii) **Life-long learning**: Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSOs are a statement that describes what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program. Program may specify 2-4 program specific outcomes, if required.

These are the statements, which are specific to the particular 11 program. They are beyond POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.