LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Artificial Intelligence and Data Science (705)

Bachelor of Engineering (B.E.) – Semester – II

Course Code:	**117052291**
Course Name:	**Fundamental of Electronics and Electrical Engineering**
Category of Course:	Engineering Science Course (ESC)
Prerequisite Course:	---

Teaching Scheme				
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**Total Hours**
3	**0**	**2**	**4**	**30**

Syllabus

Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**DC Circuits**			**3 (10%)**
	1.1 Electrical circuit elements (R, L and C), Voltage and current Sources	---	---	
	1.2 Ohm's law, Series and parallel resistive circuit with voltage & current divider rules	---	---	
	1.3 Kirchhoff's current and voltage laws	Ohm's Law (117052291-Unit-1.2)	---	
	1.4 Charging and discharging of capacitor	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
02	**Network Theorems**			**3 (10%)**
	2.1 Thevenin and Norton Theorems	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
	2.2 Superposition Theorem and Source Transformation	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
	2.3 Nodal and Mesh Analysis	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
03	**Single Phase AC Circuits**			**3 (10%)**
	3.1 Generation of Single Phase, Representation of Sinusoidal Waveforms	---	---	
	3.2 RMS, Average Values and Peak Values, Form Factor and Peak Factor	---	---	
	3.3 Phasor Representation of AC Quantities	Generation of Single Phase (117052291-Unit-3.1)	---	
04	**Analysis of Single-Phase AC Circuits**			**3 (10%)**
	4.1 Analysis of Single-Phase AC Circuits consisting of R, L and C with Power Measurement	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
	4.2 Analysis of Single-Phase Series AC Circuits consisting of RL, RC and RLC with Power Measurement	Ohm's Law (117052291-Unit-1.2), Kirchhoff's current and voltage laws (117052291-Unit-1.3)	---	
	4.3 Series RLC AC Circuit at Resonance	Analysis of Single-Phase Series RLC Circuit (117052291-Unit-4.2)	---	
05	**Three Phase AC Circuits**			**3 (10%)**
	5.1 Generation of three phase E.M. F	Generation of Single Phase (117052291-Unit-3.1)		
	5.2 Voltage and Current Relations in 'STAR' Three Phase AC Circuit	---	---	
	5.3 Voltage and Current Relations in 'DELTA' Three Phase AC Circuit	Three Phase 'STAR'AC Circuit (117052291-Unit-5.1)	---	
	5.4 Power Measurements in Three Phase AC Circuits	Three Phase 'STAR'AC Circuit (117052291-Unit-5.1)	---	
06	**Transformers**			**3 (10%)**
	6.1 Faraday's Law of Electromagnetic Induction	---	---	
	6.2 Construction of transformer, Types, Working Principle of Transformer Operations, E.M.F equation	Faraday's Law (117052291-Unit-6.1)	---	
	6.3 Single Phase Step-Up and Step-Down Transformers	Working Principle of Transformer Operations (117052291-Unit-6.2)	---	
	6.4 Three Phase Transformers	---	---	
07	**Electrical Machines**			**3 (10%)**
	7.1 Three Phase Induction Motor, Generation of Rotating magnetic field	Faraday's Law (117052291-Unit-6.1)	---	
	7.2 Single Phase Induction Motor	Faraday's Law (117052291-Unit-6.1)	---	
	7.3 DC Motors-Construction, Working & Types	Faraday's Law (117052291-Unit-6.1)	---	

08	**Diode Circuits**			**3 (10%)**
	8.1 Basic idea about forward bias, reverse bias of Diode and VI characteristics	---	---	
	8.2 Half wave rectifier, Full wave rectifier	---	---	
	8.3 Bridge rectifier	---	---	
09	**Bipolar junction transistors**			**3 (10%)**
	9.1 BJT operation, BJT voltages and currents	Basic idea about diodes (117052291-Unit-8.1)	---	
	9.2 CE characteristics	BJT operation (117052291-Unit-9.1)	---	
	9.3 Transistor as a switch	CE characteristics (117052291-Unit-9.2)	---	
10	**Transistor Biasing**			**3 (10%)**
	10.1 DC Load Line Concepts & Q Point Stabilization	CE characteristics (117052291-Unit-9.2)	---	
	10.2 Fixed Bias	CE characteristics (117052291-Unit-9.2)	---	
	10.3 Collector to Base Bias	CE characteristics (117052291-Unit-9.2)	---	
	10.3 Voltage Divider Bias	CE characteristics (117052291-Unit-9.2)	---	

Sr No.	Practical Title	Link to Theory Syllabus
1	Verify KVL and KCL using Development kit.	Unit-1
2	To verify the Thevenin Theorem	Unit-2
3	To verify the Superposition Theorem	Unit-2
4	Measurement of the electric power in a single-phase AC Resistive Circuit.	Unit-4,5
5	To obtain power & power factor of single-phase R – L Series circuits	Unit-4,5
6	To obtain power & power factor of single-phase R – L - C Series circuits	Unit-4,5
7	To plot input and output waveforms of the Half Wave Rectifier.	Unit-8
8	To plot input and output waveforms of the Bridge Rectifier.	Unit-8
9	To study the input and output characteristics of NPN transistor in Common Emitter mode.	Unit-9

Major Components/ Equipment

Sr. No.	Component/Equipment
1	DC Network Development Kit, Voltmeter, Ammeter, Connecting Wires
2	DC Network Development Kit, Voltmeter, Ammeter, Connecting Wires
3	DC Network Development Kit, Voltmeter, Ammeter, Connecting Wires
4	Ammeter (0-5 amp), Voltmeter (0-300 volt), Wattmeter (5-amp, 300-volt, 1500 watt), Multimeter, Lamp-bank (non-inductive resistance) (230V, amp), Single-phase variac
5	Ammeter (0-5 amp), Voltmeter (0-300 volt), Wattmeter (5-amp, 300-volt, 1500 watt), Multimeter, Inductive coil (50 Hz, 5 amp), Lamp-bank (non-inductive resistance) (230V,5 amp), Single-phase variac
6	Ammeter (0-5 amp) Voltmeter (0-300 volt), Wattmeter (5-amp, 300-volt, 1500 watt), Multimeter, Single-phase variac, Lamp-bank (non-inductive resistance) (230V, amp), Choke coil, Capacitor bank
7	Trainer Kit, DC Power Supply, Function Generator, Connecting Wires, DSO.
8	Trainer Kit, DC Power Supply, Function Generator, Connecting Wires, DSO.
9	Trainer Kit, DC Power Supply, Function Generator, Connecting Wires, Multimeter.

Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)

L :	3	T:	0	P:	2

Note : In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory	3	4	MCQ	26%	35
Theory			Theory Descriptive	8%	10
Theory			Formulas and Derivation	11 %	15
Theory			Numerical	30%	40
Expected Theory %	**75%**		**Calculated Theory %**	**75%**	**100**
Practical	1		Individual Project	0%	0
Practical			Group Project	9%	35
Practical			Internal Practical Evaluation (IPE)	16%	65
Practical			Viva	0%	0
Practical			Seminar	0%	0
Expected Practical %	**25%**		**Calculated Practical %**	**25%**	**100**
Overall %	**100%**			**100%**	**200**

Course Outcome

	Upon completion of the course students will be able to
CO1	Apply fundamental circuit principles in a methodical way that is appropriate for analysis and design and then use these network theorems to further analyze the electric circuit.
CO2	Identify and analyze the waveforms and phasor diagrams for single phase AC circuits.
CO3	Summarize the working principles and uses of electrical machines, both rotational and static and recognize how rotating magnetic fields are created.
CO4	Comprehend the numerous semiconductor devices, their distinctive features and provide examples of how transistors operate, along with transistor biasing. Also, this will enable students to make contributions to their understanding of system implementation and computer hardware design.

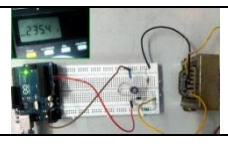
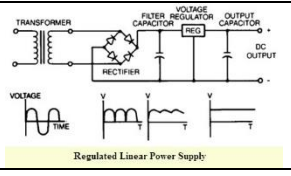
Suggested Reference Books

1	B. L. Theraja, 'A Textbook of Electrical Technology', S. Chand Publication-Volume I.
2	J.B. Gupta, Basic Electrical Engineering, Kataria & Sons -Volume I.
3	Charles Alexander and Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw Hill.
4	Edward Hughes, Harlow, "electrical & electronic technology", Pearson Education Limited.
5	U. A. Patel, '*Elements of Electrical Engineering*', Atul Prakashan.
6	Albert Malvino & David, "Electronic Principles", Tata McGraw-Hill, Seventh edition.
7	R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education.
8	David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth edition.

List of Open Source Software/Learning website

1	http://nptel.ac.in
2	https://www.electronicscoach.com
3	https://www.electrical4u.com

Practical Project/Hands on Project

Sr. No.	Project List	Linked with Unit
1	Case study: Verify KVL and KCL for given premises.	Unit 01
2	Identify the values of various passive components (R, L and C) for given circuit board.	Unit 02
3	AC voltage measuring Device using Arduino. 	Unit 04
4	Calculation of a Number of turns and voltage level for a given center tapped Transformer.	Unit 06
5	Design D.C. power supply for mobile.  Regulated Linear Power Supply	Unit 08
6	Dancing LED circuit can be used for any visual sign indication in any highways.	Unit 08

7	Security Alarm system for theft detection.	Unit 09
8	Design automatic ignition electric circuit using bread board.	All unit