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 ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. A. Rami Reddy
Course Name & Code : Numerical Methods & Integral Calculs&20FE10
L-T-P Structure : 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/B **A.Y.:** 2022 - 23

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	13/09/22		TLM1	
2.	Introduction to UNIT I	1	14/09/22		TLM2	
3.	Forward Differences	1	16/09/22		TLM1	
4.	Backward differences	1	17/09/22		TLM1	
5.	Central Differences	1	20/09/22		TLM1	
6.	Symbolic relations and separation of symbols	1	21/09/22		TLM1	
7.	Symbolic relations and separation of symbols	1	23/09/22		TLM1	
8.	Newton's forward formulae for interpolation	1	24/09/22		TLM1	
9.	Newton's backward formulae for interpolation	1	27/09/22		TLM1	
10.	Related Problems	1	28/09/22			
11.	Lagrange's Interpolation	1	30/09/22		TLM1	
12.	TUTORIAL I	1	01/10/22		TLM1	
13.	Lagrange's Interpolation	1	07/10/22		TLM3	
No. of classes required to complete UNIT-I: 13				**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
14.	Introduction to UNIT II	1	08/10/22		TLM2	
15.	Algebraic and Transcendental Equations	1	11/10/22		TLM1	
16.	False Position method	1	12/10/22		TLM1	
17.	False Position method	1	14/10/22		TLM1	
18.	Newton- Raphson Method in one variable	1	15/10/22		TLM1	
19.	Newton- Raphson Method applications	1	18/10/22		TLM1	
20.	Tutorial II	1	19/10/22		TLM3	
21.	Related Problems		21/10/22			
22.	Trapezoidal rule	1	22/10/22		TLM1	
23.	Simpson's 1/3 Rule, Simpson's 3/8 Rule	1	25/10/22		TLM1	
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
24.	Introduction to Unit-III	1	26/10/22		TLM2	
25.	Double Integrals -Cartesian coordinates	1	28/10/22		TLM1	

26.	Applications to Double integrals (Content Beyond the syllabus)	1	29/10/22		TLM2	
27.	Triple Integrals - Cartesian coordinates	1	01/11/22		TLM1	
28.	Triple Integrals - Cartesian coordinates	1	02/11/22		TLM1	
29.	Triple Integrals - Polar coordinates	1	04/11/22		TLM1	
30.	TUTORIAL - III	1	05/11/22		TLM3	
31.	Triple Integrals - Spherical coordinates	1	15/11/22		TLM 1	
32.	Change of order of Integration	1	16/11/22		TLM1	
33.	Change of order of Integration	1	18/11/22		TLM1	
34.	Change of order of Integration	1	19/11/22		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
35.	Introduction to UNIT IV	1	22/11/22		TLM1	
36.	Determination of Fourier coefficients, Even and Odd Functions	1	23/11/22		TLM1	
37.	Fourier Series in the [0,2pi]	1	25/11/22		TLM1	
38.	Fourier Series in the [0,2pi]	1	26/11/22		TLM1	
39.	Fourier Series in an arbitrary interval	1	29/11/22		TLM1	
40.	Problems	1	30/11/22		TLM1	
41.	Fourier Series in an arbitrary interval	1	02/12/22		TLM1	
42.	TUTORIAL IV	1	03/12/22		TLM3	
43.	Fourier series in an arbitrary interval odd and even functions		06/12/22		TLM1	
44.	Half-range Sine and Cosine series	1	07/12/22		TLM1	
45.	Half-range Sine and Cosine series	1	09/12/22		TLM1	
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
46.	Introduction to UNIT V	1	13/12/22		TLM1	
47.	Vector Differentiation	1	14/12/22		TLM1	
48.	Gradient	1	16/12/22		TLM1	
49.	Directional Derivative	1	17/12/22		TLM1	
50.	Directional Derivative	1	20/12/22		TLM1	
51.	Divergence	1	21/12/22		TLM3	
52.	Curl	1	23/12/22		TLM1	
53.	TUTORIAL V	1	24/12/22		TLM1	
54.	Solenoidal fields, Irrotational fields, potential surfaces	1	27/12/22		TLM1	
55.	Laplacian, second order operators	1	28/12/22		TLM 1	
56.	Properties	1	30/12/22		TLM1	
57.	Content beyond the syllabus		31/12/22			
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	**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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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **O.VENKATA SIVA**
Course Name & Code **: DATA STRUCTURES & 20CS03**
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech. /III/A-sec **A.Y.:** 2021-22

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	13-09-2022		TLM1	
2.	Classification of Data Structures	1	14-09-2022		TLM1	
3.	Introduction to Algorithm	1	15-09-2022		TLM1	
4.	Algorithm Analysis	1	16-09-2022		TLM1	
5.	Asymptotic Notations	1	20-09-2022		TLM1	
6.	List using Arrays	1	21-09-2022		TLM1	
7.	Single Linked List	3	22-09-2022, 23-09-2022 27-09-2022		TLM1	
8.	Double Linked List	3	28-09-2022 29-09-2022 30-09-2022		TLM1	
9.	Circular Linked List	2	04-10-2022 05-10-2022		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	06-10-2022		TLM2	
11.	STACKS USING ARRAYS	1	07-10-2022		TLM1	
12.	STACKS USING LINKED LIST	1	11-10-2022		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	12-10-2022 & 13-10-2022		TLM1	
14.	POSTFIX EVALUTION	1	14-10-2022		TLM1	
15.	CHECKING BALANCED PARANTHESIS	1	18-10-2022		TLM1	
16.	QUEUE	1	19-10-2022		TLM1	
17.	QUEUE USING ARRAY	1	20-10-2022		TLM1	
18.	QUEUE USING LINKED LIST	1	21-10-2022		TLM1	
19.	CIRCULAR QUEUE	2	25-10-2022		TLM1	
20.	DEQUE	1	26-10-2022		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	27-10-2022		TLM2	
22.	Insertion Sort	1	28-10-2022		TLM1	
23.	Selection Sort	1	01-11-2022		TLM1	
24.	Merge Sort	2	02-11-2022 & 03-11-2022		TLM1	
25.	Quick Sort	2	04-11-2022 & 15-11-2022		TLM1	
26.	Heap Sort	2	16-11-2022 & 17-11-2022		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	3	18-11-2022 22-11-2022 23-11-2022		TLM1	
28.	Tree Traversals	1	24-11-2022		TLM1	
29.	Binary Trees	2	25-11-2022 & 29-11-2022		TLM2	
30.	Binary Search Trees	2	30-11-2022 01-12-2022		TLM1	
31.	AVL Trees	2	02-12-2022 06-12-2022		TLM1	
32.	Operations	1	07-12-2022		TLM1	
No. of classes required to complete UNIT-IV: 11				**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
33.	GRAPHS, FUNDAMENTALS	3	08-12-2022 09-12-2022 13-12-2022		TLM1	
34.	REPRESENTATION OF GRAPHS	3	14-12-2022 15-12-2022 16-12-2022		TLM1	
35.	BFS	3	20-12-2022 21-12-2022 22-12-2022		TLM1	
36.	DFS	2	23-12-2022 27-12-2022		TLM1	

			28-12-2022			
37.	Hashing Introduction, Hash function, separate Chaining	1	29-12-2022		TLM1	
38.	Linear & Quadratic Probing	1	30-12-2022		TLM1	
39.	Double & Rehasing	4	03-01-2023 04-01-2023 05-01-2023 06-01-2023		TLM2	
No. of classes required to complete UNIT-V: 17				**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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. O.Venkata Siva**	**Dr. K. N. Prashanthi**	**Dr. Y Vijaya Bhaskar Redddy**	**Dr. D.Veeraiah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade (GPA: 3.20 out of 4)
MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. B.Y.V.N.R.Swamy, 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.:** 2022-23

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	12-09-22			
2.	Small signal modeling of transistor	1	14-09-22			
3.	h- parameter model of a Transistor	1	16-09-22			
4.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	17-09-22			
5.	Exact analysis of CE,CB,CC amplifiers	1	19-09-22			
6.	Approximate analysis of CE amplifier without Emitter resistance	1	21-09-22			
7.	Approximate analysis of CB,CC amplifier	1	23-09-22			
8.	Approximate analysis of CE amplifier with Emitter resistance	1	24-09-22			
9.	Analysis of CS FET amplifier	1	26-09-22			
10.	Analysis of CD FET amplifier	1	28-09-22			
No. of classes required to complete UNIT-I: 10				**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	30-09-22			
12.	Analysis and Design of Cascode Amplifier	1	01-10-22			
13.	Analysis and Design of Darlington pair	1	10-10-22			
14.	Frequency response of Single stage amplifier	1	12-10-22			
15.	Frequency response of multi stage amplifier	1	14-10-22			
16.	Effect of coupling and bypass capacitor on frequency response	1	15-10-22			
17.	The hybrid- π Common Emitter Transistor model	1	17-10-22			
18.	Hybrid- π Conductance in terms of low frequency h- parameters	2	19-10-22 21-10-22			
19.	Millers Theorem	1	22-10-22			
20.	The CE model - f_β , f_T and $f\alpha$	1	26-10-22			
21.	Gain with resistive load	1	28-10-22			
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	29-10-22			
23.	General characteristics of Negative feedback Amplifiers	1	31-10-22			
24.	Qualitative analysis of Voltage series feedback amplifier	1	02-11-22			
25.	Qualitative analysis of current series feedback amplifier	1	04-11-22			
26.	Qualitative analysis of Voltage shunt feedback amplifier	1	05-11-22			
27.	Qualitative analysis of current shunt feedback amplifier	1	14-11-22			
28.	Effect of feedback on frequency response of amplifier	1	16-11-22			
29.	Qualitative analysis of RC oscillators	1	18-11-22			
30.	Qualitative analysis of LC oscillators	1	19-11-22			
31.	Qualitative analysis of Crystal oscillator	1	21-11-22			
32.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	23-11-22			
33.	Class C, Class S amplifiers	1	25-11-22			
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	26-11-22			
35.	Response of LPF for step, pulse inputs	1	28-11-22			
36.	Response of LPF for square and ramp inputs	1	30-11-22			
37.	High pass RC circuit and their response for sinusoidal, step input	1	02-12-22			
38.	Response of HPF for step, pulse inputs	1	03-12-22			
39.	Response of HPF for square and ramp inputs	1	05-12-22			
40.	RC circuit as differentiator, integrator, Double differentiator	1	07-12-22			
41.	Problems on LPF	1	08-12-22			
42.	Problems on HPF	1	09-12-22			
No. of classes required to complete UNIT-IV: 09				**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	12-12-22			
44.	Analysis and Design of Bistable Multivibrators	1	14-12-22			
45.	Triggering types	1	16-12-22			
46.	Schmitt trigger circuit-Principle of operation	1	17-12-22			
47.	calculation of UTP, LTP and applications	1	19-12-22			
48.	Collector-coupled Monostable - Principle of operation	1	21-12-22			
49.	Astable Multivibrators Principle of operation	1	23-12-22			
50.	Analysis and design of Astable Multivibrators	1	24-12-22			
51.	Problems on Astable Multivibrators	1	28-12-22			
52.	Problems on Mono stable Multivibrators	1	30-12-22			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
53.	Applications of power amplifiers	1	31-12-22		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: 12-09-2022

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. B.Y.V.N.R.Swamy**	**Dr. B.Y.V.N.R.Swamy**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. K. Ravi Kumar
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- A A.Y : 2022-23

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 sampling **(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 transformand 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-A

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.	General Interaction & Introduction to the course	1	12-09-22		-	
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	13-09-22		-	
3.	Concept of signal and Classification of Signals-Continuous Time Signals, Discrete Time and Digital Signals	1	16-09-22		TLM1	
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	17-09-22		TLM1	
5.	Representation of Signals- Decaying, Raising and Double Exponential, Triangular and Rectangular, Sinc and Sampling Signals	1	19-09-22		TLM1	
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding),Amplitude Scaling	1	20-09-22		TLM1	
7.	Convolution; Graphical Method of Convolution	1	23-09-22		TLM1	
8.	Properties of Signals- Even and Odd, Causal and Non Causal, Bounded and Unbounded	1	24-09-22		TLM1	
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	26-09-22		TLM1	
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling & Convolution	1	27-09-22		TLM1	
11.	Problems practice Session	1	30-09-22		TLM1	
12.	Problems practice Session	1	01-10-22		TLM1	
No. of classes required to complete UNIT-I		**12**	**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	06-10-22		TLM1	
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	1	07-10-22		TLM1	
3.	Evaluation of Mean square error, Gibbs Phenomena	1	10-10-22		TLM1	
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	11-10-22		TLM1	
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series	1	14-10-22		TLM1	
6.	Exponential Fourier Series	1	15-10-22		TLM1	
7.	Relations among coefficients of Trigonometric Fourier Series and Exponential Fourier Series	1	17-10-22		TLM1	

8.	Representation of Periodic signal by Fourier series over the entire interval, Symmetry conditions of Fourier Series	1	18-10-22		TLM1	
9.	Parseval's Theorem and Problems involving symmetry conditions	1	21-10-22		TLM1	
10.	Problems on Trigonometric Fourier Series	1	22-10-22		TLM1	
11.	Problems on Exponential Fourier Series	1	25-10-22		TLM1	
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	28-10-22		TLM1	
2.	Deriving Fourier Transform from Fourier Series, Convergence of Fourier Transform-Dirichlet Conditions	1	29-10-22		TLM1	
3.	Properties of Fourier Transform	2	31-10-22 01-11-22		TLM1	
4.	Fourier Transform of Various Classes of Signals	1	04-11-22		TLM1	
5.	Fourier Transform of Periodic Signal	1	05-11-22		TLM1	
6.	Problems Practice Session	1	14-11-22		TLM1	
7.	Sampling Theorem	1	15-11-22		TLM1	
8.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	18-11-22		TLM1	
9.	Effect of under sampling- Aliasing, Difference between low pass sampling and band pass sampling	1	19-11-22		TLM1	
10.	Problems Practice Sessions	3	21-11-22 22-11-22 25-11-22		TLM1	
No. of classes required to complete UNIT-III		**13**	**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	26-11-22		TLM1	
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	28-11-22		TLM1	
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	29-11-22		TLM1	
4.	Time and Frequency Analysis of LTI System	1	02-12-22		TLM1	
5.	System Bandwidth and Rise Time	1	03-12-22		TLM1	
6.	Distortion less Transmission through a System	1	05-12-22		TLM1	
7.	Problems on Properties of systems	1	06-12-22		TLM1	

8.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	09-12-22		TLM1	
9.	Physically Realizable Systems and Poly-Wiener Criterion	1	10-12-22		TLM1	
10.	Problems on Properties of systems	1	12-12-22		TLM1	
11.	Problems Practice Session	1	13-12-22		TLM1	
No. of classes required to complete UNIT-IV		**11**	**No. of classes taken**			

UNIT-V: Laplace Transform

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	16-12-22		TLM1	
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	17-12-22		TLM1	
3.	Laplace Transform of Various Classes of Signals	1	19-12-22		TLM1	
4.	Region of Convergence (ROC) and its Properties	1	20-12-22		TLM1	
5.	Problems on Laplace Transform and ROC	1	23-12-22		TLM1	
6.	Properties of Laplace Transform	2	24-12-22 26-12-22		TLM1	
7.	Inverse Laplace Transform using Partial Fractions Method	1	27-12-22		TLM1	
8.	Applications of Laplace Transform: Causality of a System, Stability of a System	1	30-12-22		TLM1	
9.	Solving of Differential Equations and Analysis of RLC Circuits	1	31-12-22		TLM1	
No. of classes required to complete UNIT-V		**10**	**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.	Application of Signal Processing	**1**	12-09-22		TLM2	

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) =	30

80% of Max((M1+Q1+A1) , (M2+Q2+A2)) + 20% of Min((M1+Q1+A1) , (M2+Q2+A2))	
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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. K.Ravi Kumar	Dr. G. L.N.Murthy	Dr. G.L.N. Murthy	Dr. Y. Amar Babu

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MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor : Prof.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- A A.Y : 2022-23

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): 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	13-09-22			
2.	Introduction to UNIT-I	1	14-09-22			
3.	Concept of Probability	1	16-09-22			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	17-09-22			
5.	Classification of Random Variable	1	20-09-22			
6.	Cumulative Distribution Function (CDF) and Properties	1	21-09-22			
7.	Probability Density Function (PDF) and Properties	1	23-09-22			
8.	Pre-Defined Distributions	1	24-09-22			
9.	Pre-Defined Distributions	1	27-09-22			
10.	Expectation, Moments and Central Moments	1	28-09-22			
11.	Characteristic Function and Moment Generating Function with Properties	1	30-09-22			
12.	Transformations on Random Variables	1	01-10-22			
13.	Problem Solving Session	1	07-10-22			
14.	Problem Solving Session	1	11-10-22			
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	12-10-22			
16.	Joint Distribution Function and Properties, Marginal Distribution Function	1	14-10-22			
17.	Joint Density Function and Properties, Marginal Density Function	1	15-10-22			
18.	Statistical Independance	1	18-10-22			
19.	Distribution and Density of Sum of Random Variables	1	19-10-22			
20.	Central Limit Theorem	1	21-10-22			
21.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	22-10-22			
22.	Joint Central Moment, Covariance and Correlation Coeficient	1	25-10-22			
23.	Jointly Gaussian Random Variables and Properties.	1	26-10-22			
24.	Problem Solving Session	1	28-10-22			
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	29-10-22			
26.	Concept of Stochastic Processes	1	01-11-22			
27.	Classification of Stochastic Processes	1	02-11-22			
28.	Stationarity and Independence	1	04-11-22			
29.	Problem Solving Session	1	05-11-22			
30.	Time Averages and Ergodicity	1	15-11-22			
31.	Correlation Functions	1	16-11-22			
32.	Problem Solving Session	1	18-11-22			
33.	Problem Solving Session	1	19-11-22			
34.	Problem Solving Session	1	22-11-22			
35.	Problem Solving Session	1	23-11-22			
No. of classes required to complete UNIT-III			**11**	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	25-11-22			
37.	Power Spectral Density and Properties	1	26-11-22			
38.	Wiener-Khintchine Relation	1	29-11-22			
39.	Bandwidth of PSD	1	30-11-22			
40.	Cross Power Spectral Density and Properties	1	02-12-22			
41.	Relation between CCF and CPSD	1	03-12-22			
42.	Problem Solving Session	1	06-12-22			
43.	Problem Solving Session	1	07-12-22			
44.	Problem Solving Session	1	09-12-22			
45.	Problem Solving Session	1	10-12-22			
46.	Problem Solving Session	1	13-12-22			
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
47.	Introduction to UNIT-V	1	14-12-22			
48.	Response of a Linear System	1	16-12-22			
49.	Mean value of System Response, Mean Square value of System Response	1	17-12-22			
50.	ACF of Response, CCF of input and output	1	20-12-22			

51.	PSD of Response, CPSD of input and output	1	21-12-22			
52.	Problem Solving Session	1	23-12-22			
53.	Introduction to Noise, Classification	1	24-12-22			
54.	Modeling of Noise Sources	1	27-12-22			
55.	Effective Noise Temperature, Available power Gain, Noise Figure	1	28-12-22			
56.	White Noise, Introduction to Additive White Gaussian Noise	1	30-12-22			
57.	Problem Solving Session	1	31-12-22			
58.	Problem Solving Session	1	03-01-23			
59.	Problem Solving Session	1	04-01-23			
No. of classes required to complete UNIT-V		**13**	No. of classes taken			

Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
60.	Stochastic Signal Processing (SSP)	**1**	06-01-23			
61.	Applications of SSP	**1**	07-01-23			

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

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	Prof. B. Ramesh Reddy	Prof. B. Ramesh Reddy	Dr. G L N Murthy	Dr. Y. Amar Babu
12.09.22	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS & COMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : O.Venkata Siva
Course Name & Code : DATA STRUCTURES LAB & 20CS53
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/III/A-Sec. **A.Y.:** 2021-22

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	15-09-2022		
2.	Linked List Programs	9	22-09-2022 29-09-2022 06-10-2022		
3.	Stack, Queue Using Arrays, Linked List	3	13-10-2022		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	20-10-2022		
5.	Circular Queue Double Ended Queue	3	20-10-2022		
6.	Bubble sort Selection sort Insertion sort	3	27-10-2022 03-11-2022 17-11-2022		
7.	Merge sort Quick sort	3	24-11-2022		
8.	Heap sort Binary Tree	3	01-12-2022		
9.	Binary Search Tree	3	08-12-2022 15-12-2022		
10.	BFS,DFS	3	22-12-2022 29-12-2022		
11.	Lab Internal Exam	3	07-01-2023		

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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. O.Venkata Siva**	**Dr.K. Naga Prasanthi**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr. D. Veeraiah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. B.Y.V.N.R.Swamy, Assoc. Professor

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.:** 2022-23

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	13/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	20/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	27/09/2022			
4.	Design of two stage RC Coupled amplifier.	3	11/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	18/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	25/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	01/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	15/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	22/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	29/11/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	06/12/2022			
12.	Revision of Experiments	3	13/12/2022			
13.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	20/12/2022			
14.	Internal Lab Examination	3	27/12/2022			
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	17/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	24/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	01/10/2022			
4.	Design of two stage RC Coupled amplifier	3	15/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	22/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	29/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	05/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	19/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	26/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	03/12/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	10/12/2022			
12.	Revision of Experiments	3	17/12/2022			
13.	Verification of conduction angles of power amplifiers**(Experiment beyond syllabus)**	3	24/12/2022			
14.	Internal Lab Examination	3	31/12/2022			
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
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: 12-09-2022

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

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Y.Amar Babu/Dr.K.Ravi Kumar/Mr.N.Dharmachari

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.:** 2021-22

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.
CO2	**Analyze** the behaviour of combinational and sequential circuits using Verilog HDL simulator.
CO3	**Understand** the functionality of memories using Verilog HDL simulator
CO4	**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	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.	Implementation of Logic Gates – data flow model and behavioral model	3	13-09-22			
2.	Combinational logic circuits – adders and subtractor.	3	20-09-22			
3.	Code converters- binary to gray and gray to binary.	3	27-09-22			
4.	3 to 8 Decoder –74138.	3	04-10-22			
5.	4 Bit Comparator –7485.	3	11-10-22			
6.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	18-10-22			
7.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	25-10-22			
8.	Sequential circuits -Flip-Flops.	3	01-11-22			
9.	Decade counter –7490.	3	15-11-22			
10.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	22-11-22			
11.	Shift registers –7495.	3	29-11-22			
12.	Universal shift registers – 74194/195.	3	06-12-22			
13.	Revision	3	13-12-22			
14.	Revision	3	20-12-22			
15.	Internal Examination	3	27-12-22			
No. of classes required to complete : 36				**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.	Implementation of Logic Gates – data flow model and behavioral model	3	17-09-22			
2.	Combinational logic circuits – adders and subtractor.	3	24-09-22			
3.	Code converters- binary to gray and gray to binary.	3	01-10-22			
4.	3 to 8 Decoder –74138.	3	08-10-22			
5.	4 Bit Comparator –7485.	3	22-10-22			
6.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	29-10-22			
7.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	05-11-22			
8.	Sequential circuits -Flip-Flops.	3	19-11-22			
9.	Decade counter –7490.	3	26-11-22			
10.	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	03-12-22			
11.	Shift registers –7495.	3	17-12-22			
12.	Universal shift registers – 74194/195.	3	24-12-22			

13.	Internal Examination	3	31-12-22			
No. of classes required to complete : 36				**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

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

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DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructors: Dr.K.Ravi Kumar/Mrs B. Rajeswari/ 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-A **A.Y.:**2022-23

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	3	2	-	3	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	1	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
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	12-09-22			
2.	MATLAB windows	1	12-09-22			
3.	On-line help, File types,	1	12-09-22			
4.	Input-output,Platform dependence, General command	1	19-09-22			
5.	Programming in MATLAB	2	19-09-22			
6.	Script Files and Function Files	1	19-09-22			
7.	Executing a function	1	26-09-22			
8.	Plotting Graphs.	1	26-09-22			
No. of classes required to complete UNIT-I: 09				**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	10-10-22			
2.	Gaussian elimination, Cramer's Rule	1	10-10-22			
3.	Finding eigen values and eigenvectors,	1	31-10-22			
4.	Vector operations, Element-by-element operations	2	14-11-22			
5.	Continuous time signals, operations on signals	1	14-11-22			
6.	Convolution	1	21-11-22			
7.	Frequency analysis	1	21-11-22			
No. of classes required to complete UNIT-I:08				**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	12-09-22			
2.	Generation of sinusoidal signal.	1	26-09-22			
3.	Product of signals	1	26-09-22			
4.	Solving linear equations using matrix inverse methods	1	10-10-22			
5.	Solving linear equations using Cramer's methods	1	10-10-22			
6.	Compute Eigen values and Eigen vectors of given matrix.	1	17-10-22			
7.	Plot the family of curves of a function over a time over.	1	17-10-22			
8.	Generation of continuous	1	17-10-22			

	time signals.					
9.	Basic operations on the signals.	1	17-10-22			
10.	Convolution of signals.	1	31-10-22			
11.	Transformation of signals into time and frequency domains.	1	31-10-22			
12.	Compute and plot the Fourier coefficients for the periodic signal given signal.	1	31-10-22			
13.	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	1	14-11-22			
14.	Mini Project Practice Sessions	2	21-11-22			
15.	Mini Project Practice Sessions	4	28-11-22			
16.	Mini Project Practice Sessions	4	05-12-22			
17.	Mini Project Practice Sessions	4	12-12-22			
18.	Mini Project Practice Sessions	4	19-12-22			
19.	Internal Review/Report Submission	4	26-12-22			
No. of classes required to complete:35				**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):

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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. K. Ravi Kumar	Mr. T.Anil Raju	Dr. G. L.N.Murthy	Dr. Y. Amar Babu
Signature				

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K. Jhansi Rani
Course Name & Code : Numerical Methods & Integral Calculs&20FE10
L-T-P Structure : 2-1 -0 **Credits:3**
Program/Sem/Sec : II B.Tech/III sem/B **A.Y.:** 2022 - 23

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	12/09/22		TLM1	
2.	Introduction to UNIT I	1	13/09/22		TLM2	
3.	Forward Differences	1	16/09/22		TLM1	
4.	Backward differences	1	17/09/22		TLM1	
5.	Central Differences	1	19/09/22		TLM1	
6.	Symbolic relations and separation of symbols	1	20/09/22		TLM1	
7.	Symbolic relations and separation of symbols	1	23/09/22		TLM1	
8.	Newton's forward formulae for interpolation	1	24/09/22		TLM1	
9.	Newton's backward formulae for interpolation	1	26/09/22		TLM1	
10.	Related Problems	1	27/09/22			
11.	Lagrange's Interpolation	1	30/09/22		TLM1	
12.	TUTORIAL I	1	01/10/22		TLM1	
13.	Lagrange's Interpolation	1	07/10/22		TLM3	
No. of classes required to complete UNIT-I: 13				**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
14.	Introduction to UNIT II	1	08/10/22		TLM2	
15.	Algebraic and Transcendental Equations	1	10/10/22		TLM1	
16.	False Position method	1	11/10/22		TLM1	
17.	False Position method	1	14/10/22		TLM1	
18.	Newton- Raphson Method in one variable	1	15/10/22		TLM1	
19.	Newton- Raphson Method applications	1	17/10/22		TLM1	
20.	Tutorial II	1	18/10/22		TLM3	
21.	Related Problems		21/10/22			
22.	Trapezoidal rule	1	22/10/22		TLM1	
23.	Simpson's 1/3 Rule, Simpson's 3/8 Rule	1	25/10/22		TLM1	
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
24.	Introduction to Unit-III	1	28/10/22		TLM2	
25.	Double Integrals -Cartesian coordinates	1	29/10/22		TLM1	

26.	Applications to Double integrals (Content Beyond the syllabus)	1	31/10/22		TLM2	
27.	Triple Integrals - Cartesian coordinates	1	01/11/22		TLM1	
28.	Triple Integrals - Polar coordinates	1	04/11/22		TLM1	
29.	TUTORIAL - III	1	05/11/22		TLM3	
30.	Triple Integrals - Spherical coordinates	1	14/11/22		TLM 1	
31.	Change of order of Integration	1	15/11/22		TLM1	
32.	Change of order of Integration	1	18/11/22		TLM1	
33.	Change of order of Integration	1	19/11/22		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	21/11/22		TLM1	
35.	Determination of Fourier coefficients, Even and Odd Functions	1	22/11/22		TLM1	
36.	Fourier Series in the [0,2pi]	1	25/11/22		TLM1	
37.	Fourier Series in the [0,2pi]	1	26/11/22		TLM1	
38.	Fourier Series in an arbitrary interval	1	28/11/22		TLM1	
39.	Problems	1	29/11/22		TLM1	
40.	Fourier Series in an arbitrary interval	1	02/12/22		TLM1	
41.	TUTORIAL IV	1	03/12/22		TLM3	
42.	Fourier series in an arbitrary interval odd and even functions		05/12/22		TLM1	
43.	Half-range Sine and Cosine series	1	06/12/22		TLM1	
44.	Half-range Sine and Cosine series	1	09/12/22		TLM1	
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	12/12/22		TLM1	
46.	Vector Differentiation	1	13/12/22		TLM1	
47.	Gradient	1	16/12/22		TLM1	
48.	Directional Derivative	1	17/12/22		TLM1	
49.	Directional Derivative	1	19/12/22		TLM1	
50.	Divergence	1	20/12/22		TLM3	
51.	Curl	1	23/12/22		TLM1	
52.	TUTORIAL V	1	24/12/22		TLM1	
53.	Solenoidal fields, Irrotational fields, potential surfaces	1	26/12/22		TLM1	
54.	Laplacian, second order operators	1	27/12/22		TLM 1	
55.	Properties	1	30/12/22		TLM1	
56.	Content beyond the syllabus		31/12/22			
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.
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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				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: A. GOPI SURESH
Course Name & Code : DATA STRUCTURES & 20CS03
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech./ECE /III/B-sec **A.Y.:** 2022-23

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	2	12/9/22, 14/9/22		TLM1	
2.	Classification of Data Structures	1	16/9/22		TLM1	
3.	Introduction to Algorithm	1	17/9/22		TLM1	
4.	Algorithm Analysis	1	19/9/22		TLM1	
5.	Asymptotic Notations	1	21/9/22		TLM1	
6.	List using Arrays	3	23/9/22, 24/9/22, 26/9/22		TLM1	
7.	Single Linked List	3	28/9/22, 30/9/22, 1/10/22		TLM1	
8.	Double Linked List	3	3/10/22, 5/10/22 , 7/10/22		TLM1	
9.	Circular Linked List	2	8/10/22, 10/10/22		TLM1	
No. of classes required to complete UNIT-I: 17				**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	2	12/10/22, 14/10/22		TLM2	
11.	STACKS USING ARRAYS	1	15/10/22		TLM1	
12.	STACKS USING LINKED LIST	1	17/10/22		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	19/10/22		TLM1	
14.	POSTFIX EVALUTION	1	21/10/22		TLM1	
15.	CHECKING BALANCED PARANTHESIS, QUEUE	1	22/10/22		TLM1	
16.	QUEUE USING ARRAY & LINKED LIST	1	24/10/22		TLM1	
17.	CIRCULAR QUEUE,	1	26/10/22		TLM1	
18.	DEQUE	1	28/10/22		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	2	29/10/22, 31/10/22		TLM2	
20.	Insertion Sort	2	2/11/22, 4/11/22		TLM1	
21.	Selection Sort	2	5/11/22, 14/11/22		TLM1	
22.	Merge Sort	2	16/11/22 18/11/22,		TLM1	
23.	Quick Sort	2	19/11/22 21/11/22		TLM1	
24.	Heap Sort	2	23/11/22, 25/11/22		TLM1	
No. of classes required to complete UNIT-III: 12				**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	26/11/22		TLM1	
26.	Binary Trees, Tree Traversals	2	28/11/22 30/11/22		TLM1	
27.	Binary Trees Implementation	1	2/12/22		TLM2	
28.	Binary Search Trees	2	3/12/22 5/12/22,		TLM1	
29.	AVL Trees	1	7/12/22		TLM1	
30.	Operations & Examples	2	9/12/22, 10/12/22		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	12/12/22		TLM1	
32.	REPRESENTATION OF GRAPHS	1	14/12/22,		TLM1	
33.	BFS	2	16/12/22 17/12/22,		TLM1	
34.	DFS	2	19/12/22 21/12/22		TLM1	
35.	Hashing Introduction,	1	23/12/22		TLM1	
36.	Hash function, separate Chaining	2	24/12/22 26/12/22		TLM1	
37.	Linear & Quadratic Probing	2	28/12/22 30/12/22		TLM1	
38.	Double & Rehasing	1	31/12/22		TLM2	
39.	Revision	1	2/1/23		TLM1	

40.	Revision	1	4/1/23		TLM1	
41.	Revision	1	6/1/23		TLM1	
42.	Revision	1	7/1/23			
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 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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. A. Gopi Suresh**	**Ms.P.Sarala**	**Dr. Y. V. Bhaskar Reddy**	**Dr. D. Veeriah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.P.Venkateswara Rao, 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-B Sec **A.Y.:** 2022-23

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	12-09-22			
2.	Small signal modeling of transistor	1	13-09-22			
3.	h- parameter model of a Transistor	1	15-09-22			
4.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	17-09-22			
5.	Exact analysis of CE,CB,CC amplifiers	1	19-09-22			
6.	Approximate analysis of CE amplifier without Emitter resistance	1	20-09-22			
7.	Approximate analysis of CB,CC amplifier	1	22-09-22			
8.	Approximate analysis of CE amplifier with Emitter resistance	1	24-09-22			
9.	Analysis of CS FET amplifier	1	26-09-22			
10.	Analysis of CD FET amplifier	1	27-09-22			
No. of classes required to complete UNIT-I: 10				**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	29-09-22			
12.	Analysis and Design of Cascode Amplifier	1	01-10-22			
13.	Analysis and Design of Darlington pair	1	10-10-22			
14.	Frequency response of Single stage amplifier	1	11-10-22			
15.	Frequency response of multi stage amplifier	1	13-10-22			
16.	Effect of coupling and bypass capacitor on frequency response	1	15-10-22			
17.	The hybrid- π Common Emitter Transistor model	1	17-10-22			
18.	Hybrid- π Conductance in terms of low frequency h- parameters	2	18-10-22 20-10-22			
19.	Millers Theorem	1	22-10-22			
20.	The CE model - f_β , f_T and $f\alpha$	1	25-10-22			
21.	Gain with resistive load	1	27-10-22			
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	29-10-22			
23.	General characteristics of Negative feedback Amplifiers	1	31-10-22			
24.	Qualitative analysis of Voltage series feedback amplifier	1	01-11-22			
25.	Qualitative analysis of current series feedback amplifier	1	03-11-22			
26.	Qualitative analysis of Voltage shunt feedback amplifier	1	05-11-22			
27.	Qualitative analysis of current shunt feedback amplifier	1	14-11-22			
28.	Effect of feedback on frequency response of amplifier	1	15-11-22			
29.	Qualitative analysis of RC oscillators	1	17-11-22			
30.	Qualitative analysis of LC oscillators	1	19-11-22			
31.	Qualitative analysis of Crystal oscillator	1	21-11-22			
32.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	22-11-22			
33.	Class C, Class S amplifiers	1	24-11-22			
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	26-11-22			
35.	Response of LPF for step, pulse inputs	1	28-11-22			
36.	Response of LPF for square and ramp inputs	1	29-11-22			
37.	High pass RC circuit and their response for sinusoidal, step input	1	01-12-22			
38.	Response of HPF for step, pulse inputs	1	03-12-22			
39.	Response of HPF for square and ramp inputs	1	05-12-22			
40.	RC circuit as differentiator, integrator, Double differentiator	1	06-12-22			
41.	Problems on LPF	1	08-12-22			
42.	Problems on HPF	1	12-12-22			
No. of classes required to complete UNIT-IV: 09				**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	13-12-22			
44.	Analysis and Design of Bistable Multivibrators	1	15-12-22			
45.	Triggering types	1	17-12-22			
46.	Schmitt trigger circuit-Principle of operation	1	19-12-22			
47.	calculation of UTP, LTP and applications	1	20-12-22			
48.	Collector-coupled Monostable - Principle of operation	1	22-12-22			
49.	Astable Multivibrators Principle of operation	1	24-12-22			
50.	Analysis and design of Astable Multivibrators	1	26-12-22			
51.	Problems on Astable Multivibrators	1	27-12-22			
52.	Problems on Mono stable Multivibrators	1	29-12-22			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
53.	Applications of power amplifiers	1	31-12-22		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: 12-09-2022

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.P.Venkateswara Rao**	**Dr.B Y V N R Swamy**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. G.L.N. 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 : 2022-23

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 sampling **(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.	General Interaction & Introduction to the course	1	13.09.22		-	
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	14.09.22		-	
3.	Concept of signal and Classification of Signals-Continuous Time Signals, Discrete Time and Digital Signals	1	15.09.22		TLM1	
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	16.09.22		TLM1	
5.	Representation of Signals- Decaying, Raising and Double Exponential, Triangular and Rectangular, Sinc and Sampling Signals	1	20.09.22		TLM1	
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding), Amplitude Scaling	1	21.09.22		TLM1	
7.	Convolution; Graphical Method of Convolution	1	22.09.22		TLM1	
8.	Properties of Signals- Even and Odd, Causal and Non-Causal, Bounded and Unbounded	1	23.09.22		TLM1	
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	27.09.22		TLM1	
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling & Convolution	1	28.09.22		TLM1	
11.	Problems on Properties of Signals	1	29.09.22		TLM1	
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	30.09.22		TLM1	
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	1	11.10.22		TLM1	
3.	Evaluation of Mean square error, Gibbs Phenomena	1	12.10.22		TLM1	
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	13.10.22		TLM1	
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series	1	14.10.22		TLM1	
6.	Exponential Fourier Series	1	18.10.22		TLM1	
7.	Relations among coefficients of Trigonometric Fourier Series and Exponential Fourier Series	1	19.10.22		TLM1	
8.	Representation of Periodic signal by Fourier series over the entire	1	20.10.22		TLM1	

	interval, Symmetry conditions of Fourier Series					
9.	Parseval's Theorem and Problems involving symmetry conditions	1	21.10.22		TLM1	
10.	Problems on Trigonometric Fourier Series	1	25.10.22		TLM1	
11.	Problems on Exponential Fourier Series	1	26.10.22		TLM1	
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	27.10.22		TLM1	
2.	Deriving Fourier Transform from Fourier Series, Convergence of Fourier Transform-Dirichlet Conditions	1	28.10.22		TLM1	
3.	Properties of Fourier Transform	3	01.11.22 02.11.22 03.11.22		TLM1	
4.	Fourier Transform of Various Classes of Signals	1	04.11.22		TLM1	
5.	Fourier Transform of Periodic Signal	1	15.11.22		TLM1	
6.	Sampling Theorem	1	16.11.22		TLM1	
7.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	17.11.22		TLM1	
8.	Effect of under sampling-Aliasing, Difference between low pass sampling and band pass sampling	1	18.11.22		TLM1	
9.	Problems on Fourier Transform of periodic Signals	3	22.11.22 23.11.22 24.11.22		TLM1	
No. of classes required to complete UNIT-III		**13**	**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	25.11.22		TLM1	
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	29.11.22		TLM1	
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	30.11.22		TLM1	
4.	Time and Frequency Analysis of LTI System	1	01.12.22		TLM1	
5.	System Bandwidth and Rise Time	1	02.12.22		TLM1	
6.	Distortion less Transmission through a System	1	06.12.22		TLM1	

7.	Problems on Properties of systems	1	07.12.22		TLM1	
8.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	08.12.22		TLM1	
9.	Physically Realizable Systems and Poly-Wiener Criterion	1	09.12.22		TLM1	
10.	Problems on Properties of systems	1	13.12.22		TLM1	
No. of classes required to complete UNIT-IV		**10**	**No. of classes taken**			

UNIT-V: Laplace Transform

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	14.12.22		TLM1	
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	15.12.22		TLM1	
3.	Laplace Transform of Various Classes of Signals	1	16.12.22		TLM1	
4.	Region of Convergence (ROC) and its Properties	1	20.12.22		TLM1	
5.	Problems on Laplace Transform and ROC	1	21.12.22		TLM3	
6.	Properties of Laplace Transform	2	22.12.22 23.12.22		TLM1	
7.	Inverse Laplace Transform using Partial Fractions Method	1	27.12.22		TLM1	
8.	Applications of Laplace Transform: Causality of a System, Stability of a System	1	28.12.22		TLM1	
9.	Solving of Differential Equations and Analysis of RLC Circuits	1	29.12.22		TLM1	
No. of classes required to complete UNIT-V		**10**	**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.	Application of Signal Processing	**1**	30.12.22		TLM2	

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. G.L.N. Murthy	Dr. G.L.N.Murthy	Dr. G.L.N. Murthy	Dr. Y. Amar Babu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
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MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch.Siva Rama Krishna

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 A.Y : 2022-23

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): 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	12-09-22			
2.	Introduction to UNIT-I	1	14-09-22			
3.	Concept of Probability	1	16-09-22			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	17-09-22			
5.	Classification of Random Variable	1	19-09-22			
6.	Cumulative Distribution Function (CDF) and Properties	1	21-09-22			
7.	Probability Density Function (PDF) and Properties	1	23-09-22			
8.	Pre-Defined Distributions	1	24-09-22			
9.	Pre-Defined Distributions	1	26-09-22			
10.	Expectation, Moments and Central Moments	1	28-09-22			
11.	Characteristic Function and Moment Generating Function with Properties	1	30-09-22			
12.	Transformations on Random Variables	1	01-10-22			
13.	Problem Solving Session	1	07-10-22			
14.	Problem Solving Session		10-10-22			
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	12-10-22			
16.	Joint Distribution Function and Properties, Marginal Distribution Function	1	14-10-22			
17.	Joint Density Function and Properties, Marginal Density Function	1	15-10-22			
18.	Statistical Independance	1	17-10-22			
19.	Distribution and Density of Sum of Random Variables	1	19-10-22			
20.	Central Limit Theorem	1	21-10-22			
21.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	22-10-22			
22.	Joint Central Moment, Covariance and Correlation Coeficient	1	26-10-22			
23.	Jointly Gaussian Random Variables and Properties.	1	28-10-22			
24.	Problem Solving Session	1	29-10-22			
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	31-10-22			
26.	Concept of Stochastic Processes	1	02-11-22			
27.	Classification of Stochastic Processes	1	04-11-22			
28.	Stationarity and Independence	1	05-11-22			
29.	Problem Solving Session	1	14-11-22			
30.	Time Averages and Ergodicity	1	16-11-22			
31.	Correlation Functions	1	18-11-22			
32.	Problem Solving Session	1	19-11-22			
33.	Problem Solving Session	1	21-11-22			
34.	Problem Solving Session	1	23-11-22			
35.	Problem Solving Session	1	25-11-22			
No. of classes required to complete UNIT-III			**11**	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	26-11-22			
37.	Power Spectral Density and Properties	1	28-11-22			
38.	Wiener-Khintchine Relation	1	30-11-22			
39.	Bandwidth of PSD	1	02-12-22			
40.	Cross Power Spectral Density and Properties	1	03-12-22			
41.	Relation between CCF and CPSD	1	05-12-22			
42.	Problem Solving Session	1	07-12-22			
43.	Problem Solving Session	1	09-12-22			
44.	Problem Solving Session	1	10-12-22			
45.	Problem Solving Session	1	12-12-22			
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	14-12-22			
47.	Response of a Linear System	1	16-12-22			
48.	Mean value of System Response, Mean Square value of System Response	1	17-12-22			
49.	ACF of Response, CCF of input and output	1	19-12-22			
50.	PSD of Response, CPSD of input and output	1	21-12-22			

51.	Problem Solving Session	1	23-12-22			
52.	Introduction to Noise, Classification	1	24-12-22			
53.	Modeling of Noise Sources	1	26-12-22			
54.	Effective Noise Temperature, Available power Gain, Noise Figure	1	28-12-22			
55.	White Noise, Introduction to Additive White Gaussian Noise	1	30-12-22			
56.	Problem Solving Session	1	31-12-22			
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**				
58.	Applications of SSP	**1**				

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.

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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.

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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.

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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date	Mr.Ch.Siva Rama Krishna	Prof. B. Ramesh Reddy	Dr. G L N Murthy	Dr. Y. Amar Babu
12.09.22	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: A.GOPI SURESH/ M.SWATHI/ CH. SRINIVASA RAO
Course Name & Code : DATA STRUCTURES LAB & 20CS53
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech/ECE/III/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	17/9/22		
2.	Linked List Programs	12	24/9/22 1/10/22 8/10/22		
3.	Stack, Queue Using Arrays, Linked List	6	15/10/22 22/10/22		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	29/10/22		
5.	Circular Queue Double Ended Queue	3	5/11/22		
6.	Bubble sort Selection sort Insertion sort	6	19/11/22 26/11/22		
7.	Merge sort Quick sort	3	3/12/22		
8.	Heap sort Binary Tree	3	10/12/22		
9.	Binary Search Tree	3	17/12/22		
10.	BFS,DFS	6	24/12/22 31/12/22		
11.	Lab Internal Exam	3	7/1/23		

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.
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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.
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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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. A. GOPI SURESH**	**Ms.P.Sarala**	**Dr. Y.V. B. Reddy**	**Dr. D. Veeriah**
Signature				

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DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.P.Venkateswara 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 B Sec **A.Y.:** 2022-23

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	12/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	19/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	26/09/2022			
4.	Design of two stage RC Coupled amplifier.	3	10/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	17/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	31/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	14/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	21/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	28/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	05/12/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	12/12/2022			
12.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	19/12/2022			
13.	Internal Lab Examination	3	26/12/2022			
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	16/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	23/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	30/09/2022			
4.	Design of two stage RC Coupled amplifier	3	14/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	21/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	28/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	04/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	18/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	25/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	02/12/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	09/12/2022			
12.	Revision of Experiments	3	16/12/2022			
13.	Verification of conduction angles of power amplifiers **(Experiment beyond syllabus)**	3	23/12/2022			
14.	Internal Lab Examination	3	30/12/2022			
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
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: 12-09-2022

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**Mr.P.Venkateswara Rao**	**Mr.P.Venkateswara Rao**	**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/Mr.N.Dharmachari

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.:** 2021-22

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.
CO2	**Analyze** the behavior of combinational and sequential circuits using Verilog HDL simulator.
CO3	**Understand** the functionality of memories using Verilog HDL simulator
CO4	**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	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)

UNIT-I: Introduction & Gate Level Modeling

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.	Verilog as HDL, Levels of Design abstraction	1	13-09-22		TLM2	
2.	Simulation and Synthesis	1	20-09-22		TLM2	
3.	System Tasks, Test Benches	1	27-09-22		TLM2	
4.	Language Constructs & Conventions	1	11-10-22		TLM2	
5.	Gate level Modeling: Logic Gate Primitives, Module Structure	1	18-10-22		TLM2	
6.	Tri-State Gates, Array of Instances of Primitives	1	25-10-22		TLM2	
No. of classes required to complete UNIT-I: 06				**No. of classes taken:**		

UNIT-II: Switch Level Modeling, Behavioral Modeling & Data Flow Level Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Switch Level modeling: Basic switch primitives,	1	01-11-22		TLM2	
8.	CMOS Switch, Bi-directional Gates	1	15-11-22		TLM2	
9.	Time Delays with Switch Primitives	1	22-11-22		TLM2	
10.	CMOS NOT, NAND, and NOR gates using switch primitives	1	29-11-22		TLM2	
11.	Behavioral Level Modeling: Operations and Assignments, Functional bifurcation	1	06-12-22		TLM2	
12.	Multiple always blocks, Blocking and Non-blocking Assignments	1	06-12-22		TLM2	
13.	case statement	1	13-12-22		TLM2	
14.	Data flow modeling: Continuous Assignment Structures	1	20-12-22		TLM2	
15.	Delays and Continuous Assignments	1	27-12-22		TLM2	
16.	Assignments to Vectors, Operators		27-12-22		TLM2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

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 and COs	3	12-09-22		TLM4	
2.	Implementation of Logic Gates – data flow and behavioral model	3	19-09-22		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	26-09-22		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	10-10-22		TLM4	
5.	3 to 8 Decoder –74138.	3	17-10-22		TLM4	
6.	4 Bit Comparator –7485.	3	31-10-22		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	14-11-22		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer–74154.	3	21-11-22		TLM4	
9.	Sequential circuits -Flip-Flops.	3	28-11-22		TLM4	
10.	Decade counter –7490.	3	05-12-22		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip-flops	3	12-12-22		TLM4	
12.	Shift registers –7495.	3	19-12-22		TLM4	
13.	Revision & Experiment beyond the curriculum	3	26-12-22		TLM4	
14.	Internal Examination	3			TLM4	
No. of classes required to complete 36				**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 and COs	**3**	16-09-22		TLM4	
2)	Implementation of Logic Gates – data flow and behavioral model	3	23-09-22		TLM4	
3)	Combinational logic circuits – adders and subtractor.	3	30-09-22		TLM4	
4)	Code converters- binary to gray and gray to binary.	3	07-10-22		TLM4	
5)	3 to 8 Decoder –74138.	3	14-10-22		TLM4	
6)	4 Bit Comparator –7485.	3	21-10-22		TLM4	
7)	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	28-10-22		TLM4	
8)	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer – 74154.	3	04-11-22		TLM4	
9)	Sequential circuits -Flip-Flops.	3	18-11-22		TLM4	
10	Decade counter –7490.	3	25-11-22		TLM4	
11	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	02-12-22		TLM4	
12	Shift registers –7495.	3	09-12-22		TLM4	
13	Revision & Experiment beyond the curriculum	3	16-12-22		TLM4	
14	Internal Examination	3			TLM4	
No. of classes required to complete 36				**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 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	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.G. Venkata Rao**	**Dr.K.Ravi Kumar**	**Dr. P. Lachi Reddy**	**Dr. Y. Amar Babu**
Signature				

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DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructors: Dr.G.L.N.Murthy/Mrs B. Rajeswari/ 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-B **A.Y.:** 2022-23

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-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

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	15-09-22			
2.	MATLAB windows	1	15-09-22			
3.	On-line help, File types,	1	15-09-22			
4.	Input-output, Platform dependence, General command	1	22-09-22			
5.	Programming in MATLAB	1	22-09-22			
6.	Script Files and Function Files	1	22-09-22			
7.	Executing a function	1	29-09-22			
8.	Plotting Graphs.	1	29-09-22			
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	13-10-22			
2.	Gaussian elimination, Cramer's Rule	1	13-10-22			
3.	Finding eigen values and eigenvectors,	1	20-10-22			
4.	Vector operations, Element-by-element operations	1	20-10-22			
5.	Continuous time signals, operations on signals	1	27-10-22			
6.	Convolution	1	27-10-22			
7.	Frequency analysis	1	03-11-22			
No. of classes required to complete UNIT-I: 07				**No. of classes taken:**		

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	15-09-22			
2.	Generation of continuous time signals .	1	22-09-22			
3.	Product of signals	1	29-09-22			
4.	Plot the family of curves of a function over a time over.	1	29-09-22			
5.	Solving linear equations using matrix inverse methods	1	13-10-22			
6.	Solving linear equations using Cramer's methods	1	13-10-22			
7.	Compute Eigen values and Eigen vectors of given matrix.	2	20-10-22			
8.	Basic operations on the signals.	1	27-10-22			
9.	Convolution of signals.	1	27-10-22			
10.	Transformation of signals into time and frequency domains.	3	03-11-22			

11.	Compute and plot the Fourier coefficients for the periodic signal given signal.	4	17-11-22			
12.	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	4	17-11-22			
13.	Mini Project /Review	4	24-11-22			
14.	Mini Project /Review	4	01-12-22			
15.	Mini Project /Review	4	08-12-22			
16.	Mini Project /Review	4	15-12-22			
17.	Review/ Internal Evaluation	4	22-12-22			
18.	Internal Evaluation	4	29-12-22			
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**
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. G.L.N.Murthy**	**Mr. T.Anil Raju**	**Dr. G. L.N.Murthy**	**Dr. Y. Amar Babu**
Signature				

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

COURSE HANDOUT

PART-A

Name of Course Instructor **:** Dr. K.R. Kavitha
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.:** 2022 - 23

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	13/09/22		TLM1	
2.	Introduction to UNIT I	1	14/09/22		TLM2	
3.	Forward Differences	1	16/09/22		TLM1	
4.	Backward differences	1	17/09/22		TLM1	
5.	Central Differences	1	20/09/22		TLM1	
6.	Symbolic relations and separation of symbols	1	21/09/22		TLM1	
7.	Symbolic relations and separation of symbols	1	23/09/22		TLM1	
8.	Newton's forward formulae for interpolation	1	24/09/22		TLM1	
9.	Newton's backward formulae for interpolation	1	27/09/22		TLM1	
10.	Lagrange's Interpolation	1	28/09/22		TLM1	
11.	Lagrange's Interpolation	1	30/09/22		TLM1	
12.	Tutorial I	1	01/10/22		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	11/10/22		TLM2	
14.	Algebraic and Transcendental Equations	1	12/10/22		TLM1	
15.	False Position method	1	14/10/22		TLM1	
16.	False Position method	1	15/10/22		TLM1	
17.	Newton- Raphson Method in one variable	1	18/10/22		TLM1	
18.	Newton- Raphson Method applications	1	19/10/22		TLM1	
19.	Trapezoidal rule	1	21/10/22		TLM1	
20.	Simpson's 1/3 Rule	1	22/10/22		TLM1	
21.	Simpson's 3/8 Rule	1	25/10/22		TLM1	
22.	Tutorial II	1	29/10/22		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	26/10/22		TLM1	
24.	Double Integrals	1	28/10/22		TLM1	
25.	Double Integrals -Cartesian coordinates	1	01/11/22		TLM1	
26.	Double Integrals- Polar co ordinates	1	02/11/22		TLM1	
27.	Problems	1	04/11/22		TLM1	
28.	Applications to Double integrals (Content Beyond the syllabus)	1	05/11/22		TLM2	
I MID EXAMINATIONS (13-12-2021 TO 18-12-2021)						

29.	Triple Integrals - Cartesian coordinates	1	15/11/22		TLM1	
30.	Triple Integrals - Spherical coordinates	1	16/11/22		TLM1	
31.	Change of order of Integration	1	18/11/22		TLM1	
32.	Tutorial III	1	19/11/22		TLM3	
33.	Change of order of Integration	1	22/11/22		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	23/11/22		TLM1	
35.	Determination of Fourier coefficients, Even and Odd Functions	1	25/11/22		TLM1	
36.	Fourier Series expansion in the interval $[0,2\pi]$	1	26/11/22		TLM1	
37.	Fourier Series expansion in the interval $[-\pi,\pi]$	1	29/11/22		TLM1	
38.	Fourier Series in an arbitrary interval [0, 2l]	1	30/11/22		TLM1	
39.	Fourier Series in an arbitrary interval [-l, l]	1	02/12/22		TLM1	
40.	Fourier series in an arbitrary interval odd and even functions	1	03/12/22		TLM1	
41.	Half-range Sine and Cosine series	1	06/12/22		TLM1	
42.	Half-range Sine and Cosine series		07/12/22		TLM1	
43.	Tutorial IV	1	09/12/22		TLM3	
44.	Introduction to Fourier transforms (Content Beyond the Syllabus)	1	13/12/22		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	14/12/22		TLM1	
46.	Vector Differentiation	1	16/12/22		TLM1	
47.	Gradient	1	17/12/22		TLM1	
48.	Directional Derivative	1	20/12/22		TLM1	
49.	Divergence	1	21/12/22		TLM1	
50.	Curl	1	23/12/22		TLM1	
51.	Solenoidal and Irrotational functions, potential surfaces	1	24/12/22		TLM1	
52.	Laplacian and second order operators	1	27/12/22		TLM1	
53.	TUTORIAL - V	1	28/12/22		TLM3	
54.	Properties	1	30/12/22		TLM1	
55.	Introduction to Vector Integrals (Content Beyond the Syllabus)	1	31/12/22		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.
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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. R. Kavitha**	**Dr. K. R. Kavitha**	**Dr. A. Rami Reddy**	**Dr. A. Rami Reddy**
Signature				

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **P. Sarala**
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.:** 2022-23

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	13-09-2022		TLM1	
2.	Classification of Data Structures	1	14-09-2022		TLM1	
3.	Introduction to Algorithm	1	16-09-2022		TLM1	
4.	Algorithm Analysis	1	17-09-2022		TLM1	
5.	Asymptotic Notations	1	20-09-2022		TLM1	
6.	List using Arrays	1	21-09-2022		TLM1	
7.	Single Linked List	2	23-09-2022 24-09-2022		TLM1	
8.	Double Linked List	2	27-09-2022 28-09-2022		TLM1	
9.	Circular Linked List	2	30-10-2022 01-10-2022		TLM1	
No. of classes required to complete UNIT-I: 12				**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	11-10-2022		TLM2	
11.	STACKS USING ARRAYS	1	12-10-2022		TLM1	
12.	STACKS USING LINKED LIST	1	14-10-2022		TLM1	
13.	INFIX TO POSTFIX CONVERSION	2	15-10-2022 & 18-10-2022		TLM1	
14.	POSTFIX EVALUTION	1	19-10-2022		TLM1	
15.	CHECKING BALANCED PARANTHESIS	1	21-10-2022		TLM1	
16.	QUEUE	1	22-10-2022		TLM1	
17.	QUEUE USING ARRAY	1	25-10-2022		TLM1	
18.	QUEUE USING LINKED LIST	1	26-10-2022		TLM1	
19.	CIRCULAR QUEUE	2	28-10-2022 29-10-2022		TLM1	
20.	DEQUE	1	01-11-2022		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	02-11-2022		TLM2	
22.	Insertion Sort	1	04-11-2022		TLM1	
23.	Selection Sort	1	05-11-2022		TLM1	
24.	Merge Sort	2	15-11-2022 & 16-11-2022		TLM1	
25.	Quick Sort	2	18-11-2022 & 19-11-2022		TLM1	
26.	Heap Sort	2	22-11-2022 & 23-11-2022		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	1	25-11-2022		TLM1	
28.	Tree Traversals	2	26-11-2022 & 29-11-2022		TLM1	
29.	Binary Trees	1	02-12-2022		TLM2	
30.	Binary Search Trees	2	06-12-2022 & 07-12-2022		TLM1	
31.	AVL Trees	1	09-12-2022		TLM1	
32.	Operations	1	13-12-2022		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
33.	GRAPHS, FUNDAMENTALS	2	14-12-2022 16-12-2022		TLM1	
34.	REPRESENTATION OF GRAPHS	1	17-12-2022		TLM1	
35.	BFS	2	21-12-2022 & 23-12-2022		TLM1	
36.	DFS	2	27-12-2022 & 28-12-2022		TLM1	
37.	Hashing Introduction, Hash function, separate Chaining	1	30-12-2022		TLM1	
38.	Linear & Quadratic Probing	2	03-01-2023 &		TLM1	

			04-01-2023			
39.	Double & Rehasing	2	06-01-2023 & 07-01-2023		TLM2	
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.
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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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms.P.Sarala**	**Ms. P. Sarala**	**Dr. K. Naga Prashanthi**	**Dr. D.Veeriah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade (GPA: 3.20 out of 4)
MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. B.Y.V.N.R.Swamy, 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-C Sec **A.Y.:** 2022-23

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	12-09-22			
2.	Small signal modeling of transistor	1	13-09-22			
3.	h- parameter model of a Transistor	1	15-09-22			
4.	h- parameter model of a Transistor in CE,CB,CC Configuration	1	16-09-22			
5.	Exact analysis of CE,CB,CC amplifiers	1	19-09-22			
6.	Approximate analysis of CE amplifier without Emitter resistance	1	20-09-22			
7.	Approximate analysis of CB,CC amplifier	1	22-09-22			
8.	Approximate analysis of CE amplifier with Emitter resistance	1	23-09-22			
9.	Analysis of CS FET amplifier	1	26-09-22			
10.	Analysis of CD FET amplifier	1	27-09-22			
No. of classes required to complete UNIT-I: 10				**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	29-09-22			
12.	Analysis and Design of Cascode Amplifier	1	30-09-22			
13.	Analysis and Design of Darlington pair	1	10-10-22			
14.	Frequency response of Single stage amplifier	1	11-10-22			
15.	Frequency response of multi stage amplifier	1	13-10-22			
16.	Effect of coupling and bypass capacitor on frequency response	1	14-10-22			
17.	The hybrid- π Common Emitter Transistor model	1	17-10-22			
18.	Hybrid- π Conductance in terms of low frequency h- parameters	2	18-10-22 20-10-22			
19.	Millers Theorem	1	21-10-22			
20.	The CE model - f_β , f_T and $f\alpha$	1	25-10-22			
21.	Gain with resistive load	1	27-10-22			
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	28-10-22			
23.	General characteristics of Negative feedback Amplifiers	1	31-10-22			
24.	Qualitative analysis of Voltage series feedback amplifier	1	01-11-22			
25.	Qualitative analysis of current series feedback amplifier	1	03-11-22			
26.	Qualitative analysis of Voltage shunt feedback amplifier	1	04-11-22			
27.	Qualitative analysis of current shunt feedback amplifier	1	14-11-22			
28.	Effect of feedback on frequency response of amplifier	1	15-11-22			
29.	Qualitative analysis of RC oscillators	1	17-11-22			
30.	Qualitative analysis of LC oscillators	1	18-11-22			
31.	Qualitative analysis of Crystal oscillator	1	21-11-22			
32.	Introduction to Power amplifiers, Class A, Class B amplifiers	1	22-11-22			
33.	Class C, Class S amplifiers	1	24-11-22			
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	25-11-22			
35.	Response of LPF for step, pulse inputs	1	28-11-22			
36.	Response of LPF for square and ramp inputs	1	29-11-22			
37.	High pass RC circuit and their response for sinusoidal, step input	1	01-12-22			
38.	Response of HPF for step, pulse inputs	1	02-12-22			
39.	Response of HPF for square and ramp inputs	1	05-12-22			
40.	RC circuit as differentiator, integrator, Double differentiator	1	06-12-22			
41.	Problems on LPF	1	08-12-22			
42.	Problems on HPF	1	12-12-22			
No. of classes required to complete UNIT-IV: 09				**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	13-12-22			
44.	Analysis and Design of Bistable Multivibrators	1	15-12-22			
45.	Triggering types	1	16-12-22			
46.	Schmitt trigger circuit-Principle of operation	1	19-12-22			
47.	calculation of UTP, LTP and applications	1	20-12-22			
48.	Collector-coupled Monostable - Principle of operation	1	22-12-22			
49.	Astable Multivibrators Principle of operation	1	23-12-22			
50.	Analysis and design of Astable Multivibrators	1	26-12-22			
51.	Problems on Astable Multivibrators	1	27-12-22			
52.	Problems on Mono stable Multivibrators	1	29-12-22			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
53.	Applications of power amplifiers	1	30-12-22		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: 12-09-2022

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. B.Y.V.N.R.Swamy**	**Dr. B.Y.V.N.R.Swamy**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade (GPA: 3.20 out of 4)
MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor : Prof.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 A.Y : 2022-23

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): 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	13-09-22			
2.	Introduction to UNIT-I	1	14-09-22			
3.	Concept of Probability	1	15-09-22			
4.	Concept of Random Variable, Conditions for a function to be a Random Variable	1	16-09-22			
5.	Classification of Random Variable	1	20-09-22			
6.	Cumulative Distribution Function (CDF) and Properties	1	21-09-22			
7.	Probability Density Function (PDF) and Properties	1	22-09-22			
8.	Pre-Defined Distributions	1	23-09-22			
9.	Pre-Defined Distributions	1	27-09-22			
10.	Expectation, Moments and Central Moments	1	28-09-22			
11.	Characteristic Function and Moment Generating Function with Properties	1	29-09-22			
12.	Transformations on Random Variables	1	30-09-22			
13.	Problem Solving Session	1	07-10-22			
14.	Problem Solving Session	1	11-10-22			
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	12-10-22			
16.	Joint Distribution Function and Properties, Marginal Distribution Function	1	13-10-22			
17.	Joint Density Function and Properties, Marginal Density Function	1	14-10-22			
18.	Statistical Independence	1	18-10-22			
19.	Distribution and Density of Sum of Random Variables	1	19-10-22			
20.	Central Limit Theorem	1	20-10-22			
21.	Expected Value of Function of Random Variables, Joint Moment about the Origin, Correlation	1	21-10-22			
22.	Joint Central Moment, Covariance and Correlation Coefficient	1	25-10-22			
23.	Jointly Gaussian Random Variables and Properties.	1	26-10-22			
24.	Problem Solving Session	1	27-10-22			
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	28-10-22			
26.	Concept of Stochastic Processes	1	01-11-22			
27.	Classification of Stochastic Processes	1	02-11-22			
28.	Stationarity and Independence	1	03-11-22			
29.	Problem Solving Session	1	04-11-22			
30.	Time Averages and Ergodicity	1	15-11-22			
31.	Correlation Functions	1	16-11-22			
32.	Problem Solving Session	1	17-11-22			
33.	Problem Solving Session	1	18-11-22			
34.	Problem Solving Session	1	22-11-22			
35.	Problem Solving Session	1	23-11-22			
No. of classes required to complete UNIT-III			**11**	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	24-11-22			
37.	Power Spectral Density and Properties	1	25-11-22			
38.	Wiener-Khintchine Relation	1	29-11-22			
39.	Bandwidth of PSD	1	30-11-22			
40.	Cross Power Spectral Density and Properties	1	01-12-22			
41.	Relation between CCF and CPSD	1	02-12-22			
42.	Problem Solving Session	1	06-12-22			
43.	Problem Solving Session	1	07-12-22			
44.	Problem Solving Session	1	08-12-22			
45.	Problem Solving Session	1	09-12-22			
46.	Problem Solving Session	1	13-12-22			
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
47.	Introduction to UNIT-V	1	14-12-22			
48.	Response of a Linear System	1	15-12-22			
49.	Mean value of System Response, Mean Square value of System Response	1	16-12-22			
50.	ACF of Response, CCF of input and output	1	20-12-22			

51.	PSD of Response, CPSD of input and output	1	21-12-22			
52.	Problem Solving Session	1	22-12-22			
53.	Introduction to Noise, Classification	1	23-12-22			
54.	Modeling of Noise Sources	1	27-12-22			
55.	Effective Noise Temperature, Available power Gain, Noise Figure	1	28-12-22			
56.	White Noise, Introduction to Additive White Gaussian Noise	1	29-12-22			
57.	Problem Solving Session	1	30-12-22			
58.	Problem Solving Session	1	03-01-23			
59.	Problem Solving Session	1	04-01-23			
No. of classes required to complete UNIT-V		**13**	No. of classes taken			

Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
60.	Stochastic Signal Processing (SSP)	**1**	05-01-23			
61.	Applications of SSP	**1**	06-01-23			

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

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	Prof. B. Ramesh Reddy	Prof. B. Ramesh Reddy	Dr. G L N Murthy	Dr. Y. Amar Babu
12.09.22	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : N Dharmachari

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 : 2022-23

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 sampling **(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-A

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.	General Interaction & Introduction to the course	1	13.09.22		-	
2.	Course Objective and Outcomes, POs, PSOs and Mapping with COs	1	14.09.22		-	
3.	Concept of signal and Classification of Signals-Continuous Time Signals, Discrete Time and Digital Signals	1	15.09.22		TLM1	
4.	Representation of Signals- Impulse, Unit Step, Unit Ramp, Signum.	1	16.09.22		TLM1	
5.	Representation of Signals- Decaying, Raising and Double Exponential, Triangular and Rectangular, Sinc and Sampling Signals	1	20.09.22		TLM1	
6.	Operations on Signals– Time Shifting, Time Scaling and Time Reversal (Folding),Amplitude Scaling	1	21.09.22		TLM1	
7.	Convolution; Graphical Method of Convolution	1	22.09.22		TLM1	
8.	Properties of Signals- Even and Odd, Causal and Non Causal, Bounded and Unbounded	1	23.09.22		TLM1	
9.	Properties of Signals -Periodic and Aperiodic, Energy and Power, Deterministic and Random Signals	1	27.09.22		TLM1	
10.	Problems on Time shifting, Time scaling, Time Reversal, Amplitude Scaling & Convolution	1	28.09.22		TLM1	
11.	Problems on Properties of Signals	2	29.09.22 30.09.22		TLM1	
No. of classes required to complete UNIT-I		**12**	**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	03.10.2022		TLM1	
2.	Condition for orthogonal signals, Approximation of a Signal by a set of mutually orthogonal signals	2	04.10.2022 06.10.2022		TLM1	
3.	Evaluation of Mean square error, Gibbs Phenomena	1	11.10.2022		TLM1	
4.	Orthogonality in complex signals-Approximation of a complex signal by another complex signal & a set of mutually orthogonal complex signals.	1	12.10.22		TLM1	
5.	Fourier Series- Dirichlet Conditions and Trigonometric Fourier Series	1	13.10.22		TLM1	
6.	Exponential Fourier Series	1	14.10.22		TLM1	
7.	Relations among coefficients of Trigonometric Fourier Series and Exponential Fourier Series	1	18.10.22		TLM1	

8.	Representation of Periodic signal by Fourier series over the entire interval, Symmetry conditions of Fourier Series	1	19.10.22		TLM1	
9.	Parseval's Theorem and Problems involving symmetry conditions	1	20.10.22		TLM1	
10.	Problems on Trigonometric Fourier Series	1	21.10.22		TLM1	
11.	Problems on Exponential Fourier Series	1	25.10.22		TLM1	
No. of classes required to complete UNIT-II		**12**	**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	26.10.22		TLM1	
2.	Deriving Fourier Transform from Fourier Series, Convergence of Fourier Transform-Dirichlet Conditions	1	27.10.22		TLM1	
3.	Properties of Fourier Transform	3	28.10.22		TLM1	
4.	Fourier Transform of Various Classes of Signals	1	01.11.22 02.11.22 03.11.22		TLM1	
5.	Fourier Transform of Periodic Signal	1	04.11.22		TLM1	
6.	Sampling Theorem	1	15.11.22		TLM1	
7.	Types of sampling-Ideal sampling, flat top sampling, natural sampling Reconstruction of signal from its samples	1	16.11.22		TLM1	
8.	Effect of under sampling-Aliasing, Difference between low pass sampling and band pass sampling	1	17.11.22		TLM1	
9.	Problems on Fourier Transform of periodic Signals	3	18.11.22 22.11.22 23.11.22		TLM1	
No. of classes required to complete UNIT-III		**13**	**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	24.11.22		TLM1	
2.	Properties of Systems: Linear and Non Linear, Time Invariant and Variant, Causal and Non Causal	1	25.11.22		TLM1	
3.	Properties of Systems : Stable and Unstable, Static and Dynamic, Invertible and Non-invertible	1	29.11.22		TLM1	
4.	Time and Frequency Analysis of LTI System	1	30.11.22		TLM1	
5.	System Bandwidth and Rise Time	1	01.12.22		TLM1	

6.	Distortion less Transmission through a System	1	02.12.22		TLM1	
7.	Problems on Properties of systems	1	06.12.22		TLM1	
8.	Ideal and Practical Characteristics of LPF, HPF, BPF & BSF	1	07.12.22		TLM1	
9.	Physically Realizable Systems and Poly-Wiener Criterion	1	08.12.22		TLM1	
10.	Problems on Properties of systems	2	09.12.22 13.12.22		TLM1	
No. of classes required to complete UNIT-IV		**11**	**No. of classes taken**			

UNIT-V: Laplace Transform

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	14.12.22		TLM1	
2.	Relation between Laplace and Fourier Transforms, Existence of Laplace Transform	1	15.12.22		TLM1	
3.	Laplace Transform of Various Classes of Signals	1	16.12.22		TLM1	
4.	Region of Convergence (ROC) and its Properties	1	20.12.22		TLM1	
5.	Problems on Laplace Transform and ROC	1	21.12.22		TLM1	
6.	Properties of Laplace Transform	2	22.12.22 23.12.22		TLM1	
7.	Inverse Laplace Transform using Partial Fractions Method	1	27.12.22		TLM1	
8.	Applications of Laplace Transform: Causality of a System, Stability of a System	1	28.12.22		TLM1	
9.	Solving of Differential Equations and Analysis of RLC Circuits	1	29.12.22		TLM1	
No. of classes required to complete UNIT-V		**10**	**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.	Application of Signal Processing	**1**	30.12.22		TLM2	

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. N.Dharmachari	Dr. G. L.N.Murthy	Dr. G.L.N. Murthy	Dr. Y. Amar Babu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS & COMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **P. Sarala/ M. Swathi/ T. Vineetha**
Course Name & Code **: DATA STRUCTURES LAB & 20CS53**
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/III/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	6	13-09-2022 20-09-2022		
2.	Linked List Programs	9	27-09-2022 11-10-2022 18-10-2022		
3.	Stack, Queue Using Arrays, Linked List	3	25-10-2022 08-11-2022		
4.	Infix to Postfix, Evaluation of Postfix Expression	3	15-11-2022		
5.	Circular Queue Double Ended Queue	3	22-11-2022		
6.	Bubble sort Selection sort Insertion sort	3	29-11-2022		
7.	Merge sort Quick sort	3	06-12-2022		
8.	Heap sort Binary Tree	3	13-12-2022		
9.	Binary Search Tree	3	20-12-2022		
10.	BFS,DFS	3	27-12-2022		
11.	Lab Internal Exam	3	03-01-2023		

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	To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.
PSO 2	To inculcate an ability to analyze, design and implement data driven applications into the students
PSO 3	Develop an ability to implement various processes/methodologies/practices employed in design, validation, testing and maintenance of software products.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms.P.Sarala**	**Ms. P. Sarala**	**Dr. K. Naga Prashanthi**	**Dr. D. Veeriah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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MHRD India Rankings NIRF-2022 (Rank-Band: 251-300)
Accredited by NBA under Tier-I (ECE, EEE, ME, CSE & IT)
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 ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. James Vijay
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 **A.Y.:** 2022-23

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	14/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response.	3	21/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response.	3	28/09/2022			
4.	Design of two stage RC Coupled amplifier.	3	12/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	19/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	26/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	02/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	16/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	23/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	30/11/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	07/12/2022			
12.	Revision of Experiments	3	14/12/2022			
13.	Verification of conduction angles of power amplifiers**(Experiment beyond syllabus)**	3	21/12/2022			
14.	Internal Lab Examination	3	28/12/2022			
No. of classes required to complete : 42				**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	15/09/2022			
2.	Determination of Gain and Bandwidth of CE amplifier from frequency response	3	22/09/2022			
3.	Determination of Gain and Bandwidth of CS FET amplifier from frequency response	3	29/09/2022			
4.	Design of two stage RC Coupled amplifier	3	13/10/2022			
5.	Design of Transistorized Current series Feedback amplifier for Bandwidth improvement	3	20/10/2022			
6.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.	3	27/10/2022			
7.	Analysis of Stabilization of Gain of Transistorized Current shunt Feedback amplifier	3	03/11/2022			
8.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	17/11/2022			
9.	Design and Realization of Transistorized Colpitts Oscillator to generate a sinusoidal signal	3	24/11/2022			
10.	Design and Realization of Low pass filter using RC networks.	3	01/12/2022			
11.	Design and Realization of High Pass filter using RC networks.	3	08/12/2022			
12.	Revision of Experiments	3	15/12/2022			
13.	Verification of conduction angles of power amplifiers**(Experiment beyond syllabus)**	3	22/12/2022			
14.	Internal Lab Examination	3	29/12/2022			
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
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	**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**	**HOD**
Name of the Faculty	**Mr. P. James Vijay**	**Mr.P.Venkateswara Rao**	**Dr. G. Srinivasulu**	**Dr. Y. Amar Babu**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ECE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.N.Dharmachari/Dr.K.Ravikumar

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 C Sec **A.Y.:** 2022-23

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.
CO2	**Analyze** the behavior of combinational and sequential circuits using Verilog HDL simulator.
CO3	**Understand** the functionality of memories using Verilog HDL simulator
CO4	**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	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)

UNIT-I: Introduction & Gate Level Modeling

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.	Verilog as HDL, Levels of Design abstraction	1	16-09-22		TLM2	
2.	Simulation and Synthesis	1	23-09-22		TLM2	
3.	System Tasks, Test Benches	1	30-09-22		TLM2	
4.	Language Constructs & Conventions	1	07-10-22		TLM2	
5.	Gate level Modeling: Logic Gate Primitives, Module Structure	1	14-10-22		TLM2	
6.	Tri-State Gates, Array of Instances of Primitives	1	21-10-22		TLM2	
No. of classes required to complete UNIT-I: 06				**No. of classes taken:**		

UNIT-II: Switch Level Modeling, Behavioral Modeling & Data Flow Level Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Switch Level modeling: Basic switch primitives,	1	28-10-22		TLM2	
8.	CMOS Switch, Bi-directional Gates	1	04-11-22		TLM2	
9.	Time Delays with Switch Primitives	1	18-11-22		TLM2	
10.	CMOS NOT, NAND, and NOR gates using switch primitives	1	25-11-22		TLM2	
11.	Behavioral Level Modeling: Operations and Assignments, Functional bifurcation	1	02-12-22		TLM2	
12.	Multiple always blocks, Blocking and Non-blocking Assignments	1	09-12-22		TLM2	
13.	case statement	1	16-12-22		TLM2	
14.	Data flow modeling: Continuous Assignment Structures	1	23-12-22		TLM2	
15.	Delays and Continuous Assignments,Assignments to Vectors,Operators	1	30-12-22		TLM2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

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 and COs	3	14-09-22		TLM4	
2.	Implementation of Logic Gates – data flow and behavioral model	3	21-09-22		TLM4	
3.	Combinational logic circuits – adders and subtractor.	3	28-09-22		TLM4	
4.	Code converters- binary to gray and gray to binary.	3	12-10-22		TLM4	
5.	3 to 8 Decoder –74138.	3	19-10-22		TLM4	
6.	4 Bit Comparator –7485.	3	26-10-22		TLM4	
7.	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	02-11-22		TLM4	
8.	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer–74154.	3	16-11-22		TLM4	
9.	Sequential circuits -Flip-Flops.	3	23-11-22		TLM4	
10.	Decade counter –7490.	3	30-10-22		TLM4	
11.	Synchronous & Asynchronous Counters using D & T- Flip-flops	3	07-12-22		TLM4	
12.	Shift registers –7495.	3	14-12-22		TLM4	
13.	Revision & Experiment beyond the curriculum	3	21-12-22		TLM4	
14.	Internal Examination	3	28-12-22		TLM4	
No. of classes required to complete 36				**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 and COs	**3**	15-09-22		TLM4	
2)	Implementation of Logic Gates – data flow and behavioral model	3	23-09-22		TLM4	
3)	Combinational logic circuits – adders and subtractor.	3	29-09-22		TLM4	
4)	Code converters- binary to gray and gray to binary.	3	06-10-22		TLM4	
5)	3 to 8 Decoder –74138.	3	13-10-22		TLM4	
6)	4 Bit Comparator –7485.	3	20-10-22		TLM4	
7)	8 x 1 Multiplexer – 74151 and 1X4 Demultiplexer – 74155.	3	27-10-22		TLM4	
8)	16 x 1 Multiplexer – 74150 and 4X16 Demultiplexer –74154.	3	03-11-22		TLM4	
9)	Sequential circuits -Flip-Flops.	3	17-11-22		TLM4	
10)	Decade counter –7490.	3	24-11-22		TLM4	
11)	Synchronous & Asynchronous Counters using D & T- Flip Flops	3	01-12-22		TLM4	
12)	Shift registers –7495.	3	08-12-22		TLM4	
13)	Experiment beyond the curriculum	3	15-12-22		TLM4	
14)	Revision	3	22-12-22		TLM4	
15)	Internal Examination	3	29-12-22		TLM4	
No. of classes required to complete 36				**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 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	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.N.Dharmachari**	**Dr.K.Ravi Kumar**	**Dr. P. Lachi Reddy**	**Dr. Y. Amar Babu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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 Instructors: Mrs B. Rajeswari /Dr.G.L.N. 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.:** 2022-23

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	3	2	-	3	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	1	-	3
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
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	17-09-22			
2.	MATLAB windows	1	17-09-22			
3.	On-line help, File types,	1	17-09-22			
4.	Input-output, Platform dependence, General command	1	24-09-22			
5.	Programming in MATLAB	2	24-09-22			
6.	Script Files and Function Files	1	24-09-22			
7.	Executing a function	1	01-10-22			
8.	Plotting Graphs.	1	01-10-22			
No. of classes required to complete UNIT-I: 09				**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	2	08-10-22			
2.	Gaussian elimination, Cramer's Rule	1	08-10-22			
3.	Finding eigen values and eigenvectors,	1	15-10-22			
4.	Vector operations, Element-by-element operations	2	15-10-22			
5.	Continuous time signals, operations on signals	1	15-10-22			
6.	Convolution	1	15-10-22			
7.	Frequency analysis	1	15-10-22			
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	4	17-09-22			
2	Generation of sinusoidal signal, Product of signals	2	24-09-22			
3	Solving linear equations using matrix inverse methods	2	24-09-22			
4	Solving linear equations using Cramer's methods	2	01-10-22			
5	Compute Eigen values and Eigen vectors of given matrix.	2	01-10-22			
6	Plot the family of curves of a function over a time over.	4	08-10-22			
7	Plot the family of curves of a function over a time over.	4	15-10-22			
8	Generation of continuous time signals.	4	22-10-22			
9	Basic operations on the signals.	4	29-10-22			

10	Convolution of signals, Transformation of signals into time and frequency domains.	4	05-11-22			
11	Compute and plot the Fourier coefficients for the periodic signal given signal.	4	19-11-22			
12	Demonstrate the synthesis of the square wave by successively adding of the Fourier components of given signal.	4	26-11-22			
13	Mini Project Practice Sessions	4	03-12-22			
14	Mini Project Practice Sessions	4	10-12-22			
15	Mini Project Practice Sessions	4	17-12-22			
16	Mini Project Practice Sessions	4	24-12-22			
17	Mini Project Practice Sessions	4	31-12-22			
18	Internal Review/ Report Submission	4	07-01-23			
No. of classes required to complete:18				**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**

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Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Mrs. B. Rajeswari	**Mr. T.Anil Raju**	**Dr. G. L.N.Murthy**	**Dr. Y. Amar Babu**