



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs. K Rani Rudrama  
Course Name & Code : Digital Communications – 20EC09  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This course provides the knowledge on different digital modulation techniques. The course provides different concepts on information theory, block codes and convolution codes. It gives the methods of optimum receivers for digital communication systems and performance of probability of error for digital modulation techniques.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Understand</b> the concepts of digital communication system ( <b>Understand – L2</b> )
<b>CO 2</b>	<b>Analyze</b> the Baseband and Pass band digital modulation techniques ( <b>Analyze – L3</b> )
<b>CO 3</b>	<b>Examine</b> the optimum reception and probability of error of digital modulation ( <b>Apply – L3</b> )
<b>CO 4</b>	<b>Apply</b> source coding and error control coding techniques in digital communication process ( <b>Apply – L3</b> )

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1	1	-	-	-	-	-	-	-	-	2	1	-	-
<b>CO2</b>	3	2	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

#### **TEXT BOOKS:**

**T1:** Simon Haykin, “*Digital Communications*”, John Wiley & sons, 2nd Edition.

**T2:** Taub and Schilling, “*Principles of Communication Systems*”, TMH Publications, 3<sup>rd</sup> edition.

#### **REFERENCE BOOKS:**

**R1:** J. S. Chitode, “*Digital Communications*”, Technical Publications, first edition.

**R2:** V.ChandraSekar, “*Communication Systems*”, Oxford University Press.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section - A****UNIT-I: Pulse Digital Modulation**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the course – Digital Communications, CEOs, COs & POs	1	05.07.2023			
2.	Introduction to Unit-I	1	06.07.2023			
3.	Elements of a Digital Communication System	1	07.07.2023			
4.	Sampling and Quantization of signals	1	08.07.2023			
5.	Derivation for Quantization noise	1	12.07.2023			
6.	Introduction to Pulse Code Modulation (PCM) System - Transmitter	1	13.07.2023			
7.	Pulse Code Modulation (PCM) System - Receiver	1	14.07.2023			
8.	Calculation of output SNR in PCM	1	15.07.2023			
9.	Need for non-uniform quantization- Companding- $\mu$ -law, A-law	1	19.07.2023			
10.	Differential Pulse Code Modulation	1	20.07.2023			
11.	Delta Modulation	1	21.07.2023			
12.	Examples on PCM and DM	1	22.07.2023			
13.	Adaptive Delta Modulation	1	26.07.2023			
<b>No. of classes required to complete UNIT-I</b>		<b>13</b>	<b>No. of classes taken</b>			

**UNIT-II: Optimal Reception of Digital Signal**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Introduction to Unit-II	1	27.07.2023			
15.	Model of digital communication system	1	28.07.2023			
16.	Gram- Schmidt orthogonalization procedure	1	02.08.2023			
17.	Gram- Schmidt orthogonalization procedure	1	03.08.2023			
18.	Geometric interpretation of signals	1	04.08.2023			
19.	Response of bank of correlators to noisy input	1	05.08.2023			
20.	Detection of known signals in noise: Maximum likelihood detector	1	09.08.2023			
21.	Probability of error	1	10.08.2023			
22.	Correlation Receiver	1	11.08.2023			
23.	Matched Filter Receiver	1	12.08.2023			
24.	Matched Filter Receiver	1	16.08.2023			
25.	Probability of error for matched filter	1	17.08.2023			
<b>No. of classes required to complete UNIT-II</b>		<b>12</b>	<b>No. of classes taken</b>			

**UNIT-III: Digital Modulation Techniques**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Unit - III	1	18.08.2023			
27.	Wave form representation of different digital modulation techniques	1	19.08.2023			
28.	Amplitude Shift Keying	1	23.08.2023			
29.	Coherent Binary Phase Shift Keying	1	24.08.2023			
30.	<b>Quadrature Phase Shift Keying</b>	<b>1</b>	25.08.2023			
31.	Differential PSK	1	26.08.2023			
32.	Coherent Frequency Shift Keying	1	07.09.2023			
33.	Probability of error for BASK	1	08.09.2023			
34.	Probability of error for BPSK	1	09.09.2023			
35.	Probability of error for BFSK	1	13.09.2023			
<b>No. of classes required to complete UNIT-III</b>		<b>10</b>	<b>No. of classes taken</b>			

**UNIT-IV: Information Theory and Source Coding**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Unit-IV	1	14.09.2023			
37.	Discrete message and information content	1	15.09.2023			
38.	Concept of Information, Average Information, Entropy, Information rate	1	16.09.2023			
39.	Mutual information and its properties	1	20.09.2023			
40.	Introduction to source coding, source coding theorem	1	21.09.2023			
41.	Shannon-Fano coding - Problems	1	22.09.2023			
42.	Huffman coding - Problems	1	23.09.2023			
43.	Solving Problems	1	27.09.2023			
44.	Channel Capacity of Gaussian channel	1	29.09.2023			
45.	BW-SNR tradeoff	1	30.09.2023			
<b>No. of classes required to complete UNIT-IV</b>		<b>10</b>	<b>No. of classes taken</b>			

**UNIT-V: Linear Block codes and Convolutional codes**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction to Unit-IV – Channel coding	1	04.10.2023			
47.	Linear Block Codes (LBC) – Matrix Representation, Encoding	1	05.10.2023			
48.	Syndrome decoding of LBC	1	06.10.2023			
49.	Error detection and correction capabilities of LBC	1	07.10.2023			
50.	Solving Problems	1	11.10.2023			
51.	Introduction to Binary cyclic codes – Systematic and non systematic form.	1	12.10.2023			

52.	Binary cyclic codes – Encoding and Syndrome Calculation	1	13.10.2023			
53.	Convolution codes- time domain, transform domain	1	14.10.2023			
54.	Convolution codes- Transform domain	1	18.10.2023			
55.	State diagrams, Trellis, Tree diagrams	1	19.10.2023			
56.	Decoding using Viterbi algorithm	1	20.10.2023			
57.	Decoding using Viterbi algorithm	1	21.10.2023			
58.	Solving Problems	1	25.10.2023			
59.	Revision	1	26.10.2023			
<b>No. of classes required to complete UNIT-V</b>		<b>14</b>	<b>No. of classes taken</b>			

### Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
		1	27.10.2023			
		1	28.10.2023			

### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)</b>	70
Total Marks = CIE + SEE	100



## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs. K Rani Rudrama	Dr. E V Krishna Rao	Dr. M Venkata Sudhakar	Dr. Y. Amar Babu



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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. V.Ravi Sekhara Reddy  
 Course Name & Code : Antennas and Wave Propagation & 20EC10  
 L-T-P Structure : 3-0-0 Credits : 3  
 Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y :2023-24

**Pre-Requisites:** EM Waves and Transmission Lines.

**Course Objectives:** This course provides the knowledge on Antennas and Radiation fundamentals. The course will expose different types of Antennas and their applications. The course also gives the complete information regarding Propagation of Radio wave in atmosphere.

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	<b>Understand</b> basic antenna parameters, radiation mechanism, characteristics of radio wave propagations ( <b>Understand – L2</b> )
CO2	<b>Analyze</b> wire antenna, ground, space, and sky wave propagation mechanism for communication purpose and various Antenna Arrays ( <b>Analyze – L4</b> )
CO3	<b>Design</b> HF, VHF and UHF Antennas ( <b>Apply – L3</b> )
CO4	<b>Apply</b> antenna measurement methods to assess antenna's performance ( <b>Apply – L3</b> )

**Course Articulation Matrix (Correlation between COs &POs, PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-		-	-	-		-	1	3	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	2	3	-	-
CO4	1	2	3	2	-	-			-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition
- T2** G.S.N Raju, "Antennas and Wave Propagation", Pearson Education Publishers.

### **REFERENCE BOOK(S):**

- R1** Jordan and Balmain, Electromagnetic fields and Radiating systems, Pearson Education Publishers.
- R2** John D. Kraus, "Antennas and Wave Propagation", TMH Publishers

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

#### **UNIT-I: Antenna Fundamentals and Radiation fundamentals:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	1	11-07-2023			
2.	Introduction to Unit-I	1	12-07-2023			
3.	Radiation mechanism-Single wire Antenna	1	13-07-2023			
4.	Current Distribution on a thin wire antenna	1	14-07-2023			
5.	Isotropic Radiators, Directional Antennas	1	18-07-2023			
6.	Antenna Parameters: Radiation intensity, Radiation Pattern,	1	19-07-2023			
7.	Total Power radiated, gain, Directivity, Radiation efficiency	1	20-07-2023			
8.	Power gain, HPBW, FNBW, effective aperture, effective length, Band Width	1	21-07-2023			
9.	Potential functions-heuristic approach, Maxwell's equation approach	1	25-07-2023			
10.	Potential functions for sinusoidal oscillations	1	26-07-2023			
11.	Analysis of Radiation fields of a Alternating current element	1	27-07-2023			
12.	Quarter wave Monopole and half wave dipole	1	28-07-2023			
13.	Power radiated by current element	1	01-08-2023			
14.	Radiation resistance of current element, quarter wave Monopole and half wave dipole	1	02-08-2023			
No. of classes required to complete UNIT-I : 14			No. of classes taken :			

#### **UNIT-II: Antennas Array Analysis:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Various forms of Antenna Arrays	1	03-08-2023			
16.	Linear Array of Two Point Sources	1	04-08-2023			
17.	Linear Array of and N-Point Sources	1	08-08-2023			
18.	Expression for electric field from two element arrays	1	09-08-2023			
19.	Expression for electric field from N element arrays,	1	10-08-2023			
20.	Broad-side array	1	11-08-2023			
21.	End-Fire array	1	16-08-2023			
22.	Method of pattern multiplication	1	17-08-2023			

23.	Binomial array	1	18-08-2023			
24.	Loop Antenna	1	22-08-2023			
No. of classes required to complete UNIT-II		<b>10</b>	No. of classes taken:			

### UNIT-III: HF, VHF and UHF Antennas:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Resonant and Non resonant antennas	1	23-08-2023			
26.	Helical Antenna	1	24-08-2023			
27.	Travelling wave antennas – V Antenna	1	25-08-2023			
28.	Inverted V Antenna	1	05-09-2023			
29.	Rhombic Antenna	1	07-09-2023			
30.	Broadband Antennas-Folded Dipole	1	08-09-2023			
31.	Yagi-Uda Antenna	1	12-09-2023			
32.	Log-Periodic Antenna	1	13-09-2023			
No. of classes required to complete UNIT-III : 08				No. of classes taken:		

### UNIT-IV: Microwave Antennas & Antenna Measurements:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Horn Antenna & Types	1	14-09-2023			
34.	Reflector Antennas- Corner Reflector	1	15-09-2023			
35.	Parabolic Reflector – (Geometry, types of feeds, F/D Ratio, Spill Over, Back Lobes)	2	19-09-2023			
36.	Lens Antenna, Fundamentals of Rectangular Patch antenna	1	20-09-2023			
37.	Measurement of Antenna parameters- Directional pattern	1	21-09-2023			
38.	Radiation resistance	1	22-09-2023			
39.	Gain (Two Antenna, Three Antenna Methods)	1	26-09-2023			
40.	Directivity, Beam width	1	27-09-2023			
41.	SLR	1	29-09-2023			
42.	Polarization, Impedance	1	03-10-2023			
No. of classes required to complete UNIT-IV: 11			No. of classes taken:			

### UNIT-V: Wave Propagation, Ground Wave Propagation, Sky Wave Propagation, Space Wave Propagation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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43.	Concepts of Propagation-frequency ranges	1	04-10-2023			
44.	Types of propagation	1	05-10-2023			
45.	Formation of Ionospheric Layers and their Characteristics	1	06-10-2023			
46.	Mechanism of Reflection and Refraction	1	10-10-2023			
47.	Critical Frequency	1	11-10-2023			
48.	MUF & Skip Distance	1	12-10-2023			
49.	Optimum Frequency	1	13-10-2023			
50.	LUHF, Virtual Height	1	17-10-2023			
51.	Fundamental Equation for free space Propagation	1	18-10-2023			
52.	Basic Transmission Loss Calculations	1	19-10-2023			
53.	Space Wave Propagation Mechanism	1	20-10-2023			
54.	LOS and Radio Horizon	1	25-10-2023			
55.	Duct Propagation	1	26-10-2023			
No. of classes required to complete UNIT-V :13			No. of classes taken			

### Contents beyond the Syllabus

S.No	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of microstrip patch Antennas	1	27-10-2023		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date:**

<b>Course Instructor</b> Dr.V.Ravi Sekhara Reddy	<b>Course Coordinator</b> Dr.V.Ravisekhara Reddy	<b>Module Coordinator</b> Dr. M.V.Sudhakar	<b>HOD</b> Dr. Y. Amar Babu
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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Smt. M V L Bhavani  
 Course Name & Code : Linear IC Applications – 20EC11  
 L-T-P Structure : 3-0-0 Credits: 3  
 Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y : 2023-24

**PRE-REQUISITE:** Analog Electronic Circuits

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides the knowledge on basic Integrated Circuit (IC), Op-amp internal structure and various open-loop and closed loop applications of it. Design of Active Filters and different waveform generators. It provides the importance of 555 timer and its applications. It also explains the Phased Locked Loop, its applications and ADC and DAC converters.

**COURSE OUTCOMES (CO):** At the end of the course, students will be able to

CO1:	<b>Identify</b> the building blocks of linear integrated circuits, characteristics and application of Op-Amps (Understand – L2)
CO2:	<b>Apply</b> the concept of feedback to op-amps for linear and non-linear applications. (Apply – L3).
CO3:	<b>Analyze</b> Op-Amp, 555 timer applications, phase locked loops to perform addition and multiplication of signals and voltage regulators using Linear ICs (Analyze – L4)
CO4:	<b>Design</b> active filters, waveform generators and data converters using Op Amps (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	-	-	-	2	-	-	-	1	-	1	-
CO2	3	2	2	-	-	-	-	2	-	-	-	1	-	2	-
CO3	3	3	1	-	-	-	-	2	-	-	-	1	-	2	-
CO4	3	2	3	1	-	-	-	2	-	-	1	1	-	3	-

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### **BOS APPROVED TEXT BOOKS:**

**T1** Ramakanth A.Gayakwad, Op-amps and Linear Integrated Circuits, Third edition, PHI Publishers, 2006.

**T2** Roy Choudhury D., Linear Integrated Circuits, Second edition, New Age International (P) Ltd.

#### **BOS APPROVED REFERENCE BOOKS:**

**R1** Adel S. Sedra and Kenneth Carless Smith, Microelectronic Circuits, Fifth Edition. Oxford University Press

**R2** Rashid M. H., Microelectronic Circuits: Analysis and Design, Second edition, PWS Publishing Company.

**Part-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I : TRANSISTOR CURRENT SOURCES & DIFFERENTIAL AMPLIFIERS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Subject , Discussion about Syllabus and course outcomes	1	03.07.2023		TLM2	
2.	Introduction to IC, Advantages,Applications	1	05.07.2023		TLM2	
3.	Basic Current Source	1	07.07.2023		TLM1	
4.	Widlar Current Source	1	10.07.2023		TLM1	
5.	Cascode Current Source	1	12.07.2023		TLM1	
6.	Wilson Current Source	1	14.07.2023		TLM1	
7.	Differential Amplifier: Classifications	1	15.07.2023		TLM1	
8.	DC & AC Analysis of Dual input balanced output & balanced output DA	1	17.07.2023		TLM1	
9.	DC & AC Analysis of Dual input unbalanced output & unbalanced output DA	1	19.07.2023		TLM1	
10.	DC & AC Analysis of Single input balanced output & unbalanced output DA	1	21.07.2023		TLM1	
11.	DC & AC Analysis of single input unbalanced output & unbalanced output DA	1	22.07.2023		TLM1	
12.	Specifications ,FET Differential amplifier	1	24.07.2023		TLM1	
13.	Level Translator, Current mirror circuit	1	26.07.2023		TLM1	
No. of classes required to complete UNIT-I :		13	No. of classes taken:			



**UNIT-II : OPERATIONAL AMPLIFIERS (OP-AMPS) & APPLICATIONS OF OP-AMPS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	OP- Amp: Block Diagram	1	28.07.2023		TLM2	
15.	Ideal & Practical Op- Amp and its characteristics	1	31.08.2023		TLM2	
16.	DC and AC Characteristics of Op- Amp	1	02.08.2023		TLM2	
17.	IC 741 specifications	1	04.08.2023			
18.	Measurement of slew rate and CMMR	1	05.08.2023		TLM1	
19.	Application of Op Amps: Inverting and Non-inverting amplifier	1	07.08.2023		TLM1	
20.	Integrator & Differentiator	1	09.08.2023		TLM1	
21.	Difference Amplifier, Instrumentation amplifier	1	11.08.2023		TLM1	
22.	Analog Multiplier, V to I converters	1	14.08.2023		TLM1	
23.	I to V converters, Rectifiers	1	16.08.2023		TLM1	
24.	Sample and Hold circuit, Log and Antilog amplifier	1	18.08.2023		TLM1	
25.	Integrator & Differentiator	1	19.08.2023		TLM1	
No. of classes required to complete UNIT-II		12	No. of classes taken:			

**UNIT-III : OP-AMP ACTIVE FILTERS, OP-AMP WAVEFORM GENERATORS & OP-AMP SINE WAVE OSCILLATORS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Op-amp Active Filters :1 <sup>st</sup> order Low pass and High pass filter using OP-Amp	1	21.08.2023		TLM2	
27.	2 <sup>nd</sup> order Low pass and High pass filter using OP-Amp	1	23.08.2023		TLM1	
28.	Band pass filter, Band reject filters and All pass filter	1	25.08.2023		TLM2	

29.	Op-amp wave form generators: Comparator, design and analysis of Schmitt trigger	1	26.08.2023		<b>TLM1</b>	
30.	Astable Multivibrator	1	04.09.2023		<b>TLM1</b>	
31.	Monostable Multivibrator	1	08.09.2023		<b>TLM1</b>	
32.	Triangular wave Generators	1	11.09.2023		<b>TLM1</b>	
33.	Op-amp sine wave oscillators: Design and analysis of RC phase shift oscillator	1	13.09.2023		<b>TLM1</b>	
34.	Wein Bridge oscillator	1	15.09.2023			
35.	Assignment -1	1	16.09.2023		<b>TLM3</b>	
No. of classes required to complete UNIT-III		10	No. of classes taken:			

#### UNIT-IV : 555 TIMER & IC VOLTAGE REGULATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction	1	20.09.2023		<b>TLM2</b>	
37.	Functional Diagram- Monostable multivibrators	1	22.09.2023		<b>TLM2</b>	
38.	Monostable multivibrators Applications	1	23.09.2023		<b>TLM2</b>	
39.	Functional Diagram- Astable multivibrators	1	25.09.2023		<b>TLM1</b>	
40.	Astable multivibrators and Applications	1	27.09.2023		<b>TLM1</b>	
41.	VCO - IC 566 & its features	1	29.09.2023		<b>TLM1</b>	
42.	IC 565 PLL Block Schematic	1	30.09.2023		<b>TLM1</b>	
43.	Applications of PLL	1	04.10.2023		<b>TLM1</b>	
44.	IC Voltage Regulators: Fixed Voltage Regulators	1	06.10.2023		<b>TLM1</b>	
45.	IC723 General Purpose Regulator	1	07.10.2023		<b>TLM1</b>	
No. of classes required to complete UNIT-IV		10	No. of classes taken:			

**UNIT-V : DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction	1	09.10.2023		TLM2	
47.	Digital to Analog Converters: Weighted resistor DAC,	1	11.10.2023		TLM2	
48.	R-2R Ladder DAC	1	16.10.2023		TLM2	
49.	Inverted R-2R DAC	1	18.10.2023		TLM2	
50.	Analog to Digital Converters: Flash Type ADC	1	20.10.2023		TLM1	
51.	Counter Type ADC	1	21.10.2023		TLM1	
52.	Successive Approximation ADC	1	25.10.2023		TLM1	
53.	Charge Balancing ADC	1	27.10.2023		TLM1	
54.	Dual Slope ADC	1	28.10.2023		TLM1	
No. of classes required to complete UNIT-V:		09	No. of classes taken:			

**Contents beyond the Syllabus**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
55.	Introduction to VLSI and Applications of VLSI	1	28.10.2023		TLM2	

**Teaching Learning Methods**

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS:**

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)(Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)</b>	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor  
Mrs. M.V L Bhavani

Course Coordinator  
Mrs. M.V L Bhavani

Module Coordinator  
Dr.G.Srinivasulu

HOD  
Dr.Y.Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

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## DEPARTMENT OF ECE

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor :** Dr. P. Rakesh Kumar, Associate Professor

**Course Name & Code :** Data Communication & Computer Networks – 20EC14

**Regulation:** R20

**L-T-P Structure :** 3-0-0

**Credits:** 03

**Program/Sem/Sec :** B. Tech. V-Sem., ECE A-Section

**A.Y.:** 2023-24

**PREREQUISITE:** Digital Communications

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides knowledge on Data Communication and Computer Networks and various protocols used in different layers.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	<b>Understand</b> the functions of the OSI, TCP/IP reference models. ( <b>Understand – L2</b> )
<b>CO2</b>	<b>Summarize</b> design issues for layer protocols. ( <b>Understand – L2</b> )
<b>CO3</b>	<b>Examine</b> the routing algorithms to find shortest paths for packet delivery. ( <b>Apply – L3</b> )
<b>CO4</b>	<b>Interpret</b> the operations of application layer protocols. ( <b>Understand – L2</b> )

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	-	-	-	-	-	-	-	-	3	3	-	-
<b>CO2</b>	2	1	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	-	2	2	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	2	2	-	-	-	-	-	-	-	-	-	3	3	-	-
<b>1 - Low</b>			<b>2 –Medium</b>						<b>3 - High</b>						

#### **TEXTBOOKS:**

**T1** Tanenbaum and Wetherall, “Computer Networks”, Pearson Education, 5<sup>th</sup> Edition.

**T2** Behrouz A. Forouzan, “Data Communication and Networking”, 4<sup>th</sup> Edition, Tata McGraw hill, New Delhi, 2006.

#### **REFERENCE BOOKS:**

**R1** S. Keshav, “An Engineering Approach to Computer Networks”, Pearson Education, 2<sup>nd</sup> Edition.

**R2** W. A. Shay, “Understanding Communications and Networks”, Cengage Learning, 3<sup>rd</sup> Edition

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN)**

#### **UNIT-I: Introduction, Physical Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CO discussion and overview of Syllabus	1	04-07-2023		TLM2	
2.	Introduction to Data Communication and Computer Networks	1	05-07-2023		TLM1	
3.	Network Hardware	1	06-07-2023		TLM2	
4.	Network software	1	11-07-2023		TLM2	
5.	Network models LAN, WAN, MAN,	1	12-07-2023		TLM2	
6.	OSI Reference Model	1	13-07-2023		TLM2	
7.	TCP/IP Reference Model	1	15-07-2023		TLM2	
8.	Comparison between OSI and TCP/IP	1	18-07-2023		TLM2	
9.	Critique of OSI and TCP/IP	1	19-07-2023		TLM2	
10.	Physical Layer: Guided Transmission Medium	1	20-07-2023		TLM2	
11.	Guided Transmission Medium	1	22-07-2023		TLM2	
12.	Wireless Transmission Medium	1	25-07-2023		TLM2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

#### **UNIT-II: Data Link Layer, Medium Access Control Sub Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to DLL, Design Issues	1	26-07-2023		TLM2	
14.	Framing Methods	1	27-07-2023		TLM2	
15.	Error Detection and Correction Codes	1	01-08-2023		TLM2	
16.	CRC, Checksum	1	02-08-2023		TLM1	
17.	Stop & wait, Sliding window, one bit, go-back -n, Selective repeat protocols,	1	03-08-2023		TLM2	
18.	MAC sub layer, channel allocation problem	1	05-08-2023		TLM2	
19.	Multiple Access protocols- ALOHA, CSMA protocols, CSMA with collision detection, Collision free protocols	1	08-08-2023		TLM2	
20.	Ethernet	1	09-08-2023		TLM2	
21.	Wireless LANs-Infrastructure, Protocol stack	1	10-08-2023		TLM2	
22.	MAC frame, 802.11 services	1	16-08-2023		TLM2	
23.	Bluetooth-Architecture, Protocol stack, Frame structure	1	17-08-2023		TLM2	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		

**UNIT-III: Network Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Network Layer Design Issues- store and forward	1	19-08-2023		TLM2	
25.	Datagrams and virtual circuits	1	22-08-2023		TLM2	
26.	Routing algorithms- Optimality Principle	1	23-08-2023		TLM2	
27.	Shortest Path Algorithm, Flooding,	1	24-08-2023		TLM1	
28.	Distance vector routing	1	26-08-2023		TLM1	
29.	Link state routing	1	05-09-2023		TLM2	
30.	Hierarchical routing	1	06-09-2023		TLM2	
31.	Board cast routing & Multicast Routing	1	07-09-2023		TLM2	
32.	Congestion control in data subnets, warning bits	1	09-09-2023		TLM2	
33.	Load shedding, choke packets, Jitter control, RED	1	12-09-2023		TLM2	
No. of classes required to complete UNIT-III: 10					No. of classes taken:	

**UNIT-IV: Internetworking, Transport Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Internetworking	1	13-09-2023		TLM2	
35.	Tunneling, Packet Fragmentation	1	14-09-2023		TLM2	
36.	Network Layer in the Internet	1	16-09-2023		TLM2	
37.	IPv4	1	20-09-2023		TLM2	
38.	IPV6, comparison between IPv4 and IPv6	1	21-09-2023		TLM2	
39.	Internet control protocols, OSPF BGP	1	23-09-2023		TLM2	
40.	Transport layer services to the upper Layers	1	26-09-2023		TLM2	
41.	Addressing, Connection establishment	1	27-09-2023		TLM2	
42.	Connection release, Crash Recovery	1	30-09-2023		TLM2	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

**UNIT-V: The Internet Transport Protocols, Application Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Internet transport protocols: UDP-RPC, Real Time Transport Protocols	1	03-10-2023		TLM2	
44.	Internet transport protocols: TCP, TCP service model	1	04-10-2023		TLM2	
45.	TCP Segment Header	1	05-10-2023		TLM2	
46.	Domain Name system	1	07-10-2023		TLM2	
47.	Email Architecture and services, SMTP	1	10-10-2023		TLM2	
48.	WWW and its architecture	1	11-10-2023		TLM2	
49.	WWW and its architecture	1	12-10-2023		TLM2	
50.	FTP, FTP Commands & Replies	1	14-10-2023		TLM2	
51.	Structure of Management Information	1	17-10-2023		TLM2	

52.	Management Information Base	1	18-10-2023		TLM2	
53.	Simple Network Management Protocol	1	19-10-2023		TLM2	
54.	Revision	1	21-10-2023		TLM1	
<b>No. of classes required to complete UNIT-V: 12</b>				<b>No. of classes taken:</b>		

### Contents beyond the Syllabus:

S. No.	Topics	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
55.	Network Security	1	26-10-2023		TLM2	
56.	Mobile Networks	1	28-10-2023		TLM2	
<b>No. of classes required to complete beyond syllabus: 02</b>				<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100



## **PART-D**

### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date: 03-07-2023**

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Dr. P. Rakesh Kumar</b>	<b>Dr. P. Rakesh Kumar</b>	<b>Dr. M. V. Sudhakar</b>	<b>Dr. Y. Amar Babu</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. S.Naganjaneyulu

Course Name & Code : OOP through JAVA(20IT81)

L-T-P Structure : 3-0-0

Credits : 3

Program/Sem/Sec : B.Tech. -ECE / V-Sem /A

A.Y.: 2023 - 24

**PRE-REQUISITE: Programming for Problem Solving Using C**

**COURSE EDUCATIONAL OBJECTIVE (CEO):** Concentrates on the methodological and technical aspects of software design and Programming based on Object-Oriented Programming (OOP). Acquire the basic knowledge and skills necessary to implement Object-Oriented Programming Techniques in software development through JAVA. Know about the importance of Collections and GUI based applications through JAVA.

**COURSE OUTCOMES (COs):** At the end of the course, the student will be able to:

<b>C01</b>	Understand Object Oriented Programming Concepts through constructs of JAVA. <b>(Understand- L2)</b>
<b>C02</b>	Apply the concepts of Inheritance and Polymorphism on real-world applications. <b>(Apply - L3)</b>
<b>C03</b>	Implement reusability using interface and packages. <b>(Understand- L2)</b>
<b>C04</b>	Construct robust applications using exception handling. <b>(Apply - L3)</b>
<b>C05</b>	Understand multi-threading concepts. <b>(Understand - L2)</b>

**COURSE ARTICULATION MATRIX**(Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>C01</b>	3	1	-	-	-	-	-	-	-	-	-	-
<b>C02</b>	3	2	-	-	1	-	-	-	-	-	-	3
<b>C03</b>	3	1	-	-	2	-	-	-	-	-	-	3
<b>C04</b>	3	1	-	-	2	-	-	-	-	-	-	3
<b>C05</b>	3	2	-	-	2	-	-	-	-	-	-	3

### **TEXTBOOK:**

**T1: Java Fundamentals** – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

### **REFERENCE BOOKS:**

**R1:** The Java™ Programming Language: Ken Arnold, James Gosling, Pearson

**R2:** Introduction to Java Programming 7/e, Brief version, Y.Daniel Liang, Pearson

**R3:** Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program P.J.Deitel and H.M.Deitel, PHI.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN):**

#### **UNIT – I: Introduction to OOP & JAVA:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Java Buzzwords / Features	1	11/07/23		TLM1,2	
2.	Object Oriented Programming (OOP) concepts	1	12/07/23		TLM1,2	
3.	Java History, Advantages	1	13/07/23		TLM1,2	
4.	Datatypes, Operators, Expressions	1	15/07/23		TLM1,2	
5.	Control Statements	1	18/07/23		TLM1,2	
6.	Methods and recursion , Sample programs	1	19/07/23		TLM1,2	
7.	Java Objects and References	1	20/07/23		TLM1,2	
8.	Constructors	1	22/07/23		TLM1,2	
9.	this keyword	1	25/07/23		TLM1,2	
10.	Arrays (single and multi-dimensional),	2	26/07/23 27/07/23		TLM1,2	
11.	String, StringBuffer, StringTokenizer Classes	3	01/08/23 02/08/23		TLM1,2	
No. of classes required to complete UNIT – I: 12				No. of classes taken:		

#### **UNIT – II: Extending Classes/ Reusability**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	<b>Inheritance</b> : Introduction , Derived Classes, Advantages and Types of Inheritance	2	03/08/23 05/08/23		TLM1,2	
13.	Implementation of Inheritance	1	08/08/23		TLM1,2	
14.	Inheritance and Member Accessibility	1	09/08/23		TLM1,2	
15.	Overriding, super keyword	1	10/08/23		TLM1,2	
16.	abstract classes and methods	1	16/08/23		TLM1,2	
17.	final keyword, final methods and final classes	1	17/08/23		TLM1,2	
18.	Dynamic Binding, Polymorphism	1	19/08/23		TLM1,2	
No. of classes required to complete UNIT – II: 08				No. of classes taken:		

#### **UNIT – III: Interfaces & Packages**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	<b>Interfaces:</b> Differences between classes and interfaces	1	22/08/23		TLM1,2	
20.	defining an interface	1	23/08/22		TLM1,2	

21.	implementing interface	1	24/08/23		TLM1,2	
22.	variables in interface, extending interfaces	1	26/08/23		TLM1,2	
23.	<b>Packages:</b> Defining, Creating	1	05/09/23		TLM1,2	
24.	Accessing a Package,	1	07/09/23		TLM1,2	
25.	importing packages,	1	12/09/23		TLM1,2	
26.	access controls (public, protected, default and private).	1	13/09/23		TLM1,2	
27.	Wrapper Classes (Like Integer, Float, Double).	1	14/09/23		TLM1,2	
<b>No. of classes required to complete UNIT – III: 09</b>				<b>No. of classes taken:</b>		

#### UNIT – IV: Exception handling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	<b>Exception Handling:</b> Concepts of exception handling	1	16/09/23		TLM1,2	
29.	benefits of exception handling	1	19/09/23		TLM1,2	
30.	usage of try, catch	1	20/09/23		TLM1,2	
31.	multiple catch clause	1	21/09/23		TLM1,2	
32.	Nested try, throw	1	23/09/23		TLM1,2	
33.	throws	1	26/09/23		TLM1,2	
34.	finally	1	27/09/23		TLM1,2	
35.	built in exceptions	1	30/09/23		TLM1,2	
36.	creating own exception	1	03/10/23		TLM1,2	
<b>No. of classes required to complete UNIT – IV: 09</b>				<b>No. of classes taken:</b>		

#### UNIT – V: Multithreading

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Multithreading: Introduction	1	04//10/23		TLM1,2	
38.	Thread life cycle	1	05/10/23		TLM1,2	
39.	creating threads (by extending thread class)	1	07/10/23		TLM1,2	
40.	creating threads (implementing Runnable Interface)	1	10/10/23		TLM1,2	
41.	Example programs on threads	1	12/10/23		TLM1,2	
42.	Synchronization : method, Synchronization block	1	17/10/23		TLM1,2	
43.	Thread Priorities	1	18/10/23		TLM1,2	
44.	isAlive() and join() methods	1	19/10/23		TLM1,2	
45.	Inter thread Communication	2	21/10/23 24/10/23		TLM1,2	
<b>No. of classes required to complete UNIT – V:10</b>				<b>No. of classes taken:</b>		

**Content Beyond the Syllabus:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction to collection framework	1	25/10/23		TLM1,2	
47.	List: ArrayList, LinkedList	1	26/10/23		TLM1,2	
48.	Vector, Sets: Hashed Set	1	28/10/23		TLM1,2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS (R20 Regulation):**

Evaluation Task	Marks
Assignment – I(Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I – Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I – Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment – II(Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II – Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II – Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>P01</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>P02</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>P03</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>P04</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>P05</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>P06</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice
<b>P07</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>P08</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>P09</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>P010</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>P011</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>P012</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr S Naganjaneyulu	Dr S Naganjaneyulu	Dr.K.Phaneendra	Dr B.Srinivasa Rao
Signature				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs. K Rani Rudrama  
Course Name & Code : Digital Communication Lab – 20EC57  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This Course provides practical exposure on different aspects of digital communications. It demonstrates the importance of different modulation techniques in digital communication systems. It also gives the knowledge about different encoding and decoding techniques used in digital communication systems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Interpret</b> baseband and pass band modulation and demodulation techniques ( <b>Understand– L2</b> )
<b>CO2</b>	<b>Apply</b> coding techniques for error detection and correction in digital data transmission ( <b>Apply – L3</b> )
<b>CO3</b>	<b>Implement</b> frequency and phase shift keying techniques using Software Defined Radio ( <b>Apply – L3</b> ).
<b>CO4</b>	<b>Adopt</b> effective communication, presentation and report writing skills ( <b>Apply – L3</b> ).

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO2</b>	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	2	-	2	3	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’



**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section – A****Batch-1(21761A0401 to 21761A0436) Monday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	03.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	10.07.2023			
2	Experiment – 2	CO1,CO4	3	17.07.2023			
3	Experiment – 4	CO1,CO4	3	24.07.2023			
4	Experiment – 5	CO1,CO4	3	07.08.2023			
5	Experiment – 6	CO1,CO4	3	14.08.2023			
6	Experiment – 8	CO2,CO4	3	21.08.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	04.09.2023			
8	Experiment – 7	CO1,CO4	3	11.09.2023			
9	Experiment – 9	CO2,CO4	3	25.09.2023			
10	Experiment – 10	CO3,CO4	3	25.09.2023			
11	Experiment – 11	CO3,CO4	3	09.10.2023			
12	Experiment – 12	CO3,CO4	3	09.10.2023			
--	Internal Examination	--	3	16.10.2023			

**Batch-2 (21761A0437 to 21761A0464 & 22765A0401 to 21765A0408) Friday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	07.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	14.07.2023			
2	Experiment – 2	CO1,CO4	3	21.07.2023			
3	Experiment – 4	CO1,CO4	3	28.07.2023			
4	Experiment – 5	CO1,CO4	3	04.08.2023			
5	Experiment – 6	CO1,CO4	3	11.08.2023			
6	Experiment – 8	CO2,CO4	3	18.08.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	25.08.2023			
8	Experiment – 7	CO1,CO4	3	08.09.2023			
9	Experiment – 9	CO2,CO4	3	15.09.2023			
10	Experiment – 10	CO3,CO4	3	22.09.2023			
11	Experiment – 11	CO3,CO4	3	29.09.2023			
12	Experiment – 12	CO3,CO4	3	06.10.2023			
13	Revision		3	13.10.2023			
--	Internal Examination		3	27.10.2023			

**Experiments to be conducted:**

Exp. No	CYCLE-1	Exp. No	CYCLE-2
1	Generate digital signal from analog using Pulse Code Modulation and reconstruct original signal.	3	Perform Adaptive Delta Modulation and obtain the reconstructed original signal.
2	Demonstrate the analog to digital conversion using Delta Modulation and Demodulation	7	Generate the digital modulated signal using Quadrature Phase shift Keying Modulation and reconstruct the original signal
4	Generate the Amplitude Shift Keying Modulated signal and reconstruct the original signal using demodulation.	9	Apply the Binary Cyclic Code for error detection and correction of digital data
5	Obtain the modulated and demodulated signals for Frequency Shift Keying	10	Binary Frequency Shift Keying Modulation and Demodulation
6	Perform a digital modulation using Binary Phase Shift Keying and reconstruct the original signal using coherent detection	11	Binary Phase Shift Keying Modulation and Demodulation
8	Examine the error detection and correction process using Linear Block Code	12	Quadrature Phase Shift Keying Modulation and Demodulation

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

Evaluation Task	Expt. no's	Marks
Day to Day work = A	1,2,3,4,5,6,7,8...	A = 05
Record = B	1,2,3,4,5,6,7,8...	B = 05
Internal Test = C	1,2,3,4,5,6,7,8...	C = 05
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

Mrs. K Rani Rudrama

Course Coordinator

Mrs. K Rani Rudrama

Module Coordinator

Dr. M Venkata Sudhakar

HOD

Dr. Y. Amar Babu



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L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Smt. M V L Bhavani / Mrs. K. Balavani  
Course Name & Code : Linear IC Applications Lab – 20EC58  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y : 2023-24

#### COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course provides the practical knowledge on Op-Amp applications like arithmetic circuits, filters and oscillators also provides knowledge on IC555 timer and IC723.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Demonstrate</b> the characteristics and applications of Op-Amps (Understand – L2)
<b>CO2</b>	<b>Apply</b> the 555 Timer circuit concepts for the realization of waveform generators (Apply – L3).
<b>CO3</b>	<b>Design</b> Active filters, arithmetic circuits, waveform generators and data converters using Op-Amp (Apply – L3)
<b>CO4</b>	<b>Adapt</b> effective Communication, presentation and report writing skills (Apply – L3)

#### COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	2	-
<b>CO2</b>	2	3	1	1	-	-	-	2	1	2	-	1	-	2	-
<b>CO3</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	3	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section – A****Batch-1(21761A0437 to 21761A0464 and 22765A0401to 22765A0408) Monday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	03-07-2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	10-07-2023			
2	Experiment – 2	CO1,CO3	3	17-07-2023			
3	Experiment – 3	CO1,CO3	3	24-07-2023			
4	Experiment – 4	CO1,CO3	3	31.07.2023			
5	Experiment – 5,6	CO1,CO3	3	07.08.2023			
Cycle – II							
7	Experiment – 3	CO2	3	14.08.2023			
8	Experiment – 7	CO2	3	21.08.2023			
9	Experiment – 9	CO1,CO3	3	11.09.2023			
10	Experiment – 10	CO1,CO3	3	25.09.2023			
11	Experiment – 11	CO1,CO3	3	09.10.2023			
--	Internal Examination	--	3	16.10.2023			

**Batch-2 (20761A0401 to 20761A0436) Friday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	07-07-2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	14-07-2023			
2	Experiment – 2	CO1,CO3	3	21-07-2023			
3	Experiment – 4	CO1,CO3	3	28-07-2023			
4	Experiment – 5	CO1,CO3	3	04-08-2023			
5	Experiment – 6	CO1,CO3	3	11-08-2023			
6	Experiment – 8	CO1,CO3	3	18.08.2023			
Cycle – II							
7	Experiment – 3	CO2	3	08.09.2023			
8	Experiment – 7	CO2	3	15.09.2023			
9	Experiment – 9	CO1,CO3	3	22.09.2023			
10	Experiment – 10	CO1,CO3	3	29.09.2023			
11	Experiment – 11	CO1,CO3	3	06.10.2023			
12	Experiment beyond syllabus	CO3	3	13.10.2023			
13	Revision	CO1,CO3	3	20.10.2023			
--	Internal Examination	--	3	27.10.2023			

**Experiments to be conducted:**

<b>Exp. No</b>	<b>CYCLE-1</b>	<b>Exp. No</b>	<b>CYCLE-2</b>
1	Verification of functionality of Inverting and Non-inverting amplifiers for the Sine and Square wave inputs.	7	Design and Realization of 555 timer based Monostable multivibrator for Pulse generation.
2	Realization of Adder and Subtractor using Op-Amp.	8	Design and Realization of 555 timer based Astable multivibrator for square wave generation
3	Realization of Differentiator and Integrator using Op-Amp	9	Design and Realization of RC phase shift Oscillator for sinusoidal signal generation using Op-Amp.
4	Design, Realization and plot the frequency response of First order Low pass and High pass filters using Op-Amp.	10	Design and Realization of Function generator for square wave and triangular waves using Op-Amps.
5	Design and plot the frequency response of Band pass filter using Op-Amp.	11	Design and Realization of 3-bit Digital to Analog converter using Op-Amp
6	Design and Realization of Op-Amp based Astable multivibrator for Square wave generation.		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

<b>Evaluation Task</b>	<b>Expt. no's</b>	<b>Marks</b>
Day to Day work = <b>A</b>	1,2,3,4,5,6,7,8...	<b>A = 05</b>
Record = <b>B</b>	1,2,3,4,5,6,7,8...	<b>B = 05</b>
Internal Test = <b>C</b>	1,2,3,4,5,6,7,8...	<b>C = 05</b>
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>



## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor  
Smt. M V L Bhavani

Course Coordinator  
Mrs. K. Balavani

Module Coordinator  
Dr. G.Srinivasulu

HOD  
Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. V.Ravi Sekhara Reddy  
 Course Name & Code : Design and Simulation of Antennas Lab & 20ECS3

L-T-P Structure : 1-0-2 Credits: 2  
 Program/Sem/Sec : B.Tech., ECE., V-Sem., Sections- A A.Y :2023-24

**Pre-Requisites:** Electromagnetic waves and Transmission Lines.

**Course Objectives:** In this course, student will learn about how to design and analyze various transmission lines and antennas using Ansys HFSS Software

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	Understand the basic concepts of transmission lines and antennas according to Requirement and applications. ( <b>Understand – L2</b> )
CO2	Apply software tools for different transmission lines and antennas. ( <b>Apply – L3</b> )
CO3	Analyze the different parameters of transmission lines and antennas. ( <b>Analyze – L4</b> )
CO4	Design the different parameters of transmission lines and antennas. ( <b>Apply – L3</b> )
CO5	Adapt effective Communication, presentation and report writing skills (Apply – L3)

**Course Articulation Matrix (Correlation between COs &POs, PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put ‘-’

**1**-Slight(Low),

**2**-Moderate(Medium),

**3**-Substantial (High).

### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition
- T2** JR James, PS Hall "Handbook of Microstrip Antennas" IEE Electromagnetic waves series, 1986.

### **REFERENCE BOOK(S):**

- R1** Matthew N.O. Sadiku, "Elements of Engineering Electromagnetics", Oxford University Press, 4th Edition.
- R2** David. M. Pozar "Microwave Engineering", 4th edition, WILEY Publication, 2013.

**PART-B (Theory)****COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT-I:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction of the course Design and Simulation of Antennas	1	11-07-2023			
2.	Introduction to S parameters, Return Loss	1	18-07-2023			
3.	Voltage Standing Wave Ratio(VSWR)	1	25-07-2023			
4.	Transmission coefficient	1	01-08-2023			
5.	Basics of HFSS simulation software	1	08-08-2023			
6.	Transmission lines-short circuit	1	22-08-2023			
7.	Transmission lines-open circuit	1	05-09-2023			
No. of classes required to complete UNIT-I : 7			No. of classes taken :			

**UNIT-II:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction to micro strip patch antennas	1	12-09-2023			
9.	Design specifications	1	19-09-2023			
10.	Rectangular Patch Antennas	1	26-09-2023			
11.	Circular Patch Antennas	1	03-10-2023			
12.	Dual band Patch antennas	1	10-10-2023			
13.	Wide band Patch Antennas	1	17-10-2023			
14.	Revision	1	24-10-2023			
No. of classes required to complete UNIT-II		7	No. of classes taken:			

**PART-B (Lab)****COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

S.No.	Experiment Name	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Introduction-Design and Simulation of Antennas	3	11-07-2023			
2.	Design of micro strip patch antennas using strip line feed and coaxial feed	3	18-07-2023			
3.	Design of patch antennas for Wi-Fi and Wi-Max applications.	3	25-07-2023			
4.	Design of Rectangular and Circular micro strip patch.	3	01-08-2023			
5.	Design of Dipole and dual band antenna,	3	08-08-2023			

6.	Design of microstrip line	3	22-08-2023			
7.	Design of open and short circuit transmission line	3	05-09-2023			
8.	Design of multi stub unit	3	12-09-2023			
9.	Study of characteristic impedances of transmission line	3	19-09-2023			
10.	Design of project by students	3	26-09-2023			
11.	Design of project by students	3	03-10-2023			
12.	Presentation	3	10-10-2023			
13.	Presentation	3	17-10-2023			
14.	Documentation	3	24-10-2023			
No. of classes required to complete UNIT-III : 14				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS (R20 Regulation):**

Report	<b>10</b>
Quality of work	10
Presentation	20
Interaction / Queries	10
Total	50

### **PART-D**

#### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

**PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
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<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
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<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date:****Course Instructor**

Dr. V.Ravi Sekhara Reddy

**Course Coordinator**

Dr. B Siva Hari Prasad

**Module Coordinator**

Dr. M.V.Sudhakar

**HOD**

Dr. Y. Amar Babu



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L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : Ms. G Asha/Smt M V L Bhavani

Course Name & Code : Association & 20ASSOC

Program/Sem/Sec : B.Tech., ECE., V-Sem, A Sec

A.Y : 2023-24

**PART-B**

**PLAN OF ACTION (Association of Electronics and Communication Engineers of LBRCE):-**

S.No.	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1	Introduction to the Association and its activities followed by JAM	10-07-2023		
2	Discussion on Community Service Projects	17-07-2023		
3	Group Discussion on Orissa Train Accident	24-07-2023		
4	Quiz-current affairs	31-07-2023		
5	Technology update-Presentation on electrical vehicles	07-08-2023		
6	Group Discussion on Chendrayan-3	14-08-2023		
7	Debate-Role of AI on Man Kind.	21-08-2023		
8	Speeches on Usage of mobiles-Effecting young minds	04-09-2023		
9	Essay Writing- Necessity to save earth from pollution	11-09-2023		
10	Presentation on Role of Technology in economical growth of a country	25-09-2023		
11	Presentation on 5G Technology	09-10-2023		
12	Technical Quiz	16-10-2023		

Course Instructors

1. Ms. G Asha
2. Smt. M V L Bhavani

HOD

Dr.Y.Amar Babu



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**DEPARTMENT OF ELECTRONICS & COMMUNICATIONS  
ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : **Dr. Kavuluru VenuGopal**  
 Course Name & Code : **DATABASE MANAGEMENT SYSTEM CONCEPTS & 20ITM3**  
 L-T-P Structure : **3-1-0** **Credits : 4**  
 Program/Sem/Sec : **B. Tech (Minor), ASE, ECE, EEE, MECH** **A. Y : 2023-24**

**PREREQUISITE:** Elementary set theory, concepts of relations and functions, propositional logic data structures (trees, Graphs, dictionaries) & File Concepts.

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course enables the students to know about DBMS basic concepts, Database Languages, Database Design, Normalization process and Transaction processing and Indexing.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Demonstrate</b> the Basic Components of Database Management System. <b>(Understand -L2)</b>
<b>CO 2</b>	<b>Design</b> Entity-Relationship Diagrams for different applications. <b>(Apply -L3)</b>
<b>CO 3</b>	<b>Examine</b> the relational data model and various constraints. <b>(Apply- L3)</b>
<b>CO 4</b>	<b>Demonstrate</b> Structured Query Language languages (SQL) to manage relational databases and perform various operations on the data. <b>(Apply- L3)</b>
<b>CO 5</b>	<b>Employ</b> principles of normalization for effective database design & transaction management. <b>(Apply- L3)</b>

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	2	-	-	-	-	-	-	-	-	-	3	2	2
<b>CO2</b>	3	3	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO3</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO4</b>	2	1	2	-	-	-	-	-	-	-	-	-	3	2	3
<b>CO5</b>	2	1	2	-	-	-	-	-	-	-	-	-	2	3	3

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

**1-** Slight (Low), **2** – Moderate (Medium), **3** - Substantial(High)

**TEXT BOOKS :**

<b>T1</b>	Henry F. Korth, Abraham Silberschatz, S. Sudarshan, "Database Concepts", McGraw Hill, 6th edition, 2009. B
<b>T2</b>	RamezElmasri, Shamkanth . Navathe, "Fundamentals Of Database Systems", Addison Wesley, 6th edition, 2010.

**REFERENCE BOOKS:**

<b>R1</b>	Raghu Ramakrishna, Johannes Gehrke, "Database Management System", McGraw Hill 3rd edition, 2000.
<b>R2</b>	Date C. J, "An Introduction to Database System", Pearson Education, 8th edition, 2003.
<b>R3</b>	Shara Maheshwari, Ruchi Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi, 2005.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction**

UNIT-1: Introduction						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	2	12-.07.2023		TLM1,2	
2.	Introduction, An overview of database management system, Database system Vs file system	2	14.07.2023		TLM1,2	
3.	Database system concepts and architecture, Data models schema and instances	2	18.07.2023		TLM1,2	
4.	Data independence and database language and interfaces	2	21.07.2023		TLM1,2	
5.	Data definitions language, DML, Overall Database Structure	2	21-07.2023		TLM1,2	
6.	Revision on Unit-1	2	26.07.2023		TLM1,2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

**UNIT-II: Entity Relationship Model**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	ER model concepts - attributes, entity, Relationships	2	28.07.2023		TLM1,2	
2.	notation for ER diagram, Mapping constraints	2	01.08.2023		TLM1,2	
3.	Relationships of higher degree, keys -Concepts of Super Key, and identity key, primary key	2	04.08.2023		TLM1,2	
4.	Generalization,Aggregation	2	08.08.2023		TLM1,2	
5.	Reduction of ER diagrams to tables	2	11.08.2023		TLM1,2	
6.	<b>Revision on Unit - II</b>	2	16.08.2023		TLM1,2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		



**UNIT-III: Relational Data Model:**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Relational data model concepts	2	18.08.2023		TLM1,2	
2.	Integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints	2	23.08.2023		TLM1,2	
3.	referential integrity	2	25.08.2023		TLM1,2	
4.	Keys constraints	2	05.09.2023		TLM1,2	
5.	Domain constraints	2	08.09.2023		TLM1,2	
6.	Relational Algebra	2	12.09.2023		TLM1,2	
7.	Revision of UNIT-3 & Assignment-I	2	13.09.2023		TLM1,2	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		
I MID EXAMINATIONS				28/08/2023 TO 02/09/2023		

**UNIT-IV: Introduction to SQL**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of SQL, Advantage of SQL	2	15.09.2023		TLM1,2	
2.	SQL Data types and Literals	2	22.09.2023		TLM1,2	
3.	Insert, Update and Delete Operations	2	26.09.2023		TLM1,2	
4.	Tables, Views and Indexes	2	29.09.2023		TLM1,2	
5.	Nested Queries, Aggregate Functions	2	03.10.2023		TLM1,2	
6.	Joins, Unions, Intersection, Minus.	2	04.10.2023		TLM1,2	
7.	Revision of Unit-4	2	06.10.2023		TLM1,2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		

**Unit -V : Normalization**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Functional Dependencies	2	10.10.2023		TLM1,2	
2.	Normal Forms - First, Second	2	11.10.2023		TLM1,2	
3.	Third Normal Forms, BCNF.	1	13.11.2023		TLM1,2	
4.	Transaction System, Testing of Serializability	1	13.10.2023		TLM1,2	
5.	Serializability of Schedules, Conflict & View Serializability	1	17.11.2023		TLM1,2	
6.	Recoverability, Deadlock Handling.	1	18.10.2023		TLM1,2	
7.	<b>Revision of UNIT-5 &amp; Assignment-II</b>	2	20.10.2023		TLM1,2	
No. of classes required to complete UNIT-V: 7				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM1,2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C**

Evaluation Task	Marks
Assignment – I(Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I – Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I – Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment – II(Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II – Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II – Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	<b>M=30</b>
Cumulative Internal Examination (CIE): M	<b>30</b>
Semester End Examination (SEE)	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	<b>Organize, Analyze and Interpret the data to extract meaningful conclusions.</b>
<b>PSO 2</b>	<b>Design, Implement and Evaluate a computer-based system to meet desired needs.</b>
<b>PSO 3</b>	<b>Develop IT application services with the help of different current Engineering tools.</b>

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. Kavuluru Venu Gopal	Dr. Kavuluru Venu Gopal	Dr. B.Srinivasa Rao	Dr.B.Srinivasa Rao



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),  
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution  
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada  
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs Swathi Buragadda  
Course Name & Code : IDAA (20CSM7)  
L-T-P Structure : 3-1-0 Credits : 4  
Program/Sem/Sec : B.Tech., ECE,EEE V-A,B,C A.Y: 2023-24

**PRE-REQUISITE:** Data structures and DMS

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to learn various algorithm design techniques and analyze the computing resources of the algorithms and motivate the students to design new algorithms for various problems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Identify the characteristic of an algorithm and analyses its time and space complexity. (Understand L2)
<b>CO 2</b>	Apply the divide-and-conquer method for solving problems like searching and sorting. (Apply - L3)
<b>CO 3</b>	Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. (Apply - L3)
<b>CO 4</b>	Apply dynamic programming paradigm to solve optimization problems like travelling salesperson problem, 0/1 knapsack problem, Optimal binary search tree (Apply- L3)
<b>CO 5</b>	Analyze the backtracking and branch and bound search methods on optimization problems like N-queen, sum of subsets, 0/1 knapsack, Hamiltonian circuit and so on. (Apply- L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
<b>CO3</b>	2	2	-	1	-	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	2	3	-	1	-	-	-	-	-	-	-	-	-	-	1
<b>CO5</b>	2	3	1	-	-	-	-	-	-	-	-	-	-	-	1

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

#### **TEXT BOOKS:**

T1: Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Computer Algorithms', Galgotia Publications.

T2: Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, Pearson, 2007.

**REFERENCE BOOKS:**

- R1: Aho, Hopcroft & Ullman, 'The Design and Analysis of Computer Algorithms',  
Addison Wesley publications
- R2: Thomas H. Cormen et al, 'Introduction to Algorithms', PHI.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section C****UNIT-I : Introduction**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	10.07.2022		TLM1	
2.	Algorithm definition and Specifications	1	12.07.2023		TLM1	
3.	Performance Analysis	2	14.07.2023		TLM1	
4.	Time Complexity and space complexity					
5.	Asymptotic Notations- Big-Oh, Omega and Theta	1	17.07.2023		TLM1	
6.	Revision	1	19.07.2023		TLM3	
No. of classes required to complete UNIT-I		6		No of classes taken		

**UNIT-II: Divide & Conquer**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Divide & Conquer Technique: General Method	1	21.07.2023		TLM1	
8.	Binary Search and its analysis	1	21.07.2023		TLM1	
9.	Finding Maximum and Minimum and its Analysis	1	24.07.2023		TLM1	
10.	Merge sort and its Analysis	1	26.07.2023		TLM1	
11.	Quick Sort algorithm and its analysis	1	28.07.2023		TLM1	
12.	Closest pair of points	1	28.07.2023		TLM1	
13.	Revision	1	02.08.2023		TLM3	
<b>No. of classes required to complete UNIT-II</b>		7		<b>No of classes taken</b>		

**UNIT-III: The Greedy method**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Greedy Method – Introduction, General method	1	04.08.2023		TLM1	

15.	Knapsack problem, Example problem	2	04.08.2023		TLM1	
16.	Job sequencing with deadlines, Example problem	2	07.08.2023 & 09.08.2023		TLM1	
17.	Minimum cost spanning trees, example problem	2	11.08.2023		TLM1	
18.	Optimal storage on tapes, Example problem	2	14.08.2023 & 16.08.2023		TLM1	
19.	Single source shortest path problem	2	18.08.2023		TLM1	
20.	Huffman coding	2	21.08.2023 & 23.08.2023		TLM1	
21.	Tutorial – II / Quiz - II	1	25.08.2023		TLM3	
<b>No. of classes required to complete UNIT-III</b>		<b>14</b>		<b>No of classes taken</b>		

#### UNIT-IV: Dynamic Programming

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Dynamic Programming-General method	2	04.09.2023 & 13.09.2023		TLM1	
23.	Multistage Graph, Example problem	2	15.09.2023		TLM1	
24.	All pairs shortest path, Example problem	3	20.09.2023 & 22.09.2023		TLM1	
25.	Optimal Binary Search Tree, Example problem	2	25.09.2023 & 27.09.2023		TLM1	
26.	0/1 Knapsack Problem	3	04.10.2023 & 06.10.2023		TLM1	
27.	Travelling Salesperson Problem	2	09.10.2023 & 11.10.2023		TLM1	
28.	Single source shortest path problem, Example Problem	2	13.10.2023		TLM1	
29.	Reliability design, Example Problem	2	16.10.2023 & 18.10.2023		TLM1	
30.	Tutorial – III / Quiz - III	1	20.10.2023		TLM3	
<b>No. of classes required to complete UNIT-IV</b>		<b>19</b>		<b>No of classes taken</b>		

#### UNIT-V: Back tracking

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	General Method	1	20.10.2023		TLM1	
32.	The 8-Queens problem	1	25.10.2023		TLM1	
33.	Sum of subsets problem	2	27.10.2022		TLM1	
34.	Graph coloring problem	1	01.11.2023		TLM1	
35.	Hamiltonian cycles	2	01.11.2023		TLM1	
<b>No. of classes required to complete UNIT-V</b>		<b>07</b>		<b>No of classes taken</b>		

### Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Convex hull	1	29.10.2022		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40

Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs B.Swathi			Dr.D.Veeraiah





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## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### COURSE HANDOUT

#### PART-A

**PROGRAM** : B.Tech, V-Sem  
**ACADEMIC YEAR** : 2023-24  
**COURSE NAME & CODE** : Fundamentals of Data Science – 20ADM2  
**L-T-P STRUCTURE** : 3-1-0  
**COURSE CREDITS** : 4  
**COURSE INSTRUCTOR** : V.CHANDRA KUMAR  
**COURSE COORDINATOR** : V.CHANDRA KUMAR  
**PRE-REQUISITE:** Basic Mathematical Knowledge.

**COURSE OBJECTIVE:** In this Course student will learn about- The objective of the course is to perform the operations associated with relations and functions. Relate practical examples to the functions and relations and interpret the associated operations and terminology used in the context. Use formal logic proofs and/or informal but rigorous logical reasoning to, for example, predict the behavior of software or to solve problems such as puzzles.

#### **COURSE OUTCOMES (CO):**

At the end of the course, the student will be able to:

<b>CO1</b>	Construct mathematical arguments using logical connectives & quantifiers and verify them.(Understand – L2)
<b>CO2</b>	Demonstrate the basic terminology of functions, relations, lattices, and their operations.(Understand – L2)
<b>CO3</b>	Apply the properties of graphs to solve the graph theory problems in Computer science.(Apply – L3)
<b>CO4</b>	Illustrate the basic principles/techniques to solve different algebraic structures & combinatorial problems.(Apply – L3)
<b>CO5</b>	Solve linear recurrence relations by recognizing homogeneity using constant coefficients characteristic roots and Generating functions. (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3													
<b>CO2</b>	3	3	1	2											
<b>CO3</b>	3	3	1	2											
<b>CO4</b>	3	3	2	1											
<b>CO5</b>	3	3	1												
1 - Low				2 –Medium				3 – High							

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put ‘-’

1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

**BOS APPROVED TEXT BOOKS:****T1** Python for Data Analysis [1,2,3,4,5]**BOS APPROVED REFERENCE BOOKS:****R1** Python :The complete Reference, Martin C.Brown, McGraw Hill Education**PART-B****COURSE DELIVERY PLAN (LESSON PLAN)****UNIT-I**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to python	1	4-7-2023		2,4	CO1	T1,R1	
2.	Python Features, Python Applications	1	5-7-2023		2,4	CO1	T1,R1	
3.	Python Data Types	1	7-7-2023		2,4	CO1	T1,R1	
4.	Python Operators	1	10-7-2023		2,4	CO1	T1,R1	
5.	Input and output statements	1	12-7-2023		2,4	CO1	T1,R1	
6.	Introduction to Control statements	1	14-7-2023		2,4	CO1	T1,R1	
7.	If, if-elif statements in python	1	17-7-2023		2,4	CO1	T1,R1	
8	String operations in python	1	19-7-2023		2,4	CO1	T1,R1	
9.	String methods in python	1	21-7-2023		2,4	CO1	T1,R1	
10	Introduction to lists in python	1	24-7-2023		2,4	CO1	T1,R1	
11	Lists functions in python	1	26-7-2023		2,4	CO1	T1,R1	
12	Introduction to Tuples in python	1	28-7-2023		2,4	CO1	T1,R1	
13	Introduction to Dictionaries	1	31-7-2023		2,4	CO1	T1,R1	
14	Tuples, Dictionaries methods	1	31-7-2023		3			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

**UNIT-II**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book Followed	HOD Sign Weekly
14.	What is Data Science	1	2-8-2023		2,4	CO2	T1,R1	
15.	Introduction to DataScience	1	4-8-2023		2,4	CO2	T1,R1	
16.	Data Science Applications	1	7-8-2023		2,4	CO2	T1,R1	
17.	Data Science Life Cycle	1	9-8-2023		2,4	CO2	T1,R1	
18.	Data Analysis in Python	1	11-8-2023		2,4	CO2	T1,R1	
19.	Exploratory Data Analysis in python	1			2,4	CO2	T1,R1	

20.	Data Science process	1	14-8-2023		2,4	CO2	T1,R1	
21.	Role of Data Scientist	1	16-8-2023		2,4	CO2	T1,R1	
22.	Data Cleaning	1	16-8-2023		2,4	CO2	T1,R1	
23	Data transformation techniques	1	18-8-2023		2,4	CO2	T1,R1	
24	Principle Data Analysis	1	19-8-2023		2,4	CO2	T1,R1	
25	Principle Data Analysis example	1	21-8-2023		3			
No. of classes required to complete UNIT-II		12			No. of classes taken:			

### UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Introduction to NumPy	1	23-8-2023		2,4	CO3	T1,R2	
27.	Basics of NumPy	1	25-8-2023		2,4	CO3	T1,R2	
28.	Multi Dimensional Array object	1	26-8-2023		2,4	CO3	T1,R2	
29.	Creating nd Arrays	1	04-9-2023		2,4	CO3	T1,R2	
30.	Data types nor nd Arrays	1	06-9-2023		2,4	CO3	T1,R2	
31.	Operations between Arrays and scalars	1	8-9-2023		2,4	CO3	T1,R2	
32.	Basic Indexing and Slicing operations	1	11-9-2023		2,4	CO3	T1,R2	
33.	Boolean Indexing and Fancy Indexing	1	13-9-2023		2,4	CO3	T1,R2	
34	Data processing Using Arrays, Expressing conditional logic arrays	1	15-9-2023		2,4	CO3	T1,R2	
35.	Methods for Boolean Arrays	1	15-9-2023		3			
No. of classes required to complete UNIT-III		10			No. of classes taken:			

### UNIT-IV

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction to Pandas	1	18-9-2023		1,4,5	CO4	T1,R2	
37.	Pandas Libraries	1	20-9-2023		1,4,5	CO4	T1,R2	
38.	Architecture For Pandas Libraries	1	22-9-2023		1,4,5	CO4	T1,R2	
39.	Features of Pandas	1	25-9-2023		1,4,5	CO4	T1,R2	
40.	Applications of Pandas	1	27-9-2023		1,4,5	CO4	T1,R2	
41.	Data Structure Series in python	1	29-9-2023					
42.	Data frame, Index objects	1	4-10-2023					
43.	Functionality of Re indexing	1	4-10-2023					
44.	Dropping Entries from an axis in pandas	1	6-10-2023		1,4,3	CO4	T1,R2	
45.	Indexing ,selection in pandas	1	6-10-2023					
46.	Filtering, Sorting in Pandas	1	8-10-2023					

No. of classes required to complete UNIT-IV	11			No. of classes taken:
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UNIT-V

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
48.	Introduction to Data Preprocessing	1	09-10-2023		1,4,5	CO5	T1,R2	
49.	Data loading ,Storage and File formats	1	11-10-2023		1,4,5	CO5	T1,R2	
50.	Reading and Writing data in text format, Binary Data formats	1	13-10-2023		1,4,5	CO5	T1,R2	
51.	Interacting with html and web apis	1	13-10-2023		1,4,5	CO5	T1,R2	
52.	Combining and merging Datasets	1	16-10-2023		1,4,5	CO5	T1,R2	
53.	Reshaping and pivoting data transformation	1	17-10-2023		1,4,3	CO5	T1,R2	
54	Data Aggregation and Group operations	1	18-10-2023		1,4,3	CO5	T1,R2	
55	Group by operations and transformations	1	20-10-2023		1,4,3	CO5	T1,R2	
56	Pivot tables in data pre processing	1	20-10-2023		1,4,3	CO5	T1,R2	
57.	Cross Tabulation Format in data preprocessing	1	25-10-2023		1,4,3	CO5	T1,R2	
No. of classes required to complete UNIT-V		7			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
55.	Applications of Data science	1	28-10-2023					
56.	Introduction to Data Analytics in Python	1	30-10-2023					

Teaching Learning Methods					
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Problem Solving	<b>TLM7</b>	Seminars or GD
<b>TLM2</b>	PPT	<b>TLM5</b>	Programming	<b>TLM8</b>	Lab Demo
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Assignment or Quiz	<b>TLM9</b>	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions- 1	03-07-2023	26-08-2023	7W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	7W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practicals	06-11-2023	11-11-2023	1W
Semester End Examinations	13-11-2023	25-11-2023	2W

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. V. Chandra Kumar</b>	<b>MR.V. Chandra Kumar</b>	<b>Dr. O. Rama Devi</b>	<b>Dr. O. Rama Devi</b>
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK,  
Kakinada

Accredited by NAAC with "A" Grade and NBA (ASE, ECE, EEE, CSE, Civil, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr E V Krishna Rao

Course Name & Code : Digital Communications – 20EC09

L-T-P Structure : 3-0-0

Credits : 3

Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- B

A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This course provides the knowledge on different digital modulation techniques. The course provides different concepts on information theory, block codes and convolution codes. It gives the methods of optimum receivers for digital communication systems and performance of probability of error for digital modulation techniques.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Understand</b> the concepts of digital communication system ( <b>Understand – L2</b> )
<b>CO 2</b>	<b>Analyze</b> the Baseband and Pass band digital modulation techniques ( <b>Analyze – L4</b> )
<b>CO 3</b>	<b>Examine</b> the optimum reception and probability of error of digital modulation ( <b>Apply – L3</b> )
<b>CO 4</b>	<b>Apply</b> source coding and error control coding techniques in digital communication process ( <b>Apply – L3</b> )

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1	1	-	-	-	-	-	-	-	-	2	1	-	-
<b>CO2</b>	3	2	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: '-'

#### **TEXT BOOKS:**

**T1:** Simon Haykin, "Digital Communications", John Wiley & sons, 2nd Edition.

**T2:** Taub and Schilling, "Principles of Communication Systems", TMH Publications, 3<sup>rd</sup> edition.

#### **REFERENCE BOOKS:**

**R1:** J. S. Chitode, "Digital Communications", Technical Publications, first edition.

**R2:** V.ChandraSekar, "Communication Systems", Oxford University Press.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section - B**

#### **UNIT-I: Pulse Digital Modulation**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the course – Digital Communications, CEOs, COs & POs	1	04.07.2023			
2.	Introduction to Unit-I	1	05.07.2023			
3.	Elements of a Digital Communication System	1	07.07.2023			
4.	Sampling and Quantization of signals	1	10.07.2023			
5.	Derivation for Quantization noise	1	11.07.2023			
6.	Introduction to Pulse Code Modulation (PCM) System - Transmitter	1	12.07.2023			
7.	Pulse Code Modulation (PCM) System - Receiver	1	14.07.2023			
8.	Calculation of output SNR in PCM	1	17.07.2023			
9.	Need for non-uniform quantization- Companding- $\mu$ -law, A-law	1	18.07.2023			
10.	Differential Pulse Code Modulation	1	19.07.2023			
11.	Delta Modulation	1	21.07.2023			
12.	Examples on PCM and DM	1	24.07.2023			
13.	Adaptive Delta Modulation	1	25.07.2023			
<b>No. of classes required to complete UNIT-I</b>		<b>13</b>	<b>No. of classes taken</b>			

#### **UNIT-II: Optimal Reception of Digital Signal**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Introduction to Unit-II	1	26.07.2023			
15.	Model of digital communication system	1	28.07.2023			
16.	Gram- Schmidt orthogonalization procedure	1	31.07.2023			
17.	Gram- Schmidt orthogonalization procedure	1	01.08.2023			
18.	Geometric interpretation of signals	1	02.08.2023			
19.	Response of bank of correlators to noisy input	1	04.08.2023			
20.	Detection of known signals in noise: Maximum likelihood detector	1	07.08.2023			
21.	Probability of error	1	08.08.2023			
22.	Correlation Receiver	1	09.08.2023			
23.	Matched Filter Receiver	1	11.08.2023			
24.	Matched Filter Receiver	1	14.08.2023			



25.	Probability of error for matched filter	1	16.08.2023			
<b>No. of classes required to complete UNIT-II</b>		<b>12</b>	<b>No. of classes taken</b>			

### UNIT-III: Digital Modulation Techniques

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Unit - III	1	18.08.2023			
27.	Wave form representation of different digital modulation techniques	1	21.08.2023			
28.	Amplitude Shift Keying	1	22.08.2023			
29.	Coherent Binary Phase Shift Keying	1	23.08.2023			
30.	<b>Quadrature Phase Shift Keying</b>	<b>1</b>	25.08.2023			
31.	Differential PSK	1	<b>04.09.2023</b>			
32.	Coherent Frequency Shift Keying	1	05.09.2023			
33.	Probability of error for BASK	1	08.09.2023			
34.	Probability of error for BPSK	1	11.09.2023			
35.	Probability of error for BFSK	1	12.09.2023			
<b>No. of classes required to complete UNIT-III</b>		<b>10</b>	<b>No. of classes taken</b>			

### UNIT-IV: Information Theory and Source Coding

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Unit-IV	1	13.09.2023			
37.	Discrete message and information content	1	15.09.2023			
38.	Concept of Information, Average Information, Entropy, Information rate	1	19.09.2023			
39.	Mutual information and its properties	1	20.09.2023			
40.	Introduction to source coding, source coding theorem	1	22.09.2023			
41.	Shannon-Fano coding - Problems	1	25.09.2023			
42.	Huffman coding - Problems	1	26.09.2023			
43.	Solving Problems	1	27.09.2023			
44.	Channel Capacity of Gaussian channel	1	29.09.2023			
45.	BW-SNR tradeoff	1	03.10.2023			
<b>No. of classes required to complete UNIT-IV</b>		<b>10</b>	<b>No. of classes taken</b>			

### UNIT-V: Linear Block codes and Convolutional codes

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction to Unit-IV – Channel coding	1	04.10.2023			

47.	Linear Block Codes (LBC) – Matrix Representation, Encoding	1	06.10.2023			
48.	Syndrome decoding of LBC	1	09.10.2023			
49.	Error detection and correction capabilities of LBC	1	10.10.2023			
50.	Solving Problems	1	11.10.2023			
51.	Introduction to Binary cyclic codes – Systematic and non systematic form.	1	13.10.2023			
52.	Binary cyclic codes – Encoding and Syndrome Calculation	1	16.10.2023			
53.	Convolution codes- time domain, transform domain	1	17.10.2023			
54.	Convolution codes- Transform domain	1	18.10.2023			
55.	State diagrams, Trellis, Tree diagrams	1	20.10.2023			
56.	Decoding using Viterbi algorithm	1	24.10.2023			
57.	Decoding using Viterbi algorithm	1	25.10.2023			
58.	Solving Problems	1	27.10.2023			
<b>No. of classes required to complete UNIT-V</b>		<b>13</b>	<b>No. of classes taken</b>			

#### Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
59.		1	27.10.2023			

#### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

#### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min((M1+Q1+A1), (M2+Q2+A2))</b>	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HOD</b>
<b>Dr E V Krishna Rao</b>	<b>Dr. E V Krishna Rao</b>	<b>Dr. M Venkata Sudhakar</b>	<b>Dr. Y. Amar Babu</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. B.Y.V.N.R.Swamy  
Course Name & Code : Antennas and Wave Propagation & 20EC10  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Sections- B A.Y :2023-24

**Pre-Requisites:** EM Waves and Transmission Lines.

**Course Objectives:** This course provides the knowledge on Antennas and Radiation fundamentals. The course will expose different types of Antennas and their applications. The course also gives the complete information regarding Propagation of Radio wave in atmosphere.

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	<b>Understand</b> basic antenna parameters, radiation mechanism, characteristics of radio wave propagations ( <b>Understand – L2</b> )
CO2	<b>Analyze</b> wire antenna, ground, space, and sky wave propagation mechanism for communication purpose and various Antenna Arrays ( <b>Analyze – L4</b> )
CO3	<b>Design</b> HF, VHF and UHF Antennas ( <b>Apply – L3</b> )
CO4	<b>Apply</b> antenna measurement methods to assess antenna's performance ( <b>Apply – L3</b> )

**Course Articulation Matrix (Correlation between COs & POs, PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-		-	-	-		-	1	3	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	2	3	-	-
CO4	1	2	3	2	-	-			-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition  
**T2** G.S.N Raju, "Antennas and Wave Propagation", Pearson Education Publishers.

### **REFERENCE BOOK(S):**

- R1** Jordan and Balmain, Electromagnetic fields and Radiating systems, Pearson Education Publishers.  
**R2** John D. Kraus, "Antennas and Wave Propagation", TMH Publishers

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section-C**

#### **UNIT-I: Antenna Fundamentals and Radiation fundamentals:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	1	11-07-2023			
2.	Introduction to Unit-I	1	12-07-2023			
3.	Radiation mechanism-Single wire Antenna	1	13-07-2023			
4.	Current Distribution on a thin wire antenna	1	14-07-2023			
5.	Isotropic Radiators, Directional Antennas	1	18-07-2023			
6.	Antenna Parameters: Radiation intensity, Radiation Pattern,	1	19-07-2023			
7.	Total Power radiated, gain, Directivity, Radiation efficiency	1	20-07-2023			
8.	Power gain, HPBW, FNBW, effective aperture, effective length, Band Width	1	21-07-2023			
9.	Potential functions-heuristic approach, Maxwell's equation approach	1	25-07-2023			
10.	Potential functions for sinusoidal oscillations	1	26-07-2023			
11.	Analysis of Radiation fields of a Alternating current element	1	27-07-2023			
12.	Quarter wave Monopole and half wave dipole	1	28-07-2023			
13.	Power radiated by current element	1	01-08-2023			
14.	Radiation resistance of current element, quarter wave Monopole and half wave dipole	1	02-08-2023			
No. of classes required to complete UNIT-I : 14			No. of classes taken :			

#### **UNIT-II: Antennas Array Analysis:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Various forms of Antenna Arrays	1	03-08-2023			
16.	Linear Array of Two Point Sources	1	04-08-2023			
17.	Linear Array of and N-Point Sources	1	08-08-2023			
18.	Expression for electric field from two element arrays	1	09-08-2023			
19.	Expression for electric field from N element arrays,	1	10-08-2023			
20.	Broad-side array	1	11-08-2023			
21.	End-Fire array	1	16-08-2023			
22.	Method of pattern multiplication	1	17-08-2023			

23.	Binomial array	1	18-08-2023			
24.	Loop Antenna	1	22-08-2023			
No. of classes required to complete UNIT-II		<b>10</b>	No. of classes taken:			

#### **UNIT-III: HF, VHF and UHF Antennas:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Resonant and Non resonant antennas	1	23-08-2023			
26.	Helical Antenna	1	24-08-2023			
27.	Travelling wave antennas – V Antenna	1	25-08-2023			
28.	Inverted V Antenna	1	05-09-2023			
29.	Rhombic Antenna	1	07-09-2023			
30.	Broadband Antennas-Folded Dipole	1	08-09-2023			
31.	Yagi-Uda Antenna	1	12-09-2023			
32.	Log-Periodic Antenna	1	13-09-2023			
No. of classes required to complete UNIT-III : 08				No. of classes taken:		

#### **UNIT-IV: Microwave Antennas & Antenna Measurements:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Horn Antenna & Types	1	14-09-2023			
34.	Reflector Antennas- Corner Reflector	1	15-09-2023			
35.	Parabolic Reflector – (Geometry, types of feeds, F/D Ratio, Spill Over, Back Lobes)	2	19-09-2023			
36.	Lens Antenna, Fundamentals of Rectangular Patch antenna	1	20-09-2023			
37.	Measurement of Antenna parameters- Directional pattern	1	21-09-2023			
38.	Radiation resistance	1	22-09-2023			
39.	Gain (Two Antenna, Three Antenna Methods)	1	26-09-2023			
40.	Directivity, Beam width	1	27-09-2023			
41.	SLR	1	29-09-2023			
42.	Polarization, Impedance	1	03-10-2023			
No. of classes required to complete UNIT-IV: 11			No. of classes taken:			

#### **UNIT-V: Wave Propagation, Ground Wave Propagation, Sky Wave Propagation, Space Wave Propagation**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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43.	Concepts of Propagation-frequency ranges	1	04-10-2023			
44.	Types of propagation	1	05-10-2023			
45.	Formation of Ionospheric Layers and their Characteristics	1	06-10-2023			
46.	Mechanism of Reflection and Refraction	1	10-10-2023			
47.	Critical Frequency	1	11-10-2023			
48.	MUF & Skip Distance	1	12-10-2023			
49.	Optimum Frequency	1	13-10-2023			
50.	LUHF, Virtual Height	1	17-10-2023			
51.	Fundamental Equation for free space Propagation	1	18-10-2023			
52.	Basic Transmission Loss Calculations	1	19-10-2023			
53.	Space Wave Propagation Mechanism	1	20-10-2023			
54.	LOS and Radio Horizon	1	25-10-2023			
55.	Duct Propagation	1	26-10-2023			
No. of classes required to complete UNIT-V :13			No. of classes taken			

### Contents beyond the Syllabus

S.No	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of microstrip patch Antennas	1	27-10-2023		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Mark
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date:**

**Course Instructor**  
Dr. B.Y.V.N.R.Swamy

**Course Coordinator**  
Dr.V.Ravisekhara Reddy

**Module Coordinator**  
Dr. M.V.Sudhakar

**HOD**  
Dr. Y. Amar Babu





# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr. B. Poornaiah  
 Course Name & Code : Linear IC Applications – 20EC11  
 L-T-P Structure : 3-0-0 Credits: 3  
 Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- B A.Y : 2023-24

**PRE-REQUISITE:** Analog Electronic Circuits

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides the knowledge on basic Integrated Circuit (IC), Op-amp internal structure and various open-loop and closed loop applications of it. Design of Active Filters and different waveform generators. It provides the importance of 555 timer and its applications. It also explains the Phased Locked Loop, its applications and ADC and DAC converters.

**COURSE OUTCOMES (CO):** At the end of the course, students will be able to

CO1:	<b>Identify</b> the building blocks of linear integrated circuits, characteristics and application of Op-Amps (Understand – L2)
CO2:	<b>Apply</b> the concept of feedback to op-amps for linear and non-linear applications. (Apply – L3).
CO3:	<b>Analyze</b> Op-Amp, 555 timer applications, phase locked loops to perform addition and multiplication of signals and voltage regulators using Linear ICs (Analyze – L4)
CO4:	<b>Design</b> active filters, waveform generators and data converters using Op Amps (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	-	-	-	2	-	-	-	1	-	1	-
CO2	3	2	2	-	-	-	-	2	-	-	-	1	-	2	-
CO3	3	3	1	-	-	-	-	2	-	-	-	1	-	2	-
CO4	3	2	3	1	-	-	-	2	-	-	1	1	-	3	-

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### **BOS APPROVED TEXT BOOKS:**

**T1** Ramakanth A.Gayakwad, Op-amps and Linear Integrated Circuits, Third edition, PHI Publishers, 2006.

**T2** Roy Choudhury D., Linear Integrated Circuits, Second edition, New Age International (P) Ltd.

#### **BOS APPROVED REFERENCE BOOKS:**

- R1** Adel S. Sedra and Kenneth Carless Smith, Microelectronic Circuits, Fifth Edition. Oxford University Press
- R2** Rashid M. H., Microelectronic Circuits: Analysis and Design, Second edition, PWS Publishing Company.

**Part-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I : TRANSISTOR CURRENT SOURCES & DIFFERENTIAL AMPLIFIERS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Subject , Discussion about Syllabus and course outcomes	1	06.07.2023		TLM2	
2.	Introduction to IC, Advantages,Applications	1	07.07.2023		TLM2	
3.	Basic Current Source	1	10.07.2023		TLM1	
4.	Widlar Current Source	1	13.07.2023		TLM1	
5.	Cascode Current Source	1	14.07.2023		TLM1	
6.	Wilson Current Source	1	15.07.2023		TLM1	
7.	Differential Amplifier: Classifications	1	17.07.2023		TLM1	
8.	DC & AC Analysis of Dual input balanced output & balanced output DA	1	20.07.2023		TLM1	
9.	DC & AC Analysis of Dual input unbalanced output & unbalanced output DA	1	21.07.2023		TLM1	
10.	DC & AC Analysis of Single input balanced output & unbalanced output DA	1	22.07.2023		TLM1	
11.	DC & AC Analysis of single input unbalanced output & unbalanced output DA	1	24.07.2023		TLM1	
12.	Specifications ,FET Differential amplifier	1	27.07.2023		TLM1	
13.	Level Translator, Current mirror circuit	1	28.07.2023		TLM1	
No. of classes required to complete UNIT-I :		13		No. of classes taken:		

**UNIT-II : OPERATIONAL AMPLIFIERS (OP-AMPS) & APPLICATIONS OF OP-AMPS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	OP- Amp: Block Diagram	1	31.07.2023		TLM2	
15.	Ideal & Practical Op- Amp and its characteristics	1	03.08.2023		TLM2	
16.	DC and AC Characteristics of Op- Amp	1	04.08.2023		TLM2	
17.	IC 741 specifications	1	05.08.2023		TLM1	
18.	Measurement of slew rate and CMMR	1	07.08.2023		TLM1	
19.	Application of Op Amps: Inverting and Non-inverting amplifier	1	10.08.2023		TLM1	
20.	Integrator & Differentiator	1	11.08.2023		TLM1	
21.	Difference Amplifier, Instrumentation amplifier	1	14.08.2023		TLM1	
22.	Analog Multiplier, V to I converters	1	17.08.2023		TLM1	
23.	I to V converters, Rectifiers	1	18.08.2023		TLM1	
24.	Sample and Hold circuit, Log and Antilog amplifier	1	19.08.2023		TLM1	
25.	Integrator & Differentiator	1	21.08.2023		TLM1	
No. of classes required to complete UNIT-II		12	No. of classes taken:			

**UNIT-III : OP-AMP ACTIVE FILTERS, OP-AMP WAVEFORM GENERATORS & OP-AMP SINE WAVE OSCILLATORS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Op-amp Active Filters :1 <sup>st</sup> order Low pass and High pass filter using OP-Amp	1	24.08.2023		TLM2	
27.	2 <sup>nd</sup> order Low pass and High pass filter using OP-Amp	1	25.08.2023		TLM1	
28.	Band pass filter, Band reject filters and All pass filter	1	26.08.2023		TLM2	

29.	Op-amp wave form generators: Comparator, design and analysis of Schmitt trigger	1	04.09.2023		<b>TLM1</b>	
30.	Astable Multivibrator	1	07.09.2023		<b>TLM1</b>	
31.	Monostable Multivibrator	1	08.09.2023		<b>TLM1</b>	
32.	Triangular wave Generators	1	11.09.2023		<b>TLM1</b>	
33.	Op-amp sine wave oscillators: Design and analysis of RC phase shift oscillator	1	14.09.2023		<b>TLM1</b>	
34.	Wein Bridge oscillator	1	15.09.2023		<b>TLM1</b>	
35.	Assignment -1	1	16.09.2023		<b>TLM3</b>	
No. of classes required to complete UNIT-III		10	No. of classes taken:			

#### UNIT-IV : 555 TIMER & IC VOLTAGE REGULATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction	1	21.09.2023		<b>TLM2</b>	
37.	Functional Diagram- Monostable multivibrators	1	22.09.2023		<b>TLM2</b>	
38.	Monostable multivibrators Applications	1	23.09.2023		<b>TLM2</b>	
39.	Functional Diagram- Astable multivibrators	1	25.09.2023		<b>TLM1</b>	
40.	Astable multivibrators and Applications	1	29.09.2023		<b>TLM1</b>	
41.	VCO - IC 566 & its features	1	30.09.2023		<b>TLM1</b>	
42.	IC 565 PLL Block Schematic	1	05.10.2023		<b>TLM1</b>	
43.	Applications of PLL	1	06.10.2023		<b>TLM1</b>	
44.	IC Voltage Regulators: Fixed Voltage Regulators	1	07.10.2023		<b>TLM1</b>	
45.	IC723 General Purpose Regulator	1	09.10.2023		<b>TLM1</b>	
No. of classes required to complete UNIT-IV		10		No. of classes taken:		

**UNIT-V : DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	Introduction	1	12.10.2023		TLM2	
50.	Digital to Analog Converters: Weighted resistor DAC,	1	13.10.2023		TLM2	
51.	R-2R Ladder DAC	1	16.10.2023		TLM2	
52.	Inverted R-2R DAC	1	19.10.2023		TLM2	
53.	Analog to Digital Converters: Flash Type ADC	1	20.10.2023		TLM1	
54.	Counter Type ADC	1	21.10.2023		TLM1	
55.	Successive Approximation ADC	1	26.10.2023		TLM1	
56.	Charge Balancing ADC	1	27.10.2023		TLM1	
57.	Dual Slope ADC	1	28.10.2023		TLM1	
No. of classes required to complete UNIT-V:		09		No. of classes taken		

**Contents beyond the Syllabus**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
58.	Introduction to VLSI and Applications of VLSI	1	28.10.2023		TLM2	

**Teaching Learning Methods**

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS:**

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)(Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)</b>	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr.B.Poornaiah	Mrs. M.V L Bhavani	Dr.G.Srinivasulu	Dr.Y.Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF ECE

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor** : Dr. P. Lachi Reddy, Professor

**Course Name & Code** : Data Communication & Computer Networks – 20EC14

**Regulation:** R20

**L-T-P Structure** : 3-0-0

**Credits:** 03

**Program/Sem/Sec** : B. Tech. V-Sem., ECE B-Section

**A.Y.:** 2023-24

**PREREQUISITE:** Digital Communications

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides knowledge on Data Communication and Computer Networks and various protocols used in different layers.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	<b>Understand</b> the functions of the OSI, TCP/IP reference models. ( <b>Understand – L2</b> )
<b>CO2</b>	<b>Summarize</b> design issues for layer protocols. ( <b>Understand – L2</b> )
<b>CO3</b>	<b>Examine</b> the routing algorithms to find shortest paths for packet delivery. ( <b>Apply – L3</b> )
<b>CO4</b>	<b>Interpret</b> the operations of application layer protocols. ( <b>Understand – L2</b> )

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	-	-	-	-	-	-	-	-	3	3	-	-
<b>CO2</b>	2	1	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	-	2	2	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	2	2	-	-	-	-	-	-	-	-	-	3	3	-	-
<b>1 - Low</b>			<b>2 –Medium</b>						<b>3 - High</b>						

#### **TEXTBOOKS:**

**T1** Tanenbaum and Wetherall, “Computer Networks”, Pearson Education, 5<sup>th</sup> Edition.

**T2** Behrouz A. Forouzan, “Data Communication and Networking”, 4<sup>th</sup> Edition, Tata McGraw hill, New Delhi, 2006.

#### **REFERENCE BOOKS:**

**R1** S. Keshav, “An Engineering Approach to Computer Networks”, Pearson Education, 2<sup>nd</sup> Edition.

**R2** W. A. Shay, “Understanding Communications and Networks”, Cengage Learning, 3<sup>rd</sup> Edition

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN)**

#### **UNIT-I: Introduction, Physical Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CO discussion and overview of Syllabus	1	03-07-2023			
2.	Introduction to Data Communication and Computer Networks	1	04-07-2023			
3.	Network Hardware	1	06-07-2023			
4.	Network software	1	10-07-2023			
5.	Network models LAN, WAN, MAN,	1	11-07-2023			
6.	OSI Reference Model	1	13-07-2023			
7.	TCP/IP Reference Model	1	15-07-2023			
8.	Comparison between OSI and TCP/IP	1	17-07-2023			
9.	Critique of OSI and TCP/IP	1	18-07-2023			
10.	Physical Layer: Guided Transmission Medium	1	20-07-2023			
11.	Guided Transmission Medium	1	22-07-2023			
12.	Wireless Transmission Medium	1	24-07-2023			
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

#### **UNIT-II: Data Link Layer, Medium Access Control Sub Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to DLL, Design Issues	1	25-07-2023			
14.	Framing Methods	1	27-07-2023			
15.	Error Detection and Correction Codes	1	31-07-2023			
16.	CRC, Checksum	1	01-08-2023			
17.	Stop & wait, Sliding window, one bit, go-back -n, Selective repeat protocols,	1	03-08-2023			
18.	MAC sub layer, channel allocation problem	1	05-08-2023			
19.	Multiple Access protocols- ALOHA, CSMA protocols, CSMA with collision detection, Collision free protocols	1	07-08-2023			
20.	Ethernet	1	08-08-2023			
21.	Wireless LANs-Infrastructure, Protocol stack	1	10-08-2023			
22.	MAC frame, 802.11 services	1	14-08-2023			
23.	Bluetooth-Architecture, Protocol stack, Frame structure	1	17-08-2023			
No. of classes required to complete UNIT-II: 11				No. of classes taken:		



**UNIT-III: Network Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Network Layer Design Issues- store and forward	1	19-08-2023			
25.	Datagrams and virtual circuits	1	21-08-2023			
26.	Routing algorithms- Optimality Principle	1	22-08-2023			
27.	Shortest Path Algorithm, Flooding,	1	24-08-2023			
28.	Distance vector routing	1	26-08-2023			
29.	Link state routing	1	04-09-2023			
30.	Hierarchical routing	1	05-09-2023			
31.	Board cast routing & Multicast Routing	1	07-09-2023			
32.	Congestion control in data subnets, warning bits	1	11-09-2023			
33.	Load shedding, choke packets, Jitter control, RED	1	12-09-2023			
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

**UNIT-IV: Internetworking, Transport Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Internetworking	1	14-09-2023			
35.	Tunneling, Packet Fragmentation	1	16-09-2023			
36.	Network Layer in the Internet	1	19-09-2023			
37.	IPv4	1	21-09-2023			
38.	IPV6, comparison between IPv4 and IPv6	1	23-09-2023			
39.	Internet control protocols, OSPF BGP	1	25-09-2023			
40.	Transport layer services to the upper Layers	1	26-09-2023			
41.	Addressing, Connection establishment	1	30-09-2023			
42.	Connection release, Crash Recovery	1	03-10-2023			
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

**UNIT-V: The Internet Transport Protocols, Application Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Internet transport protocols: UDP-RPC, Real Time Transport Protocols	1	05-10-2023			
44.	Internet transport protocols: TCP, TCP service model	1	07-10-2023			
45.	TCP Segment Header	1	09-10-2023			
46.	Domain Name system	1	10-10-2023			
47.	Email Architecture and services, SMTP	1	12-10-2023			
48.	WWW and its architecture	1	16-10-2023			
49.	FTP, FTP Commands & Replies	1	17-10-2023			
50.	Structure of Management Information	1	19-10-2023			
51.	Management Information Base	1	21-10-2023			
52.	Simple Network Management Protocol	1	24-10-2023			
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

**Contents beyond the Syllabus:**

S. No.	Topics	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
53.	Network Security	1	26-10-2023			
54.	Mobile Networks	1	28-10-2023			
<b>No. of classes required to complete beyond syllabus: 02</b>				<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS (R20 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

## **PART-D**

### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date: 03-07-2023**

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Dr. P. Lachi Reddy</b>	<b>Dr. P. Rakesh Kumar</b>	<b>Dr. M. V. Sudhakar</b>	<b>Dr. Y. Amar Babu</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I), ISO 9001:2015 Certified Institution  
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada  
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.  
Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### COURSE ANDOUT

#### PART-A

Name of Course Instructor : Dr. K.Venu Gopal  
Course Name & Code : OOPS through JAVA (20IT81)  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech. ECE / V-Sem /C A.Y.: 2023 – 23

**PRE-REQUISITE:** Programming for Problem Solving Using C

**COURSE EDUCATIONAL OBJECTIVE (CEO):** Concentrates on the methodological and technical aspects of software design and Programming based on Object-Oriented Programming (OOP). Acquire the basic knowledge and skills necessary to implement Object-Oriented Programming Techniques in software development through JAVA. Know about the importance of Collections and GUI based applications through JAVA.

**COURSE OUTCOMES (COs):** At the end of the course, the student will be able to:

CO1	Understand Object Oriented Programming Concepts through constructs of JAVA. (Understand- L2)
CO2	Apply the concepts of Inheritance and Polymorphism on real-world applications. (Apply - L3)
CO3	Implement reusability using interface and packages. (Understand- L2)
CO4	Construct robust applications using exception handling. (Apply - L3)
CO5	Understand multi-threading concepts. (Understand - L2)

**COURSE ARTICULATION MATRIX**(Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	1	-	-	-	-	-	-	3
CO3	3	1	-	-	2	-	-	-	-	-	-	3
CO4	3	1	-	-	2	-	-	-	-	-	-	3
CO5	3	2	-	-	2	-	-	-	-	-	-	3

#### **TEXTBOOK:**

**T1:** Java Fundamentals – A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

#### **REFERENCE BOOKS:**

**R1:** The Java™ Programming Language: Ken Arnold, James Gosling, Pearson

**R2:** Introduction to Java Programming 7/e, Brief version, Y.Daniel Liang, Pearson

**R3:** Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java: How to Program P.J.Deitel and H.M.Deitel, PHI.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN):**

#### **UNIT – I: Introduction to OOP & JAVA:**

No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Java Buzzwords / Features	1	11-07-2023		TLM1,2	
2.	Object Oriented Programming (OOP) concepts	1	12-07-2023		TLM1,2	
3.	Java History, Advantages	1	14-07-2023		TLM1,2	
4.	Data types	1	15-07-2023		TLM1,2	
5.	Operators, Expressions	1	18-07-2023		TLM1,2	
6.	Control Statements	1	19-07-2023		TLM1,2	
7.	Methods,& Recursion,Sample Progr	1	21-07-2023		TLM1,2	
8.	Java Objects and References	1	22-07-2023		TLM1,2	
9.	Constructors	1	25-07-2023		TLM1,2	
10.	this keyword	1	26-07-2023		TLM1,2	
11.	Arrays (single & multi- dimensional)	1	28-07-2023		TLM1,2	
12.	String, String Buffer, String Tokenizer Classes	1	29-07-2023		TLM1,2	
No. of classes required to complete UNIT – I:12				No. of classes taken:		

#### **UNIT – II: Extending Classes/ Reusability**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	<b>Inheritance:</b> Introduction, Derived Classes	1	01-08-2023		TLM1,2	
14.	Advantages and Types of Inheritance	1	02-08-2023		TLM1,2	
15.	Implementation of Inheritance	1	04-08-023		TLM1,2	
16.	Inheritance & Member Accessibility	1	05-08-2023		TLM1,2	
17.	Overriding	1	08-08-2023		TLM1,2	
18.	super keyword	1	09-08-2023		TLM1,2	
19.	abstract classes and methods	1	11-08-2023		TLM1,2	
20.	final keyword, methods and final classes	1	16-08-2023		TLM1,2	
21.	Dynamic Binding	1	18-08-2023		TLM1,2	
22.	Polymorphism	1	19-08-2023		TLM1,2	
No. of classes required to complete UNIT – II: 10				No. of classes taken:		

**UNIT – III: Interfaces & Packages**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	<b>Interfaces:</b> Differences between classes and interfaces	1	22-08-2023		TLM1,2	
24.	defining an interface	1	23-08-2023		TLM1,2	
25.	implementing interface	1	25-08-2023		TLM1,2	
26.	Variables in interface, extending interfaces	1	26-08-2023		TLM1,2	
27.	<b>Packages:</b> Defining, Creating	1	05-09-2023		TLM1,2	
28.	Accessing a Package,	1	06-09-2023		TLM1,2	
29.	importing packages,	1	08-09-2023		TLM1,2	
30	access controls (public, protected, default and private).	1	12-09-2023		TLM1,2	
31	Wrapper Classes (Like Integer, Float, Double).	1	13-09-2023		TLM1,2	
No. of classes required to complete UNIT – III: 09				No. of classes taken:		

**UNIT – IV: Exception handling**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	<b>Exception Handling:</b> Concepts of exception handling	1	19-09-2023		TLM1,2	
33.	benefits of exception handling	1	20-09-2023		TLM1,2	
34	usage of try, catch	1	22-09-2023		TLM1,2	
35	multiple catch clause	1	23-09-2023		TLM1,2	
36.	Nested try, throw	1	26-09-2023		TLM1,2	
37.	throws	1	27-09-2023		TLM1,2	
38.	finally	1	29-09-2023		TLM1,2	
39	built in exceptions	1	30-09-2023		TLM1,2	
40	creating own exception	1	03-10-2023		TLM1,2	
No. of classes required to complete UNIT – IV: 09				No. of classes taken:		

**UNIT – V: Multithreading**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Multithreading: Introduction	1	04-10-2023		TLM1,2	
42.	Thread life cycle	1	06-10-2023		TLM1,2	
43.	creating threads (by extending thread class)	1	07-10-2023		TLM1,2	
44.	creating threads (implementing Runnable Interface)	1	10-10-2023		TLM1,2	
45.	Example programs on threads	1	11-10-2023		TLM1,2	
46.	Synchronization : method	1	13-10-2023		TLM1,2	

47.	Synchronization block	1	14-10-2023		TLM1,2	
48.	Thread Priorities	1	17-10-2023		TLM1,2	
49.	isAlive() and join() methods	2	18-10-2023 20-10-2023		TLM1,2	
50.	Inter thread Communication	2	21-10-2023 24-10-2023		TLM1,2	
<b>No. of classes required to complete UNIT – V:12</b>				<b>No. of classes taken:</b>		

### Content Beyond the Syllabus:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Intro collection framework	1	25-10-2023		TLM1,2	
52.	List: Array List, LinkedList	1	27-10-2023		TLM1,2	
53.	Vector, Sets: Hashed Set	1	28-10-2023		TLM1,2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS -R20Regulation

Evaluation Task	Marks
Assignment – I(Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I – Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I – Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment – II(Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II – Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II – Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100



## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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<b>PO7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.K.VenuGopal	Dr.S.Naganjaneyulu	Dr S.Naganjaneyulu	Dr B.Srinivasa Rao
Signature				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mr. Ch Siva Rama Krishna  
Course Name & Code : Digital Communication Lab – 20EC57  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- B A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This Course provides practical exposure on different aspects of digital communications. It demonstrates the importance of different modulation techniques in digital communication systems. It also gives the knowledge about different encoding and decoding techniques used in digital communication systems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Interpret</b> baseband and pass band modulation and demodulation techniques ( <b>Understand– L2</b> )
<b>CO2</b>	<b>Apply</b> coding techniques for error detection and correction in digital data transmission ( <b>Apply – L3</b> )
<b>CO3</b>	<b>Implement</b> frequency and phase shift keying techniques using Software Defined Radio ( <b>Apply – L3</b> ).
<b>CO4</b>	<b>Adopt</b> effective communication, presentation and report writing skills ( <b>Apply – L3</b> ).

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO2</b>	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	2	-	2	3	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

**PART-B**  
**COURSE DELIVERY PLAN (LESSON PLAN): Section – B**

**Batch-1(21761A0465 to 21761A0499) Tuesday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	04.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	11.07.2023			
2	Experiment – 2	CO1,CO4	3	18.07.2023			
3	Experiment – 4	CO1,CO4	3	25.07.2023			
4	Experiment – 5	CO1,CO4	3	01.08.2023			
5	Experiment – 6	CO1,CO4	3	08.08.2023			
6	Experiment – 8	CO2,CO4	3	22.08.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	05.09.2023			
8	Experiment – 7	CO1,CO4	3	12.09.2023			
9	Experiment – 9	CO2,CO4	3	19.09.2023			
10	Experiment – 10	CO3,CO4	3	26.09.2023			
11	Experiment – 11	CO3,CO4	3	03.10.2023			
12	Experiment – 12	CO3,CO4	3	10.10.2023			
13			3	20.10.2023			
--	Internal Examination	--	3	17.10.2023			

**Batch-2 (21761A04A0 to 21761A04C9 & 22765A0410 to 21765A0415) Friday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	06.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	13.07.2023			
2	Experiment – 2	CO1,CO4	3	20.07.2023			
3	Experiment – 4	CO1,CO4	3	27.07.2023			
4	Experiment – 5	CO1,CO4	3	03.08.2023			
5	Experiment – 6	CO1,CO4	3	10.08.2023			
6	Experiment – 8	CO2,CO4	3	17.08.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	24.08.2023			
8	Experiment – 7	CO1,CO4	3	07.09.2023			
9	Experiment – 9	CO2,CO4	3	16.09.2023			
10	Experiment – 10	CO3,CO4	3	21.09.2023			
11	Experiment – 11	CO3,CO4	3	28.09.2023			
12	Experiment – 12	CO3,CO4	3	05.10.2023			
13				12.10.2023			
--	Internal Examination		3	26.10.2023			

**Experiments to be conducted:**

Exp. No	CYCLE-1	Exp. No	CYCLE-2
1	Generate digital signal from analog using Pulse Code Modulation and reconstruct original signal.	3	Perform Adaptive Delta Modulation and obtain the reconstructed original signal.
2	Demonstrate the analog to digital conversion using Delta Modulation and Demodulation	7	Generate the digital modulated signal using Quadrature Phase shift Keying Modulation and reconstruct the original signal
4	Generate the Amplitude Shift Keying Modulated signal and reconstruct the original signal using demodulation.	9	Apply the Binary Cyclic Code for error detection and correction of digital data
5	Obtain the modulated and demodulated signals for Frequency Shift Keying	10	Binary Frequency Shift Keying Modulation and Demodulation
6	Perform a digital modulation using Binary Phase Shift Keying and reconstruct the original signal using coherent detection	11	Binary Phase Shift Keying Modulation and Demodulation
8	Examine the error detection and correction process using Linear Block Code	12	Quadrature Phase Shift Keying Modulation and Demodulation

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

Evaluation Task	Expt. no's	Marks
Day to Day work = A	1,2,3,4,5,6,7,8...	A = 05
Record = B	1,2,3,4,5,6,7,8...	B = 05
Internal Test = C	1,2,3,4,5,6,7,8...	C = 05
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

Course Coordinator

Module Coordinator

HOD

Mr. Ch Siva Rama Krishna

Mrs. K Rani Rudrama

Dr. M Venkata Sudhakar

Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr. B.Poornaiah / Mrs. K. Balavani / Ms.G. Asha  
Course Name & Code : Linear IC Applications Lab – 20EC58  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- A A.Y : 2023-24

#### COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course provides the practical knowledge on Op-Amp applications like arithmetic circuits, filters and oscillators also provides knowledge on IC555 timer and IC723.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Demonstrate</b> the characteristics and applications of Op-Amps (Understand – L2)
<b>CO2</b>	<b>Apply</b> the 555 Timer circuit concepts for the realization of waveform generators (Apply – L3).
<b>CO3</b>	<b>Design</b> Active filters, arithmetic circuits, waveform generators and data converters using Op-Amp (Apply – L3)
<b>CO4</b>	<b>Adapt</b> effective Communication, presentation and report writing skills (Apply – L3)

#### COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	2	-
<b>CO2</b>	2	3	1	1	-	-	-	2	1	2	-	1	-	2	-
<b>CO3</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	3	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

**PART-B**  
**COURSE DELIVERY PLAN (LESSON PLAN): Section – B**

**Batch-1(21761A04A0 to 21761A04C9 and 22765A0410 to 22765A0415) Tuesday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	04-07-2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	11-07-2023			
2	Experiment – 2	CO1,CO3	3	18-07-2023			
3	Experiment – 3	CO1,CO3	3	25-07-2023			
4	Experiment – 4	CO1,CO3	3	01.08.2023			
5	Experiment – 5	CO1,CO3	3	08.08.2023			
6	Experiment – 6	CO1,CO3	3	22.08.2023			
Cycle – II							
7	Experiment – 3	CO2	3	05.09.2023			
8	Experiment – 7	CO2	3	12.09.2023			
9	Experiment – 9	CO1,CO3	3	19.09.2023			
10	Experiment – 10	CO1,CO3	3	26.09.2023			
11	Experiment – 11	CO1,CO3	3	03.10.2023			
12	Experiment beyond syllabus	CO3	3	10.10.2023			
--	Internal Examination	--	3	17.10.2023			



**Batch-2 (20761A0465 to 20761A0499) Thursday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	06-07-2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	13-07-2023			
2	Experiment – 2	CO1,CO3	3	20-07-2023			
3	Experiment – 4	CO1,CO3	3	27-07-2023			
4	Experiment – 5	CO1,CO3	3	03-08-2023			
5	Experiment – 6	CO1,CO3	3	10-08-2023			
6	Experiment – 8	CO1,CO3	3	17.08.2023			
Cycle – II							
7	Experiment – 3	CO2	3	24.08.2023			
8	Experiment – 7	CO2	3	07.09.2023			
9	Experiment – 9	CO1,CO3	3	14.09.2023			
10	Experiment – 10	CO1,CO3	3	21.09.2023			
11	Experiment – 11	CO1,CO3	3	05.10.2023			
12	Experiment beyond syllabus	CO3	3	12.10.2023			
--	Internal Examination	--	3	19.10.2023			

**Experiments to be conducted:**

Exp. No	CYCLE-1	Exp. No	CYCLE-2
1	Verification of functionality of Inverting and Non-inverting amplifiers for the Sine and Square wave inputs.	7	Design and Realization of 555 timer based Monostable multivibrator for Pulse generation.
2	Realization of Adder and Subtractor using Op-Amp.	8	Design and Realization of 555 timer based Astable multivibrator for square wave generation
3	Realization of Differentiator and Integrator using Op-Amp	9	Design and Realization of RC phase shift Oscillator for sinusoidal signal generation using Op-Amp.
4	Design, Realization and plot the frequency response of First order Low pass and High pass filters using Op-Amp.	10	Design and Realization of Function generator for square wave and triangular waves using Op-Amps.
5	Design and plot the frequency response of Band pass filter using Op-Amp.	11	Design and Realization of 3-bit Digital to Analog converter using Op-Amp
6	Design and Realization of Op-Amp based Astable multivibrator for Square wave generation.		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

Evaluation Task	Expt. no's	Marks
Day to Day work = A	1,2,3,4,5,6,7,8...	A = 05
Record = B	1,2,3,4,5,6,7,8...	B = 05
Internal Test = C	1,2,3,4,5,6,7,8...	C = 05
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

Dr. B. Poornaiah

Course Coordinator

Mrs. K. Balavani

Module Coordinator

Dr. G.Srinivasulu

HOD

Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr. B.Y.V.N.R.Swamy  
Course Name & Code : Design and Simulation of Antennas Lab & 20ECS3  
L-T-P Structure : 1-0-2 Credits : 2  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Sections- B A.Y :2023-24

**Pre-Requisites:** Electromagnetic waves and Transmission Lines.

**Course Objectives:** In this course, student will learn about how to design and analyze various transmission lines and antennas using Ansys HFSS Software

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	Understand the basic concepts of transmission lines and antennas according to Requirement and applications. ( <b>Understand – L2</b> )
CO2	Apply software tools for different transmission lines and antennas. ( <b>Apply – L3</b> )
CO3	Analyze the different parameters of transmission lines and antennas. ( <b>Analyze – L4</b> )
CO4	Design the different parameters of transmission lines and antennas. ( <b>Apply – L3</b> )
CO5	Adapt effective Communication, presentation and report writing skills (Apply – L3)

**Course Articulation Matrix (Correlation between COs &POs, PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put ‘-’

1-Slight(Low),

2-Moderate(Medium),

3-Substantial (High).

#### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition  
**T2** JR James, PS Hall "Handbook of Microstrip Antennas" IEE Electromagnetic waves series, 1986.

#### **REFERENCE BOOK(S):**

- R1** Matthew N.O. Sadiku, "Elements of Engineering Electromagnetics", Oxford University Press, 4th Edition.  
**R2** David. M. Pozar "Microwave Engineering", 4th edition, WILEY Publication, 2013.

**PART-B (Theory)****COURSE DELIVERY PLAN (LESSON PLAN): Section-B****UNIT-I:**

UNIT-I:						
S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction of the course Design and Simulation of Antennas	1	15-07-2023			
2.	Introduction to S parameters, Return Loss	1	22-07-2023			
3.	Voltage Standing Wave Ratio(VSWR)	1	05-08-2023			
4.	Transmission coefficient	1	12-08-2023			
5.	Basics of HFSS simulation software	1	19-08-2023			
6.	Transmission lines-short circuit	1	26-08-2023			
7.	Transmission lines-open circuit	1	09-09-2023			
No. of classes required to complete UNIT-I : 8			No. of classes taken :			

**UNIT-II:**

UNIT II:						
S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction to micro strip patch antennas	1	16-09-2023			
9.	Design specifications	1	23-09-2023			
10.	Rectangular Patch Antennas	1	30-09-2023			
11.	Circular Patch Antennas	1	07-10-2023			
12.	Dual band Patch antennas	1	14-10-2023			
13.	Wide band Patch Antennas	1	21-10-2023			
14.	Revision	1	28-10-2023			
No. of classes required to complete UNIT-II		7	No. of classes taken:			

**PART-B (Lab)****COURSE DELIVERY PLAN (LESSON PLAN): Section-B**

S.No.	Experiment Name	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Introduction-Design and Simulation of Antennas	3	15-07-2023			
2.	Design of micro strip patch antennas using strip line feed and coaxial feed	3	22-07-2023			
3.	Design of patch antennas for Wi-Fi and Wi-Max applications.	3	05-08-2023			
4.	Design of Rectangular and Circular micro strip patch.	3	12-08-2023			
5.	Design of Dipole and dual band antenna,	3	19-08-2023			

6.	Design of microstrip line	3	26-08-2023			
7.	Design of open and short circuit transmission line	3	09-09-2023			
8.	Design of multi stub unit	3	16-09-2023			
9.	Study of characteristic impedances of transmission line	3	23-09-2023			
10.	Design of project by students	3	30-09-2023			
11.	Design of project by students	3	07-10-2023			
12.	Presentation	3	14-10-2023			
13.	Presentation	3	21-10-2023			
14.	Documentation	3	28-10-2023			
No. of classes required to complete UNIT-III : 15				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS (R20 Regulation):**

Report	<b>10</b>
Quality of work	10
Presentation	20
Interaction / Queries	10
Total	50

### **PART-D**

#### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
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<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date:

**Course Instructor**  
Dr. B.Y.V.N.R.Swamy

**Course Coordinator**  
Dr. B Siva Hari Prasad

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : N Dharmachari

Course Name & Code : REAL TIME OPERATING SYSTEMS – 20ECH2

L-T-P Structure : 3-1-0 Credits : 4

Program/Sem/Sec : B.Tech., ECE., V-Sem., Honors A.Y : 2023-24

**PRE-REQUISITE:** VLSI Design

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

In this course student will learn about fundamental concepts of real time operating systems, operating system objects, services and I/O concepts, various interrupts and timers

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Understand the basic set of commands and utilities in Linux/UNIX systems.
<b>CO 2</b>	<b>Explain</b> the fundamental concepts of real-time operating systems.
<b>CO 3</b>	<b>Analyze</b> real-time operating systems objects, services and I/O concepts
<b>CO 4</b>	<b>Evaluate</b> various Interrupts and Timers.
<b>CO 5</b>	<b>Design</b> real time embedded systems using the concepts of RTOS.

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	-	-	-	-	-	-	-	--	-	-	1	-	1	-
<b>CO2</b>	2	1	2	1	2	-	-	-	-	-	-	1	-	2	-
<b>CO3</b>	2	2	2	2	2	-	--	-	-	-	-	2	-	3	-
<b>CO4</b>	3	3	3	3	3	-	-	-	-	-	-	2	-	3	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

#### **TEXT BOOK:**

1.Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

#### **REFERENCE BOOKS:**

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh



## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

#### **UNIT-I: Introduction**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	General Interaction & Introduction to the course	1	03.07.23		-	
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	05.07.23		-	
3.	Introduction	2	07.07.23		TLM1	
4.	Introduction to UNIX/LINUX	1	10.07.23		TLM2	
5.	Overview of Commands	3	12.07.23 14.07.23		TLM2	
6.	File I/O (open, create, close, lseek, read, write),	2	17.07.23 19.07.23		TLM2	
7.	Process Control (fork, vfork, exit, wait, waitpid, exec)	2	21.07.23		TLM2	
<b>No. of classes required to complete UNIT-I</b>		<b>12</b>	<b>No. of classes taken</b>			

#### **UNIT-II: Real Time Operating Systems**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Brief History of OS, Defining RTOS	1	24.07.23		TLM2	
2.	The Scheduler, Objects, Services	1	26.07.23		TLM2	
3.	Characteristics of RTOS, Defining a Task	2	28.07.23		TLM2	
4.	Tasks States and Scheduling, Task Operations	1	31.07.23		TLM1	
5.	Structure, Synchronization,	1	02.08.23		TLM2	
6.	Communication and Concurrency.	2	04.08.23		TLM1	
7	Defining Semaphores, Operations and Use	1	07.08.23		TLM1	
8	Defining Message Queue, States	1	09.08.23		TLM2	
9	Content, Storage, Operations and Use	2	11.08.23		TLM2	
<b>No. of classes required to complete UNIT-II</b>		<b>12</b>	<b>No. of classes taken</b>			

#### **UNIT-III:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Objects	2	14.08.23 16.08.23		TLM2	
2.	Services	2	18.08.23		TLM2	
3.	I/O Pipes	2	21.08.23 23.08.23		TLM1	
4.	Event Registers, Signals	2	25.08.23		TLM1	

5.	Other Building Blocks, Component Configuration	1	04.09.23		TLM2	
6.	Basic I/O Concepts, I/O Subsystem	2	08.09.23		TLM2	
<b>No. of classes required to complete UNIT-III</b>		<b>11</b>	<b>No. of classes taken</b>			

#### UNIT-IV: Exceptions, Interrupts and Timers

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Exceptions	1	11.09.23		TLM2	
2.	Interrupts	1	13.09.23		TLM1	
3.	Applications	2	15.09.23		TLM2	
4.	Processing of Exceptions	1	20.09.23		TLM2	
5.	Spurious Interrupts	2	22.09.23		TLM2	
6.	Real Time Clocks	1	25.09.23		TLM2	
7.	Programmable Timers	1	27.09.23		TLM2	
8.	Timer Interrupt Service Routines (ISR)	2	29.09.23		TLM1	
9.	Soft Timers	1	04.10.23		TLM2	
10.	Operations	2	06.10.23		TLM2	
<b>No. of classes required to complete UNIT-IV</b>		<b>14</b>	<b>No. of classes taken</b>			

#### UNIT-V:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	RT Linux	2	09.10.23 11.10.23		TLM2	
2.	MicroC/OS-II	2	13.10.23		TLM2	
3.	Vx Works	1	16.10.23		TLM2	
4.	Embedded Linux	1	18.10.23		TLM2	
5.	Tiny OS	2	20.10.23		TLM2	
6.	Basic Concepts of Android OS	1	25.10.23		TLM2	
<b>No. of classes required to complete UNIT-V</b>		<b>11</b>	<b>No. of classes taken</b>			

## Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hands-on in codeblocks IDE	2	27.10.23		TLM4	

## Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)</b>	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

	effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor  
Mr. N.Dharmachari

Course Coordinator  
Mr. N.Dharmachari

Module Coordinator  
Dr. P.Lachi Reddy

HOD  
Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with Grade 'A', ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

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## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### COURSE HANDOUT

#### PART-A

**PROGRAM** : B.Tech, V-Sem  
**ACADEMIC YEAR** : 2023-24  
**COURSE NAME & CODE** : Fundamentals of Data Science – 20ADM2  
**L-T-P STRUCTURE** : 3-1-0  
**COURSE CREDITS** : 4  
**COURSE INSTRUCTOR** : V.CHANDRA KUMAR  
**COURSE COORDINATOR** : V.CHANDRA KUMAR  
**PRE-REQUISITE:** Basic Mathematical Knowledge.

**COURSE OBJECTIVE:** In this Course student will learn about- The objective of the course is to perform the operations associated with relations and functions. Relate practical examples to the functions and relations and interpret the associated operations and terminology used in the context. Use formal logic proofs and/or informal but rigorous logical reasoning to, for example, predict the behavior of software or to solve problems such as puzzles.

#### **COURSE OUTCOMES (CO):**

At the end of the course, the student will be able to:

<b>CO1</b>	Construct mathematical arguments using logical connectives & quantifiers and verify them.(Understand – L2)
<b>CO2</b>	Demonstrate the basic terminology of functions, relations, lattices, and their operations.(Understand – L2)
<b>CO3</b>	Apply the properties of graphs to solve the graph theory problems in Computer science.(Apply – L3)
<b>CO4</b>	Illustrate the basic principles/techniques to solve different algebraic structures & combinatorial problems.(Apply – L3)
<b>CO5</b>	Solve linear recurrence relations by recognizing homogeneity using constant coefficients characteristic roots and Generating functions. (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3													
<b>CO2</b>	3	3	1	2											
<b>CO3</b>	3	3	1	2											
<b>CO4</b>	3	3	2	1											
<b>CO5</b>	3	3	1												
1 - Low				2 –Medium				3 – High							

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put ‘-’

1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

**BOS APPROVED TEXT BOOKS:****T1** Python for Data Analysis [1,2,3,4,5]**BOS APPROVED REFERENCE BOOKS:****R1** Python :The complete Reference, Martin C.Brown, McGraw Hill Education**PART-B****COURSE DELIVERY PLAN (LESSON PLAN)****UNIT-I**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to python	1	4-7-2023		2,4	CO1	T1,R1	
2.	Python Features, Python Applications	1	5-7-2023		2,4	CO1	T1,R1	
3.	Python Data Types	1	7-7-2023		2,4	CO1	T1,R1	
4.	Python Operators	1	10-7-2023		2,4	CO1	T1,R1	
5.	Input and output statements	1	12-7-2023		2,4	CO1	T1,R1	
6.	Introduction to Control statements	1	14-7-2023		2,4	CO1	T1,R1	
7.	If, if-elif statements in python	1	17-7-2023		2,4	CO1	T1,R1	
8	String operations in python	1	19-7-2023		2,4	CO1	T1,R1	
9.	String methods in python	1	21-7-2023		2,4	CO1	T1,R1	
10	Introduction to lists in python	1	24-7-2023		2,4	CO1	T1,R1	
11	Lists functions in python	1	26-7-2023		2,4	CO1	T1,R1	
12	Introduction to Tuples in python	1	28-7-2023		2,4	CO1	T1,R1	
13	Introduction to Dictionaries	1	31-7-2023		2,4	CO1	T1,R1	
14	Tuples, Dictionaries methods	1	31-7-2023		3			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

**UNIT-II**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book Followed	HOD Sign Weekly
14.	What is Data Science	1	2-8-2023		2,4	CO2	T1,R1	
15.	Introduction to DataScience	1	4-8-2023		2,4	CO2	T1,R1	
16.	Data Science Applications	1	7-8-2023		2,4	CO2	T1,R1	
17.	Data Science Life Cycle	1	9-8-2023		2,4	CO2	T1,R1	
18.	Data Analysis in Python	1	11-8-2023		2,4	CO2	T1,R1	
19.	Exploratory Data Analysis in python	1			2,4	CO2	T1,R1	

20.	Data Science process	1	14-8-2023		2,4	CO2	T1,R1	
21.	Role of Data Scientist	1	16-8-2023		2,4	CO2	T1,R1	
22.	Data Cleaning	1	16-8-2023		2,4	CO2	T1,R1	
23	Data transformation techniques	1	18-8-2023		2,4	CO2	T1,R1	
24	Principle Data Analysis	1	19-8-2023		2,4	CO2	T1,R1	
25	Principle Data Analysis example	1	21-8-2023		3			
No. of classes required to complete UNIT-II		12			No. of classes taken:			

### UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Introduction to NumPy	1	23-8-2023		2,4	CO3	T1,R2	
27.	Basics of NumPy	1	25-8-2023		2,4	CO3	T1,R2	
28.	Multi Dimensional Array object	1	26-8-2023		2,4	CO3	T1,R2	
29.	Creating nd Arrays	1	04-9-2023		2,4	CO3	T1,R2	
30.	Data types nor nd Arrays	1	06-9-2023		2,4	CO3	T1,R2	
31.	Operations between Arrays and scalars	1	8-9-2023		2,4	CO3	T1,R2	
32.	Basic Indexing and Slicing operations	1	11-9-2023		2,4	CO3	T1,R2	
33.	Boolean Indexing and Fancy Indexing	1	13-9-2023		2,4	CO3	T1,R2	
34	Data processing Using Arrays, Expressing conditional logic arrays	1	15-9-2023		2,4	CO3	T1,R2	
35.	Methods for Boolean Arrays	1	15-9-2023		3			
No. of classes required to complete UNIT-III		10			No. of classes taken:			

### UNIT-IV

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction to Pandas	1	18-9-2023		1,4,5	CO4	T1,R2	
37.	Pandas Libraries	1	20-9-2023		1,4,5	CO4	T1,R2	
38.	Architecture For Pandas Libraries	1	22-9-2023		1,4,5	CO4	T1,R2	
39.	Features of Pandas	1	25-9-2023		1,4,5	CO4	T1,R2	
40.	Applications of Pandas	1	27-9-2023		1,4,5	CO4	T1,R2	
41.	Data Structure Series in python	1	29-9-2023					
42.	Data frame, Index objects	1	4-10-2023					
43.	Functionality of Re indexing	1	4-10-2023					
44.	Dropping Entries from an axis in pandas	1	6-10-2023		1,4,3	CO4	T1,R2	
45.	Indexing ,selection in pandas	1	6-10-2023					
46.	Filtering, Sorting in Pandas	1	8-10-2023					

No. of classes required to complete UNIT-IV	11			No. of classes taken:
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UNIT-V

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
48.	Introduction to Data Preprocessing	1	09-10-2023		1,4,5	CO5	T1,R2	
49.	Data loading ,Storage and File formats	1	11-10-2023		1,4,5	CO5	T1,R2	
50.	Reading and Writing data in text format, Binary Data formats	1	13-10-2023		1,4,5	CO5	T1,R2	
51.	Interacting with html and web apis	1	13-10-2023		1,4,5	CO5	T1,R2	
52.	Combining and merging Datasets	1	16-10-2023		1,4,5	CO5	T1,R2	
53.	Reshaping and pivoting data transformation	1	17-10-2023		1,4,3	CO5	T1,R2	
54.	Data Aggregation and Group operations	1	18-10-2023		1,4,3	CO5	T1,R2	
55.	Group by operations and transformations	1	20-10-2023		1,4,3	CO5	T1,R2	
56.	Pivot tables in data pre processing	1	20-10-2023		1,4,3	CO5	T1,R2	
57.	Cross Tabulation Format in data preprocessing	1	25-10-2023		1,4,3	CO5	T1,R2	
No. of classes required to complete UNIT-V		7			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
55.	Applications of Data science	1	28-10-2023					
56.	Introduction to Data Analytics in Python	1	30-10-2023					

Teaching Learning Methods					
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Problem Solving	<b>TLM7</b>	Seminars or GD
<b>TLM2</b>	PPT	<b>TLM5</b>	Programming	<b>TLM8</b>	Lab Demo
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Assignment or Quiz	<b>TLM9</b>	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions- 1	03-07-2023	26-08-2023	7W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	7W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practicals	06-11-2023	11-11-2023	1W
Semester End Examinations	13-11-2023	25-11-2023	2W



## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. V. Chandra Kumar</b>	<b>MR.V. Chandra Kumar</b>	<b>Dr. O. Rama Devi</b>	<b>Dr. O. Rama Devi</b>
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),  
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution  
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada  
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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs Swathi Buragadda  
Course Name & Code : IDAA (20CSM7)  
L-T-P Structure : 3-1-0 Credits : 4  
Program/Sem/Sec : B.Tech., ECE,EEE V-A,B,C A.Y: 2023-24

**PRE-REQUISITE:** Data structures and DMS

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to learn various algorithm design techniques and analyze the computing resources of the algorithms and motivate the students to design new algorithms for various problems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Identify the characteristic of an algorithm and analyses its time and space complexity. (Understand L2)
<b>CO 2</b>	Apply the divide-and-conquer method for solving problems like searching and sorting. (Apply - L3)
<b>CO 3</b>	Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. (Apply - L3)
<b>CO 4</b>	Apply dynamic programming paradigm to solve optimization problems like travelling salesperson problem, 0/1 knapsack problem, Optimal binary search tree (Apply- L3)
<b>CO 5</b>	Analyze the backtracking and branch and bound search methods on optimization problems like N-queen, sum of subsets, 0/1 knapsack, Hamiltonian circuit and so on. (Apply- L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
<b>CO3</b>	2	2	-	1	-	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	2	3	-	1	-	-	-	-	-	-	-	-	-	-	1
<b>CO5</b>	2	3	1	-	-	-	-	-	-	-	-	-	-	-	1

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

#### **TEXT BOOKS:**

T1: Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Computer Algorithms', Galgotia Publications.

T2: Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, Pearson, 2007.

**REFERENCE BOOKS:**

- R1: Aho, Hopcroft & Ullman, 'The Design and Analysis of Computer Algorithms',  
Addison Wesley publications
- R2: Thomas H. Cormen et al, 'Introduction to Algorithms', PHI.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section C****UNIT-I : Introduction**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	10.07.2022		TLM1	
2.	Algorithm definition and Specifications	1	12.07.2023		TLM1	
3.	Performance Analysis	2	14.07.2023		TLM1	
4.	Time Complexity and space complexity					
5.	Asymptotic Notations- Big-Oh, Omega and Theta	1	17.07.2023		TLM1	
6.	Revision	1	19.07.2023		TLM3	
No. of classes required to complete UNIT-I		6		No of classes taken		

**UNIT-II: Divide & Conquer**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Divide & Conquer Technique: General Method	1	21.07.2023		TLM1	
8.	Binary Search and its analysis	1	21.07.2023		TLM1	
9.	Finding Maximum and Minimum and its Analysis	1	24.07.2023		TLM1	
10.	Merge sort and its Analysis	1	26.07.2023		TLM1	
11.	Quick Sort algorithm and its analysis	1	28.07.2023		TLM1	
12.	Closest pair of points	1	28.07.2023		TLM1	
13.	Revision	1	02.08.2023		TLM3	
<b>No. of classes required to complete UNIT-II</b>		7		<b>No of classes taken</b>		

**UNIT-III: The Greedy method**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Greedy Method – Introduction, General method	1	04.08.2023		TLM1	

15.	Knapsack problem, Example problem	2	04.08.2023		TLM1	
16.	Job sequencing with deadlines, Example problem	2	07.08.2023 & 09.08.2023		TLM1	
17.	Minimum cost spanning trees, example problem	2	11.08.2023		TLM1	
18.	Optimal storage on tapes, Example problem	2	14.08.2023 & 16.08.2023		TLM1	
19.	Single source shortest path problem	2	18.08.2023		TLM1	
20.	Huffman coding	2	21.08.2023 & 23.08.2023		TLM1	
21.	Tutorial – II / Quiz - II	1	25.08.2023		TLM3	
<b>No. of classes required to complete UNIT-III</b>		<b>14</b>		<b>No of classes taken</b>		

#### UNIT-IV: Dynamic Programming

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Dynamic Programming-General method	2	04.09.2023 & 13.09.2023		TLM1	
23.	Multistage Graph, Example problem	2	15.09.2023		TLM1	
24.	All pairs shortest path, Example problem	3	20.09.2023 & 22.09.2023		TLM1	
25.	Optimal Binary Search Tree, Example problem	2	25.09.2023 & 27.09.2023		TLM1	
26.	0/1 Knapsack Problem	3	04.10.2023 & 06.10.2023		TLM1	
27.	Travelling Salesperson Problem	2	09.10.2023 & 11.10.2023		TLM1	
28.	Single source shortest path problem, Example Problem	2	13.10.2023		TLM1	
29.	Reliability design, Example Problem	2	16.10.2023 & 18.10.2023		TLM1	
30.	Tutorial – III / Quiz - III	1	20.10.2023		TLM3	
<b>No. of classes required to complete UNIT-IV</b>		<b>19</b>		<b>No of classes taken</b>		

#### UNIT-V: Back tracking

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	General Method	1	20.10.2023		TLM1	
32.	The 8-Queens problem	1	25.10.2023		TLM1	
33.	Sum of subsets problem	2	27.10.2022		TLM1	
34.	Graph coloring problem	1	01.11.2023		TLM1	
35.	Hamiltonian cycles	2	01.11.2023		TLM1	
<b>No. of classes required to complete UNIT-V</b>		<b>07</b>		<b>No of classes taken</b>		

### Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Convex hull	1	29.10.2022		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40

Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs B.Swathi			Dr.D.Veeraiah



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**Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada**

**L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India**

**DEPARTMENT OF ELECTRONICS & COMMUNICATIONS  
ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : **Dr. Kavuluru VenuGopal**  
 Course Name & Code : **DATABASE MANAGEMENT SYSTEM CONCEPTS & 20ITM3**  
 L-T-P Structure : **3-1-0** **Credits : 4**  
 Program/Sem/Sec : **B. Tech (Minor), ASE, ECE, EEE, MECH** **A. Y : 2023-24**

**PREREQUISITE:** Elementary set theory, concepts of relations and functions, propositional logic data structures (trees, Graphs, dictionaries) & File Concepts.

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course enables the students to know about DBMS basic concepts, Database Languages, Database Design, Normalization process and Transaction processing and Indexing.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Demonstrate</b> the Basic Components of Database Management System. <b>(Understand -L2)</b>
<b>CO 2</b>	<b>Design</b> Entity-Relationship Diagrams for different applications. <b>(Apply -L3)</b>
<b>CO 3</b>	<b>Examine</b> the relational data model and various constraints. <b>(Apply- L3)</b>
<b>CO 4</b>	<b>Demonstrate</b> Structured Query Language languages (SQL) to manage relational databases and perform various operations on the data. <b>(Apply- L3)</b>
<b>CO 5</b>	<b>Employ</b> principles of normalization for effective database design & transaction management. <b>(Apply- L3)</b>

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	2	-	-	-	-	-	-	-	-	-	3	2	2
<b>CO2</b>	3	3	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO3</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO4</b>	2	1	2	-	-	-	-	-	-	-	-	-	3	2	3
<b>CO5</b>	2	1	2	-	-	-	-	-	-	-	-	-	2	3	3

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

**1-** Slight (Low), **2** – Moderate (Medium), **3** - Substantial(High)



**TEXT BOOKS :**

<b>T1</b>	Henry F. Korth, Abraham Silberschatz, S. Sudarshan, "Database Concepts", McGraw Hill, 6th edition, 2009. B
<b>T2</b>	RamezElmasri, Shamkanth . Navathe, "Fundamentals Of Database Systems", Addison Wesley, 6th edition, 2010.

**REFERENCE BOOKS:**

<b>R1</b>	Raghu Ramakrishna, Johannes Gehrke, "Database Management System", McGraw Hill 3rd edition, 2000.
<b>R2</b>	Date C. J, "An Introduction to Database System", Pearson Education, 8th edition, 2003.
<b>R3</b>	Shara Maheshwari, Ruchi Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi, 2005.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction**

UNIT-1: Introduction						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	2	12-.07.2023		TLM1,2	
2.	Introduction, An overview of database management system, Database system Vs file system	2	14.07.2023		TLM1,2	
3.	Database system concepts and architecture, Data models schema and instances	2	18.07.2023		TLM1,2	
4.	Data independence and database language and interfaces	2	21.07.2023		TLM1,2	
5.	Data definitions language, DML, Overall Database Structure	2	21-07.2023		TLM1,2	
6.	Revision on Unit-1	2	26.07.2023		TLM1,2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

**UNIT-II: Entity Relationship Model**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	ER model concepts - attributes, entity, Relationships	2	28.07.2023		TLM1,2	
2.	notation for ER diagram, Mapping constraints	2	01.08.2023		TLM1,2	
3.	Relationships of higher degree, keys -Concepts of Super Key, and identity key, primary key	2	04.08.2023		TLM1,2	
4.	Generalization,Aggregation	2	08.08.2023		TLM1,2	
5.	Reduction of ER diagrams to tables	2	11.08.2023		TLM1,2	
6.	<b>Revision on Unit - II</b>	2	16.08.2023		TLM1,2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

**UNIT-III: Relational Data Model:**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Relational data model concepts	2	18.08.2023		TLM1,2	
2.	Integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints	2	23.08.2023		TLM1,2	
3.	referential integrity	2	25.08.2023		TLM1,2	
4.	Keys constraints	2	05.09.2023		TLM1,2	
5.	Domain constraints	2	08.09.2023		TLM1,2	
6.	Relational Algebra	2	12.09.2023		TLM1,2	
7.	Revision of UNIT-3 & Assignment-I	2	13.09.2023		TLM1,2	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		
I MID EXAMINATIONS				28/08/2023 TO 02/09/2023		

**UNIT-IV: Introduction to SQL**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of SQL, Advantage of SQL	2	15.09.2023		TLM1,2	
2.	SQL Data types and Literals	2	22.09.2023		TLM1,2	
3.	Insert, Update and Delete Operations	2	26.09.2023		TLM1,2	
4.	Tables, Views and Indexes	2	29.09.2023		TLM1,2	
5.	Nested Queries, Aggregate Functions	2	03.10.2023		TLM1,2	
6.	Joins, Unions, Intersection, Minus.	2	04.10.2023		TLM1,2	
7.	Revision of Unit-4	2	06.10.2023		TLM1,2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		

**Unit -V : Normalization**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Functional Dependencies	2	10.10.2023		TLM1,2	
2.	Normal Forms - First, Second	2	11.10.2023		TLM1,2	
3.	Third Normal Forms, BCNF.	1	13.11.2023		TLM1,2	
4.	Transaction System, Testing of Serializability	1	13.10.2023		TLM1,2	
5.	Serializability of Schedules, Conflict & View Serializability	1	17.11.2023		TLM1,2	
6.	Recoverability, Deadlock Handling.	1	18.10.2023		TLM1,2	
7.	Revision of UNIT-5 & Assignment-II	2	20.10.2023		TLM1,2	
No. of classes required to complete UNIT-V: 7				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM1,2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C**

Evaluation Task	Marks
Assignment – I(Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I – Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I – Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment – II(Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II – Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II – Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	<b>M=30</b>
Cumulative Internal Examination (CIE): M	<b>30</b>
Semester End Examination (SEE)	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	<b>Organize, Analyze and Interpret the data to extract meaningful conclusions.</b>
<b>PSO 2</b>	<b>Design, Implement and Evaluate a computer-based system to meet desired needs.</b>
<b>PSO 3</b>	<b>Develop IT application services with the help of different current Engineering tools.</b>

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. Kavuluru Venu Gopal	Dr. Kavuluru Venu Gopal	Dr. B.Srinivasa Rao	Dr.B.Srinivasa Rao



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING  
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L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : Mr. K.V.Ashok/ Mr. P. James Vijay

Course Name & Code : Association & 20ASSOC

Program/Sem/Sec : B.Tech., ECE., V-Sem, B Sec

A.Y : 2023-24

**PART-B**

**PLAN OF ACTION (Association of Electronics and Communication Engineers of LBRCE):-**

S.No.	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1	Introduction to the Association and its activities followed by JAM	10-07-2023		
2	Discussion on Community Service Projects	17-07-2023		
3	Group Discussion on How to avoid train accidents	24-07-2023		
4	Group Discussion on The Role of social media in Society	31-07-2023		
5	Group Discussion on Electronics in Automotive Technology	07-08-2023		
6	Debate on "Should Cryptocurrencies Replace Traditional Banking Systems?"	14-08-2023		
7	Debate on "The Role of Internships and Practical Experience in College Education."	21-08-2023		
8	Peer- Teaching (21761A0465-21761A0490)	04-09-2023		
9	Peer- Teaching (21761A0491-21761A04A4)	11-09-2023		
10	Peer- Teaching (21761A04A5-21761A04C4)	25-09-2023		
11	Peer- Teaching (21761A04C5-22765A0412)	09-10-2023		
12	Technical Quiz	16-10-2023		

Course Instructors

1. Mr. K.V.Ashok
2. Mr. P. James Vijay

HOD

Dr.Y.Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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Kakinada

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L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr E V Krishna Rao

Course Name & Code : Digital Communications – 20EC09

L-T-P Structure : 3-0-0

Credits : 3

Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- C

A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This course provides the knowledge on different digital modulation techniques. The course provides different concepts on information theory, block codes and convolution codes. It gives the methods of optimum receivers for digital communication systems and performance of probability of error for digital modulation techniques.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Understand</b> the concepts of digital communication system ( <b>Understand – L2</b> )
<b>CO 2</b>	<b>Analyze</b> the Baseband and Pass band digital modulation techniques ( <b>Analyze – L4</b> )
<b>CO 3</b>	<b>Examine</b> the optimum reception and probability of error of digital modulation ( <b>Apply – L3</b> )
<b>CO 4</b>	<b>Apply</b> source coding and error control coding techniques in digital communication process ( <b>Apply – L3</b> )

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1	1	-	-	-	-	-	-	-	-	2	1	-	-
<b>CO2</b>	3	2	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: '-'

#### **TEXT BOOKS:**

**T1:** Simon Haykin, "Digital Communications", John Wiley & sons, 2nd Edition.

**T2:** Taub and Schilling, "Principles of Communication Systems", TMH Publications, 3<sup>rd</sup> edition.

#### **REFERENCE BOOKS:**

**R1:** J. S. Chitode, "Digital Communications", Technical Publications, first edition.

**R2:** V.ChandraSekar, "Communication Systems", Oxford University Press.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section - C**

#### **UNIT-I: Pulse Digital Modulation**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the course – Digital Communications, CEOs, COs & POs	1	04.07.2023			
2.	Introduction to Unit-I Elements of a Digital Communication System	1	05.07.2023			
3.	Sampling and Quantization of signals	1	10.07.2023			
4.	Derivation for Quantization noise	1	11.07.2023			
5.	Introduction to Pulse Code Modulation (PCM) System - Transmitter	1	12.07.2023			
6.	Pulse Code Modulation (PCM) System - Receiver	1	15.07.2023			
7.	Calculation of output SNR in PCM	1	17.07.2023			
8.	Need for non-uniform quantization- Companding- $\mu$ -law, A-law	1	18.07.2023			
9.	Differential Pulse Code Modulation	1	19.07.2023			
10.	Delta Modulation	1	22.07.2023			
11.	Examples on PCM and DM	1	24.07.2023			
12.	Adaptive Delta Modulation	1	25.07.2023			
<b>No. of classes required to complete UNIT-I</b>		<b>13</b>	<b>No. of classes taken</b>			

#### **UNIT-II: Optimal Reception of Digital Signal**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to Unit-II	1	26.07.2023			
14.	Model of digital communication system	1	31.07.2023			
15.	Gram- Schmidt orthogonalization procedure	1	01.08.2023			
16.	Gram- Schmidt orthogonalization procedure	1	02.08.2023			
17.	Geometric interpretation of signals	1	05.08.2023			
18.	Response of bank of correlators to noisy input	1	07.08.2023			
19.	Detection of known signals in noise: Maximum likelihood detector	1	08.08.2023			
20.	Probability of error, Correlation Receiver	1	09.08.2023			
21.	Matched Filter Receiver	1	14.08.2023			

22.	Matched Filter Receiver	1	16.08.2023			
23.	Probability of error for matched filter	1	19.08.2023			
<b>No. of classes required to complete UNIT-II</b>		<b>12</b>	<b>No. of classes taken</b>			

### UNIT-III: Digital Modulation Techniques

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Introduction to Unit - III	1	21.08.2023			
25.	Wave form representation of different digital modulation techniques	1	22.08.2023			
26.	Amplitude Shift Keying	1	23.08.2023			
27.	Coherent Binary Phase Shift Keying	1	26.08.2023			
28.	<b>Quadrature Phase Shift Keying</b>	<b>1</b>	<b>04.09.2023</b>			
29.	Differential PSK	1	05.09.2023			
30.	Coherent Frequency Shift Keying	1	11.09.2023			
31.	Probability of error for BASK, BPSK	1	12.09.2023			
32.	Probability of error for BFSK	1	13.09.2023			
<b>No. of classes required to complete UNIT-III</b>		<b>10</b>	<b>No. of classes taken</b>			

### UNIT-IV: Information Theory and Source Coding

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Introduction to Unit-IV	1	16.09.2023			
34.	Discrete message and information content	1	19.09.2023			
35.	Concept of Information, Average Information, Entropy, Information rate	1	20.09.2023			
36.	Mutual information and its properties	1	23.09.2023			
37.	Introduction to source coding, source coding theorem	1	25.09.2023			
38.	Shannon-Fano coding - Problems	1	26.09.2023			
39.	Huffman coding - Problems	1	27.09.2023			
40.	Solving Problems	1	30.09.2023			
41.	Channel Capacity of Gaussian channel	1	03.10.2023			
42.	BW-SNR tradeoff	1	04.10.2023			
<b>No. of classes required to complete UNIT-IV</b>		<b>10</b>	<b>No. of classes taken</b>			

### UNIT-V: Linear Block codes and Convolutional codes

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Introduction to Unit-IV – Channel	1	07.10.2023			



	coding					
44.	Linear Block Codes (LBC) – Matrix Representation, Encoding	1	09.10.2023			
45.	Syndrome decoding of LBC	1	10.10.2023			
46.	Error detection and correction capabilities of LBC	1	11.10.2023			
47.	Introduction to Binary cyclic codes – Systematic and non systematic form.	1	16.10.2023			
48.	Binary cyclic codes – Encoding and Syndrome Calculation	1	17.10.2023			
49.	Convolution codes- time domain, transform domain	1	18.10.2023			
50.	Convolution codes- Transform domain	1	21.10.2023			
51.	State diagrams, Trellis, Tree diagrams	1	24.10.2023			
52.	Decoding using Viterbi algorithm	1	25.10.2023			
53.	Decoding using Viterbi algorithm	1	28.10.2023			
<b>No. of classes required to complete UNIT-V</b>		<b>12</b>	<b>No. of classes taken</b>			

### Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
54.		1	28.10.2023			

### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min((M1+Q1+A1), (M2+Q2+A2))</b>	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HOD</b>
<b>Dr. E V Krishna Rao</b>	<b>Dr. E V Krishna Rao</b>	<b>Dr. M Venkata Sudhakar</b>	<b>Dr. Y. Amar Babu</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. B Siva Hari Prasad

Course Name & Code : Antennas and Wave Propagation & 20EC10

L-T-P Structure : 3-0-0

Program/Sem/Sec : B.Tech., ECE., V-Sem., Sections- C

Credits : 3

A.Y : 2023-24

**Pre-Requisites:** EM Waves and Transmission Lines.

**Course Objectives:** This course provides the knowledge on Antennas and Radiation fundamentals. The course will expose different types of Antennas and their applications. The course also gives the complete information regarding Propagation of Radio wave in atmosphere.

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	<b>Understand</b> basic antenna parameters, radiation mechanism, characteristics of radio wave propagations ( <b>Understand – L2</b> )
CO2	<b>Analyze</b> wire antenna, ground, space, and sky wave propagation mechanism for communication purpose and various Antenna Arrays ( <b>Analyze – L4</b> )
CO3	<b>Design</b> HF, VHF and UHF Antennas ( <b>Apply – L3</b> )
CO4	<b>Apply</b> antenna measurement methods to assess antenna's performance ( <b>Apply – L3</b> )

**Course Articulation Matrix (Correlation between COs & POs, PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-		-	-	-		-	1	3	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	2	3	-	-
CO4	1	2	3	2	-	-			-	-	-	2	3	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition
- T2** G.S.N Raju, "Antennas and Wave Propagation", Pearson Education Publishers.

### **REFERENCE BOOK(S):**

- R1** Jordan and Balmain, Electromagnetic fields and Radiating systems, Pearson Education Publishers.
- R2** John D. Kraus, "Antennas and Wave Propagation", TMH Publishers

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section-C****UNIT-I: Antenna Fundamentals and Radiation fundamentals:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	1	11-07-2023			
2.	Introduction to Unit-I	1	12-07-2023			
3.	Radiation mechanism-Single wire Antenna	1	13-07-2023			
4.	Current Distribution on a thin wire antenna	1	14-07-2023			
5.	Isotropic Radiators, Directional Antennas	1	18-07-2023			
6.	Antenna Parameters: Radiation intensity, Radiation Pattern,	1	19-07-2023			
7.	Total Power radiated, gain, Directivity, Radiation efficiency	1	20-07-2023			
8.	Power gain, HPBW, FNBW, effective aperture, effective length, Band Width	1	21-07-2023			
9.	Potential functions-heuristic approach, Maxwell's equation approach	1	25-07-2023			
10.	Potential functions for sinusoidal oscillations	1	26-07-2023			
11.	Analysis of Radiation fields of a Alternating current element	1	27-07-2023			
12.	Quarter wave Monopole and half wave dipole	1	28-07-2023			
13.	Power radiated by current element	1	01-08-2023			
14.	Radiation resistance of current element, quarter wave Monopole and half wave dipole	1	02-08-2023			
No. of classes required to complete UNIT-I : 14			No. of classes taken :			

**UNIT-II: Antennas Array Analysis:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Various forms of Antenna Arrays	1	03-08-2023			
16.	Linear Array of Two Point Sources	1	04-08-2023			
17.	Linear Array of and N-Point Sources	1	08-08-2023			
18.	Expression for electric field from two element arrays	1	09-08-2023			
19.	Expression for electric field from N element arrays,	1	10-08-2023			
20.	Broad-side array	1	11-08-2023			
21.	End-Fire array	1	16-08-2023			
22.	Method of pattern multiplication	1	17-08-2023			

23.	Binomial array	1	18-08-2023			
24.	Loop Antenna	1	22-08-2023			
No. of classes required to complete UNIT-II		<b>10</b>	No. of classes taken:			

### UNIT-III: HF, VHF and UHF Antennas:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Resonant and Non resonant antennas	1	23-08-2023			
26.	Helical Antenna	1	24-08-2023			
27.	Travelling wave antennas – V Antenna	1	25-08-2023			
28.	Inverted V Antenna	1	05-09-2023			
29.	Rhombic Antenna	1	07-09-2023			
30.	Broadband Antennas-Folded Dipole	1	08-09-2023			
31.	Yagi-Uda Antenna	1	12-09-2023			
32.	Log-Periodic Antenna	1	13-09-2023			
No. of classes required to complete UNIT-III : 08				No. of classes taken:		

### UNIT-IV: Microwave Antennas & Antenna Measurements:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Horn Antenna & Types	1	14-09-2023			
34.	Reflector Antennas- Corner Reflector	1	15-09-2023			
35.	Parabolic Reflector – (Geometry, types of feeds, F/D Ratio, Spill Over, Back Lobes)	2	19-09-2023			
36.	Lens Antenna, Fundamentals of Rectangular Patch antenna	1	20-09-2023			
37.	Measurement of Antenna parameters- Directional pattern	1	21-09-2023			
38.	Radiation resistance	1	22-09-2023			
39.	Gain (Two Antenna, Three Antenna Methods)	1	26-09-2023			
40.	Directivity, Beam width	1	27-09-2023			
41.	SLR	1	29-09-2023			
42.	Polarization, Impedance	1	03-10-2023			
No. of classes required to complete UNIT-IV: 11			No. of classes taken:			

### UNIT-V: Wave Propagation, Ground Wave Propagation, Sky Wave Propagation, Space Wave Propagation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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43.	Concepts of Propagation-frequency ranges	1	04-10-2023			
44.	Types of propagation	1	05-10-2023			
45.	Formation of Ionospheric Layers and their Characteristics	1	06-10-2023			
46.	Mechanism of Reflection and Refraction	1	10-10-2023			
47.	Critical Frequency	1	11-10-2023			
48.	MUF & Skip Distance	1	12-10-2023			
49.	Optimum Frequency	1	13-10-2023			
50.	LUHF, Virtual Height	1	17-10-2023			
51.	Fundamental Equation for free space Propagation	1	18-10-2023			
52.	Basic Transmission Loss Calculations	1	19-10-2023			
53.	Space Wave Propagation Mechanism	1	20-10-2023			
54.	LOS and Radio Horizon	1	25-10-2023			
55.	Duct Propagation	1	26-10-2023			
No. of classes required to complete UNIT-V :13			No. of classes taken			

### Contents beyond the Syllabus

S.No	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of microstrip patch Antennas	1	27-10-2023		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

**Date:**

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HOD</b>
Dr. B. Siva Hari Prasad	Dr.V.Ravisekhara Reddy	Dr. B.Y.V.N.R.Swamy	Dr. Y. Amar Babu



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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Smt.K.Balavani

Course Name & Code : Linear IC Applications – 20EC11

L-T-P Structure : 3-0-0

Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- C

Credits: 3

A.Y : 2023-24

**PRE-REQUISITE:** Analog electronic circuits

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides the knowledge on basic Integrated Circuit (IC), Op-amp internal structure and various open-loop and closed loop applications of it. Design of Active Filters and different waveform generators. It provides the importance of 555 timer and its applications. It also explains the Phased Locked Loop, its applications and ADC and DAC converters.

**COURSE OUTCOMES (CO):** At the end of the course, students will be able to

CO1:	<b>Identify</b> the building blocks of linear integrated circuits, characteristics and application of Op-Amps. (Understand – L2)
CO2:	<b>Apply</b> the concept of feedback to op-amps for linear and non-linear applications. (Apply – L3).
CO3:	<b>Analyze</b> Op-Amp, 555 timer applications, phase locked loops to perform addition and multiplication of signals and voltage regulators using Linear ICs. (Analyze – L4)
CO4:	<b>Design</b> active filters, waveform generators and data converters using Op Amps. (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	-	-	-	2	-	-	-	1	-	1	-
CO2	3	2	2	-	-	-	-	2	-	-	-	1	-	2	-
CO3	3	3	1	-	-	-	-	2	-	-	-	1	-	2	-
CO4	3	2	3	1	-	-	-	2	-	-	1	1	-	3	-

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### **BOS APPROVED TEXT BOOKS:**

**T1** Ramakanth A.Gayakwad, Op-amps and Linear Integrated Circuits, Third edition, PHI Publishers, 2006.

**T2** Roy Choudhury D., Linear Integrated Circuits, Second edition, New Age International (P) Ltd.

#### **BOS APPROVED REFERENCE BOOKS:**

**R1** Adel S. Sedra and Kenneth Carless Smith, Microelectronic Circuits, Fifth Edition. Oxford University Press

**R2** Rashid M. H., Microelectronic Circuits: Analysis and Design, Second edition, PWS Publishing Company.



**Part-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I : TRANSISTOR CURRENT SOURCES & DIFFERENTIAL AMPLIFIERS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Subject , Discussion about Syllabus and course outcomes	1	04.07.2023			
2.	Basic Current Source	1	05.07.2023			
3.	Widlar Current Source	1	06.07.2023			
4.	Cascode Current Source	1	07.07.2023			
5.	Wilson Current Source	1	11.07.2023			
6.	Differential Amplifier:Classifications	1	12.07.2023			
7.	DC & AC Analysis of Dual input balanced output & balanced output DA	1	13.07.2023			
8.	DC & AC Analysis of Dual input unbalanced output & unbalanced output DA	1	14.07.2023			
9.	DC & AC Analysis of Single input balanced output & unbalanced output DA	1	18.07.2023			
10.	DC & AC Analysis of single input unbalanced output & unbalanced output DA	1	19.07.2023			
11.	Specifications ,FET Differential amplifier	1	20.07.2023			
12.	Level Translator, Current mirror circuit	1	21.07.2023			
13.	Assignment	1	25.07.2023			
No. of classes required to complete UNIT-I :			13	No. of classes taken:		

**UNIT-II : OPERATIONAL AMPLIFIERS (OP-AMPS) & APPLICATIONS OF OP-AMPS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	OP- Amp: Block Diagram	1	26.07.2023			
15.	Ideal & Practical Op- Amp and its characteristics	1	27.07.2023			
16.	DC and AC Characteristics of Op- Amp	1	28.07.2023			
17.	IC 741 specifications	1	01.08.2023			
18.	Measurement of slew rate and CMMR	1	02.08.2023			
19.	Application of Op Amps:Inverting and Non-inverting amplifier	1	03.08.2023			
20.	Integrator & Differentiator	1	04.08.2023			
21.	Difference Amplifier, Instrumentation amplifier	1	08.08.2023			
22.	Analog Multiplier, V to I converters, I to V converters	1	09.08.2023			
23.	Rectifiers, Sample and Hold circuit	1	10.08.2023			
24.	Log and Antilog amplifier, Integrator & Differentiator	1	11.08.2023			
25.	Assignment	1	16.08.2023			
No. of classes required to complete UNIT-II		12	No. of classes taken:			

**UNIT-III : OP-AMP ACTIVE FILTERS, OP-AMP WAVEFORM GENERATORS & OP-AMP SINE WAVE OSCILLATORS**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Op-amp Active Filters : 1 <sup>st</sup> order Low pass and High pass filter using OP-Amp	1	17.08.2023			

27.	2 <sup>nd</sup> order Low pass and High pass filter using OP-Amp	1	18.08.2023			
28.	Band pass filter	1	22.08.2023			
29.	Band reject filters and All pass filter	1	23.08.2023			
30.	Op-amp wave form generators: Comparator, design and analysis of Schmitt trigger	2	24.08.2023 25.08.2023			
31.	Astable Multivibrator	1	05.09.2023			
32.	Monostable Multivibrator	1	07.09.2023			
33.	Triangular wave Generators	1	08.09.2023			
34.	Op-amp sine wave oscillators: Design and analysis of RC phase shift oscillator, Wein Bridge oscillator	2	12.09.2023 13.09.2023			
35.	Assignment	1	14.09.2023			
No. of classes required to complete UNIT-III		12	No. of classes taken:			

#### UNIT-IV: 555 TIMER & IC VOLTAGE REGULATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction	1	15.09.2023			
37.	Functional Diagram- Monostable multivibrators	1	19.09.2023			
38.	Monostable multivibrators Applications	1	20.09.2023			
39.	Functional Diagram- Astable multivibrators	1	21.09.2023			
40.	Astable multivibrators and Applications	1	22.09.2023			
41.	VCO - IC 566 & its features	1	26.09.2023			
42.	IC 565 PLL Block Schematic	1	27.09.2023			
43.	Applications of PLL	1	29.09.2023			
44.	Applications of PLL	1	03.10.2023			

45.	IC Voltage Regulators: Fixed Voltage Regulators, IC723 General Purpose Regulator	2	04.10.2023  05.10.2023			
46.	Assignment	1	06.10.2023			
No. of classes required to complete UNIT-IV		12		No. of classes taken:		

#### UNIT-V: DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Introduction	1	10.10.2023			
48.	Digital to Analog Converters: Weighted resistor DAC,	1	11.10.2023			
49.	R-2R Ladder DAC	1	12.10.2023			
50.	Inverted R-2R DAC	1	13.10.2023			
51.	Analog to Digital Converters: Flash Type ADC	1	17.10.2023			
52.	Counter Type ADC	1	18.10.2023			
53.	Successive Approximation ADC	1	19.10.2023			
54.	Charge Balancing ADC	1	20.10.2023			
55.	Dual Slope ADC	1	24.10.2023			
56.	Assignment	1	25.10.2023			
No. of classes required to complete UNIT-V:		10		No. of classes taken		

#### Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
57.	Introduction to VLSI and Applications of VLSI	2	26.10.2023 27.10.2023			

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS:**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE)</b> (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

### **PART-D**

#### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
Smt.K.Balavani	Smt.M.V.L Bhavani	Dr.G.Srinivasulu	Dr.Y.Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF ECE

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor :** Dr. K.Ravi Kumar, Associate Professor

**Course Name & Code :** Data Communication & Computer Network – 20EC14 **Regulation:** R20

**L-T-P Structure :** 3-0-0 **Credits:** 03

**Program/Sem/Sec :** B. Tech. V-Sem., ECE C-Section **A.Y.:** 2023-24

**PREREQUISITE:** Digital Communications

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course provides knowledge on Data Communication and Computer Networks and various protocols used in different layers.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	<b>Understand</b> the functions of the OSI, TCP/IP reference models. ( <b>Understand – L2</b> )
<b>CO2</b>	<b>Summarize</b> design issues for layer protocols. ( <b>Understand – L2</b> )
<b>CO3</b>	<b>Examine</b> the routing algorithms to find shortest paths for packet delivery. ( <b>Apply – L3</b> )
<b>CO4</b>	<b>Interpret</b> the operations of application layer protocols. ( <b>Understand – L2</b> )

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	-	-	-	-	-	-	-	-	3	3	-	-
<b>CO2</b>	2	1	1	-	-	-	-	-	-	-	-	2	3	-	-
<b>CO3</b>	3	3	-	2	2	-	-	-	-	-	-	2	3	-	-
<b>CO4</b>	2	2	-	-	-	-	-	-	-	-	-	3	3	-	-
<b>1 - Low</b>			<b>2 –Medium</b>						<b>3 - High</b>						

#### **TEXTBOOKS:**

- T1** Tanenbaum and Wetherall, “Computer Networks”, Pearson Education, 5<sup>th</sup> Edition.  
**T2** Behrouz A. Forouzan, “Data Communication and Networking”, 4<sup>th</sup> Edition, Tata McGraw hill, New Delhi, 2006.

#### **REFERENCE BOOKS:**

- R1** S. Keshav, “An Engineering Approach to Computer Networks”, Pearson Education, 2<sup>nd</sup> Edition.  
**R2** W. A. Shay, “Understanding Communications and Networks”, Cengage Learning, 3<sup>rd</sup> Edition

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN)**

#### **UNIT-I: Introduction, Physical Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CO discussion and overview of Syllabus	1	06-07-2023			
2.	Introduction to Data Communication and Computer Networks	1	07-07-2023			
3.	Network Hardware,	1	10-07-2023			
4.	Network software	1	13-07-2023			
5.	Network models LAN, WAN, MAN,	1	14-07-2023			
6.	OSI Reference Model	1	15-07-2023			
7.	TCP/IP Reference Model	1	17-07-2023			
8.	Comparison between OSI and TCP/IP	1	20-07-2023			
9.	Critique of OSI and TCP/IP	1	21-07-2023			
10.	Physical Layer: Guided Transmission Medium	1	22-07-2023			
11.	Guided Transmission Medium	1	24-07-2023			
12.	Wireless Transmission Medium	1	27-07-2023			
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

#### **UNIT-II: Data Link Layer, Medium Access Control Sub Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to DLL, Design Issues	1	28-07-2023			
14.	Framing Methods	1	31-07-2023			
15.	Error Detection and Correction Codes	1	03-08-2023			
16.	CRC, Checksum	1	04-08-2023			
17.	Stop & wait, Sliding window, one bit, go-back -n, Selective repeat protocols,	1	05-08-2023			
18.	MAC sub layer, channel allocation problem	1	07-08-2023			
19.	Multiple Access protocols- ALOHA, CSMA protocols, CSMA with collision detection, Collision free protocols	1	10-08-2023			
20.	Ethernet	1	11-08-2023			
21.	Wireless LANs-Infrastructure, Protocol stack	1	14-08-2023			
22.	MAC frame, 802.11 services	1	17-08-2023			
23.	Bluetooth-Architecture, Protocol stack, Frame structure	1	18-08-2023			
<b>No. of classes required to complete UNIT-II: 11</b>				<b>No. of classes taken:</b>		

#### **UNIT-III: Network Layer:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Network Layer Design Issues- store and forward	1	19-08-2023			



25.	Datagrams and virtual circuits	1	21-08-2023			
26.	Routing algorithms- Optimality Principle	1	24-08-2023			
27.	Shortest Path Algorithm, Flooding,	1	25-08-2023			
28.	Distance vector routing	1	26-08-2023			
29.	Link state routing	1	04-09-2023			
30.	Hierarchical routing	1	07-09-2023			
31.	Board cast routing & Multicast Routing	1	08-09-2023			
32.	Congestion control in data subnets, warning bits	1	09-09-2023			
33.	Load shedding, choke packets, Jitter control, RED	1	11-09-2023			
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-IV: Internetworking, Transport Layer:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Internetworking	1	14-09-2023			
35.	Tunneling, Packet Fragmentation	1	15-09-2023			
36.	Network Layer in the Internet	1	21-09-2023			
37.	IPv4	1	22-09-2023			
38.	IPV6, comparison between IPv4 and IPv6	1	23-09-2023			
39.	Internet control protocols, OSPF BGP	1	25-09-2023			
40.	Transport layer services to the upper Layers	1	29-09-2023			
41.	Addressing, Connection establishment	1	30-09-2023			
42.	Connection release, Crash Recovery	1	05-10-2023			
<b>No. of classes required to complete UNIT-IV: 09</b>				<b>No. of classes taken:</b>		

#### UNIT-V: The Internet Transport Protocols, Application Layer:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Internet transport protocols: UDP-RPC, Real Time Transport Protocols	1	09-10-2023			
44.	Internet transport protocols: TCP, TCP service model	1	12-10-2023			
45.	TCP Segment Header	1	13-10-2023			
46.	Domain Name system	1	14-10-2023			
47.	Email Architecture and services, SMTP	1	16-10-2023			
48.	WWW and its architecture	1	19-10-2023			
49.	WWW and its architecture	1	20-10-2023			
50.	FTP, FTP Commands & Replies	1	21-10-2023			
51.	Structure of Management Information	1	26-10-2023			
52.	Management Information Base	1	27-10-2023			
53.	Simple Network Management Protocol	1	28-10-2023			
<b>No. of classes required to complete UNIT-V: 11</b>				<b>No. of classes taken:</b>		

**Contents beyond the Syllabus:**

S. No.	Topics	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
55.	Network Security	1	06-10-2023			
56.	Mobile Networks	1	07-10-2023			
<b>No. of classes required to complete beyond syllabus: 02</b>				<b>No. of classes taken:</b>		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**PART-C****EVALUATION PROCESS (R20 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	<b>M=30</b>
Cumulative Internal Examination (CIE): M	<b>30</b>
Semester End Examination (SEE)	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

**PART-D****PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

**PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 11-07-2023

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Dr. K. Ravi Kumar</b>	<b>Dr. P. Rakesh Kumar</b>	<b>Dr. M. V. Sudhakar</b>	<b>Dr. Y. Amar Babu</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mr. M.Sambasiva Reddy  
Course Name & Code : Digital Communication Lab – 20EC57  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- C A.Y : 2023-24

**PRE-REQUISITE:** Analog Communications.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

This Course provides practical exposure on different aspects of digital communications. It demonstrates the importance of different modulation techniques in digital communication systems. It also gives the knowledge about different encoding and decoding techniques used in digital communication systems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Interpret</b> baseband and pass band modulation and demodulation techniques ( <b>Understand– L2</b> )
<b>CO2</b>	<b>Apply</b> coding techniques for error detection and correction in digital data transmission ( <b>Apply – L3</b> )
<b>CO3</b>	<b>Implement</b> frequency and phase shift keying techniques using Software Defined Radio ( <b>Apply – L3</b> ).
<b>CO4</b>	<b>Adopt</b> effective communication, presentation and report writing skills ( <b>Apply – L3</b> ).

#### **COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	2	-	-	-	-	-	-	-	2	3	-	-
<b>CO2</b>	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	2	-	2	3	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

**PART-B**  
**COURSE DELIVERY PLAN (LESSON PLAN): Section – B**

**Batch-1(21761A0465 to 21761A0499) Tuesday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	05.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	12.07.2023			
2	Experiment – 2	CO1,CO4	3	19.07.2023			
3	Experiment – 4	CO1,CO4	3	26.07.2023			
4	Experiment – 5	CO1,CO4	3	02.08.2023			
5	Experiment – 6	CO1,CO4	3	09.08.2023			
6	Experiment – 8	CO2,CO4	3	16.08.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	23.08.2023			
8	Experiment – 7	CO1,CO4	3	13.09.2023			
9	Experiment – 9	CO2,CO4	3	20.09.2023			
10	Experiment – 10	CO3,CO4	3	27.09.2023			
11	Experiment – 11	CO3,CO4	3	04.10.2023			
12	Experiment – 12	CO3,CO4	3	11.10.2023			
13	Experiment beyond the syllabus		3	18.10.2023			
--	Internal Examination	--	3	25.10.2023			

**Batch-2 (21761A04A0 to 21761A04C9 & 22765A0410 to 21765A0415) Friday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to DC Lab experiments, COs, POs and PSOs	--	3	15.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO4	3	22.07.2023			
2	Experiment – 2	CO1,CO4	3	05.08.2023			
3	Experiment – 4	CO1,CO4	3	12.08.2023			
4	Experiment – 5	CO1,CO4	3	19.08.2023			
5	Experiment – 6	CO1,CO4	3	26.08.2023			
6	Experiment – 8	CO2,CO4	3	09.09.2023			
Cycle – II							
7	Experiment – 3	CO1,CO4	3	16.09.2023			
8	Experiment – 7	CO1,CO4	3	23.09.2023			
9	Experiment – 9	CO2,CO4	3	30.09.2023			
10	Experiment – 10	CO3,CO4	3	07.10.2023			
11	Experiment – 11	CO3,CO4	3	14.10.2023			
12	Experiment – 12	CO3,CO4	3	21.10.2023			
13	Internal Examination		3	28.10.2023			

**Experiments to be conducted:**

<b>Exp. No</b>	<b>CYCLE-1</b>	<b>Exp. No</b>	<b>CYCLE-2</b>
1	Generate digital signal from analog using Pulse Code Modulation and reconstruct original signal.	3	Perform Adaptive Delta Modulation and obtain the reconstructed original signal.
2	Demonstrate the analog to digital conversion using Delta Modulation and Demodulation	7	Generate the digital modulated signal using Quadrature Phase shift Keying Modulation and reconstruct the original signal
4	Generate the Amplitude Shift Keying Modulated signal and reconstruct the original signal using demodulation.	9	Apply the Binary Cyclic Code for error detection and correction of digital data
5	Obtain the modulated and demodulated signals for Frequency Shift Keying	10	Binary Frequency Shift Keying Modulation and Demodulation
6	Perform a digital modulation using Binary Phase Shift Keying and reconstruct the original signal using coherent detection	11	Binary Phase Shift Keying Modulation and Demodulation
8	Examine the error detection and correction process using Linear Block Code	12	Quadrature Phase Shift Keying Modulation and Demodulation

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

<b>Evaluation Task</b>	<b>Expt. no's</b>	<b>Marks</b>
Day to Day work = <b>A</b>	1,2,3,4,5,6,7,8...	<b>A = 05</b>
Record = <b>B</b>	1,2,3,4,5,6,7,8...	<b>B = 05</b>
Internal Test = <b>C</b>	1,2,3,4,5,6,7,8...	<b>C = 05</b>
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

Course Coordinator

Module Coordinator

HOD

Mr. M.Sambasiva Reddy

Mrs. K Rani Rudrama

Dr. M Venkata Sudhakar

Dr. Y. Amar Babu





# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs.K.Balavani  
Course Name & Code : Linear IC Applications Lab – 20EC58  
L-T-P Structure : 0-0-3 Credits : 1.5  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Section- C A.Y : 2023-2024

#### COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course provides the practical knowledge on Op-Amp applications like arithmetic circuits, filters and oscillators also provides knowledge on IC555 timer and IC723.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO1</b>	<b>Demonstrate</b> the characteristics and applications of Op-Amps (Understand – L2)
<b>CO2</b>	<b>Apply</b> the 555 Timer circuit concepts for the realization of waveform generators (Apply – L3).
<b>CO3</b>	<b>Design</b> Active filters, arithmetic circuits, waveform generators and data converters using Op-Amp (Apply – L3)
<b>CO4</b>	<b>Adapt</b> effective Communication, presentation and report writing skills (Apply – L3)

#### COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	2	-
<b>CO2</b>	2	3	1	1	-	-	-	2	1	2	-	1	-	2	-
<b>CO3</b>	2	3	1	2	-	-	-	2	1	2	-	1	-	3	-
<b>CO4</b>	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****Batch-1(21761A04G6 to 21761A04J4 & 22765A0416 to 22765A0423 ) Wednesday – FN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	05.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	12.07.2023			
2	Experiment – 2	CO1,CO3	3	19.07.2023			
3	Experiment – 3	CO1,CO3	3	26.07.2023			
4	Experiment – 4	CO1,CO3	3	02.08.2023			
5	Experiment – 5	CO1,CO3	3	09.08.2023			
6	Experiment – 6	CO1,CO3	3	16.08.2023			
Cycle – II							
7	Experiment – 3	CO2	3	25.08.2023			
8	Experiment – 7	CO2	3	13.09.2023			
9	Experiment – 9	CO1,CO3	3	20.09.2023			
10	Experiment – 10	CO1,CO3	3	27.09.2023			
11	Experiment – 11	CO1,CO3	3	04.10.2023			
12	Experiment beyond syllabus	CO3	3	11.10.2023			
13	Revision	--	3	18.10.2023			
--	Internal Examination	--	3	25.10.2023			

**Batch-2 (21761A04D0 to 21761A0G5) Saturday – AN**

Expt. No	Experiment/s	COs	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
--	Introduction to LIA Lab experiments, COs, POs and PSOs	--	3	15.07.2023			
Cycle – I							
1	Experiment – 1	CO1,CO3	3	22.07.2023			
2	Experiment – 2	CO1,CO3	3	05.08.2023			
3	Experiment – 4	CO1,CO3	3	12.08.2023			
4	Experiment – 5	CO1,CO3	3	19.08.2023			
5	Experiment – 6	CO1,CO3	3	26.08.2023			
6	Experiment – 8	CO1,CO3	3	09.09.2023			
Cycle – II							
7	Experiment – 3	CO2	3	16.09.2023			
8	Experiment – 7	CO2	3	23.09.2023			
9	Experiment – 9	CO1,CO3	3	30.09.2023			
10	Experiment – 10	CO1,CO3	3	07.10.2023			
11	Experiment – 11	CO1,CO3	3	14.10.2023			
12	Experiment beyond syllabus	CO3	3	21.10.2023			
--	Internal Examination	--	3	28.10.2023			

**Experiments to be conducted:**

<b>Exp. No</b>	<b>CYCLE-1</b>	<b>Exp. No</b>	<b>CYCLE-2</b>
1	Verification of functionality of Inverting and Non-inverting amplifiers for the Sine and Square wave inputs.	7	Design and Realization of 555 timer based Monostable multivibrator for Pulse generation.
2	Realization of Adder and Subtractor using Op-Amp.	8	Design and Realization of 555 timer based Astable multivibrator for square wave generation
3	Realization of Differentiator and Integrator using Op-Amp	9	Design and Realization of RC phase shift Oscillator for sinusoidal signal generation using Op-Amp.
4	Design, Realization and plot the frequency response of First order Low pass and High pass filters using Op-Amp.	10	Design and Realization of Function generator for square wave and triangular waves using Op-Amps.
5	Design and plot the frequency response of Band pass filter using Op-Amp.	11	Design and Realization of 3-bit Digital to Analog converter using Op-Amp
6	Design and Realization of Op-Amp based Astable multivibrator for Square wave generation.		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

**Part - C****EVALUATION PROCESS:**

<b>Evaluation Task</b>	<b>Expt. no's</b>	<b>Marks</b>
Day to Day work = <b>A</b>	1,2,3,4,5,6,7,8...	<b>A = 05</b>
Record = <b>B</b>	1,2,3,4,5,6,7,8...	<b>B = 05</b>
Internal Test = <b>C</b>	1,2,3,4,5,6,7,8...	<b>C = 05</b>
<b>Cumulative Internal Examination : A + B + C = 15</b>	1,2,3,4,5,6,7,8...	<b>15</b>
<b>Semester End Examinations = D</b>	1,2,3,4,5,6,7,8...	<b>D = 35</b>
<b>Total Marks: A + B + C + D = 50</b>	1,2,3,4,5,6,7,8...	<b>50</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
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<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor

Mrs.K.Balavani

Course Coordinator

Mrs.K.Balavani

Module Coordinator

Dr. G.Srinivasulu

HOD

Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. B Siva Hari Prasad  
 Course Name & Code : Design and Simulation of Antennas Lab & 20ECS3

L-T-P Structure : 1-0-2 Credits : 2  
 Program/Sem/Sec : B.Tech., ECE., V-Sem., Sections- C A.Y :2023-24

**Pre-Requisites:** Electromagnetic waves and Transmission Lines.

**Course Objectives:** In this course, student will learn about how to design and analyze various transmission lines and antennas using Ansys HFSS Software

**Course Outcomes (COs):** At the end of the course, students are able to

CO1	Understand the basic concepts of transmission lines and antennas according to Requirement and applications. ( <b>Understand – L2</b> )
CO2	Apply software tools for different transmission lines and antennas. ( <b>Apply – L3</b> )
CO3	Analyze the different parameters of transmission lines and antennas. ( <b>Analyze – L4</b> )
CO4	Design the different parameters of transmission lines and antennas. ( <b>Apply – L3</b> )
CO5	Adapt effective Communication, presentation and report writing skills (Apply – L3)

**Course Articulation Matrix (Correlation between COs &POs, PSOs):**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	2	-	-	-	1	2	3		1	-	-	-

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put ‘-’

**1**-Slight (Low),

**2**-Moderate (Medium),

**3**-Substantial (High).

### **TEXT BOOK(S):**

- T1** Constantine A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & sons Publishers, 2nd Edition
- T2** JR James, PS Hall "Handbook of Microstrip Antennas" IEE Electromagnetic waves series, 1986.

### **REFERENCE BOOK(S):**

- R1** Matthew N.O. Sadiku, "Elements of Engineering Electromagnetics", Oxford University Press, 4<sup>th</sup> Edition.
- R2** David. M. Pozar "Microwave Engineering", 4th edition, WILEY Publication, 2013.

**PART-B (Theory)****COURSE DELIVERY PLAN (LESSON PLAN): Section-C****UNIT-I:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction of the course Design and Simulation of Antennas	1	15-07-2023			
2.	Introduction to S parameters, Return Loss	1	22-07-2023			
3.	Voltage Standing Wave Ratio(VSWR)	1	05-08-2023			
4.	Transmission coefficient	1	12-08-2023			
5.	Basics of HFSS simulation software	1	19-08-2023			
6.	Transmission lines-short circuit	1	26-08-2023			
7.	Transmission lines-open circuit	1	09-09-2023			
No. of classes required to complete UNIT-I : 8			No. of classes taken :			

**UNIT-II:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Introduction to micro strip patch antennas	1	16-09-2023			
9.	Design specifications	1	23-09-2023			
10.	Rectangular Patch Antennas	1	30-09-2023			
11.	Circular Patch Antennas	1	07-10-2023			
12.	Dual band Patch antennas	1	14-10-2023			
13.	Wide band Patch Antennas	1	21-10-2023			
14.	Revision	1	28-10-2023			
No. of classes required to complete UNIT-II		7	No. of classes taken:			

**PART-B (Lab)****COURSE DELIVERY PLAN (LESSON PLAN): Section-B**

S.No.	Experiment Name	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Introduction-Design and Simulation of Antennas	3	15-07-2023			
2.	Design of micro strip patch antennas using strip line feed and coaxial feed	3	22-07-2023			
3.	Design of patch antennas for Wi-Fi and Wi-Max applications.	3	05-08-2023			
4.	Design of Rectangular and Circular micro strip patch.	3	12-08-2023			
5.	Design of Dipole and dual band antenna,	3	19-08-2023			

6.	Design of microstrip line	3	26-08-2023			
7.	Design of open and short circuit transmission line	3	09-09-2023			
8.	Design of multi stub unit	3	16-09-2023			
9.	Study of characteristic impedances of transmission line	3	23-09-2023			
10.	Design of project by students	3	30-09-2023			
11.	Design of project by students	3	07-10-2023			
12.	Presentation	3	14-10-2023			
13.	Presentation	3	21-10-2023			
14.	Documentation	3	28-10-2023			
No. of classes required to complete UNIT-III : 15				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### **PART-C**

#### **EVALUATION PROCESS (R20 Regulation):**

Report	<b>10</b>
Quality of work	10
Presentation	20
Interaction / Queries	10
Total	50

### **PART-D**

#### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

<b>PEO 1</b>	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
<b>PEO 2</b>	To Function professionally in the rapidly changing world with advances in technology
<b>PEO 3</b>	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
<b>PEO 4</b>	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?



### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry
<b>PSO 2</b>	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3</b>	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date:

**Course Instructor**  
Dr. B Siva Hari Prasad

**Course Coordinator**  
Dr. B Siva Hari Prasad

**Module Coordinator**  
Dr. B.Y.V.N.R. Swamy

**HOD**  
Dr. Y. Amar Babu



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING  
(AUTONOMOUS)**

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada  
Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT & MECH) Under Tier-I  
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : Mr N.Dharmachari/Smt K.Balavani

Course Name & Code : Association & 20ASSOC

Program/Sem/Sec : B.Tech., ECE., V-Sem, C Sec

A.Y : 2023-24

**PART-B**

**PLAN OF ACTION (Association of Electronics and Communication Engineers of LBRCE):-**

S.No.	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1	Introduction to the Association and its activities followed by JAM	10-07-2023		
2	Discussion on Community Service Projects	17-07-2023		
3	Group Discussion on Orissa Train Accident	24-07-2023		
4	Quiz-current affairs	31-07-2023		
5	Technology update-Presentation on electrical vehicles	07-08-2023		
6	Group Discussion on Chendrayan-3	14-08-2023		
7	Debate-Role of AI on Man Kind.	21-08-2023		
8	Speeches on Usage of mobiles-Effecting young minds	04-09-2023		
9	Essay Writing- Necessity to save earth from pollution	11-09-2023		
10	Presentation on Role of Technology in economical growth of a country	25-09-2023		
11	Presentation on 5G Technology	09-10-2023		
12	Technical Quiz	16-10-2023		

Course Instructors

1. Mr N.Dharmachari
2. Smt. K.Balavani

HOD

Dr.Y.Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada

L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE HANDOUT

### PART-A

Name of Course Instructor : N Dharmachari  
Course Name & Code : REAL TIME OPERATING SYSTEMS – 20ECH2  
L-T-P Structure : 3-1-0 Credits : 4  
Program/Sem/Sec : B.Tech., ECE., V-Sem., Honors A.Y : 2023-24

**PRE-REQUISITE:** VLSI Design

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

In this course student will learn about fundamental concepts of real time operating systems, operating system objects, services and I/O concepts, various interrupts and timers

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Understand the basic set of commands and utilities in Linux/UNIX systems.
<b>CO 2</b>	<b>Explain</b> the fundamental concepts of real-time operating systems.
<b>CO 3</b>	<b>Analyze</b> real-time operating systems objects, services and I/O concepts
<b>CO 4</b>	<b>Evaluate</b> various Interrupts and Timers.
<b>CO 5</b>	<b>Design</b> real time embedded systems using the concepts of RTOS.

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	-	-	-	-	-	-	-	--	-	-	1	-	1	-
<b>CO2</b>	2	1	2	1	2	-	-	-	-	-	-	1	-	2	-
<b>CO3</b>	2	2	2	2	2	-	--	-	-	-	-	2	-	3	-
<b>CO4</b>	3	3	3	3	3	-	-	-	-	-	-	2	-	3	-

**Correlation Levels:** 1-Slight (Low), 2-Moderate (Medium), 3-Substantial (High) and No correlation: ‘-’

#### **TEXT BOOK:**

1.Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

#### **REFERENCE BOOKS:**

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

#### **UNIT-I: Introduction**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	General Interaction & Introduction to the course	1	03.07.23		-	
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	05.07.23		-	
3.	Introduction	2	07.07.23		TLM1	
4.	Introduction to UNIX/LINUX	1	10.07.23		TLM2	
5.	Overview of Commands	3	12.07.23 14.07.23		TLM2	
6.	File I/O (open, create, close, lseek, read, write),	2	17.07.23 19.07.23		TLM2	
7.	Process Control (fork, vfork, exit, wait, waitpid, exec)	2	21.07.23		TLM2	
<b>No. of classes required to complete UNIT-I</b>		<b>12</b>	<b>No. of classes taken</b>			

#### **UNIT-II: Real Time Operating Systems**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Brief History of OS, Defining RTOS	1	24.07.23		TLM2	
2.	The Scheduler, Objects, Services	1	26.07.23		TLM2	
3.	Characteristics of RTOS, Defining a Task	2	28.07.23		TLM2	
4.	Tasks States and Scheduling, Task Operations	1	31.07.23		TLM1	
5.	Structure, Synchronization,	1	02.08.23		TLM2	
6.	Communication and Concurrency.	2	04.08.23		TLM1	
7	Defining Semaphores, Operations and Use	1	07.08.23		TLM1	
8	Defining Message Queue, States	1	09.08.23		TLM2	
9	Content, Storage, Operations and Use	2	11.08.23		TLM2	
<b>No. of classes required to complete UNIT-II</b>		<b>12</b>	<b>No. of classes taken</b>			

#### **UNIT-III:**

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Objects	2	14.08.23 16.08.23		TLM2	
2.	Services	2	18.08.23		TLM2	
3.	I/O Pipes	2	21.08.23 23.08.23		TLM1	
4.	Event Registers, Signals	2	25.08.23		TLM1	

5.	Other Building Blocks, Component Configuration	1	04.09.23		TLM2	
6.	Basic I/O Concepts, I/O Subsystem	2	08.09.23		TLM2	
<b>No. of classes required to complete UNIT-III</b>		<b>11</b>	<b>No. of classes taken</b>			

#### UNIT-IV: Exceptions, Interrupts and Timers

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Exceptions	1	11.09.23		TLM2	
2.	Interrupts	1	13.09.23		TLM1	
3.	Applications	2	15.09.23		TLM2	
4.	Processing of Exceptions	1	20.09.23		TLM2	
5.	Spurious Interrupts	2	22.09.23		TLM2	
6.	Real Time Clocks	1	25.09.23		TLM2	
7.	Programmable Timers	1	27.09.23		TLM2	
8.	Timer Interrupt Service Routines (ISR)	2	29.09.23		TLM1	
9.	Soft Timers	1	04.10.23		TLM2	
10.	Operations	2	06.10.23		TLM2	
<b>No. of classes required to complete UNIT-IV</b>		<b>14</b>	<b>No. of classes taken</b>			

#### UNIT-V:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	RT Linux	2	09.10.23 11.10.23		TLM2	
2.	MicroC/OS-II	2	13.10.23		TLM2	
3.	Vx Works	1	16.10.23		TLM2	
4.	Embedded Linux	1	18.10.23		TLM2	
5.	Tiny OS	2	20.10.23		TLM2	
6.	Basic Concepts of Android OS	1	25.10.23		TLM2	
<b>No. of classes required to complete UNIT-V</b>		<b>11</b>	<b>No. of classes taken</b>			

## Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hands-on in codeblocks IDE	2	27.10.23		TLM4	

## Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS:

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Cumulative Internal Examination (CIE) =</b> 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
<b>Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)</b>	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1:</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2:</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3:</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4:</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5:</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6:</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7:</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8:</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9:</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10:</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

	effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11:</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12:</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1:</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2:</b>	<b>VLSI and Embedded Systems:</b> Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools
<b>PSO 3:</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor  
Mr. N.Dharmachari

Course Coordinator  
Mr. N.Dharmachari

Module Coordinator  
Dr. P.Lachi Reddy

HOD  
Dr. Y. Amar Babu



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with Grade 'A', ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

<http://lbrce.ac.in>, Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### COURSE HANDOUT

#### PART-A

**PROGRAM** : B.Tech, V-Sem  
**ACADEMIC YEAR** : 2023-24  
**COURSE NAME & CODE** : Fundamentals of Data Science – 20ADM2  
**L-T-P STRUCTURE** : 3-1-0  
**COURSE CREDITS** : 4  
**COURSE INSTRUCTOR** : V.CHANDRA KUMAR  
**COURSE COORDINATOR** : V.CHANDRA KUMAR  
**PRE-REQUISITE:** Basic Mathematical Knowledge.

**COURSE OBJECTIVE: In this Course student will learn about-** The objective of the course is to perform the operations associated with relations and functions. Relate practical examples to the functions and relations and interpret the associated operations and terminology used in the context. Use formal logic proofs and/or informal but rigorous logical reasoning to, for example, predict the behavior of software or to solve problems such as puzzles.

#### **COURSE OUTCOMES (CO):**

At the end of the course, the student will be able to:

<b>CO1</b>	Construct mathematical arguments using logical connectives & quantifiers and verify them.(Understand – L2)
<b>CO2</b>	Demonstrate the basic terminology of functions, relations, lattices, and their operations.(Understand – L2)
<b>CO3</b>	Apply the properties of graphs to solve the graph theory problems in Computer science.(Apply – L3)
<b>CO4</b>	Illustrate the basic principles/techniques to solve different algebraic structures & combinatorial problems.(Apply – L3)
<b>CO5</b>	Solve linear recurrence relations by recognizing homogeneity using constant coefficients characteristic roots and Generating functions. (Apply – L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3													
<b>CO2</b>	3	3	1	2											
<b>CO3</b>	3	3	1	2											
<b>CO4</b>	3	3	2	1											
<b>CO5</b>	3	3	1												
1 - Low				2 –Medium				3 – High							

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put ‘-’

1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).



**BOS APPROVED TEXT BOOKS:****T1** Python for Data Analysis [1,2,3,4,5]**BOS APPROVED REFERENCE BOOKS:****R1** Python :The complete Reference, Martin C.Brown, McGraw Hill Education**PART-B****COURSE DELIVERY PLAN (LESSON PLAN)****UNIT-I**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to python	1	4-7-2023		2,4	CO1	T1,R1	
2.	Python Features, Python Applications	1	5-7-2023		2,4	CO1	T1,R1	
3.	Python Data Types	1	7-7-2023		2,4	CO1	T1,R1	
4.	Python Operators	1	10-7-2023		2,4	CO1	T1,R1	
5.	Input and output statements	1	12-7-2023		2,4	CO1	T1,R1	
6.	Introduction to Control statements	1	14-7-2023		2,4	CO1	T1,R1	
7.	If, if-elif statements in python	1	17-7-2023		2,4	CO1	T1,R1	
8	String operations in python	1	19-7-2023		2,4	CO1	T1,R1	
9.	String methods in python	1	21-7-2023		2,4	CO1	T1,R1	
10	Introduction to lists in python	1	24-7-2023		2,4	CO1	T1,R1	
11	Lists functions in python	1	26-7-2023		2,4	CO1	T1,R1	
12	Introduction to Tuples in python	1	28-7-2023		2,4	CO1	T1,R1	
13	Introduction to Dictionaries	1	31-7-2023		2,4	CO1	T1,R1	
14	Tuples, Dictionaries methods	1	31-7-2023		3			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

**UNIT-II**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book Followed	HOD Sign Weekly
14.	What is Data Science	1	2-8-2023		2,4	CO2	T1,R1	
15.	Introduction to DataScience	1	4-8-2023		2,4	CO2	T1,R1	
16.	Data Science Applications	1	7-8-2023		2,4	CO2	T1,R1	
17.	Data Science Life Cycle	1	9-8-2023		2,4	CO2	T1,R1	
18.	Data Analysis in Python	1	11-8-2023		2,4	CO2	T1,R1	
19.	Exploratory Data Analysis in python	1			2,4	CO2	T1,R1	

20.	Data Science process	1	14-8-2023		2,4	CO2	T1,R1	
21.	Role of Data Scientist	1	16-8-2023		2,4	CO2	T1,R1	
22.	Data Cleaning	1	16-8-2023		2,4	CO2	T1,R1	
23	Data transformation techniques	1	18-8-2023		2,4	CO2	T1,R1	
24	Principle Data Analysis	1	19-8-2023		2,4	CO2	T1,R1	
25	Principle Data Analysis example	1	21-8-2023		3			
No. of classes required to complete UNIT-II		12			No. of classes taken:			

### UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Introduction to NumPy	1	23-8-2023		2,4	CO3	T1,R2	
27.	Basics of NumPy	1	25-8-2023		2,4	CO3	T1,R2	
28.	Multi Dimensional Array object	1	26-8-2023		2,4	CO3	T1,R2	
29.	Creating nd Arrays	1	04-9-2023		2,4	CO3	T1,R2	
30.	Data types nor nd Arrays	1	06-9-2023		2,4	CO3	T1,R2	
31.	Operations between Arrays and scalars	1	8-9-2023		2,4	CO3	T1,R2	
32.	Basic Indexing and Slicing operations	1	11-9-2023		2,4	CO3	T1,R2	
33.	Boolean Indexing and Fancy Indexing	1	13-9-2023		2,4	CO3	T1,R2	
34	Data processing Using Arrays, Expressing conditional logic arrays	1	15-9-2023		2,4	CO3	T1,R2	
35.	Methods for Boolean Arrays	1	15-9-2023		3			
No. of classes required to complete UNIT-III		10			No. of classes taken:			

### UNIT-IV

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction to Pandas	1	18-9-2023		1,4,5	CO4	T1,R2	
37.	Pandas Libraries	1	20-9-2023		1,4,5	CO4	T1,R2	
38.	Architecture For Pandas Libraries	1	22-9-2023		1,4,5	CO4	T1,R2	
39.	Features of Pandas	1	25-9-2023		1,4,5	CO4	T1,R2	
40.	Applications of Pandas	1	27-9-2023		1,4,5	CO4	T1,R2	
41.	Data Structure Series in python	1	29-9-2023					
42.	Data frame, Index objects	1	4-10-2023					
43.	Functionality of Re indexing	1	4-10-2023					
44.	Dropping Entries from an axis in pandas	1	6-10-2023		1,4,3	CO4	T1,R2	
45.	Indexing ,selection in pandas	1	6-10-2023					
46.	Filtering, Sorting in Pandas	1	8-10-2023					

No. of classes required to complete UNIT-IV	11			No. of classes taken:
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UNIT-V

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
48.	Introduction to Data Preprocessing	1	09-10-2023		1,4,5	CO5	T1,R2	
49.	Data loading ,Storage and File formats	1	11-10-2023		1,4,5	CO5	T1,R2	
50.	Reading and Writing data in text format, Binary Data formats	1	13-10-2023		1,4,5	CO5	T1,R2	
51.	Interacting with html and web apis	1	13-10-2023		1,4,5	CO5	T1,R2	
52.	Combining and merging Datasets	1	16-10-2023		1,4,5	CO5	T1,R2	
53.	Reshaping and pivoting data transformation	1	17-10-2023		1,4,3	CO5	T1,R2	
54	Data Aggregation and Group operations	1	18-10-2023		1,4,3	CO5	T1,R2	
55	Group by operations and transformations	1	20-10-2023		1,4,3	CO5	T1,R2	
56	Pivot tables in data pre processing	1	20-10-2023		1,4,3	CO5	T1,R2	
57.	Cross Tabulation Format in data preprocessing	1	25-10-2023		1,4,3	CO5	T1,R2	
No. of classes required to complete UNIT-V		7			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
55.	Applications of Data science	1	28-10-2023					
56.	Introduction to Data Analytics in Python	1	30-10-2023					

Teaching Learning Methods					
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Problem Solving	<b>TLM7</b>	Seminars or GD
<b>TLM2</b>	PPT	<b>TLM5</b>	Programming	<b>TLM8</b>	Lab Demo
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Assignment or Quiz	<b>TLM9</b>	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions- 1	03-07-2023	26-08-2023	7W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	7W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practicals	06-11-2023	11-11-2023	1W
Semester End Examinations	13-11-2023	25-11-2023	2W

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. V. Chandra Kumar</b>	<b>MR.V. Chandra Kumar</b>	<b>Dr. O. Rama Devi</b>	<b>Dr. O. Rama Devi</b>
<b>Signature</b>				



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING**

**(AUTONOMOUS)**

**Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)**

**Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada**

**L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India**

**DEPARTMENT OF ELECTRONICS & COMMUNICATIONS  
ENGINEERING**

**COURSE HANDOUT**

**PART-A**

Name of Course Instructor : **Dr. Kavuluru VenuGopal**  
 Course Name & Code : **DATABASE MANAGEMENT SYSTEM CONCEPTS & 20ITM3**  
 L-T-P Structure : **3-1-0** **Credits : 4**  
 Program/Sem/Sec : **B. Tech (Minor), ASE, ECE, EEE, MECH** **A. Y : 2023-24**

**PREREQUISITE:** Elementary set theory, concepts of relations and functions, propositional logic data structures (trees, Graphs, dictionaries) & File Concepts.

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course enables the students to know about DBMS basic concepts, Database Languages, Database Design, Normalization process and Transaction processing and Indexing.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	<b>Demonstrate</b> the Basic Components of Database Management System. <b>(Understand -L2)</b>
<b>CO 2</b>	<b>Design</b> Entity-Relationship Diagrams for different applications. <b>(Apply -L3)</b>
<b>CO 3</b>	<b>Examine</b> the relational data model and various constraints. <b>(Apply- L3)</b>
<b>CO 4</b>	<b>Demonstrate</b> Structured Query Language languages (SQL) to manage relational databases and perform various operations on the data. <b>(Apply- L3)</b>
<b>CO 5</b>	<b>Employ</b> principles of normalization for effective database design & transaction management. <b>(Apply- L3)</b>

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	2	-	-	-	-	-	-	-	-	-	3	2	2
<b>CO2</b>	3	3	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO3</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
<b>CO4</b>	2	1	2	-	-	-	-	-	-	-	-	-	3	2	3
<b>CO5</b>	2	1	2	-	-	-	-	-	-	-	-	-	2	3	3

**Note:** Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

**1-** Slight (Low), **2** – Moderate (Medium), **3** - Substantial(High)

**TEXT BOOKS :**

<b>T1</b>	Henry F. Korth, Abraham Silberschatz, S. Sudarshan, "Database Concepts", McGraw Hill, 6th edition, 2009. B
<b>T2</b>	RamezElmasri, Shamkanth . Navathe, "Fundamentals Of Database Systems", Addison Wesley, 6th edition, 2010.

**REFERENCE BOOKS:**

<b>R1</b>	Raghu Ramakrishna, Johannes Gehrke, "Database Management System", McGraw Hill 3rd edition, 2000.
<b>R2</b>	Date C. J, "An Introduction to Database System", Pearson Education, 8th edition, 2003.
<b>R3</b>	Shara Maheshwari, Ruchi Jain, "DBMS: Complete Practical Approach", Firewall Media, New Delhi, 2005.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction**

UNIT-1: Introduction						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	2	12-.07.2023		TLM1,2	
2.	Introduction, An overview of database management system, Database system Vs file system	2	14.07.2023		TLM1,2	
3.	Database system concepts and architecture, Data models schema and instances	2	18.07.2023		TLM1,2	
4.	Data independence and database language and interfaces	2	21.07.2023		TLM1,2	
5.	Data definitions language, DML, Overall Database Structure	2	21-07.2023		TLM1,2	
6.	<b>Revision on Unit-1</b>	2	26.07.2023		TLM1,2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

**UNIT-II: Entity Relationship Model**

UNIT - II: Entity-Relationship Model						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	ER model concepts - attributes, entity, Relationships	2	28.07.2023		TLM1,2	
2.	notation for ER diagram, Mapping constraints	2	01.08.2023		TLM1,2	
3.	Relationships of higher degree, keys -Concepts of Super Key, and identity key, primary key	2	04.08.2023		TLM1,2	
4.	Generalization,Aggregation	2	08.08.2023		TLM1,2	
5.	Reduction of ER diagrams to tables	2	11.08.2023		TLM1,2	
6.	<b>Revision on Unit - II</b>	2	16.08.2023		TLM1,2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

**UNIT-III: Relational Data Model:**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Relational data model concepts	2	18.08.2023		TLM1,2	
2.	Integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints	2	23.08.2023		TLM1,2	
3.	referential integrity	2	25.08.2023		TLM1,2	
4.	Keys constraints	2	05.09.2023		TLM1,2	
5.	Domain constraints	2	08.09.2023		TLM1,2	
6.	Relational Algebra	2	12.09.2023		TLM1,2	
7.	Revision of UNIT-3 & Assignment-I	2	13.09.2023		TLM1,2	
No. of classes required to complete UNIT-III: 14				No. of classes taken:		
I MID EXAMINATIONS				28/08/2023 TO 02/09/2023		

**UNIT-IV: Introduction to SQL**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of SQL, Advantage of SQL	2	15.09.2023		TLM1,2	
2.	SQL Data types and Literals	2	22.09.2023		TLM1,2	
3.	Insert, Update and Delete Operations	2	26.09.2023		TLM1,2	
4.	Tables, Views and Indexes	2	29.09.2023		TLM1,2	
5.	Nested Queries, Aggregate Functions	2	03.10.2023		TLM1,2	
6.	Joins, Unions, Intersection, Minus.	2	04.10.2023		TLM1,2	
7.	Revision of Unit-4	2	06.10.2023		TLM1,2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		



### Unit -V : Normalization

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Functional Dependencies	2	10.10.2023		TLM1,2	
2.	Normal Forms - First, Second	2	11.10.2023		TLM1,2	
3.	Third Normal Forms, BCNF.	1	13.11.2023		TLM1,2	
4.	Transaction System, Testing of Serializability	1	13.10.2023		TLM1,2	
5.	Serializability of Schedules, Conflict & View Serializability	1	17.11.2023		TLM1,2	
6.	Recoverability, Deadlock Handling.	1	18.10.2023		TLM1,2	
7.	Revision of UNIT-5 & Assignment-II	2	20.10.2023		TLM1,2	
No. of classes required to complete UNIT-V: 7				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM1,2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

Evaluation Task	Marks
Assignment – I(Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I – Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I – Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment – II(Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II – Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II – Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	<b>M=30</b>
Cumulative Internal Examination (CIE): M	<b>30</b>
Semester End Examination (SEE)	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	<b>Organize, Analyze and Interpret the data to extract meaningful conclusions.</b>
<b>PSO 2</b>	<b>Design, Implement and Evaluate a computer-based system to meet desired needs.</b>
<b>PSO 3</b>	<b>Develop IT application services with the help of different current Engineering tools.</b>

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. Kavuluru Venu Gopal	Dr. Kavuluru Venu Gopal	Dr. B.Srinivasa Rao	Dr.B.Srinivasa Rao



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),  
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution  
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada  
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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Mrs Swathi Buragadda  
Course Name & Code : IDAA (20CSM7)  
L-T-P Structure : 3-1-0 Credits : 4  
Program/Sem/Sec : B.Tech., ECE,EEE V-A,B,C A.Y: 2023-24

**PRE-REQUISITE:** Data structures and DMS

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to learn various algorithm design techniques and analyze the computing resources of the algorithms and motivate the students to design new algorithms for various problems.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

<b>CO 1</b>	Identify the characteristic of an algorithm and analyses its time and space complexity. (Understand L2)
<b>CO 2</b>	Apply the divide-and-conquer method for solving problems like searching and sorting. (Apply - L3)
<b>CO 3</b>	Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. (Apply - L3)
<b>CO 4</b>	Apply dynamic programming paradigm to solve optimization problems like travelling salesperson problem, 0/1 knapsack problem, Optimal binary search tree (Apply- L3)
<b>CO 5</b>	Analyze the backtracking and branch and bound search methods on optimization problems like N-queen, sum of subsets, 0/1 knapsack, Hamiltonian circuit and so on. (Apply- L3)

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
<b>CO3</b>	2	2	-	1	-	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	2	3	-	1	-	-	-	-	-	-	-	-	-	-	1
<b>CO5</b>	2	3	1	-	-	-	-	-	-	-	-	-	-	-	1

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

#### **TEXT BOOKS:**

T1: Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Computer Algorithms', Galgotia Publications.

T2: Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, Pearson, 2007.

**REFERENCE BOOKS:**

- R1: Aho, Hopcroft & Ullman, 'The Design and Analysis of Computer Algorithms',  
Addison Wesley publications
- R2: Thomas H. Cormen et al, 'Introduction to Algorithms', PHI.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section C****UNIT-I : Introduction**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	10.07.2022		TLM1	
2.	Algorithm definition and Specifications	1	12.07.2023		TLM1	
3.	Performance Analysis	2	14.07.2023		TLM1	
4.	Time Complexity and space complexity					
5.	Asymptotic Notations- Big-Oh, Omega and Theta	1	17.07.2023		TLM1	
6.	Revision	1	19.07.2023		TLM3	
No. of classes required to complete UNIT-I		6		No of classes taken		

**UNIT-II: Divide & Conquer**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Divide & Conquer Technique: General Method	1	21.07.2023		TLM1	
8.	Binary Search and its analysis	1	21.07.2023		TLM1	
9.	Finding Maximum and Minimum and its Analysis	1	24.07.2023		TLM1	
10.	Merge sort and its Analysis	1	26.07.2023		TLM1	
11.	Quick Sort algorithm and its analysis	1	28.07.2023		TLM1	
12.	Closest pair of points	1	28.07.2023		TLM1	
13.	Revision	1	02.08.2023		TLM3	
<b>No. of classes required to complete UNIT-II</b>		7		<b>No of classes taken</b>		

**UNIT-III: The Greedy method**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Greedy Method – Introduction, General method	1	04.08.2023		TLM1	

15.	Knapsack problem, Example problem	2	04.08.2023		TLM1	
16.	Job sequencing with deadlines, Example problem	2	07.08.2023 & 09.08.2023		TLM1	
17.	Minimum cost spanning trees, example problem	2	11.08.2023		TLM1	
18.	Optimal storage on tapes, Example problem	2	14.08.2023 & 16.08.2023		TLM1	
19.	Single source shortest path problem	2	18.08.2023		TLM1	
20.	Huffman coding	2	21.08.2023 & 23.08.2023		TLM1	
21.	Tutorial – II / Quiz - II	1	25.08.2023		TLM3	
<b>No. of classes required to complete UNIT-III</b>		<b>14</b>		<b>No of classes taken</b>		

#### UNIT-IV: Dynamic Programming

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Dynamic Programming-General method	2	04.09.2023 & 13.09.2023		TLM1	
23.	Multistage Graph, Example problem	2	15.09.2023		TLM1	
24.	All pairs shortest path, Example problem	3	20.09.2023 & 22.09.2023		TLM1	
25.	Optimal Binary Search Tree, Example problem	2	25.09.2023 & 27.09.2023		TLM1	
26.	0/1 Knapsack Problem	3	04.10.2023 & 06.10.2023		TLM1	
27.	Travelling Salesperson Problem	2	09.10.2023 & 11.10.2023		TLM1	
28.	Single source shortest path problem, Example Problem	2	13.10.2023		TLM1	
29.	Reliability design, Example Problem	2	16.10.2023 & 18.10.2023		TLM1	
30.	Tutorial – III / Quiz - III	1	20.10.2023		TLM3	
<b>No. of classes required to complete UNIT-IV</b>		<b>19</b>		<b>No of classes taken</b>		

#### UNIT-V: Back tracking

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	General Method	1	20.10.2023		TLM1	
32.	The 8-Queens problem	1	25.10.2023		TLM1	
33.	Sum of subsets problem	2	27.10.2022		TLM1	
34.	Graph coloring problem	1	01.11.2023		TLM1	
35.	Hamiltonian cycles	2	01.11.2023		TLM1	
<b>No. of classes required to complete UNIT-V</b>		<b>07</b>		<b>No of classes taken</b>		

### Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Convex hull	1	29.10.2022		TLM2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

### PART-C

### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40

Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

## **PART-D**

### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs B.Swathi			Dr.D.Veeraiah