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: Mr.G.Venkata Rao, Assoc. Professor
Course Name & Code : ACD-20EC03 **Regulation**: R20
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B. Tech. III-Sem., ECE-A Sec **A.Y.:** 2023-24

PRE REQUISITE: Fundamentals of Electronics.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides focus on h-parameter models, analysis, selection and proper biasing of transistors like BJT and FET, emphasis on working principles of BJT / FET amplifiers using appropriate equivalent models, gives importance to feedback in amplifiers to improve the amplifier characteristics, design of Oscillators, linear wave shaping Circuits and Multivibrators.

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

CO1	Understand the concept of amplifier, Oscillator and linear wave shaping circuits. **(Understand – L2)**
CO2	Apply the suitable models of the transistor for estimating gain, input resistance, and output resistance and feedback concepts at amplifier and oscillator circuits. **(Apply – L3)**
CO3	Analyze feedback concepts in amplifier, oscillator circuits, and Multivibrators. **(Analyze – L4)**
CO4	Apply knowledge of transistor for the design of amplifiers, oscillator circuits, linear wave shaping Circuits and Multivibrators**. (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
CO1	2	3	1	-	-	3	1	-	-	-	1	2	-	2	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	3	1	1	-	-	-	-	-	-	-	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	1	1	-	3	-
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.

T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Small Signal Amplifiers, FET 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 course, Course Outcomes, Introduction to UNIT-I	1	07/08/23			
2.	Small signal modeling of transistor	1	08/08/23			
3.	h- parameter model of a Transistor	1	09/08/23			
4.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	10/08/23			
5.	Exact analysis of CE,CB,CC amplifiers	1	14/08/23			
6.	Approximate analysis of CE amplifier without Emitter resistance	1	16/08/23			
7.	Approximate analysis of CB,CC amplifier	1	17/08/23			
8.	Approximate analysis of CE amplifier with Emitter resistance	1	21/08/23			
9.	Analysis of CS FET amplifier	1	22/08/23			
10.	Analysis of CD FET amplifier	2	23/08/23 24/08/23			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: Multistage Amplifiers, Frequency Response of 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
11.	Analysis and Design of Cascade Amplifier	1	28/08/23			
12.	Analysis and Design of Cascode Amplifier	1	29/08/23			
13.	Analysis and Design of Darlington pair	1	30/08/23			
14.	Frequency response of Single stage amplifier	1	31/08/23			
15.	Frequency response of multi stage amplifier	1	04/09/23			
16.	Effect of coupling and bypass capacitor on frequency response	1	05/09/23			
17.	The hybrid- π Common Emitter Transistor model	1	07/09/23			
18.	Hybrid- π Conductance in terms of low frequency h- parameters	2	11/09/23 12/09/23			
19.	Millers Theorem	1	13/09/23			
20.	The CE model - f_β , f_T and $f\alpha$	1	14/09/23			
21.	Gain with resistive load	1	19/09/23			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Feedback amplifiers, Oscillators, Introduction to power 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
22.	Classification of Amplifiers, Feedback block Diagram	1	20/09/23			
23.	General characteristics of Negative feedback Amplifiers	1	21/09/23			
24.	Qualitative analysis of Voltage series feedback amplifier	1	25/09/23			
25.	Qualitative analysis of current series feedback amplifier	1	26/09/23			
26.	Qualitative analysis of Voltage shunt feedback amplifier	1	27/09/23			
27.	Qualitative analysis of current shunt feedback amplifier	1	20/09/23			
28.	Effect of feedback on frequency response of amplifier	1	09/10/23			
29.	Qualitative analysis of RC oscillators	1	10/10/23			
30.	Qualitative analysis of LC oscillators	1	11/10/23			
31.	Qualitative analysis of Crystal oscillator	1	12/10/23			
32.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	16/10/23			
33.	Class C, Class S amplifiers	1	17/10/23			
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Linear wave shaping Circuits

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.	Low pass RC circuit and their response for sinusoidal input	1	18/10/23			
35.	Response of LPF for step, pulse inputs	1	19/10/23			
36.	Response of LPF for square and ramp inputs	1	26/10/23			
37.	High pass RC circuit and their response for sinusoidal, step input	1	30/10/23			
38.	Response of HPF for step, pulse inputs	2	31/10/23 01/11/23			
39.	Response of HPF for square and ramp inputs	1	02/11/23			
40.	RC circuit as differentiator, integrator, Double differentiator	1	06/11/23			
41.	Problems on LPF	1	07/11/23			
42.	Problems on HPF	1	08/11/23			
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Multivibrators

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.	Bistable Multivibrator- self-biased transistor binary, Principle of operation	1	09/11/23			
44.	Analysis and Design of Bistable Multivibrators	2	13/11/23 14/11/23			
45.	Triggering types	1	15/11/23			
46.	Schmitt trigger circuit-Principle of operation	1	16/11/23			
47.	calculation of UTP, LTP and applications	1	20/11/23			
48.	Collector-coupled Monostable - Principle of operation	1	21/11/23			
49.	Astable Multivibrators Principle of operation	1	22/11/23			
50.	Analysis and design of Astable Multivibrators	1	23/11/23			
51.	Problems on Astable Multivibrators	1	27/11/23			
52.	Problems on Mono stable Multivibrators	1	28/11/23			
No. of classes required to complete UNIT-V: 11				**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
53.	Abot ICs	2	29/11/23 30/11/23		TLM1	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 04-08-2023

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.G.Venkata Rao**	**Dr.B V Siva Kumar**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.G.Venkata Rao
Course Name & Code : ACD Lab-20EC53 **Regulation**: R20
L-T-P Structure : 0-0-2 **Credits:** 1
Program/Sem/Sec : B. Tech. III-Sem., ECE A Sec **A.Y.:** 2023-24

PREREQUISITE: Fundamentals of Electronic Devices

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the practical exposure on designing of different single stage and multistage stage amplifiers, effect of capacitances on frequency response, analysis of power and feedback amplifiers.

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

CO1	**Demonstrate** the characteristics of Amplifiers, Oscillators, feedback amplifiers, and Multivibrators.
CO2	**Apply** the knowledge of capacitances on frequency response, Timer circuits and its applications
CO3	**Design** of feedback amplifiers, Power amplifiers and waveform generators using Electronic devices and components.
CO4	Adapt effective Communication, presentation and report writing skills

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	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	1	2	-	-	-	-	-	-	-	1	-	2	-
CO4	-	-	-	-	-	-	-	-	3	2	-	-	-	3	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.
T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	07/08/23			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	14/08/23			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	21/08/23			
4.	Design of two stage RC Coupled amplifier.	3	28/08/23			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	04/09/23			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	11/09/23			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	25/09/23			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	09/10/23			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	16/10/23			
10.	Design and Realization of Low pass filter using RC networks.	3	30/10/23			
11.	Design and Realization of High Pass filter using RC networks.	3	06/11/23			
12.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	13/11/23			
13.	Revision		20/11/23			
14.	Internal Lab Examination	3	27/11/23			
No. of classes required to complete : 39				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	10/08/23			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	17/08/23			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	24/08/23			
4.	Design of two stage RC Coupled amplifier	3	31/08/23			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	07/09/23			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	14/09/23			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	21/09/23			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	12/10/23			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	19/10/23			
10.	Design and Realization of Low pass filter using RC networks.	3	26/10/23			
11.	Design and Realization of High Pass filter using RC networks.	3	02/11/23			
12.	Revision of Experiments	3	09/11/23			
13.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	16/11/23			
14.	Revision		23/11/23			
15.	Internal Lab Examination	3	30/11/23			
No. of classes required to complete : 42				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
PEO 2	To Function professionally in the rapidly changing world with advances in technology
PEO 3	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices
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PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 12-09-2022

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Mr.G,Venkata Rao**	**Mr.G,Venkata Rao**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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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 B Rambabu**

Course Name & Code : Signals and Systems – 20EC04

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

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

PRE-REQUISITE: Vectors, Scalars, Approximation of a vector by another vector, Differentiation and Integration of signals.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course introduces signals and the way to perform mathematical operations on them.Further, it also introduces representation of signals in both time and frequency domains using orthogonal functions and describes Fourier series, the Fourier Transform and Laplace Transforms along with their properties. The course characterizes system behavior by estimating system response. It also introduces the concepts of sampling.

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

CO 1	**Summarize** the basic concepts of signals, systems and their properties **(Understand – L2)**
CO 2	**Examine** the operations on signals and approximate using orthogonal functions. **(Apply – L3)**
CO 3	**Apply** the concept of impulse response to analyze the linear timeinvariant systems **(Apply – L3)**
CO 4	**Analyze** continuous time periodic and aperiodic signals using Fourier series, Fourier transform and Laplace transforms **(Analyze – L4)**

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	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

TEXT BOOKS:

T1: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI/Pearson publishers,2nd Edition.

T2: B P Lathi, Signals, Systems and Communications, BSP, 2003, 3rd Edition.

REFERENCE BOOKS:

R1: Simon Haykin, Signals and Systems, John Wiley, 2004

R2: P. Ramesh Babu, R.Ananda Natarajan "Signals and Systems", Scitech Publications , 2nd edition,2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - B

UNIT-I: Signal Analysis

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	1	08.08.2023			
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	10.08.2023			
3.	Concept of signal and Classification of Signals-Continuous Time and Analog, Discrete Time and Digital Signals.	1	11.08.2023			
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	17.08.2023			
5.	Decaying, Raising and Double Exponential, Gate and Rectangular, Sinc and Sampling Signals	1	18.08.2023			
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding),Amplitude Scaling	1	19.08.2023			
7.	Convolution; Graphical Method of Convolution	1	22.08.2023			
8.	Properties of Signals- Even and Odd, Causal and Non Causal, Bounded and Unbounded	1	24.08.2023			
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	25.08.2023			
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling.	1	26.08.2023			
11.	Problems on Convolution	1	29.08.2023			
No. of classes required to complete UNIT-I		**11**	**No. of classes taken**			

UNIT-II: Signal Approximation and Fourier Series

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Approximation of a Signal by another signal-Mean square error	1	31.08.2023			
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	1	01.09.2023			
3.	Evaluation of Mean square error, Gibbs Phenomena	1	02.09.2023			
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	05.09.2023			
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series (TFS)	1	07.09.2023			
6.	Exponential Fourier Series (EFS)	1	08.09.2023			
7.	Relations among coefficients of TFS and EFS	1	12.09.2023			
8.	Representation of Periodic signal by Fourier series over the entire interval	1	14.09.2023			
9.	Symmetry conditions of Fourier Series	1	15.09.2023			
10.	Parseval's Theorem	1	16.09.2023			
11.	Problems on Fourier Series	1	19.09.2023			
No. of classes required to complete UNIT-II		**11**	**No. of classes taken**			

UNIT-III: Fourier Transform and Sampling Theorem

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Representation of aperiodic signal by Fourier Transform and it's need	1	21.09.2023			
2.	Deriving Fourier Transform from Fourier Series, Convergence of Fourier Transform-Dirichlet Conditions	1	22.09.2023			
3.	Properties of Fourier Transform	1	23.09.2023			
4.	Properties of Fourier Transform	1	26.09.2023			
5.	**Fourier Transform of Various Classes of Signals - Problems**	**1**	**29.09.2023**			
6.	Fourier Transform of Various Classes of Signals - Problems	1	30.09.2023			
7.	Fourier Transform of Periodic Signal	1	10.10.2023			
8.	Sampling Theorem	1	12.10.2023			
9.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	13.10.2023			
10.	Effect of under sampling- Aliasing, Difference between low pass sampling and band pass sampling	1	17.10.2023			
11.	Problem on Fourier Transform of periodic Signals	1	19.10.2023			
No. of classes required to complete UNIT-III		**11**	**No. of classes taken**			

UNIT-IV: Signal Transmission Through Linear Systems

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	System Definition and Classification	1	20.10.2023			
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	21.10.2023			
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	24.10.2023			
4.	Time and Frequency Analysis of LTI System	1	26.10.2023			
5.	Problems	1	27.10.2023			
6.	System Bandwidth and Rise Time	1	28.10.2023			
7.	Distortion less Transmission through a System	1	31.10.2023			
8.	Problems on Properties of systems	1	02.11.2023			
9.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	03.11.2023			
10.	Physically Realizable Systems and Poly-Wiener Criterion	1	04.11.2023			
11.	Problems	1	07.11.2023			
No. of classes required to complete UNIT-IV		**11**	**No. of classes taken**			

UNIT-V: Laplace Transforms

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of Laplace Transform	1	09.11.2023			
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	10.11.2023			
3.	Laplace Transform of Various Classes of Signals	1	14.11.2023			
4.	Region of Convergence (ROC) and its Properties	1	16.11.2023			
5.	Problems on Laplace Transform and ROC	1	17.11.2023			
6.	Properties of Laplace Transform	1	18.11.2023			
7.	Properties of Laplace Transform	1	21.11.2023			
8.	Inverse Laplace Transform using Partial Fractions Method	1	23.11.2023			
9.	Applications of Laplace Transform: Causality of a System, Stability of a System & Problems	1	24.11.2023			
10.	Solving of Differential Equations and Analysis of RLC Circuits & Problems	1	25.11.2023			
11.	Problems	1	28.11.2023			
No. of classes required to complete UNIT-V		**11**	**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.	Introduction to 2D & 3D Signals	**1**	30.11.2023			
2.	Convolution operation on 2D Signals	**1**	01.12.2023			

Teaching Learning Methods

TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**Problem analysis**: 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:	**Design/development of solutions**: 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:	**Conduct investigations of complex problems**: 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:	**Modern tool usage**: 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:	**The engineer and society**: 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:	**Environment and sustainability**: 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:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10:	**Communication**: 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:	**Project management and finance**: 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:	**Life-long learning**: 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:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** 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
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 04.08.2023

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr B Rambabu	Mr. T Anil Raju	Dr. G L N Murthy	Dr. Y. Amar Babu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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/Dr.Y.Amar Babu/ Mr.K.V.Ashok/Mrs. M. Ramya Harika

Course Name & Code : DSD Lab-20EC54 **Regulation**: R20
L-T-P Structure : 1-0-2 **Credits:** 2
Program/Sem/Sec : B. Tech. III-Sem., ECE A Sec **A.Y.:** 2023-24

PREREQUISITE: Digital Electronics

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides practical exposure in Xilinx compiler and in-built simulator to describe the simulation of digital circuits using Verilog HDL and explain Verilog HDL programs to generate test bench simulations.

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

CO1	**Demonstrate** the functionality of logic gates using Verilog HDL simulator. (**Understand-L2)**
CO2	**Analyze** the behaviour of combinational and sequential circuits using Verilog HDL simulator. (**Analyze-L4)**
CO3	**Understand** the functionality of memories using Verilog HDL simulator. (**Understand-L2)**
CO4	**Adapt** effective Communication, presentation and report writing. (**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
CO1	1	1	2	1	2	-	-	-	-	-	-	1	-	**2**	-
CO2	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO3	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	-	2	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 John F. Wakerly, "Digital Design", Principles and Practices, Pearson education, 4th edition

T2 T.R. Padmanabhan and B. Bala Tripura Sundari, "Design through Verilog HDL", Wiley IEEE Press.

REFERENCE BOOKS:

R1 Charles H. Roth Jr., "Digital System Design Using VHDL", PWS Publications, USA, Reprint 2002.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	07-08-2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	14-08-2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	21-08-2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	28-08-2023		TLM4	
5.	3 to 8 Decoder –74138.	3	04-09-2023		TLM4	
6.	4 Bit Comparator –7485.	3	11-09-2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	1	25-09-2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	2	25-10-2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	16-10-2023		TLM4	
10.	Decade counter –7490.	3	30-10-2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	06-11-2023		TLM4	
12.	Shift registers –7495.	3	13-11-2023		TLM4	
13.	Universal shift registers – 74194/195.	3	20-11-2023		TLM4	
14.	Internal Examination	3	27-11-2023			
No. of classes required to complete : 39				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	03-08-2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	10-08-2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	17-08-2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	24-08-2023		TLM4	
5.	3 to 8 Decoder –74138.	3	31-08-2023		TLM4	
6.	4 Bit Comparator –7485.	3	07-09-2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	14-09-2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	21-09-2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	19-10-2023		TLM4	
10.	Decade counter –7490.	3	26-10-2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	02-11-2023		TLM4	
12.	Shift registers –7495.	3	09-11-2023		TLM4	
13.	Universal shift registers – 74194/195.	3	16-11-2023		TLM4	

14.	Practice Labs	3	23-11-2023			
15.	Internal Examination	3	30-11-2023			
No. of classes required to complete : 39				**No. of classes taken:**		

Content beyond Syllabus

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of 4-bit ALU	3	09-10-2023/ 12-10-2023		TLM4	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Dr.K. Ravi Kumar**	**Dr. K. Ravi Kumar**	**Dr. P. Lachi Reddy**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering
Academic Year: 2023 – 24

COURSE HANDOUT

PART-A:

Name of Course Instructor : Dr. G. L. N. Murthy, Professor of ECE
Course Name & Code : Random Variables and Stochastic Processes – 20EC05
L-T-P-Cr Structure : 3-0-0-3
Program/Sem/Sec : B.Tech., ECE., III-Sem., Section - A

Pre-Requisites: Probability Theory, Basics of Differentiation and Integration.

Course Objective: This course provides the knowledge on random variables and their statistical behavior. It also provides the complete information about temporal and spectral characteristics of random processes. The course also provides the information about evaluation of system response to random inputs and Noise characteristics.

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

CO1	Summarize the concepts of random variables, random processes and noise. **(Understand-L2)**
CO2	Use the mathematical concepts of random variables and random processes for determining statistical parameters and spectral characteristics **(Apply-L3)**
CO3	Analyze the behavior of random variables and random processes using distribution and density functions **(Analyze-L4)**
CO4	Apply the knowledge of random variables and stochastic processes for analyzing the system behavior **(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	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	2	1	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	2	-	-	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 BOOK(S):

T1 **Peyton Z. Peebles, Jr**, "Probability, Random Variables and Random Signal Principles", Tata Mc Graw-Hill, 4th edition, New Delhi.

T2 **Y.Mallikarjuna Reddy,** "Probability Theory and Stochastic Processes", Universities Press(India) Pvt. Ltd., 2010.

PART-B: Course Delivery Plan (Lesson Plan): B.Tech., ECE., III-Sem., Section - A

UNIT-I: Random Variables, Operations on One Random Variable

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 RVSP Course	1	08-08-23			
2.	Introduction to UNIT-I	1	09-08-23			
3.	Concept of Probability	1	10-08-23			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	16-08-23			
5.	Classification of Random Variable	1	17-08-23			
6.	Cumulative Distribution Function (CDF) and Properties	1	19-08-23			
7.	Probability Density Function (PDF) and Properties	1	22-08-23			
8.	Pre-Defined Distributions	1	23-08-23			
9.	Pre-Defined Distributions	1	24-08-23			
10.	Expectation, Moments and Central Moments	1	26-08-23			
11.	Characteristic Function with Properties	1	29-08-23			
12.	Moment Generating Function with Properties	1	30-08-23			
13.	Problem Solving Session	1	31-08-23			
No. of classes required to complete UNIT-I		**13**	No. of classes taken			

UNIT-II: Multiple Random Variables, Operations on Multiple Random Variables

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	02-09-23			
15.	Joint Distribution Function and Properties, Marginal Distribution Function	1	05-09-23			
16.	Joint Density Function and Properties, Marginal Density Function	1	07-09-23			
17.	Statistical Independence	1	12-09-23			
18.	Distribution and Density of Sum of Random Variables	1	13-09-23			
19.	Central Limit Theorem	1	14-09-23			
20.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	16-09-23			
21.	Joint Central Moment, Covariance and Correlation Coefficient	1	19-09-23			
22.	Problem Solving Session	1	20-09-23			
23.	Problem Solving Session	1	21-09-23			
No. of classes required to complete UNIT-II		**10**	No. of classes taken			

UNIT-III: Stochastic Processes-Temporal Characteristics

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	23-09-23			
25.	Concept of Stochastic Processes, Classification of Stochastic Processes	1	26-09-23			
26.	Distribution and Density of Stochastic Processes	1	27-09-23			
27.	Stationary Stochastic Processes	1	28-09-23			
28.	Problem Solving Session	1	30-09-23			
29.	Time Averages and Ergodicity	1	10-10-23			
30.	Correlation Functions- ACF & Properties	1	11-10-23			
31.	Correlation Functions- CCF & Properties	1	12-10-23			
32.	Covariance Functions-Autocovariance and Cross-covariance Functions	1	17-10-23			
33.	Problem Solving Session	1	18-10-23			
34.	Problem Solving Session	1	19-10-23			
35.	Problem Solving Session	1	21-10-23			
No. of classes required to complete UNIT-III			**12**	No. of classes taken		

UNIT-IV: Stochastic Processes-Spectral Characteristics

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	24-10-23			
37.	Power Spectral Density and Properties	1	25-10-23			
38.	Relation between CCF & CPSD - Wiener-Khintchine Relation	1	26-10-23			
39.	Cross Power Spectral Density and Properties	1	28-10-23			
40.	Relation between CCF & CPSD	1	31-10-23			
41.	Relation between CCF and CPSD	1	01-11-23			
42.	Problem Solving Session	1	02-11-23			
43.	Problem Solving Session	1	04-11-23			
44.	Problem Solving Session	1	07-11-23			
45.	Problem Solving Session	1	08-11-23			
No. of classes required to complete UNIT-IV			**10**	No. of classes taken		

UNIT-V: Linear Systems with Random Inputs, Noise

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-V	1	09-11-23			
47.	Response of a Linear System	1	14-11-23			
48.	Mean value of System Response, Mean Square value of System Response	1	15-11-23			
49.	ACF of Response, CCF of input and output	1	16-11-23			
50.	Relation b/n ACF of Response, and CCF of input and output	1	18-11-23			
51.	PSD of Response, CPSD of input and output	1	21-11-23			
52.	Problem Solving Session	1	22-11-23			
53.	Definition of Noise, and Classification	1	23-11-23			
54.	Modeling of Noise Sources	1	25-11-23			
55.	Available Power Gain and Noise Figure	1	28-11-23			
56.	Problem Solving Session	1	29-11-23			
No. of classes required to complete UNIT-V		**11**	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
57.	Stochastic Signal Processing (SSP)	**1**	30-11-23			
58.	Applications of SSP	**1**	02-12-23			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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**
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	**30**
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	**70**
Total Marks = CIE + SEE	**100**

PART-D: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

PO 1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: **Problem analysis**: 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: **Design/development of solutions**: 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: **Conduct investigations of complex problems**: 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: **Modern tool usage**: 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: **The engineer and society**: 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: **Environment and sustainability**: 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: **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: **Communication**: 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: **Project management and finance**: 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: **Life-long learning**: 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.

PSO 1: **Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

PSO 2: **VLSI and Embedded Systems:** 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

PSO 3: **Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Date **07.08.2023**	Dr. B. Ramesh Reddy **Course Coordinator**	Dr. G L N Murthy **Course Instructor & Module Coordinator**	Dr. Y. Amar Babu **HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
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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: **M.Kiran Kumar**
Course Name & Code **: DATA STRUCTURES & 20CS03**
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech. /III sem-ECE/A-sec **A.Y.:** 2023-24

PREREQUISITE: Programming Language

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques**.**

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

CO1	Write the algorithms for various operations on list using arrays and linked list and analyze the time complexity of its operations. **(Understand - L2)**
CO2	Apply linear data structures like stack and queue in problem solving. (**Apply - L3**)
CO3	Demonstrate various sorting techniques and compare their computational complexities in terms of space and time. **(Understand - L2)**
CO4	Write the algorithms for various operations on binary trees, binary search trees and AVL trees. (**Understand - L2**)
CO5	Demonstrate graph traversal techniques and hashing techniques. (**Understand - L2**)

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											3		
CO2	3	1											3		
CO3	3	2											2		
CO4	3	1											3		
CO5	3	1											1		
1 - Low					**2** –Medium							**3** - High			

TEXTBOOKS:

T1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd edition [1,2,3 units].

T2 ReemaThareja, Data Structures using c, Oxford Publications [3,4,5].

REFERENCE BOOKS:

R1 Langson, Augenstein &Tenenbaum, 'Data Structures using C and C++', 2nd Ed, PHI.

R2 RobertL.Kruse, Leung and Tando, 'Data Structures and Program Design in C', 2ndedition, PHI.

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	HOD Sign Weekly
1.	Introduction to Data Structures	1	07-08-2023		TLM1	
2.	Classification of Data Structures	1	08-08-2023		TLM1	
3.	Introduction to Algorithm	1	11-08-2023		TLM1	
4.	Algorithm Analysis	1	12-08-2023		TLM1	
5.	Asymptotic Notations	1	14-08-2023		TLM1	
6.	List using Arrays	1	15-08-2023		TLM1	
7.	Single Linked List	3	18-08-2023 19-08-2023 21-08-2023		TLM1	
8.	Double Linked List	3	22-08-2023 25-08-2023 26-08-2023		TLM1	
9.	Circular Linked List	2	28-08-2023 01-09-2023		TLM1	
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	HOD Sign Weekly
10.	STACKS ADT	1	02-09-2023		TLM2	
11.	STACKS USING ARRAYS	1	04-09-2023 05-09-2023		TLM1	
12.	STACKS USING LINKED LIST	1	08-09-2023		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	09-09-2023 11-09-2023		TLM1	
14.	POSTFIX EVALUTION	1	12-09-2023		TLM1	
15.	CHECKING BALANCED PARANTHESIS, QUEUE	1	15-09-2023		TLM1	
16.	QUEUE USING ARRAY & LINKED LIST	1	16-09-2023		TLM1	
17.	CIRCULAR QUEUE,	1	18-09-2023		TLM1	
18.	DEQUE	1	22-09-2023		TLM1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: SORTING TECHNIQUES

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.	Bubble sort	1	23-09-2023		TLM2	
20.	Insertion Sort	1	25-09-2023		TLM1	
21.	Selection Sort	1	26-09-2023		TLM1	
22.	Merge Sort	2	29-09-2023 30-09-2023		TLM1	
23.	Quick Sort	2	09-10-2023 10-10-2023		TLM1	
24.	Heap Sort	2	13-10-2023 14-10-2023		TLM1	
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT-IV: TREES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to Trees	1	16-10-2023		TLM1	
26.	Binary Trees, Tree Traversals	2	17-10-2023 20-10-2023		TLM1	
27.	Binary Trees Implementation	1	21-10-2023		TLM2	
28.	Binary Search Trees	2	27-10-2023		TLM1	
29.	AVL Trees	1	28-10-2023		TLM1	
30.	Operations & Examples	2	30-10-2023 31-11-2023		TLM1	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: GRAPHS & HASHING TECHNQIUES

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.	GRAPHS, FUNDAMENTALS	1	03-11-2023		TLM1	
32.	REPRESENTATION OF GRAPHS	1	04-11-2023		TLM1	
33.	BFS	2	06-11-2023 07-11-2023		TLM1	
34.	DFS	2	10-11-2023 11-11-2023		TLM1	
35.	Hashing Introduction,	1	13-11-2023		TLM1	
36.	Hash function, separate Chaining	2	14-11-2023 17-11-2023		TLM1	
37.	Linear & Quadratic Probing	2	18-11-2023 20-11-2023		TLM1	
38.	Double & Rehasing	1	21-11-2023		TLM2	
39.	Revision	1	24-11-2023 25-11-2023		TLM1	
40.	Revision	1	27-11-2023 28-11-2023		TLM1	
41.	Revision	1	01-12-2023 02-12-2023		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr.M.Kiran Kumar**	**Mr. D. Anil kumar**	**Dr. K Naga Prasanthi**	**Dr. D. Veeraiah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution

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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: M.Kiran Kumar

Course Name & Code : DATA STRUCTURES LAB & 20CS53

L-T-P Structure : 0-0-3 **Credits:** 1.5

Program/Sem/Sec : B.Tech/III sem-ECE /A-Sec. **A.Y.:** 2022-23

PREREQUISITE: C Programming Language

COURSE OBJECTIVE:

The objective of this course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques

COURSE OUTCOMES (CO):

CO1: Implement Linear Data Structures using array and Linked list. (**Apply - L3**)

CO2: Implement Various Sorting Techniques. (**Apply - L3**)

CO3: : Implement Non-Linear Data Structure such as Trees &Graphs. (**Apply - L3**)

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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		2	1		1										
CO2		2	1		1										
CO3		2	1		1										
CO4								2	2	2					

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction & List using Arrays	3	08-08-2023		
2.	Linked List Programs	6	22-08-2023 05-09-2023		
3.	Stack, Queue Using Arrays, Linked List	3	12-09-2023		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	26-09-2023		
5.	Circular Queue Double Ended Queue	3	10-10-2023		
6.	Bubble sort Selection sort Insertion sort	3	17-10-2023		
7.	Merge sort Quick sort	3	31-10-2023		
8.	Heap sort Binary Tree	3	07-11-2023		
9.	Binary Search Tree	3	14-11-2023		
10.	BFS,DFS	3	25-11-2023		
11.	Lab Internal Exam	3	28-11-2023		

PART-C

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr.M.Kiran Kumar**	**Mr. D. Anil kumar**	**Dr. K Naga Prasanthi**	**Dr. D. Veeraiah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

Department of Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructors: Dr.B.Rambau/Dr.M.V.Sudhakar/Mr.T.Anil Raju/Mr.M.K.Linga Murthy

Course Name & Code	**:** Signal Modeling and Analysis- 20ECS1	**Regulation**: R20
L-T-P Structure	**:** 1-0-2	**Credits:** 2
Program/Sem/Sec	: B.Tech., ECE., III-Sem., Section-A	**A.Y.:** 2023-24

PREREQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this course, student will learn about basic signal modeling and analysis concepts like generations of signals using trigonometric function, solving linear equations and analyzing time function in frequency using MATLAB software.

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

CO1	Understand the programming concept of plotting trigonometric function, linear equations solutions in MATLAB
CO2	Analyze the time frequency relations of signals in MATLAB.
CO3	Adapt effective communication, presentation and report writing.

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	1	1	-	1	2	-	-	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	-	-	-	2	-	-	-	1	2	3		1	-	-	-
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1 Rudra Pratap., Getting started with MATLAB: A Quick Introduction for Scientists and Engineers

T2 B.P. Lathi., Principles of LINEAR SYSTEMS and SIGNALS, second edition, OXFORD University PRESS.

REFERENCE BOOKS:

R1 Larry E. Knop., Linear Algebra: A First Course with Applications.

PART-A

UNIT-1: MATLAB Basics

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 MATLAB	1	09-08-23		TLM4	
2.	MATLAB windows	1	09-08-23		TLM4	
3.	On-line help, File types,	1	09-08-23		TLM4	
4.	Input-output, Platform dependence, General command	1	09-08-23		TLM4	
5.	Programming in MATLAB	1	16-08-23		TLM4	
6.	Script Files and Function Files	1	16-08-23		TLM4	
7.	Executing a function	1	16-08-23		TLM4	
8.	Plotting Graphs.	1	16-08-23		TLM4	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT – II: Linear Algebra and Signal Operations

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.	Solving a linear system	1	23-08-23		TLM1	
2.	Gaussian elimination, Cramer's Rule	1	23-08-23		TLM1	
3.	Finding eigen values and eigenvectors,	1	23-08-23		TLM1	
4.	Vector operations, Element-by-element operations	1	23-08-23		TLM1	
5.	Continuous time signals, operations on signals	1	30-08-23		TLM1	
6.	Convolution	1	30-08-23		TLM1	
7.	Frequency analysis	1	30-08-23		TLM1	
No. of classes required to complete UNIT-I: 07				**No. of classes taken:**		

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to MATLAB	1	13-09-23		TLM4	
2	Generation of continuous time signals .	1	13-09-23		TLM4	
3	Product of signals	1	13-09-23		TLM4	
	Plot the family of curves of a function over a time over.	1	13-09-23		TLM4	
4	Solving linear equations using matrix inverse methods	1	20-09-23		TLM4	
5	Solving linear equations using Cramer's methods	1	20-09-23		TLM4	
6	Compute Eigen values and Eigen vectors of given matrix.	2	20-09-23		TLM4	

7	Basic operations on the signals.	2	27-09-23		TLM4	
8	Convolution of signals.	2	27-09-23		TLM4	
9	Transformation of signals into time and frequency domains.	4	04-10-23		TLM4	
10	Compute and plot the Fourier coefficients for the periodic signal given signal.	4	11-10-23		TLM4	
11	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	4	18-10-23		TLM4	
12	Mini Project /Review	4	25-10-23		TLM6	
13	Mini Project /Review	4	01-11-23		TLM6	
14	Mini Project /Review	4	08-11-23		TLM6	
15	Mini Project /Review	4	15-11-23		TLM6	
16	Review/ Internal Evaluation	4	22-11-23		TLM6	
17	Internal Evaluation	4	29-11-23		TLM6	
No. of classes required to complete:47				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Report=A	Mini Project	A=10
Quality of work=B	Mini Project	B=10
Presentation=C	Mini Project	C=20
Interaction/Queries=D	Mini Project	**D=10**
Total=A+B+C+D	Mini Project	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. B.Rambabu**	**Dr. B.Rambabu**	**Dr. G. L.N.Murthy**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
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Phone: 08659-222933, Fax: 08659-222931
FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. A. Rami Reddy
Course Name & Code : Numerical Methods & Integral Calculus & 20FE10
L-T-P Structure : 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ECE A **A.Y.:** 2023 - 24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

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

CO1	Estimate the best fit polynomial for the given tabulated data using Interpolation.(Understand – L2)
CO2	Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3	Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4	Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5	Evaluate the directional derivative, divergence and angular velocity of a vector function. (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
CO1	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO2	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO3	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO4	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO5	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
1 - Low					**2** –Medium							**3** - High			

TEXTBOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.
T2 Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.
T3 S. S. Sastry, "Introductory Methods of Numerical Analysis" 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

R1 M. D. Greenberg, "Advanced Engineering Mathematics", 2nd Edition, TMH Publications, New Delhi, 2011.
R2 Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & sons, New Delhi, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Interpolation and Finite Differences

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 course, Course Outcomes	1	07/08/23		TLM1	
2.	Introduction to UNIT I	1	09/08/23		TLM2	
3.	Forward Differences	1	11/08/23		TLM1	
4.	Backward differences	1	14/08/23		TLM1	
5.	Central Differences	1	16/08/23		TLM1	
6.	Symbolic relations and separation of symbols	1	18/08/23		TLM1	
7.	Symbolic relations and separation of symbols	1	19/08/23		TLM1	
8.	Newton's forward formulae for interpolation	1	21/08/23		TLM1	
9.	Newton's backward formulae for interpolation	1	23/08/23		TLM1	
10.	Lagrange's Interpolation	1	25/08/23		TLM1	
11.	Lagrange's Interpolation	1	26/08/23		TLM1	
12.	Tutorial I	1	28/08/23		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Numerical solutions of Equations and Numerical Integration

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 UNIT II	1	30/08/23		TLM2	
14.	Algebraic and Transcendental Equations	1	01/09/23		TLM1	
15.	False Position method	1	02/09/23		TLM1	
16.	False Position method	1	04/09/23		TLM1	
17.	Newton- Raphson Method in one variable	1	08/09/23		TLM1	
18.	Newton- Raphson Method applications	1	09/09/23		TLM1	
19.	Trapezoidal rule	1	11/09/23		TLM1	
20.	Simpson's 1/3 Rule	1	13/09/23		TLM1	
21.	Simpson's 3/8 Rule	1	15/09/23		TLM1	
22.	Tutorial II	1	16/09/23		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Multiple Integrals

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.	Introduction to Unit-III	1	20/09/23		TLM1	
24.	Double Integrals -Cartesian coordinates	1	22/09/23		TLM1	
25.	Double Integrals- Polar co ordinates	1	23/09/23		TLM1	
26.	Problems	1	25/09/23		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	27/09/23		TLM2	
28.	Revision for mid exam	1	29/09/23			
I MID EXAMINATIONS (02-10-2023 TO 07-10-2023)						
29.	Triple Integrals - Cartesian coordinates	1	30/09/23		TLM1	

30.	Triple Integrals - Spherical coordinates	1	09/10/23		TLM1	
31.	Change of order of Integration	1	11/10/23		TLM1	
32.	Tutorial III	1	13/10/23		TLM3	
33.	Change of order of Integration	1	14/10/23		TLM1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Fourier Series

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.	Introduction to UNIT IV	1	16/10/23		TLM1	
35.	Determination of Fourier coefficients, Even and Odd Functions	1	18/10/23		TLM1	
36.	Fourier Series expansion in the interval $[0,2\pi]$	1	25/10/23		TLM1	
37.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	27/10/23		TLM1	
38.	Fourier Series in an arbitrary interval [0, 2l]	1	28/10/23		TLM1	
39.	Fourier Series in an arbitrary interval [-l, l]	1	30/10/23		TLM1	
40.	Fourier series in an arbitrary interval odd and even functions	1	01/11/23		TLM1	
41.	Half-range Sine and Cosine series	1	03/11/23		TLM1	
42.	Half-range Sine and Cosine series	1	04/11/23		TLM1	
43.	Tutorial IV	1	06/11/23		TLM3	
44.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	08/11/23		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Introduction to UNIT V	1	10/11/23		TLM1	
46.	Vector Differentiation	1	11/11/23		TLM1	
47.	Gradient	1	13/11/23		TLM1	
48.	Directional Derivative	1	15/11/23		TLM1	
49.	Divergence	1	17/11/23		TLM1	
50.	Curl	1	18/11/23		TLM1	
51.	Solenoidal and Irrotational functions, potential surfaces	1	20/11/23		TLM1	
52.	Laplacian and second order operators	1	22/11/23		TLM1	
53.	TUTORIAL - V	1	24/11/23		TLM3	
54.	Properties	1	25/11/23		TLM1	
55.	Introduction to Vector Integrals (Content Beyond the Syllabus)	1	27/11/23		TLM1	
56.	Revision	1	29/11/23			
57.	Revision	1	1/12/23			
58.	Revision	1	2/12/23			
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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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PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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. A. Rami Reddy**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931
FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. K. Jhansi Rani
Course Name & Code : Numerical Methods & Integral Calculus & 20FE10
L-T-P Structure : 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ECE B **A.Y.:** 2023 - 24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

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

CO1	Estimate the best fit polynomial for the given tabulated data using Interpolation.(Understand – L2)
CO2	Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3	Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4	Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5	Evaluate the directional derivative, divergence and angular velocity of a vector function. (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
CO1	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO2	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO3	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO4	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
CO5	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**			
1 - Low					**2** –Medium							**3** - High			

TEXTBOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.
T2 Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.
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REFERENCE BOOKS:

R1 M. D. Greenberg, "Advanced Engineering Mathematics", 2nd Edition, TMH Publications, New Delhi, 2011.
R2 Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & sons, New Delhi, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Interpolation and Finite Differences

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 course, Course Outcomes	1	07/08/23		TLM1	
2.	Introduction to UNIT I	1	09/08/23		TLM2	
3.	Forward Differences	1	11/08/23		TLM1	
4.	Backward differences	1	14/08/23		TLM1	
5.	Central Differences	1	16/08/23		TLM1	
6.	Symbolic relations and separation of symbols	1	18/08/23		TLM1	
7.	Symbolic relations and separation of symbols	1	19/08/23		TLM1	
8.	Newton's forward formulae for interpolation	1	21/08/23		TLM1	
9.	Newton's backward formulae for interpolation	1	23/08/23		TLM1	
10.	Lagrange's Interpolation	1	25/08/23		TLM1	
11.	Lagrange's Interpolation	1	28/08/23		TLM1	
12.	Tutorial I	1	26/08/23		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Numerical solutions of Equations and Numerical Integration

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 UNIT II	1	30/08/23		TLM2	
14.	Algebraic and Transcendental Equations	1	01/09/23		TLM1	
15.	False Position method	1	02/09/23		TLM1	
16.	False Position method	1	04/09/23		TLM1	
17.	Newton- Raphson Method in one variable	1	08/09/23		TLM1	
18.	Newton- Raphson Method applications	1	11/09/23		TLM1	
19.	Trapezoidal rule	1	13/09/23		TLM1	
20.	Simpson's 1/3 Rule	1	15/09/23		TLM1	
21.	Simpson's 3/8 Rule	1	20/09/23		TLM1	
22.	Tutorial II	1	16/09/23		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Multiple Integrals

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.	Introduction to Unit-III	1	22/09/23		TLM1	
24.	Double Integrals -Cartesian coordinates	1	23/09/23		TLM1	
25.	Double Integrals- Polar co ordinates	1	25/09/23		TLM1	
26.	Problems	1	27/09/23		TLM1	
27.	Applications to Double integrals (Content Beyond the syllabus)	1	29/09/23		TLM2	
28.	Revision for mid exam	1	30/09/23			
I MID EXAMINATIONS (02-10-2023 TO 07-10-2023)						

29.	Triple Integrals - Cartesian coordinates	1	09/10/23		TLM1	
30.	Triple Integrals - Spherical coordinates	1	11/10/23		TLM1	
31.	Change of order of Integration	1	13/10/23		TLM1	
32.	Tutorial III	1	16/10/23		TLM3	
33.	Change of order of Integration	1	18/10/23		TLM1	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Fourier Series

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.	Introduction to UNIT IV	1	25/10/23		TLM1	
35.	Determination of Fourier coefficients, Even and Odd Functions	1	27/10/23		TLM1	
36.	Fourier Series expansion in the interval $[0,2\pi]$	1	28/10/23		TLM1	
37.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	30/10/23		TLM1	
38.	Fourier Series in an arbitrary interval [0, 2l]	1	01/11/23		TLM1	
39.	Fourier Series in an arbitrary interval [-l, l]	1	03/11/23		TLM1	
40.	Fourier series in an arbitrary interval odd and even functions	1	04/11/23		TLM1	
41.	Half-range Sine and Cosine series	1	06/11/23		TLM1	
42.	Half-range Sine and Cosine series		08/11/23		TLM1	
43.	Tutorial IV	1	10/11/23		TLM3	
44.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	13/11/23		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Vector Differentiation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Introduction to UNIT V	1	15/11/23		TLM1	
46.	Vector Differentiation	1	17/11/23		TLM1	
47.	Gradient	1	18/11/23		TLM1	
48.	Directional Derivative	1	20/11/23		TLM1	
49.	Divergence	1	22/11/23		TLM1	
50.	Curl	1	24/11/23		TLM1	
51.	Solenoidal and Irrotational functions, potential surfaces	1	25/11/23		TLM1	
52.	Laplacian and second order operators	1	27/11/23		TLM1	
53.	TUTORIAL - V	1	29/11/23		TLM3	
54.	Properties	1	01/12/23		TLM1	
55.	Introduction to Vector Integrals (Content Beyond the Syllabus)	1	02/12/23		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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. Jhansi Rani**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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.
hodcse@lbrce.ac.in, cselbreddy@gmail.com, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **D Anil kumar**
Course Name & Code **: DATA STRUCTURES & 20CS03**
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech. /III sem-ECE/B-sec **A.Y.:** 2023-24

PREREQUISITE: Programming Language

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques**.**

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

CO1	Write the algorithms for various operations on list using arrays and linked list and analyze the time complexity of its operations. **(Understand - L2)**
CO2	Apply linear data structures like stack and queue in problem solving. (**Apply - L3**)
CO3	Demonstrate various sorting techniques and compare their computational complexities in terms of space and time. **(Understand - L2)**
CO4	Write the algorithms for various operations on binary trees, binary search trees and AVL trees. (**Understand - L2**)
CO5	Demonstrate graph traversal techniques and hashing techniques. (**Understand - L2**)

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											3		
CO2	3	1											3		
CO3	3	2											2		
CO4	3	1											3		
CO5	3	1											1		
1 - Low					**2** –Medium						**3** - High				

TEXTBOOKS:

T1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd edition [1,2,3 units].

T2 ReemaThareja, Data Structures using c, Oxford Publications [3,4,5].

REFERENCE BOOKS:

R1 Langson, Augenstein &Tenenbaum, 'Data Structures using C and C++', 2nd Ed, PHI.

R2 RobertL.Kruse, Leung and Tando, 'Data Structures and Program Design in C', 2ndedition, PHI.

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	HOD Sign Weekly
1.	Introduction to Data Structures	1	07-08-2023		TLM1	
2.	Classification of Data Structures	1	09-08-2023		TLM1	
3.	Introduction to Algorithm	1	11-08-2023		TLM1	
4.	Algorithm Analysis	1	12-08-2023		TLM1	
5.	Asymptotic Notations	1	14-08-2023		TLM1	
6.	List using Arrays	1	16-08-2023		TLM1	
7.	Single Linked List	3	18-08-2023 19-08-2023 21-08-2023		TLM1	
8.	Double Linked List	3	23-08-2023 25-08-2023 26-08-2023		TLM1	
9.	Circular Linked List	2	28-08-2023 01-09-2023		TLM1	
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	HOD Sign Weekly
10.	STACKS ADT	1	02-09-2023		TLM2	
11.	STACKS USING ARRAYS	1	04-09-2023		TLM1	
12.	STACKS USING LINKED LIST	1	08-09-2023		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	09-09-2023 11-09-2023		TLM1	
14.	POSTFIX EVALUTION	1	13-09-2023		TLM1	
15.	CHECKING BALANCED PARANTHESIS, QUEUE	1	15-09-2023		TLM1	
16.	QUEUE USING ARRAY & LINKED LIST	1	16-09-2023		TLM1	
17.	CIRCULAR QUEUE,	1	20-09-2023		TLM1	
18.	DEQUE	1	22-09-2023		TLM1	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: SORTING TECHNIQUES

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.	Bubble sort	1	23-09-2023		TLM2	
20.	Insertion Sort	1	25-09-2023		TLM1	
21.	Selection Sort	1	27-09-2023		TLM1	
22.	Merge Sort	2	29-09-2023 30-09-2023		TLM1	
23.	Quick Sort	2	09-10-2023 11-10-2023		TLM1	
24.	Heap Sort	2	13-10-2023 14-10-2023		TLM1	
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT-IV: TREES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to Trees	1	16-10-2023		TLM1	
26.	Binary Trees, Tree Traversals	2	18-10-2023 20-10-2023		TLM1	
27.	Binary Trees Implementation	1	21-10-2023		TLM2	
28.	Binary Search Trees	2	25-10-2023 27-10-2023		TLM1	
29.	AVL Trees	1	28-10-2023		TLM1	
30.	Operations & Examples	2	30-10-2023 01-11-2023		TLM1	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: GRAPHS & HASHING TECHNQIUES

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.	GRAPHS, FUNDAMENTALS	1	03-11-2023		TLM1	
32.	REPRESENTATION OF GRAPHS	1	04-11-2023		TLM1	
33.	BFS	2	06-11-2023 08-11-2023		TLM1	
34.	DFS	2	10-11-2023 11-11-2023		TLM1	
35.	Hashing Introduction,	1	13-11-2023		TLM1	
36.	Hash function, separate Chaining	2	15-11-2023 17-11-2023		TLM1	
37.	Linear & Quadratic Probing	2	18-11-2023 20-11-2023		TLM1	
38.	Double & Rehasing	1	22-11-2023		TLM2	
39.	Revision	1	24-11-2023 25-11-2023		TLM1	
40.	Revision	1	27-11-2023 29-11-2023		TLM1	
41.	Revision	1	01-12-2023 02-12-2023		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. D Anil kumar**	**Mr. D. Anil kumar**	**Dr. K Naga Prasanthi**	**Dr. D. Veeriah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering
Academic Year: 2023 – 24

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr B V N R Siva Kumar, Assoc. Professor

Course Name & Code : ACD-20EC03 **Regulation**: R20
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B. Tech. III-Sem., ECE-B Sec **A.Y.:** 2023-24

PRE REQUISITE: Fundamentals of Electronics.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides focus on h-parameter models, analysis, selection and proper biasing of transistors like BJT and FET, emphasis on working principles of BJT / FET amplifiers using appropriate equivalent models, gives importance to feedback in amplifiers to improve the amplifier characteristics, design of Oscillators, linear wave shaping Circuits and Multivibrators.

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

CO1	Understand the concept of amplifier, Oscillator and linear wave shaping circuits. **(Understand – L2)**
CO2	Apply the suitable models of the transistor for estimating gain, input resistance, and output resistance and feedback concepts at amplifier and oscillator circuits. **(Apply – L3)**
CO3	Analyze feedback concepts in amplifier, oscillator circuits, and Multivibrators. **(Analyze – L4)**
CO4	Apply knowledge of transistor for the design of amplifiers, oscillator circuits, linear wave shaping Circuits and Multivibrators. **(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
CO1	2	3	1	-	-	3	1	-	-	-	1	2	-	2	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	3	1	1	-	-	-	-	-	-	-	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	1	1	-	3	-
1 - Low				**2** –Medium							**3** – High				

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.
T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Small Signal Amplifiers, FET 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 course, Course Outcomes	1	08-08-23			
2.	Introduction to UNIT-I	1	09-08-23			
3.	Small signal modeling of transistor	1	11-08-23			
4.	h- parameter model of a Transistor	1	16-08-23			
5.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	18-08-23			
6.	Exact analysis of CE,CB,CC amplifiers	1	19-08-23			
7.	Approximate analysis of CE amplifier without Emitter resistance	1	22-08-23			
8.	Approximate analysis of CB amplifier	1	23-08-23			
9.	Approximate analysis of CC amplifier	1	26-08-23			
10.	Approximate analysis of CE amplifier with Emitter resistance	1	29-08-23			
11.	Analysis of CS FET amplifier	1	30-08-23			
12.	Analysis of CD FET amplifier	1	01-09-23			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Multistage Amplifiers, Frequency Response of 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
13.	Analysis and Design of Cascade Amplifier	1	02-09-23			
14.	Analysis and Design of Cascode Amplifier	1	05-09-23			
15.	Analysis and Design of Darlington pair	1	06-09-23			
16.	Frequency response of Single stage amplifier	1	08-09-23			
17.	Frequency response of multi stage amplifier	1	12-09-23			
18.	Effect of coupling and bypass capacitor on frequency response	1	13-09-23			
19.	The hybrid- π Common Emitter Transistor model	1	15-09-23			
20.	Hybrid- π Conductance in terms of low frequency h- parameters	1	16-09-23			

21.	Hybrid- π Conductance in terms of low frequency h- parameters	1	19-09-23			
22.	Millers Theorem	1	20-09-23			
23.	The CE model - f_β , f_T and $f\alpha$	1	22-09-23			
24.	Gain with resistive load	1	23-09-23			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Feedback amplifiers, Oscillators, Introduction to power 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
25.	Classification of Amplifiers, Feedback block Diagram	1	26-09-23			
26.	General characteristics of Negative feedback Amplifiers	1	27-09-23			
27.	Qualitative analysis of Voltage series feedback amplifier	1	29-09-23			
28.	Qualitative analysis of current series feedback amplifier	1	30-09-23			
29.	Qualitative analysis of Voltage shunt feedback amplifier	1	10-10-23			
30.	Qualitative analysis of current shunt feedback amplifier	1	11-10-23			
31.	Effect of feedback on frequency response of amplifier	1	13-10-23			
32.	Qualitative analysis of RC oscillators	1	17-10-23			
33.	Qualitative analysis of LC oscillators	1	18-10-23			
34.	Qualitative analysis of Crystal oscillator	1	20-10-23			
35.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	21-10-23			
36.	Class C, Class S amplifiers	1	24-10-23			
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Linear wave shaping Circuits

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.	Low pass RC circuit and their response for sinusoidal input	1	25-10-23			
38.	Response of LPF for step, pulse inputs	1	27-10-23			
39.	Response of LPF for square and ramp inputs	1	28-10-23			
40.	High pass RC circuit and their response for sinusoidal, step input	1	31-10-23			
41.	Response of HPF for step, pulse inputs	1	03-11-23			
42.	Response of HPF for square and ramp inputs	1	04-11-23			
43.	RC circuit as differentiator and integrator	1	07-11-23			
44.	Double differentiator	1	08-11-23			

No. of classes required to complete UNIT-IV: 08	No. of classes taken:

UNIT-V: Multivibrators

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Introduction to UNIT-V	1	10-11-23			
46.	Bistable Multivibrator- self-biased transistor binary	1	14-11-23			
47.	Principle of operation	1	15-11-23			
48.	Analysis and Design of Bistable Multivibrators	1	17-11-23			
49.	Triggering types	1	18-11-23			
50.	Schmitt trigger circuit-Principle of operation	1	21-11-23			
51.	Schmitt trigger circuit-Principle of operation	1	22-11-23			
52.	calculation of UTP, LTP and applications	1	24-11-23			
53.	Collector-coupled Monostable - Principle of operation	1	25-11-23			
54.	Astable Multivibrators Principle of operation	1	28-11-23			
55.	Analysis and design of Astable Multivibrators	1	29-11-23			
56.	Problems on Astable, Monostable Multivibrators	1	01-12-23			
No. of classes required to complete UNIT-V: 12				**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.	Applications of power amplifiers	1	02-12-23			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 05-08-2023

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr B V N R Siva Kumar**	**Dr B V N R Siva Kumar**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
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, CE & ASE) 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. M K Linga Murthy

Course Name & Code : Signals and Systems – 20EC04

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

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

PRE-REQUISITE: Vectors, Scalars, Approximation of a vector by another vector, Differentiation and Integration of signals.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course introduces signals and the way to perform mathematical operations on them.Further, it also introduces representation of signals in both time and frequency domains using orthogonal functions and describes Fourier series, the Fourier Transform and Laplace Transforms along with their properties. The course characterizes system behavior by estimating system response. It also introduces the concepts of sampling.

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

CO 1	**Summarize** the basic concepts of signals , systems and their properties **(Understand – L2)**
CO 2	**Examine** the operations on signals and approximate using orthogonal functions.**(Apply – L3)**
CO 3	**Apply** the concept of impulse response to analyze the linear timeinvariant systems **(Apply – L3)**
CO 4	**Analyze** continuous time periodic and aperiodic signals using Fourier series, Fourier transform and Laplace transforms **(Analyze – L4)**

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	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

TEXT BOOKS:

T1: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI/Pearson publishers,2nd Edition.

T2: B P Lathi, Signals, Systems and Communications, BSP, 2003, 3rd Edition.

REFERENCE BOOKS:

R1: Simon Haykin, Signals and Systems, John Wiley, 2004

R2: P. Ramesh Babu, R.Ananda Natarajan "Signals and Systems", Scitech Publications , 2nd edition,2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - B

UNIT-I: Signal Analysis

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	1	08.08.2023			
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	09.08.2023			
3.	Concept of signal and Classification of Signals-Continuous Time and Analog, Discrete Time and Digital Signals.	1	10.08.2023			
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	16.08.2023			
5.	Decaying, Raising and Double Exponential, Gate and Rectangular, Sinc and Sampling Signals	1	17.08.2023			
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding),Amplitude Scaling	1	19.08.2023			
7.	Convolution; Graphical Method of Convolution	1	22.08.2023			
8.	Properties of Signals- Even and Odd, Causal and Non Causal, Bounded and Unbounded	1	23.08.2023			
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	24.08.2023			
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling.	1	26.08.2023			
11.	Problems on Convolution	1	29.08.2023			
No. of classes required to complete UNIT-I		**11**	**No. of classes taken**			

UNIT-II: Signal Approximation and Fourier Series

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Approximation of a Signal by another signal-Mean square error	1	30.08.2023			
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	1	31.08.2023			
3.	Evaluation of Mean square error, Gibbs Phenomena	1	02.09.2023			
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	05.09.2023			
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series (TFS)	1	07.09.2023			
6.	Exponential Fourier Series (EFS)	1	12.09.2023			
7.	Relations among coefficients of TFS and EFS	1	13.09.2023			
8.	Representation of Periodic signal by Fourier series over the entire interval	1	14.09.2023			
9.	Symmetry conditions of Fourier Series	1	16.09.2023			
10.	Parseval's Theorem	1	19.09.2023			
11.	Problems on Fourier Series	1	20.09.2023			
No. of classes required to complete UNIT-II		**11**	**No. of classes taken**			

UNIT-III: Fourier Transform and Sampling Theorem

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Representation of aperiodic signal by Fourier Transform and it's need	1	21.09.2023			
2.	Deriving Fourier Transform from Fourier Series, Convergence of Fourier Transform-Dirichlet Conditions	1	23.09.2023			
3.	Properties of Fourier Transform	1	26.09.2023			
4.	Properties of Fourier Transform	1	27.09.2023			
5.	**Fourier Transform of Various Classes of Signals - Problems**	**1**	**30.09.2023**			
6.	Fourier Transform of Various Classes of Signals - Problems	1	10.10.2023			
7.	Fourier Transform of Periodic Signal	1	11.10.2023			
8.	Sampling Theorem	1	12.10.2023			
9.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	17.10.2023			
10.	Effect of under sampling- Aliasing, Difference between low pass sampling and band pass sampling	1	18.10.2023			
11.	Problem on Fourier Transform of periodic Signals	1	19.10.2023			
No. of classes required to complete UNIT-III		**11**	**No. of classes taken**			

UNIT-IV: Signal Transmission Through Linear Systems

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	System Definition and Classification	1	21.10.2023			
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	24.10.2023			
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	25.10.2023			
4.	Time and Frequency Analysis of LTI System	1	26.10.2023			
5.	Problems	1	28.10.2023			
6.	System Bandwidth and Rise Time	1	31.10.2023			
7.	Distortion less Transmission through a System	1	01.11.2023			
8.	Problems on Properties of systems	1	02.11.2023			
9.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	04.11.2023			
10.	Physically Realizable Systems and Poly-Wiener Criterion	1	07.11.2023			
11.	Problems	1	08.11.2023			
No. of classes required to complete UNIT-IV		**11**	**No. of classes taken**			

UNIT-V: Laplace Transforms

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of Laplace Transform	1	09.11.2023			
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	14.11.2023			
3.	Laplace Transform of Various Classes of Signals	1	15.11.2023			
4.	Region of Convergence (ROC) and its Properties	1	16.11.2023			
5.	Problems on Laplace Transform and ROC	1	18.11.2023			
6.	Properties of Laplace Transform	1	21.11.2023			
7.	Properties of Laplace Transform	1	22.11.2023			
8.	Inverse Laplace Transform using Partial Fractions Method	1	23.11.2023			
9.	Applications of Laplace Transform: Causality of a System, Stability of a System & Problems	1	25.11.2023			
10.	Solving of Differential Equations and Analysis of RLC Circuits & Problems	1	28.11.2023			
11.	Problems	1	29.11.2023			
No. of classes required to complete UNIT-V		**11**	**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.	Introduction to 2D & 3D Signals	**1**	30.11.2023			
2.	Convolution operation on 2D Signals	**1**	02.12.2023			

Teaching Learning Methods

TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**Problem analysis**: 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:	**Design/development of solutions**: 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:	**Conduct investigations of complex problems**: 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:	**Modern tool usage**: 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:	**The engineer and society**: 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:	**Environment and sustainability**: 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:	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10:	**Communication**: 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:	**Project management and finance**: 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:	**Life-long learning**: 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:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** 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
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 04.08.2023

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M K Linga Murthy	Mr. T Anil Raju	Dr. G L N Murthy	Dr. Y. Amar Babu

COURSE HANDOUT

PART-A:

Name of Course Instructor : Dr. B. Ramesh Reddy
Course Name & Code : Random Variables and Stochastic Processes – 20EC05
L-T-P-Cr Structure : 3-0-0-3
Program/Sem/Sec : B.Tech., ECE., III-Sem., Section - B

Pre-Requisites: Probability Theory, Basics of Differentiation and Integration.

Course Objective: This course provides the knowledge on random variables and their statistical behavior. It also provides the complete information about temporal and spectral characteristics of random processes. The course also provides the information about evaluation of system response to random inputs and Noise characteristics.

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

CO1	Summarize the concepts of random variables, random processes and noise. **(Understand-L2)**
CO2	Use the mathematical concepts of random variables and random processes for determining statistical parameters and spectral characteristics **(Apply-L3)**
CO3	Analyze the behavior of random variables and random processes using distribution and density functions **(Analyze-L4)**
CO4	Apply the knowledge of random variables and stochastic processes for analyzing the system behavior **(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	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	2	1	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	2	-	-	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 BOOK(S):

T1 **Peyton Z. Peebles, Jr**, "Probability, Random Variables and Random Signal Principles", Tata Mc Graw-Hill, 4th edition, New Delhi.

T2 **Y.Mallikarjuna Reddy,** "Probability Theory and Stochastic Processes", Universities Press(India) Pvt. Ltd., 2010.

PART-B: Course Delivery Plan (Lesson Plan): B.Tech., ECE., III-Sem., Section - B

UNIT-I: Random Variables, Operations on One Random Variable

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 RVSP Course	1	07-08-23			
2.	Introduction to UNIT-I	1	09-08-23			
3.	Concept of Probability	1	10-08-23			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	11-08-23			
5.	Classification of Random Variable	1	14-08-23			
6.	Cumulative Distribution Function (CDF) and Properties	1	16-08-23			
7.	Probability Density Function (PDF) and Properties	1	17-08-23			
8.	Pre-Defined Distributions	1	18-08-23			
9.	Pre-Defined Distributions	1	21-08-23			
10.	Expectation, Moments and Central Moments	1	23-08-23			
11.	Characteristic Function with Properties	1	24-08-23			
12.	Moment Generating Function with Properties	1	25-08-23			
13.	Problem Solving Session	1	28-08-23			
14.	Problem Solving Session	1	30-08-23			
No. of classes required to complete UNIT-I		**14**	No. of classes taken			

UNIT-II: Multiple Random Variables, Operations on Multiple Random Variables

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Introduction to UNIT-II	1	31-08-23			
16.	Joint Distribution Function and Properties, Marginal Distribution Function	1	01-09-23			
17.	Joint Density Function and Properties, Marginal Density Function	1	04-09-23			
18.	Statistical Independence	1	07-09-23			
19.	Distribution and Density of Sum of Random Variables	1	08-09-23			
20.	Central Limit Theorem	1	11-09-23			
21.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	13-09-23			
22.	Joint Central Moment, Covariance and Correlation Coefficient	1	14-09-23			
23.	Problem Solving Session	1	15-09-23			
24.	Problem Solving Session	1	20-09-23			
No. of classes required to complete UNIT-II		**10**	No. of classes taken			

UNIT-III: Stochastic Processes-Temporal Characteristics

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to UNIT-III	1	21-09-23			
26.	Concept of Stochastic Processes, Classification of Stochastic Processes	1	22-09-23			
27.	Distribution and Density of Stochastic Processes	1	25-09-23			
28.	Stationary Stochastic Processes	1	27-09-23			
29.	Problem Solving Session	1	29-09-23			
30.	Time Averages and Ergodicity	1	09-10-23			
31.	Correlation Functions- ACF & Properties	1	11-10-23			
32.	Correlation Functions- CCF & Properties	1	12-10-23			
33.	Covariance Functions-Autocovariance and Cross-covariance Functions	1	13-10-23			
34.	Problem Solving Session	1	16-10-23			
35.	Problem Solving Session	1	18-10-23			
36.	Problem Solving Session	1	19-10-23			
No. of classes required to complete UNIT-III			**12**	No. of classes taken		

UNIT-IV: Stochastic Processes-Spectral Characteristics

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction to UNIT-IV	1	20-10-23			
38.	Power Spectral Density and Properties	1	25-10-23			
39.	Relation between CCF & CPSD - Wiener-Khintchine Relation	1	26-10-23			
40.	Cross Power Spectral Density and Properties	1	27-10-23			
41.	Relation between CCF & CPSD	1	30-10-23			
42.	Relation between CCF and CPSD	1	01-11-23			
43.	Problem Solving Session	1	02-11-23			
44.	Problem Solving Session	1	03-11-23			
45.	Problem Solving Session	1	06-11-23			
46.	Problem Solving Session	1	08-11-23			
47.	Problem Solving Session	1	09-11-23			
No. of classes required to complete UNIT-IV			**11**	No. of classes taken		

UNIT-V: Linear Systems with Random Inputs, Noise

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Introduction to UNIT-V	1	10-11-23			
49.	Response of a Linear System	1	13-11-23			
50.	Mean value of System Response, Mean Square value of System Response	1	15-11-23			
51.	ACF of Response, CCF of input and output	1	16-11-23			
52.	Relation b/n ACF of Response, and CCF of input and output	1	17-11-23			
53.	PSD of Response, CPSD of input and output	1	20-11-23			
54.	Problem Solving Session	1	22-11-23			
55.	Definition of Noise, and Classification	1	23-11-23			
56.	Modeling of Noise Sources	1	24-11-23			
57.	Available Power Gain and Noise Figure	1	27-11-23			
58.	Problem Solving Session	1	29-11-23			
No. of classes required to complete UNIT-V		**11**	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
59.	Stochastic Signal Processing (SSP)	**1**	30-11-23			
60.	Applications of SSP	**1**	01-12-23			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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**
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	**30**
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	**70**
Total Marks = CIE + SEE	**100**

PART-D: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

PO 1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: **Problem analysis**: 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: **Design/development of solutions**: 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: **Conduct investigations of complex problems**: 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: **Modern tool usage**: 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: **The engineer and society**: 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: **Environment and sustainability**: 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: **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: **Communication**: 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: **Project management and finance**: 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: **Life-long learning**: 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.

PSO 1: **Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

PSO 2: **VLSI and Embedded Systems:** 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

PSO 3: **Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Date **07.08.2023**	Dr. B. Ramesh Reddy **Course Instructor & Course Coordinator**	Dr. G L N Murthy **Module Coordinator**	Dr. Y. Amar Babu **HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: D. Anil Kumar

Course Name & Code : DATA STRUCTURES LAB & 20CS53

L-T-P Structure : 0-0-3 **Credits:** 1.5

Program/Sem/Sec : B.Tech/III sem-ECE /B-Sec. **A.Y.:** 2022-23

PREREQUISITE: C Programming Language

COURSE OBJECTIVE:

The objective of this course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques

COURSE OUTCOMES (CO):

CO1: Implement Linear Data Structures using array and Linked list. (**Apply - L3**)

CO2: Implement Various Sorting Techniques. (**Apply - L3**)

CO3: : Implement Non-Linear Data Structure such as Trees &Graphs. (**Apply - L3**)

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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		2	1		1										
CO2		2	1		1										
CO3		2	1		1										
CO4								2	2	2					

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction & List using Arrays	3	12-08-2023		
2.	Linked List Programs	12	12-08-2023 19-08-2023 26-08-2023 02-09-2023		
3.	Stack, Queue Using Arrays, Linked List	6	09-09-2023 16-09-2023		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	23-09-2023		
5.	Circular Queue Double Ended Queue	3	30-09-2023		
6.	Bubble sort Selection sort Insertion sort	3	14-10-2023		
7.	Merge sort Quick sort	3	28-10-2023		
8.	Heap sort Binary Tree	3	04-11-2023		
9.	Binary Search Tree	3	11-11-2023		
10.	BFS,DFS	3	18-11-2023		
11.	Lab Internal Exam	3	25-11-2023		

PART-C

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. D Anil kumar**	**Mr. D. Anil kumar**	**Dr. K Naga Prasanthi**	**Dr. D. Veeriah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
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NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering
Academic Year: 2023 – 24

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr B V N R Siva Kumar
Course Name & Code : ACD Lab-20EC53 **Regulation**: R20
L-T-P Structure : 0-0-2 **Credits:** 1
Program/Sem/Sec : B. Tech. III-Sem., ECE B Sec **A.Y.:** 2023-24

PREREQUISITE: Fundamentals of Electronic Devices

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the practical exposure on designing of different single stage and multistage stage amplifiers, effect of capacitances on frequency response, analysis of power and feedback amplifiers.

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

CO1	**Demonstrate** the characteristics of Amplifiers, Oscillators, feedback amplifiers, and Multivibrators.
CO2	**Apply** the knowledge of capacitances on frequency response, Timer circuits and its applications
CO3	**Design** of feedback amplifiers, Power amplifiers and waveform generators using Electronic devices and components.
CO4	Adapt effective Communication, presentation and report writing skills

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	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	1	2	-	-	-	-	-	-	-	1	-	2	-
CO4	-	-	-	-	-	-	-	-	3	2	-	-	-	3	-
1 - Low **2** –Medium **3** - High															

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.
T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I – TUES DAY

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	08-08-2023			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	22-08-2023			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	29-08-2023			
4.	Design of two stage RC Coupled amplifier.	3	12-09-2023			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	19-09-2023			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	26-09-2023			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	10-10-2023			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	17-10-2023			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	24-10-2023			
10.	Design and Realization of Low pass filter using RC networks.	3	31-10-2023			
11.	Design and Realization of High Pass filter using RC networks.	3	07-11-2023			
12.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	14-11-2023			
13.	Revision Lab	3	21-11-2023			
14.	Internal Lab Examination	3	28-11-2023			
No. of classes required to complete : 42				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II- FRI DAY

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	11-08-2023			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	18-08-2023			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	01-09-2023			
4.	Design of two stage RC Coupled amplifier	3	08-09-2023			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	15-09-2023			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	22-09-2023			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	29-09-2023			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	13-10-2023			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	20-10-2023			
10.	Design and Realization of Low pass filter using RC networks.	3	27-10-2023			
11.	Design and Realization of High Pass filter using RC networks.	3	03-11-2023			
12.	Revision of Experiments	3	10-11-2023			
13.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	17-11-2023			
14.	Revision Lab	3	24-11-2023			
15.	Internal Lab Examination	3	02-12-2023			
No. of classes required to complete : 45				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 05-08-2023

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Dr. B V N R Siva Kumar**	**Mr. G Venkata Rao**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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: Mr. K.V. Ashok/Dr. K. Ravi Kumar/Mrs. M. Ramya Harika

Course Name & Code : DSD Lab-20EC54 **Regulation**: R20
L-T-P Structure : 1-0-2 **Credits:** 2
Program/Sem/Sec : B. Tech. III-Sem., ECE B Sec **A.Y.:** 2023-24

PREREQUISITE: Digital Electronics

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides practical exposure in Xilinx compiler and in-built simulator to describe the simulation of digital circuits using Verilog HDL and explain Verilog HDL programs to generate test bench simulations.

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

CO1	**Demonstrate** the functionality of logic gates using Verilog HDL simulator. (**Understand-L2)**
CO2	**Analyze** the behaviour of combinational and sequential circuits using Verilog HDL simulator. (**Analyze-L4)**
CO3	**Understand** the functionality of memories using Verilog HDL simulator. (**Understand-L2)**
CO4	**Adapt** effective Communication, presentation and report writing. (**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
CO1	1	1	2	1	2	-	-	-	-	-	-	1	-	**2**	-
CO2	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO3	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	-	2	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 John F. Wakerly, "Digital Design", Principles and Practices, Pearson education, 4th edition

T2 T.R. Padmanabhan and B. Bala Tripura Sundari, "Design through Verilog HDL", Wiley IEEE Press.

REFERENCE BOOKS:

R1 Charles H. Roth Jr., "Digital System Design Using VHDL", PWS Publications, USA, Reprint 2002.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	11/08/2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	18/08/2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	25/08/2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	01/09/2023		TLM4	
5.	3 to 8 Decoder –74138.	3	08/09/2023		TLM4	
6.	4 Bit Comparator –7485.	3	15/09/2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	6	29/09/2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	13/10/2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	20/10/2023		TLM4	
10.	Decade counter –7490.	3	03/11/2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	10/11/2023		TLM4	
12.	Shift registers –7495.	3	17/11/2023		TLM4	
13.	Universal shift registers – 74194/195.	3	24/11/2023		TLM4	
14.	Internal Examination	3	01/12/2023			
No. of classes required to complete : 39				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	08/08/2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	22/08/2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	29/08/2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	05/09/2023		TLM4	
5.	3 to 8 Decoder –74138.	3	12/09/2023		TLM4	
6.	4 Bit Comparator –7485.	3	19/09/2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	6	10/10/2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	17/10/2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	24/10/2023		TLM4	
10.	Decade counter –7490.	3	31/10/2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	07/11/2023		TLM4	
12.	Shift registers –7495.	3	14/11/2023		TLM4	
13.	Universal shift registers – 74194/195.	3	21/10/2023		TLM4	
14.	Internal Examination	3	28/10/2023			
No. of classes required to complete : 39				**No. of classes taken:**		

Content beyond Syllabus

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of 4-bit ALU	3	28/10/2023		TLM4	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education
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PEO 4	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner?

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Mr.K.V.Ashok**	**Dr. K. Ravi Kumar**	**Dr. P. Lachi Reddy**	**Dr. Y. Amar Babu**
Signature				

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

Department of Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructors: Dr.G.L.N.Murthy/Dr.B.Rambabu/ Mr.T. Anil Raju/Mr.M.K.Linga Murthy
Course Name & Code :Signal Modeling and Analysis- 20ECS1 **Regulation**:R20
L-T-P Structure :1-0-2 **Credits:**2
Program/Sem/Sec : B.Tech., ECE., III-Sem., Section-B **A.Y.:**2023-24

PREREQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this course, student will learn about basic signal modeling and analysis concepts like generations of signals using trigonometric function, solving linear equations and analyzing time function in frequency using MATLAB software.

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

CO1	Understand the programming concept of plotting trigonometric function, linear equations solutions in MATLAB
CO2	Analyze the time frequency relations of signals in MATLAB.
CO3	Adapt effective communication, presentation and report writing.

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	1	1	-	1	2	-	-	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	-	-	-	2	-	-	-	1	2	3		1	-	-	-
1 - Low					**2** –Medium						**3** - High				

TEXTBOOKS:

T1 Rudra Pratap., Getting started with MATLAB: A Quick Introduction for Scientists and Engineers

T2 B.P. Lathi., Principles of LINEAR SYSTEMS and SIGNALS, second edition, OXFORD University PRESS.

REFERENCE BOOKS:

R1 Larry E. Knop .,Linear Algebra: A First Course with Applications.

PART-A

UNIT-1:MATLAB Basics

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 MATLAB	1	07-08-23		TLM4	
2.	MATLAB windows	1	07-08-23		TLM4	
3.	On-line help, File types,	1	07-08-23		TLM4	
4.	Input-output,Platform dependence, General command	1	14-08-23		TLM4	
5.	Programming in MATLAB	1	14-08-23		TLM4	
6.	Script Files and Function Files	1	14-08-23		TLM4	
7.	Executing a function	1	21-08-23		TLM4	
8.	Plotting Graphs.	1	21-08-23		TLM4	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT – II: Linear Algebra and Signal Operations

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.	Solving a linear system	1	04-09-23		TLM1	
2.	Gaussian elimination, Cramer's Rule	1	11-09-23		TLM1	
3.	Finding Eigen values and eigenvectors,	1	11-09-23		TLM1	
4.	Vector operations, Element-by-element operations	1	18-09-23		TLM1	
5.	Continuous time signals, operations on signals	1	25-09-23		TLM1	
6.	Convolution	1	25-09-23		TLM1	
7.	Frequency analysis	1	09-10-23		TLM1	
No. of classes required to complete UNIT-I:07				**No. of classes taken:**		

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to MATLAB	1	07-08-23		TLM4	
2	Generation of continuous time signals.	1	14-08-23		TLM4	
3	Product of signals	2	21-08-23		TLM4	
4	Plot the family of curves of a function over a time over	4	28-08-23		TLM4	
5	Solving linear equations using matrix inverse methods	3	04-09-23		TLM4	
6	Solving linear equations using Cramer's methods	2	11-09-23		TLM4	
7	Compute Eigen values and Eigen vectors of given matrix.	3	18-09-23		TLM4	
8	Basic operations on the signals.	1	25-09-23		TLM4	
9	Convolution of signals.	1	25-09-23		TLM4	

10	Transformation of signals into time and frequency domains.	3	09-10-23		TLM4	
11	Compute and plot the Fourier coefficients for the periodic signal given signal.	2	16-10-23		TLM4	
12	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	2	16-10-23		TLM4	
13	Mini Project /Review	4	23-10-23		TLM6	
14	Mini Project /Review	4	30-10-23		TLM6	
15	Mini Project /Review	4	06-11-23		TLM6	
16	Mini Project /Review	4	13-11-23		TLM6	
17	Internal Evaluation	4	20-11-23		TLM6	
18	Internal Evaluation	4	27-11-23		TLM6	
No. of weeks required to complete:16				**No. of Weeks taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Report=A	Mini Project	A=10
Quality of work=B	Mini Project	B=10
Presentation=C	Mini Project	C=20
Interaction/Queries=D	Mini Project	**D=10**
Total=A+B+C+D	Mini Project	**50**

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. G.L.N.Murthy**	**Dr. B.Rambabu**	**Dr. G.L.N.Murthy**	**Dr. Y. Amar Babu**
Signature				

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

Name of Course Instructor : Mr. P Venkateswara Rao/Mr.P.James Vijay/Dr.A.Narendra Babu
Course Name : Association
Program/Sem/Sec : B.Tech. ECE.III-Sem, B Sec A.Y : 2023-24

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Discussion about Association Activities by teacher	10-08-2023		
2.	Two-minute talk on Aditya L1 Mission	17-08-2023		
3.	Group Discussion on National Education Policy	24-08-2023		
4.	Innovations in Technology with respect to ECE(PPT)	31-08-2023		
5.	Group Discussion on smart devices	07-09-2023		
6.	Innovations in Technology with respect to ECE(PPT)	14-09-2023		
7.	Debate on social networks	21-09-2023		
8.	Technical Quiz on competitive exam topics	12-10-2023		
9.	Current affairs on technological changes/Technical Talks (PPT/Video)	19-10-2023		
10.	Debate-Role of AI on Man Kind.	26-10-2023		
11.	Presentation on Role of Technology in economical growth of a country	02-11-2023		
12.	Group Discussion on Drone Technology for real time applications	09-11-2023		
13.	Presentation on 5G Technology	16-11-2023		
14.	Testing knowledge on verbal/quantitative/reasoning/problem solving/logical/etc skills	23-11-2023		
15.	Technical Quiz	30-11-2023		

Course Instructors
Mr.P.Venkateswara Rao
Mr.P.James Vijay
Dr.A.Narendra Babu

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, CE & ASE) 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.T.Anil Raju

Course Name & Code : Signals and Systems – 20EC04

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

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

PRE-REQUISITE: Vectors, Scalars, Approximation of a vector by another vector, Differentiation and Integration of signals.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course introduces signals and the way to perform mathematical operations on them. Further, it also introduces representation of signals in both time and frequency domains using orthogonal functions and describes Fourier series, the Fourier Transform and Laplace Transforms along with their properties. The course characterizes system behavior by estimating system response. It also introduces the concepts of sampling.

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

CO 1	**Summarize** the basic concepts of signals , systems and their properties **(Understand – L2)**
CO 2	**Examine** the operations on signals and approximate using orthogonal functions.**(Apply – L3)**
CO 3	**Apply** the concept of impulse response to analyze the linear timeinvariant systems **(Apply – L3)**
CO 4	**Analyze** continuous time periodic and aperiodic signals using Fourier series, Fourier transform and Laplace transforms **(Analyze – L4)**

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	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

TEXT BOOKS:

T1: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI/Pearson publishers,2nd Edition.

T2: B P Lathi, Signals, Systems and Communications, BSP, 2003, 3rd Edition.

REFERENCE BOOKS:

R1: Simon Haykin, Signals and Systems, John Wiley, 2004

R2: P. Ramesh Babu, R.Ananda Natarajan "Signals and Systems", Scitech Publications , 2nd edition,2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - C

UNIT-I: Signal Analysis

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	1	07.08.2023			
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	08.08.2023			
3.	Concept of signal and Classification of Signals-Continuous Time and Analog, Discrete Time and Digital Signals.	1	09.08.2023			
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	10.08.2023			
5.	Decaying, Raising and Double Exponential, Gate and Rectangular, Sinc and Sampling Signals	1	14.08.2023			
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding),Amplitude Scaling	1	16.08.2023			
7.	Convolution; Graphical Method of Convolution	1	17.08.2023			
8.	Properties of Signals- Even and Odd, Causal and Non Causal, Bounded and Unbounded	1	21.08.2023			
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	22.08.2023			
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling.	1	23.08.2023			
11.	Problems on Convolution	1	24.08.2023			
No. of classes required to complete UNIT-I		**11**	**No. of classes taken**			

UNIT-II: Signal Approximation and Fourier Series

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Approximation of a Signal by another signal-Mean square error	1	28.08.2023			
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	1	29.08.2023			
3.	Evaluation of Mean square error, Gibbs Phenomena	1	30.08.2023			
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	31.08.2023			
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series (TFS)	1	04.09.2023			
6.	Exponential Fourier Series (EFS)	1	05.09.2023			
7.	Relations among coefficients of TFS and EFS	1	07.09.2023			
8.	Representation of Periodic signal by Fourier series over the entire interval	1	11.09.2023			
9.	Symmetry conditions of Fourier Series	1	12.09.2023			
10.	Parseval's Theorem	1	13.09.2023			
11.	Problems on Fourier Series	1	14.09.2023			
No. of classes required to complete UNIT-II		**11**	**No. of classes taken**			

UNIT-III: Fourier Transform and Sampling Theorem

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Representation of aperiodic signal by Fourier Transform and it's need	1	19.09-2023			
2.	Deriving Fourier Transform from Fourier Series	1	20.09.2023			
3.	Convergence of Fourier Transform-Dirichlet Conditions	1	21.09.2023			
4.	Properties of Fourier Transform	1	25.09.2023			
5.	Properties of Fourier Transform	1	26.09.2023			
6.	**Fourier Transform of Various Classes of Signals - Problems**	**1**	**27.09.2023**			
7.	Fourier Transform of Various Classes of Signals - Problems	1	09.10.2023			
8.	Fourier Transform of Periodic Signal	1	10.10.2023			
9.	Sampling Theorem	1	11.10.2023			
10.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	12.10.2023			
11.	Effect of under sampling- Aliasing, Difference between low pass sampling and band pass sampling	1	16.10.2023			
12.	Problem on Fourier Transform of periodic Signals	1	17.10.2023			
No. of classes required to complete UNIT-III		**11**	**No. of classes taken**			

UNIT-IV: Signal Transmission Through Linear Systems

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	System Definition and Classification	1	18.10.2023			
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	19.10.2023			
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	25.10.2023			
4.	Time and Frequency Analysis of LTI System	1	26.10.2023			
5.	Problems	1	30.10.2023			
6.	System Bandwidth and Rise Time	1	31.10.2023			
7.	Distortion less Transmission through a System	1	01.11.2023			
8.	Problems on Properties of systems	1	02.11.2023			
9.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	06.11.2023			
10.	Physically Realizable Systems and Poly-Wiener Criterion	1	07.11.2023			
11.	Problems	1	08.11.2023			
No. of classes required to complete UNIT-IV		**11**	**No. of classes taken**			

UNIT-V: Laplace Transforms

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of Laplace Transform	1	09.11.2023			
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	13.11.2023			
3.	Laplace Transform of Various Classes of Signals	1	14.11.2023			
4.	Region of Convergence (ROC) and its Properties	1	15.11.2023			
5.	Problems on Laplace Transform and ROC	1	16.11.2023			
6.	Properties of Laplace Transform	1	20.11.2023			
7.	Properties of Laplace Transform	1	21.11.2023			
8.	Inverse Laplace Transform using Partial Fractions Method	1	22.11.2023			
9.	Applications of Laplace Transform: Causality of a System, Stability of a System & Problems	1	23.11.2023			
10.	Solving of Differential Equations and Analysis of RLC Circuits & Problems	1	27.11.2023			
11.	Problems	1	28.11.2023			
No. of classes required to complete UNIT-V		**11**	**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.	Introduction to 2D & 3D Signals	**1**	29.11.2023			
2.	Convolution operation on 2D Signals	**1**	30.11.2023			

Teaching Learning Methods

TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	30
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**Problem analysis**: 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:	**Design/development of solutions**: 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:	**Conduct investigations of complex problems**: 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:	**Modern tool usage**: 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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PO 7:	**Environment and sustainability**: 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:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10:	**Communication**: 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:	**Project management and finance**: 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:	**Life-long learning**: 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:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** 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
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 04.08.2023

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M K Linga Murthy	Mr. T Anil Raju	Dr. G L N Murthy	Dr. Y. Amar Babu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering
A c a d e m i c Y e a r : 2 0 2 3 – 2 4

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs.T.Kalpana
Course Name & Code **:** ACD Lab-20EC53 **Regulation**: R20
L-T-P Structure **:** 0-0-2 **Credits:** 1
Program/Sem/Sec : B. Tech. III-Sem., ECE C Sec **A.Y.:** 2023-24

PREREQUISITE: Fundamentals of Electronic Devices

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the practical exposure on designing of different single stage and multistage stage amplifiers, effect of capacitances on frequency response, analysis of power and feedback amplifiers.

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

CO1	**Demonstrate** the characteristics of Amplifiers, Oscillators, feedback amplifiers, and Multivibrators.
CO2	**Apply** the knowledge of capacitances on frequency response, Timer circuits and its applications
CO3	**Design** of feedback amplifiers, Power amplifiers and waveform generators using Electronic devices and components.
CO4	Adapt effective Communication, presentation and report writing skills

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	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	1	2	-	-	-	-	-	-	-	1	-	2	-
CO4	-	-	-	-	-	-	-	-	3	2	-	-	-	3	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.
T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	09-08-2023			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	16-08-2023			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	23-08-2023			
4.	Design of two stage RC Coupled amplifier.	3	30-08-2023			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	13-09-2023			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	20-09-2023			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	27-09-2023			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	11-10-2023			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	18-10-2023			
10.	Design and Realization of Low pass filter using RC networks.	3	25-10-2023			
11.	Design and Realization of High Pass filter using RC networks.	3	01-11-2023			
12.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	08-11-2023			
13.	Revision Lab	3	15-11-2023			
14.	Revision Lab	3	22-11-2023			
15.	Internal Lab Examination	3	29-11-2023			
No. of classes required to complete : 45				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Demo on Lab Experiments	3	12-08-2023			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	19-08-2023			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	26-08-2023			
4.	Design of two stage RC Coupled amplifier	3	02-09-2023			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	09-09-2023			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	16-09-2023			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	23-09-2023			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	30-09-2023			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	14-10-2023			
10.	Design and Realization of Low pass filter using RC networks.	3	21-10-2023			
11.	Design and Realization of High Pass filter using RC networks.	3	28-10-2023			
12.	Revision of Experiments	3	04-11-2023			
13.	Verification of conduction angles of power amplifiers**(Experiment beyond syllabus)**	3	11-11-2023			
14.	Revision Lab	3	18-11-2023			
15.	Revision Lab	3	25-11-2023			
16.	Internal Lab Examination	3	02-12-2023			
No. of classes required to complete : 48				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 07-08-2023

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Mrs.T.Kalpana**	**Mr.B.V.N.R.Siva Kumar**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering
Academic Year: 2023 – 24

COURSE HANDOUT

PART-A

Name of Course Instructor: Smt.T.Kalpana, Sr.Asst.Professor

Course Name & Code : ACD-20EC03 **Regulation**: R20
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B. Tech. III-Sem., ECE-C Sec **A.Y.:** 2023-24

PRE REQUISITE: Fundamentals of Electronics.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides focus on h-parameter models, analysis, selection and proper biasing of transistors like BJT and FET, emphasis on working principles of BJT / FET amplifiers using appropriate equivalent models, gives importance to feedback in amplifiers to improve the amplifier characteristics, design of Oscillators, linear wave shaping Circuits and Multivibrators.

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

CO1	Understand the concept of amplifier, Oscillator and linear wave shaping circuits. **(Understand – L2)**
CO2	Apply the suitable models of the transistor for estimating gain, input resistance, and output resistance and feedback concepts at amplifier and oscillator circuits. **(Apply – L3)**
CO3	Analyze feedback concepts in amplifier, oscillator circuits, and Multivibrators. **(Analyze – L4)**
CO4	Apply knowledge of transistor for the design of amplifiers, oscillator circuits, linear wave shaping Circuits and Multivibrators**.** **(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
CO1	2	3	1	-	-	3	1	-	-	-	1	2	-	2	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	3	1	1	-	-	-	-	-	-	-	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	1	1	-	3	-
1 - Low						**2** –Medium						**3** - High			

TEXTBOOKS:

T1 Jacob Millman, Christos C Halkias, Electronic Devices and Circuits, Fourth reprint, Tata McGraw Hill, Publishers, New Delhi, 2011.
T2 Anand Kumar A., Pulse and Digital Circuits, Third edition, PHI Publishers, 2005

REFERENCE BOOKS:

R1 Donald A. Neamen, Electronic Circuit Analysis and Design, Second Edition, Tata McGraw Hill Publishers, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Small Signal Amplifiers, FET 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 course, Course Outcomes	1	09-08-23			
2.	Introduction to UNIT-I	1	10-08-23			
3.	Small signal modeling of transistor	1	11-08-23			
4.	h- parameter model of a Transistor	1	12-08-23			
5.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	16-08-23			
6.	Exact analysis of CE,CB,CC amplifiers	1	17-08-23			
7.	Approximate analysis of CE amplifier without Emitter resistance	1	18-08-23			
8.	Approximate analysis of CB amplifier	1	19-08-23			
9.	Approximate analysis of CC amplifier	1	23-08-23			
10.	Approximate analysis of CE amplifier with Emitter resistance	1	24-08-23			
11.	Analysis of CS FET amplifier	1	25-08-23			
12.	Analysis of CD FET amplifier	1	26-08-23			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Multistage Amplifiers, Frequency Response of 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
13.	Analysis and Design of Cascade Amplifier	1	30-08-23			
14.	Analysis and Design of Cascode Amplifier	1	31-08-23			
15.	Analysis and Design of Darlington pair	1	01-09-23			
16.	Frequency response of Single stage amplifier	1	02-09-23			
17.	Frequency response of multi stage amplifier	1	07-09-23			
18.	Effect of coupling and bypass capacitor on frequency response	1	08-09-23			
19.	The hybrid- π Common Emitter Transistor model	1	09-09-23			
20.	Hybrid- π Conductance in terms of low frequency	1	13-09-23			

	h- parameters					
21.	Hybrid- π Conductance in terms of low frequency h- parameters	1	14-09-23			
22.	Millers Theorem	1	15-09-23			
23.	The CE model - f_β , f_T and fα	1	16-09-23			
24.	Gain with resistive load	1	20-09-23			
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Feedback amplifiers, Oscillators, Introduction to power 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
25.	Classification of Amplifiers, Feedback block Diagram	1	21-09-23			
26.	General characteristics of Negative feedback Amplifiers	1	22-09-23			
27.	Qualitative analysis of Voltage series feedback amplifier	1	23-09-23			
28.	Qualitative analysis of current series feedback amplifier	1	27-09-23			
29.	Qualitative analysis of Voltage shunt feedback amplifier	1	29-09-23			
30.	Qualitative analysis of current shunt feedback amplifier	1	30-09-23			
31.	Effect of feedback on frequency response of amplifier	1	11-10-23			
32.	Qualitative analysis of RC oscillators	1	12-10-23			
33.	Qualitative analysis of LC oscillators	1	13-10-23			
34.	Qualitative analysis of Crystal oscillator	1	14-10-23			
35.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	18-10-23			
36.	Class C, Class S amplifiers	1	19-10-23			
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Linear wave shaping Circuits

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.	Low pass RC circuit and their response for sinusoidal input	1	20-10-23			
38.	Response of LPF for step, pulse inputs	1	21-10-23			
39.	Response of LPF for square and ramp inputs	1	25-10-23			
40.	High pass RC circuit and their response for sinusoidal, step input	1	26-10-23			
41.	Response of HPF for step inputs	1	27-10-23			
42.	Response of HPF for pulse inputs	1	28-10-23			
43.	Response of HPF for square and ramp inputs	1	01-11-23			

44.	RC circuit as differentiator	1	02-11-23			
45.	RC circuit as integrator	1	03-11-23			
46.	Double differentiator	1	04-11-23			
47.	Problems on LPF	1	08-11-23			
48.	Problems on HPF	1	09-11-23			
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Multivibrators

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 to UNIT-V	1	10-11-23			
50.	Bistable Multivibrator- self-biased transistor binary	1	11-11-23			
51.	Principle of operation	1	15-11-23			
52.	Analysis and Design of Bistable Multivibrators	1	16-11-23			
53.	Triggering types	1	17-11-23			
54.	Schmitt trigger circuit-Principle of operation	1	18-11-23			
55.	Schmitt trigger circuit-Principle of operation	1	22-11-23			
56.	calculation of UTP, LTP and applications	1	23-11-23			
57.	Collector-coupled Monostable - Principle of operation	1	24-11-23			
58.	Astable Multivibrators Principle of operation	1	25-11-23			
59.	Analysis and design of Astable Multivibrators	1	29-11-23			
60.	Problems on Astable Multivibrators	1	30-11-23			
61.	Problems on Mono stable Multivibrators	1	01-12-23			
No. of classes required to complete UNIT-V: 13				**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
62.	Applications of power amplifiers	1	02-12-23		TLM1	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Date: 07-08-2023

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Smt.T.Kalpana**	**Mr.G.Venkata Rao**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**

Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 21001:2018,50001:2018,14001:2015 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

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. M. Srinivasa Reddy
Course Name & Code : Numerical Methods & Integral Calculus & 20FE10
L-T-P Structure : 3-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/ECE-C **A.Y.:** 2023 – 24.

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is to enable the students learn Numerical Techniques for solving the equations and apply interpolation techniques. They will also learn about the Fourier analysis of single valued functions, Multiple Integrals in different coordinate systems and Vector differentiation.

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

CO1	Estimate the best fit polynomial for the given tabulated data using Interpolation.(Understand – L2)
CO2	Apply numerical techniques in solving of equations and evaluation of integrals. (Apply – L3)
CO3	Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes. (Apply – L3)
CO4	Generate the single valued functions in the form of Fourier series and obtain Fourier series representation of periodic function. (Apply – L3)
CO5	Evaluate the directional derivative, divergence and angular velocity of a vector function. (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
CO1	3	2	-	2	-	-	-	-	-	-	-	1			
CO2	3	2	-	2	-	-	-	-	-	-	-	1			
CO3	3	2	-	1	-	-	-	-	-	-	-	1			
CO4	3	1	-	-	-	-	-	-	-	-	-	1			
CO5	3	1	-	1	-	-	-	-	-	-	-	1			
1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1	Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.
T2	Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.
T3	S. S. Sastry, "Introductory Methods of Numerical Analysis" 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

R1	M. D. Greenberg, "Advanced Engineering Mathematics", 2nd Edition, TMH Publications, New Delhi, 2011.
R2	Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & sons, New Delhi, 2011.
R3	W.E. Boyce and R. C. Diprima, " Elementary Differential Equations" , 7th Edition, John Wiley

	& sons, New Delhi,2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Interpolation and Finite Differences

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 course, Course Outcomes	1	7/08/23		TLM1	
2.	Introduction to UNIT I	1	10/08/23		TLM2	
3.	Forward Differences	1	11/08/23		TLM1	
4.	Backward differences	1	14/08/23		TLM1	
5.	Central Differences	1	17/08/23		TLM1	
6.	Symbolic relations and separation of symbols	1	18/08/23		TLM1	
7.	Symbolic relations and separation of symbols	1	19/08/23		TLM1	
8.	Newton's forward formulae for interpolation	1	21/08/23		TLM1	
9.	Newton's backward formulae for interpolation	1	24/08/23		TLM1	
10.	Lagrange's Interpolation	1	25/08/23		TLM1	
11.	Lagrange's Interpolation	1	26/08/23		TLM1	
12.	Tutorial I	1	28/08/23		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Numerical solutions of Equations and Numerical Integration

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 UNIT II	1	30/08/23		TLM2	
14.	Algebraic and Transcendental Equations	1	31/08/23		TLM1	
15.	False Position method	1	01/09/23		TLM1	
16.	False Position method	1	02/09/23		TLM1	
17.	Newton- Raphson Method in one variable	1	04/09/23		TLM1	
18.	Newton- Raphson Method applications	1	07/09/23		TLM1	
19.	Trapezoidal rule	1	08/09/23		TLM1	
20.	Simpson's 1/3 Rule	1	09/09/23		TLM1	
21.	Simpson's 3/8 Rule	1	11/09/23		TLM1	
22.	Problems on Numerical Integration	1	14/09/23		TLM3	
23.	Tutorial II	1	15/09/23		TLM3	
24.	Revision on Unit-II	1	16/09/23		TLM3	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Multiple Integrals

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to Unit-III	1	21/09/23		TLM1	
26.	Double Integrals -Cartesian coordinates	1	22/09/23		TLM1	
27.	Double Integrals- Polar co ordinates	1	23/09/23		TLM1	
28.	Problems	1	25/09/23		TLM1	

29.	Applications to Double integrals (Content Beyond the syllabus)	1	29/09/23		TLM2	
30.	Problems on double integrals	1	30/9/23		TLM1	
I MID EXAMINATIONS (02-10-2023 TO 07-10-2023)						
31.	Triple Integrals - Cartesian coordinates	1	09/10/23		TLM1	
32.	Triple Integrals - Spherical coordinates	1	12/10/23		TLM1	
33.	Change of order of Integration	1	13/10/23		TLM 3	
34.	Change of order of Integration	1	14/10/23		TLM1	
35.	Problems on change of order Integration.	1	16/10/23		TLM1	
36.	Tutorial III	1	19/10/23		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Fourier Series

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.	Introduction to UNIT IV	1	20/10/23		TLM1	
38.	Determination of Fourier coefficients, Even and Odd Functions	1	21/10/23		TLM1	
39.	Fourier Series expansion in the interval $[0,2\pi]$	1	26/10/23		TLM1	
40.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	27/10/23		TLM1	
41.	Fourier Series in an arbitrary interval	1	28/10/23		TLM1	
42.	Fourier series in an arbitrary interval odd and even functions	1	30/10/23		TLM1	
43.	Half-range Sine and Cosine series	1	02/11/23		TLM1	
44.	Half-range Sine and Cosine series	1	03/11/23		TLM1	
45.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	04/11/23		TLM3	
46.	Miscellaneous Problems on Fourier series	1	06/11/23		TLM2	
47.	Revision on Unit-IV	1	09/11/23		TLM1	
48.	Tutorial IV	1	10/11/23		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Vector Differentiation

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 to UNIT V	1	11/11/23		TLM1	
50.	Vector Differentiation	1	13/11/23		TLM1	
51.	Gradient	1	16/11/23		TLM1	
52.	Directional Derivative	1	17/11/23		TLM1	
53.	Divergence	1	18/11/23		TLM1	
54.	Curl	1	20/11/23		TLM1	
55.	Solenoidal and Irrotational functions, potential surfaces	1	23/11/23		TLM1	
56.	Laplacian and second order operators	1	24/11/23		TLM1	
57.	Properties	1	25/11/23		TLM3	
58.	Problems on properties	1	27/11/23		TLM1	

59.	Problems on Irrotational vector	1	30/11/23		TLM1	
60.	Revision on Unit -V	1	01/12/23			
61.	TUTORIAL - V	1	02/12/23			
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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. M.Srinivasa Reddy**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
Autonomous Status Extended up to the Academic Year 2031-32
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (CSE, IT, ECE, EEE, ME, CIV & ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructors: Dr.M.V.Sudhakar /Dr.G.L.N.Murthy / Mr.M.K.Linga Murthy /Mr.T. Anil Raju

Course Name & Code :Signal Modeling and Analysis- 20ECS1 **Regulation**:R20
L-T-P Structure :1-0-2 **Credits:**2
Program/Sem/Sec : B.Tech., ECE., III-Sem., Section-C **A.Y.:**2023-24

PREREQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this course, student will learn about basic signal modeling and analysis concepts like generations of signals using trigonometric function, solving linear equations and analyzing time function in frequency using MATLAB software.

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

CO1	Understand the programming concept of plotting trigonometric function, linear equations solutions in MATLAB
CO2	Analyze the time frequency relations of signals in MATLAB.
CO3	Adapt effective communication, presentation and report writing.

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	1	1	-	1	2	-	-	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	-	-	-	2	-	-	-	1	2	3		1	-	-	-
1 - Low					**2** –Medium						**3** - High				

TEXTBOOKS:

T1 Rudra Pratap., Getting started with MATLAB: A Quick Introduction for Scientists and Engineers

T2 B.P. Lathi., Principles of LINEAR SYSTEMS and SIGNALS, second edition, OXFORD University PRESS.

REFERENCE BOOKS:

R1 Larry E. Knop .,Linear Algebra: A First Course with Applications.

PART-A

UNIT-1:MATLAB Basics

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 MATLAB	1	11-08-23		TLM4	
2.	MATLAB windows	1	11-08-23		TLM4	
3.	On-line help, File types,	1	11-08-23		TLM4	
4.	Input-output,Platform dependence, General command	1	18-08-23		TLM4	
5.	Programming in MATLAB	1	18-08-23		TLM4	
6.	Script Files and Function Files	1	18-08-23		TLM4	
7.	Executing a function	1	25-08-23		TLM4	
8.	Plotting Graphs.	1	25-08-23		TLM4	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT – II: Linear Algebra and Signal Operations

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.	Solving a linear system	1	01-09-23		TLM1	
2.	Gaussian elimination, Cramer's Rule	1	08-09-23		TLM1	
3.	Finding Eigen values and eigenvectors,	1	08-09-23		TLM1	
4.	Vector operations, Element-by-element operations	1	15-09-23		TLM1	
5.	Continuous time signals, operations on signals	1	22-09-23		TLM1	
6.	Convolution	1	22-09-23		TLM1	
7.	Frequency analysis	1	29-09-23		TLM1	
No. of classes required to complete UNIT-I:07				**No. of classes taken:**		

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to MATLAB	1	11-08-23		TLM4	
2	Generation of continuous time signals.	1	18-08-23		TLM4	
3	Product of signals	2	25-08-23		TLM4	
4	Plot the family of curves of a function over a time over	4	01-09-23		TLM4	
5	Solving linear equations using matrix inverse methods	3	08-09-23		TLM4	
6	Solving linear equations using Cramer's methods	2	15-09-23		TLM4	
7	Compute Eigen values and Eigen vectors of given matrix.	3	22-09-23		TLM4	
8	Basic operations on the signals.	1	22-09-23		TLM4	
9	Convolution of signals.	1	29-09-23		TLM4	
10	Transformation of signals into	3	29-09-23		TLM4	

	time and frequency domains.					
11	Compute and plot the Fourier coefficients for the periodic signal given signal.	2	13-10-23		TLM4	
12	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	2	13-10-23		TLM4	
13	Mini Project /Review	4	20-10-23		TLM6	
14	Mini Project /Review	4	27-10-23		TLM6	
15	Mini Project /Review	4	03-11-23		TLM6	
16	Mini Project /Review	4	10-11-23		TLM6	
17	Internal Evaluation	4	17-11-23		TLM6	
18	Internal Evaluation	4	24-11-23		TLM6	
No. of weeks required to complete:16				**No. of Weeks taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	**Expt. no's**	**Marks**
Report=A	Mini Project	A=10
Quality of work=B	Mini Project	B=10
Presentation=C	Mini Project	C=20
Interaction/Queries=D	Mini Project	**D=10**
Total=A+B+C+D	Mini Project	**50**

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. M.V.Sudhakar**	**Dr. B.Rambabu**	**Dr. G.L.N.Murthy**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution

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

hodcse@lbrce.ac.in, cselbreddy@gmail.com, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **AMANATULLA MOHAMMAD**
Course Name & Code **: DATA STRUCTURES & 20CS03**
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech. /III/C-sec **A.Y.:** 2023-24

PREREQUISITE: Programming Language

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to make students famliar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques**.**

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

CO1	Write the algorithms for various operations on list using arrays and linked list and analyze the time complexity of its operations.**(Understand - L2)**
CO2	Apply linear data structures like stack and queue in problem solving.(**Apply - L3**)
CO3	Demonstrate various sorting techniques and compare their computational complexities in terms of space and time.**(Understand - L2)**
CO4	Write the algorithms for various operations on binary trees, binary search trees and AVL trees.(**Understand - L2**)
CO5	Demonstrate graph traversal techniques and hashing techniques.(**Understand - L2**)

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											3		
CO2	3	1											3		
CO3	3	2											2		
CO4	3	1											3		
CO5	3	1											1		
1 - Low					**2** –Medium								**3** - High		

TEXTBOOKS:

T1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd edition [1,2,3 units].

T2 ReemaThareja, Data Structures using c, Oxford Publications [3,4,5].

REFERENCE BOOKS:

R1 Langson, Augenstein &Tenenbaum, 'Data Structures using C and C++', 2nd Ed, PHI.

R2 RobertL.Kruse, Leung and Tando, 'Data Structures and Program Design in C', 2ndedition, PHI.

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	HOD Sign Weekly
1.	Introduction to Data Structures	1	07-08-2023		TLM1	
2.	Classification of Data Structures	1	08-08-2023		TLM1	
3.	Introduction to Algorithm	1	10-08-2023		TLM1	
4.	Algorithm Analysis	1	14-08-2023		TLM1	
5.	Asymptotic Notations	1	17-08-2023		TLM1	
6.	List using Arrays	1	19-08-2023		TLM1	
7.	Single Linked List	3	21-08-2023, 22-08-2023 24-08-2023		TLM1	
8.	Double Linked List	3	26-08-2023 28-08-2023 29-08-2023		TLM1	
9.	Circular Linked List	2	31-08-2023 02-09-2023		TLM1	
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	HOD Sign Weekly
10.	STACKS ADT	1	04-09-2023		TLM2	
11.	STACKS USING ARRAYS	1	05-09-2023		TLM1	
12.	STACKS USING LINKED LIST	1	07-09-2023		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	09-09-2023 & 11-09-2023		TLM1	
14.	POSTFIX EVALUTION	1	12-09-2023		TLM1	
15.	CHECKING BALANCED PARANTHESIS	1	14-09-2023		TLM1	
16.	QUEUE	1	16-09-2023		TLM1	
17.	QUEUE USING ARRAY	1	18-09-2023		TLM1	
18.	QUEUE USING LINKED LIST	1	19-09-2023		TLM1	
19.	CIRCULAR QUEUE	2	21-09-2023 23-09-2023		TLM1	
20.	DEQUE	1	25-09-2023		TLM1	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: SORTING TECHNIQUES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Bubble sort	1	26-09-2023		TLM2	
22.	Insertion Sort	1	28-09-2023		TLM1	
23.	Selection Sort	1	30-09-2023		TLM1	
24.	Merge Sort	2	09-10-2023 & 10-10-2023		TLM1	
25.	Quick Sort	2	12-10-2023 & 14-10-2023		TLM1	
26.	Heap Sort	2	16-10-2023 & 17-10-2023		TLM1	
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT-IV: TREES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Introduction	2	19-10-2023 21-10-2023		TLM1	
28.	Tree Traversals	1	23-10-2023		TLM1	
29.	Binary Trees	2	24-10-2023 26-10-2023		TLM2	
30.	Binary Search Trees	2	28-10-2023 30-10-2023		TLM1	
31.	AVL Trees	2	31-10-2023 02-11-2023		TLM1	
32.	Operations	1	04-11-2023		TLM1	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: GRAPHS & HASHING TECHNIQUES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	GRAPHS, FUNDAMENTALS	3	06-11-2023 07-11-2023 09-11-2023		TLM1	
34.	REPRESENTATION OF GRAPHS	3	11-11-2023 13-11-2023 14-11-2023		TLM1	
35.	BFS	3	16-11-2023 18-11-2023 20-11-2023		TLM1	
36.	DFS	2	21-11-2023 23-11-2023		TLM1	

37.	Hashing Introduction, Hash function, separate Chaining	1	25-11-2023		TLM1	
38.	Linear & Quadratic Probing	1	27-11-2023		TLM1	
39.	Double & Re-hasing	3	28-11-2023 30-11-2023 02-12-2023		TLM2	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 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	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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 an open-source programming environment for the success of the organization.
PSO 2	The ability to design and develop computer programs in networking, web applications, and IoT as per society's needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**H.O.D**
Name of the Faculty	**Mr. Md.Amanatulla**	**Mr.D.Anil Kumar**	**Dr. K. N. Prashanthi**	**Dr. D.Veeraiah**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : AMANATULLA MOHAMMAD
Course Name & Code : DATA STRUCTURES LAB & 20CS53
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/III sem-ECE /C-Sec. **A.Y.:** 2022-23

PREREQUISITE: C Programming Language

COURSE OBJECTIVE:

The objective of this course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques

COURSE OUTCOMES (CO):

CO1: Implement Linear Data Structures using array and Linked list. (**Apply - L3**)

CO2: Implement Various Sorting Techniques. (**Apply - L3**)

CO3: : Implement Non-Linear Data Structure such as Trees &Graphs. (**Apply - L3**)

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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		2	1		1										
CO2		2	1		1										
CO3		2	1		1										
CO4								2	2	2					

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction & List using Arrays	3	07-08-2023		
2.	Linked List Programs	12	14-08-2023 21-08-2023 28-08-2023 04-09-2023		
3.	Stack, Queue Using Arrays, Linked List	6	11-09-2023 18-09-2023		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	25-09-2023		
5.	Circular Queue Double Ended Queue	3	09-10-2023		
6.	Bubble sort Selection sort Insertion sort	3	16-10-2023		
7.	Merge sort Quick sort	3	23-10-2023		
8.	Heap sort Binary Tree	3	31-10-2023		
9.	Binary Search Tree	3	06-11-2023		
10.	BFS	3	13-11-2023		
11.	DFS	3	20-11-2023		
12.	Lab Internal Exam	3	27-11-2023		

PART-C

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Md.Amanatulla**	**Mr. D. Anil kumar**	**Dr. K Naga Prasanthi**	**Dr. D. Veeriah**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs.M.Ramya Harika/Dr. K. Ravi Kumar/Mr.K.V Ashok
Course Name & Code : DSD Lab-20EC54 **Regulation**: R20
L-T-P Structure : 1-0-2 **Credits:** 2
Program/Sem/Sec : B. Tech. III-Sem., ECE B Sec **A.Y.:** 2023-24

PREREQUISITE: Digital Electronics

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides practical exposure in Xilinx compiler and in-built simulator to describe the simulation of digital circuits using Verilog HDL and explain Verilog HDL programs to generate test bench simulations.

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

CO1	**Demonstrate** the functionality of logic gates using Verilog HDL simulator. (**Understand-L2)**
CO2	**Analyze** the behaviour of combinational and sequential circuits using Verilog HDL simulator. (**Analyze-L4)**
CO3	**Understand** the functionality of memories using Verilog HDL simulator. (**Understand-L2)**
CO4	**Adapt** effective Communication, presentation and report writing. (**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
CO1	1	1	2	1	2	-	-	-	-	-	-	1	-	**2**	-
CO2	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO3	3	2	3	2	3	-	-	-	-	-	-	2	-	**3**	-
CO4	3	2	2	1	-	-	-	-	-	-	-	2	-	2	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 John F. Wakerly, "Digital Design", Principles and Practices, Pearson education, 4th edition

T2 T.R. Padmanabhan and B. Bala Tripura Sundari, "Design through Verilog HDL", Wiley IEEE Press.

REFERENCE BOOKS:

R1 Charles H. Roth Jr., "Digital System Design Using VHDL", PWS Publications, USA, Reprint 2002.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	19/08/2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	26/08/2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	02/09/2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	16/09/2023		TLM4	
5.	3 to 8 Decoder –74138.	3	23/09/2023		TLM4	
6.	4 Bit Comparator –7485.	3	30/09/2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	14/10/2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	21/10/2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	28/10/2023		TLM4	
10.	Decade counter –7490.	3	04/11/2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	11/11/2023		TLM4	
12.	Shift registers –7495.	3	18/11/2023		TLM4	
13.	Universal shift registers –74194/195.	3	25/11/2023		TLM4	
14.	Internal Examination	3	02/12/2023			
No. of classes required to complete: 39				**No. of classes taken:**		

COURSE DELIVERY PLAN (LESSON PLAN): BATCH-II

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Lab, COs	3	09/08/2023		TLM4	
2.	Implementation of Logic Gates – data flow model and behavioral model	3	16/08/2023		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	23/08/2023		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	30/08/2023		TLM4	
5.	3 to 8 Decoder –74138.	3	13/09/2023		TLM4	
6.	4 Bit Comparator –7485.	3	20/09/2023		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	27/09/2023		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	11/10/2023		TLM4	
9.	Sequential circuits -Flip-Flops.	3	18/10/2023		TLM4	
10.	Decade counter –7490.	3	25/10/2023		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	01/11/2023		TLM4	
12.	Shift registers –7495.	3	08/11/2023		TLM4	
13.	Universal shift registers –74194/195.	3	15/11/2023		TLM4	
14.	Internal Examination	3	29/11/2023			
No. of classes required to complete: 39				**No. of classes taken:**		

Content beyond Syllabus

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of 4-bit ALU	3	22/11/2023		TLM4	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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
Cumulative Internal Examination : A + B + C = 15	1,2,3,4,5,6,7,8	**15**
Semester End Examinations = D	1,2,3,4,5,6,7,8	**D = 35**
Total Marks: A + B + C + D = 50	1,2,3,4,5,6,7,8	**50**

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	**Problem analysis**: 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	**Design/development of solutions**: 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	**Conduct investigations of complex problems**: 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	**Modern tool usage**: 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	**The engineer and society**: 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	**Environment and sustainability**: 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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	**Communication**: 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	**Project management and finance**: 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	**Life-long learning**: 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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	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
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Smt.M.Ramya Harika**	**Dr. K. Ravi Kumar**	**Dr. P. Lachi Reddy**	**Dr. Y. Amar Babu**
Signature				

COURSE HANDOUT

PART-A:

Name of Course Instructor : Dr. B. Ramesh Reddy
Course Name & Code : Random Variables and Stochastic Processes – 20EC05
L-T-P-Cr Structure : 3-0-0-3
Program/Sem/Sec : B.Tech., ECE., III-Sem., Section - C

Pre-Requisites: Probability Theory, Basics of Differentiation and Integration.

Course Objective: This course provides the knowledge on random variables and their statistical behavior. It also provides the complete information about temporal and spectral characteristics of random processes. The course also provides the information about evaluation of system response to random inputs and Noise characteristics.

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

CO1	Summarize the concepts of random variables, random processes and noise. **(Understand-L2)**
CO2	Use the mathematical concepts of random variables and random processes for determining statistical parameters and spectral characteristics **(Apply-L3)**
CO3	Analyze the behavior of random variables and random processes using distribution and density functions **(Analyze-L4)**
CO4	Apply the knowledge of random variables and stochastic processes for analyzing the system behavior **(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	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	2	2	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	2	1	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	2	-	-	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 BOOK(S):

T1 **Peyton Z. Peebles, Jr**, "Probability, Random Variables and Random Signal Principles", Tata Mc Graw-Hill, 4th edition, New Delhi.

T2 **Y.Mallikarjuna Reddy,** "Probability Theory and Stochastic Processes", Universities Press(India) Pvt. Ltd., 2010.

PART-B: Course Delivery Plan (Lesson Plan): B.Tech., ECE., III-Sem., Section - C

UNIT-I: Random Variables, Operations on One Random Variable

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 RVSP Course	1	07-08-23			
2.	Introduction to UNIT-I	1	09-08-23			
3.	Concept of Probability	1	10-08-23			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	11-08-23			
5.	Classification of Random Variable	1	14-08-23			
6.	Cumulative Distribution Function (CDF) and Properties	1	16-08-23			
7.	Probability Density Function (PDF) and Properties	1	17-08-23			
8.	Pre-Defined Distributions	1	18-08-23			
9.	Pre-Defined Distributions	1	21-08-23			
10.	Expectation, Moments and Central Moments	1	23-08-23			
11.	Characteristic Function with Properties	1	24-08-23			
12.	Moment Generating Function with Properties	1	25-08-23			
13.	Problem Solving Session	1	28-08-23			
14.	Problem Solving Session	1	30-08-23			
No. of classes required to complete UNIT-I		**14**	No. of classes taken			

UNIT-II: Multiple Random Variables, Operations on Multiple Random Variables

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Introduction to UNIT-II	1	31-08-23			
16.	Joint Distribution Function and Properties, Marginal Distribution Function	1	01-09-23			
17.	Joint Density Function and Properties, Marginal Density Function	1	04-09-23			
18.	Statistical Independence	1	07-09-23			
19.	Distribution and Density of Sum of Random Variables	1	08-09-23			
20.	Central Limit Theorem	1	11-09-23			
21.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	13-09-23			
22.	Joint Central Moment, Covariance and Correlation Coefficient	1	14-09-23			
23.	Problem Solving Session	1	15-09-23			
24.	Problem Solving Session	1	20-09-23			
No. of classes required to complete UNIT-II		**10**	No. of classes taken			

UNIT-III: Stochastic Processes-Temporal Characteristics

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to UNIT-III	1	21-09-23			
26.	Concept of Stochastic Processes, Classification of Stochastic Processes	1	22-09-23			
27.	Distribution and Density of Stochastic Processes	1	25-09-23			
28.	Stationary Stochastic Processes	1	27-09-23			
29.	Problem Solving Session	1	29-09-23			
30.	Time Averages and Ergodicity	1	09-10-23			
31.	Correlation Functions- ACF & Properties	1	11-10-23			
32.	Correlation Functions- CCF & Properties	1	12-10-23			
33.	Covariance Functions-Autocovariance and Cross-covariance Functions	1	13-10-23			
34.	Problem Solving Session	1	16-10-23			
35.	Problem Solving Session	1	18-10-23			
36.	Problem Solving Session	1	19-10-23			
No. of classes required to complete UNIT-III			**12**	No. of classes taken		

UNIT-IV: Stochastic Processes-Spectral Characteristics

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction to UNIT-IV	1	20-10-23			
38.	Power Spectral Density and Properties	1	25-10-23			
39.	Relation between CCF & CPSD - Wiener-Khintchine Relation	1	26-10-23			
40.	Cross Power Spectral Density and Properties	1	27-10-23			
41.	Relation between CCF & CPSD	1	30-10-23			
42.	Relation between CCF and CPSD	1	01-11-23			
43.	Problem Solving Session	1	02-11-23			
44.	Problem Solving Session	1	03-11-23			
45.	Problem Solving Session	1	06-11-23			
46.	Problem Solving Session	1	08-11-23			
47.	Problem Solving Session	1	09-11-23			
No. of classes required to complete UNIT-IV			**11**	No. of classes taken		

UNIT-V: Linear Systems with Random Inputs, Noise

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Introduction to UNIT-V	1	10-11-23			
49.	Response of a Linear System	1	13-11-23			
50.	Mean value of System Response, Mean Square value of System Response	1	15-11-23			
51.	ACF of Response, CCF of input and output	1	16-11-23			
52.	Relation b/n ACF of Response, and CCF of input and output	1	17-11-23			
53.	PSD of Response, CPSD of input and output	1	20-11-23			
54.	Problem Solving Session	1	22-11-23			
55.	Definition of Noise, and Classification	1	23-11-23			
56.	Modeling of Noise Sources	1	24-11-23			
57.	Available Power Gain and Noise Figure	1	27-11-23			
58.	Problem Solving Session	1	29-11-23			
No. of classes required to complete UNIT-V		**11**	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
59.	Stochastic Signal Processing (SSP)	**1**	30-11-23			
60.	Applications of SSP	**1**	01-12-23			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	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**
Cumulative Internal Examination (CIE) = 80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	**30**
Semester End Examination (SEE) (Unit-I, Unit – II, Unit –III, Unit-IV and Unit-V)	**70**
Total Marks = CIE + SEE	**100**

PART-D: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

PO 1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: **Problem analysis**: 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: **Design/development of solutions**: 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: **Conduct investigations of complex problems**: 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: **Modern tool usage**: 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: **The engineer and society**: 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: **Environment and sustainability**: 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: **Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: **Communication**: 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: **Project management and finance**: 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: **Life-long learning**: 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.

PSO 1: **Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

PSO 2: **VLSI and Embedded Systems:** 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

PSO 3: **Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Date **07.08.2023**	Dr. B. Ramesh Reddy **Course Instructor & Course Coordinator**	Dr. G L N Murthy **Module Coordinator**	Dr. Y. Amar Babu **HOD**