Lok Jagruti Kendra University
University with a Difference

Diploma in Electronics & Communication Engineering

LJ Polytechnic

Subject Code: 025030204
Electronic Circuits and Network Analysis

Course / Branch Name			Diploma in Electronics and Communication Engineering			
Subject	Electronic Circuits and Network Analysis				**Code**	025030204
Subject Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				Evaluation Scheme			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**Total Marks**
3	0	2	4	50	50	50	50

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics and Mathematics (Pre-university level)
- ✓ Measure basic electrical quantities/parameters
- ✓ Use major electrical/electronic machines//instrument/equipment

3. Rationale

In the study of this course, the students will understand the construction, working, characteristics and applications of various types of semiconductor components such as diodes and transistors, which are the basic building block of an amplifier, oscillator, switching circuit, wave shaping circuit and power supply. Electronic networks are a core area, the knowledge of which is essential for electronic engineering diploma holders and they need to assimilate it to succeed in the Industry. In this regard, the basic knowledge of various theorems, resonance, filtering and attenuation related to passive electronic components is essential. The knowledge of this core subject is essential for comprehending the courses that will be introduced later in the diploma program as well as developing requisite skills for effective functioning in the industry.

4. Objectives

- ✓ Analyze analog circuits consisting of active electronic components.
- ✓ Analyze electronic networks in terms of voltage, current, power, attenuation and frequency response Highlight the importance of transformers in the transmission and distribution of electric power.
- ✓ It will build mathematical and numerical background for the design of electronics circuit & component value.

5. Contents

Unit No.	Unit Name	Sub-Topics	Learning Outcome	% Weightage	Hours
1	**Special Purpose Diode and Its Applications**	1.1. Basic Diode Circuits, Clipper and Clamper, Voltage Doubler 1.2. Zener Diode as A Voltage Regulator 1.3. Varactor Diode, Schottky Barrier Diode, Crystal Diode 1.4. Photo Diode, LDR, Photovoltaic Cell, Photo Transistor, Light Emitting Diode, Opto Coupler, 7-Segment Display, OLED, AMOLED, multi-colour Led	• Recognizes Clipping and Clamping Circuits, Operation of These Circuits and Analyses. • The action of A Diode Clamper Circuits. • Analyzes & Measures Parameters in Basic Diode Circuits. • Voltage Regulator Circuit	15	8
2	**Transistor Amplifier And Applications**	2.1 Transistor Amplifier: Cb, Ce, Cc 2.2 Comparison of Cb, Ce and Cc Amplifier Load Line Consideration and Operating Point 2.3 Amplifier Parameters 2.4 Darlington Pair and Its Applications 2.5 Transistor Used as A Relay Driver 2.6 Transistor Used as A Tuned Amplifier	• Bipolar Junction Transistors. • Common Base, Common Emitter, And Common Collector Characteristics and Biasing Circuits. • Bias Design for Bits. • Bias Stabilization Using Collector and Emitter Feedback, And Voltage Dividers. • Transistor Analogy • The Transistor as A Switch, Relay Driver, Tuned Applications.	25	8
3	**Transistor Biasing Circuits And Thermal Stability**	3.1 Biasing; Biasing Circuits: Fixed Bias, Collector to Base Bias, Emitter Bias and Voltage Divider Bias 3.2 Thermal Instability Thermal Runaway and Stability Factor 3.3 Thermal Resistance 3.4 Heat Sink 3.5 Types of Heat Sink: Shape, Size, Color, Material	• Test Different Biasing Circuits. • Define Thermal Instability and Its Adverse Effect on Working of Any Circuit. • Justify the Need for Heat Sink. • Select Appropriate Heat Sink.	15	8
4	**Introduction of Network**	4.1 Resistor, Capacitor and Inductor Connected in	• Explain Working Principle and	25	10

	Terminology and Network Theorems	Series, Parallel and Combination 4.2 Network Terminologies and Definition 4.3 Kirchhoff's Law 4.4 Mesh and Nodal Analysis 4.5 Principle of Duality 4.6 Superposition Theorem 4.7 Thevenin's Theorem 4.8 Norton's Theorem 4.9 Reciprocity Theorem 4.10 Maximum Power Transfer Theorem 4.11 Network Transformation "T" to "Π" And "Π" to" T "	Schematic Line Diagram of Single-Phase Transformer • Explain Working of Autotransformer with Its Sketches • Construction and Working Principle of Dc Machine (Generator) • Working Principle of Dc Motor • Working Principle of Ac Motors		
5	**Filters**	5.1 Classify the Various Passive Filter Circuits. 5.2 Derive the Cut-Off Frequency Equations for Constant-K Type, T And Π Sections of Low Pass and High Pass Filters 5.3 Explain Band Pass and Band Stop Filter Using Low Pass and High Pass 5.4 Filter. 5.5 Compare High Pass, Low Pass, Band Pass and Band Stop Filters.	• Passive Filters • Band Pass and Band Stop Filters	20	8
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No	Practical / Exercises	Key Competency	Hours
1	Use multimeter for measuring electrical parameter, the value of passive components like resistor and capacitor and testing of the diode, and a transistor.	Use of multimeter	2
2	Determine voltage and frequency of sine, square and triangular wave signal using CRO.	CRO functions	2
3	Design a diode clipper circuit for the given value of clipping voltage.	Clipper circuit	2
4	Design a diode clamping circuit for the given value of clamping voltage.	Clamper circuit	2
5	Design voltage regulator for the given value of regulated voltage using Zener diode.	Zener diode as a voltage regulator	2
6	Obtain the V-I Characteristic of Zener diode.	Zener diode working	2
7	Obtain V-I characteristic of the photodiode.	photodiode working	2
8	Obtain the V-I Characteristic of LDR.	LDR working	2
9	Build and display alphanumeric character using single/multi coloured LED.	LED display	2
10	Display numbers using 7 segment LED (Common Anode and Common Cathode- Both)	7 segment LED	2
11	Test thermal stability of fixed biased type amplifier.	Fixed biased type amplifier	2
12	Build and test voltage divider biased type amplifier and measure voltage at different points on the circuit and observe waveforms.	Voltage divider biased type amplifier	2
13	Obtain input and output characteristics and calculate the gain of the CE amplifier circuit.	CE amplifier circuit.	2
14	Obtain input and output characteristics and calculate the gain of CB amplifier circuit.	CB amplifier circuit.	2
15	Build an amplifier using the Darlington pair and calculate its gain.	Darlington pair	2
16	Obtain frequency response of single-stage transistor amplifier.	Single-stage transistor amplifier	2
18	For a given multisource network, determine the output impedance and voltage and verify it using Thevenin's Theorem	Thevenin's Theorem	2
19	For a given multisource network, determine the value of current in the specified branch and verify it using the Superposition theorem	Superposition theorem	2
20	For a given multisource network, determine the output impedance and voltage and verify it using Norton's Theorem	Norton's Theorem	2
21	For a given multisource network, determine the output impedance and voltage and verify it using the Maximum power transfer theorem	Maximum power transfer theorem	2

22	Obtain the frequency response curve for high pass, low pass, bandpass and bandstop filters.	High pass, low pass, bandpass and bandstop filters.	2
		Total Hours	44

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Special Purpose Diode and Its Applications	8	40	20	20	0	10	10
2	Transistor Amplifier and Applications	8	20	20	15	20	20	5
3	Transistor Biasing Circuits and Thermal Stability	8	20	20	20	15	10	15
4	Introduction of Network Terminology and Network Theorems	10	20	20	15	20	10	15
5	Filters	9	30	20	20	10	10	10

Legends: R-Remembering C- Creating
U- Understanding E- Evaluating
App- Applying An- Analyzing

8. Textbooks

1) Network-Analysis-and-Synthesis-by-M-E-Van-Valkenburg
2) Electronic Devices and Circuit Theory Boylestad Robert Pearson, 2007 or latest

9. Reference Books

1) Electronic Devices and Circuits by Bell David A, Oxford University Press, 2008 or latest
2) Network Analysis by Mithal G. K. Khanna Publication, 2008 or latest edition
3) Network Analysis and Synthesis by Chakraborti A., Dhanpat Rai Publication,2009

10. Open Sources (Website, Video, Movie)

1) http://www.allaboutcircuits.com/vol_1/index.html
2) http://en.wikipedia.org/wiki/Electrical_network
3) http://www.mhhe.com/engcs/electrical/hkd/tutmenu.htm
4) http://en.wikipedia.org/wiki/Network_analysis_(electrical_circuits)