COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – A
Academic Year : 2026-27
Course Name & Code : Probability Theory and Stochastic Processes – 23FE12
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr. G. L. N. Murthy, Professor of ECE

Course Objectives:

1	To get basic understanding of random variables and operations that can be performed on them.
2	To know the Spectral and temporal characteristics of Random Process.
3	To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

CO1	Summarize the concepts of Probability and random processes.	L2
CO2	Examine the Temporal and Spectral characteristics of Random Signals.	L3
CO3	Analyze Linear Time Invariant systems driven by stationary random process by using Auto correlation function and Power spectral Density.	L4
CO4	Interpret the concepts of Noise and Information theory in Communication systems.	L2

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	-	-

Correlation Levels: **1.** Slight (Low),**2**-Moderate(Medium), **3**-Substantial (High).

Textbooks (T):

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

T2 Taub and Schilling - Principles of Communication systems, TMH, 2008

Reference Books(R)

R1 B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003

R2 Y Mallikarjuna Reddy, "Probability theory and Stochastic Processes", Universities Press (India), Pvt Ltd.

R3 Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002

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

UNIT-I: Probability & Random Variables

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 PTSP Course	1	13.07.2026			
2.	Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces	1	14.07.2026			
3.	**Tutorial(Context mapping)**	1	**15.07.2026**			
4.	Events, Probability Definitions and Axioms	1	16.07.2026			
5.	Discrete and Continuous Sample Spaces	1	20.07.2026			
6.	Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events	1	21.07.2026			
7.	**Tutorial (Problem Based Learning)**	1	**22.07.2026**			
8.	Cumulative Distribution Function (CDF) and Properties	1	23.07.2026			
9.	Concept of Random Variable, Conditions for a function to be a Random Variable, Classification of Random Variable		27.07.2026			
10.	Cumulative Distribution Function (CDF) Properties, Probability Density Function (PDF) and Properties	1	28.07.2026			
11.	**Tutorial (Cooperative Group Learning)**	1	**29.07.2026**			
12.	Probability Density Function (PDF) and Properties	1	30.07.2026			
13.	Pre-Defined Distributions	1	03.08.2026			
No. of classes required to complete UNIT-I: 10+3			**No. of classes taken:**			

UNIT-II: Operations on Single & Multiple Random Variables-Expectations

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin	1	04.08.2026			
15.	**Tutorial (Problem Based Learning)**	1	**05.08.2026**			
16.	Central Moments, Variance and Skew	1	06.08.2026			
17.	Chebychev's Inequality, Characteristic Function	1	10.08.2026			
18.	Moment Generating Function, Vector random variables	1	11.08.2026			
19.	**Tutorial (Think-Pair-Share Learning)**	1	**12.08.2026**			
20.	Joint Distribution Function and Properties	1	13.08.2026			

21.	Joint Distribution Function Properties, Marginal Distribution Function	1	17.08.2026			
22.	Joint Density Function and Properties	1	18.08.2026			
23.	**Tutorial (Context mapping)**	1	**19.08.2026**			
24.	Joint Density Function and Properties, Marginal Density Function	1	20.08.2026			
25.	Statistical Independence, Sum of Two Random Variables, Distribution and Density of Sum of Random Variables	1	24.08.2026			
26.	Central Limit Theorem ,Unequal Distribution, Equal Distributions	1	25.08.2026			
27.	Joint Central Moments	1	27.08.2026			
28.	Joint Characteristic Function	1	31.08.2026			
No. of classes required to complete UNIT-II: 12+3			**No. of classes taken:**			

UNIT-III: Random 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
29.	The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes	1	01.09.2026			
30.	**Tutorial (Context mapping)**	1	**02.09.2026**			
31.	Distribution and Density Functions, concept of Stationarity and Statistical Independence	1	03.09.2026			
32.	First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity	1	10.09.2026			
33.	Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes	1	15.09.2026			
34.	**Tutorial (Problem Based Learning)**	1	**16.09.2026**			
35.	Autocorrelation Function and Its Properties	1	17.09.2026			
36.	Cross-Correlation Function and Its Properties	1	21.09.2026			
37.	Covariance Functions	1	22.09.2026			
38.	**Tutorial (Think-Pair-Share Learning)**	1	**23.09.2026**			
39.	Convolution, Mean and Mean-squared Value of System Response	1	24.09.2026			
40.	Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output	1	28.09.2026			
41.	**Tutorial (Problem Based Learning)**	1	**30.09.2026**			
No. of classes required to complete UNIT-III -9+4			**No. of classes taken:**			

UNIT-IV: Random 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
42.	The Power Spectrum: Properties	1	01.10.2026			
43.	Relationship between Power Spectrum and Autocorrelation Function	1	05.10.2026			
44.	The Cross-Power Density Spectrum, Properties	1	06.10.2026			
45.	**Tutorial (Cooperative Group Learning)**	1	**07.10.2026**			
46.	Relationship between Cross-Power Spectrum and Cross-Correlation	1	08.10.2026			
47.	Spectral Characteristics of System Response: Power Density Spectrum of system response	1	12.10.2026			
48.	Cross-Power Density Spectrums of Input and Output	1	13.10.2026			
49.	**Tutorial(Think-Pair-Share Learning)**	**1**	**14.10.2026**			
No. of classes required to complete UNIT-IV: 6+2			**No. of classes taken:**			

UNIT-V: Noise Sources & Information Theory

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Resistive/Thermal Noise Source, Arbitrary Noise Sources	1	15.10.2026			
51.	Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures	1	26.10.2026			
52.	Average Noise Figure of cascaded networks, Narrow Band noise	1	27.10.2026			
53.	**Tutorial (Context mapping)**	1	**28.10.2026**			
54.	Quadrature representation of narrow band noise & its properties, Entropy	1	29.10.2026			
55.	Information rate, Source coding: Huffman coding	1	02.11.2026			
56.	Source coding: Shannon Fano coding, Mutual information	1	03.11.2026			
57.	**Tutorial(Problem Based Learning)**	1	**04.11.2026**			
58.	Channel capacity of discrete channel, Shannon-Hartley law;	1	05.11.2026			
59.	Trade -off between bandwidth and SNR	1	09.11.2026			
60.	Problem solving	1	10.11.2026			
No. of classes required to complete UNIT-V: 9+2			**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
61.	Stochastic Signal Processing (SSP)	**1**	**11.11.2026**			

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)	**A1=5**
I-Descriptive Examination (Units-I, II)	**M1=15**
I-Quiz Examination (Units-I, II)	**Q1=10**
Assignment-II (Unit-III ,IV & V)	**A2=5**
II- Descriptive Examination (UNIT-III , IV & V)	**M2=15**
II-Quiz Examination (UNIT-III,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:

Program 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.

Program 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.

Program 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.

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	47	
	Tutorial **Problem Based Learning-5** **Think-Pair-Share Learning-3** **Cooperative Group Learning-2** **Context mapping-4**	**T**	14	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns)-24 Hours Virtual Lab (10 Hrs)	**SL**	34	
		Total	**95**	

Date	Dr. G L N Murthy	Dr. K.Ravi Kumar	Dr. G L N Murthy	Dr.G.Srinivasulu
13.07.2026	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

Department of Electronics and Communication Engineering

COURSE HANDOUT

DATE: 09-07-2026

PART-A:

Program : B.Tech. III-Sem., ECE., Section–A
Academic Year : 2026-27
Course Name & Code : **UHV2**-Understanding Harmony and Ethical Human Conduct-(23HS01).
L-T-P-Cr : **2**-1-0-3
Course Instructure : Mr.S.Murahari.

Course Objectives:

1.	To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO 1	Describe the terms like Natural Acceptance, Happiness and Prosperity	L2
CO 2	Identify one's self, and one's surroundings (family, society nature)	L2
CO 3	Relate human values with human relationship and human society.	L2
CO 4	Illustrate the need for universal human values and harmonious existence.	L2
CO 5	Develop as socially and ecologically responsible engineers	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
CO 1															
CO 2			2												
CO 3						**2**		**3**	**2**						
CO 4						**1**		**2**							
CO 5							**2**	**3**				**1**			

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

Textbooks (T) and References (R):

TEXTBOOKS:

TI: R R Gaur, R Singal, G P Bagaria, "Human Values and Professional Ethics", Excel Books, New Delhi 2010.

REFERENCE BOOKS:

R1: Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
R2: Human values, A N Tripathi, New Age Publishers, New Delhi, 2004.
R3: The story of my experiments with Truth, Mohandas Karamchand Gandhi.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction to Value Education

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	1	13-07-2026		TLM2	
2.	Introduction to Unit-I	1	15-07-2026		TLM2	
3.	Process for self exploration: Natural Acceptance	1	16-07-2026		TLM2	
4.	**Tutorial-PS1**: Sharing about Oneself	1	**17-07-2026**		TLM2	
5.	Right Understanding, Relationship and Physical Facility	**1**	20-07-2026		TLM3	
6.	Right Understanding, Relationship and Physical Facility	1	22-07-2026		TLM2	
7.	Understanding Value Education	1	23-07-2026		TLM2	
8.	Continuous Happiness and Prosperity- Basic Human Aspirations	1	24-07-2026		TLM2	
9.	Happiness and Prosperity-Current Scenario	1	27-07-2026		TLM2	
10.	**Tutorial-PS2**: Exploring Human Consciousness: **CHART PREPARATION**	**1**	**29-07-2026**		TLM2	
11.	Method to Fulfill the Basic Human Aspirations	1	30-07-2026		TLM2	
12.	Method to Fulfill the Basic Human Aspirations	1	**31-07-2026**		TLM2	
13.	**Tutorial-PS3:** Exploring Natural Acceptance: **DEBATE**	1	**03-08-2026**		TLM3	
No. of classes required to complete UNIT-10+3			**No. of classes taken :**			

UNIT-II: Harmony in the Human Being

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.	Understanding Human being as the Co-existence of the self and the body	1	06-08-2026		TLM2	
2.	Understanding Human being as the Co-existence of the self and the body	1	07-08-2026		TLM2	
3.	Distinguishing between the Needs of the self and the body	1	10-08-2026		TLM2	
4.	**Tutorial PS4 Distinguishing between the Needs of the self and the body-CHART PREPARATION.**	1	**12-08-2026**		TLM3	
5.	The body as an Instrument of the self	**1**	13-08-2026		TLM2	
6.	Understanding Harmony in the self	1	14-08-2026		TLM2	
7.	**Tutorial PS5 Sources of Imagination in the self**	1	**17-08-2026**		TLM3	
8.	Harmony of the self with the body	1	19-08-2026		TLM2	
9.	Programme to ensure self-regulation and Health	**1**	20-08-2026		TLM2	
10.	Programme to ensure self-regulation and Health	1	21-8-2026		TLM2	
11.	**Tutorial -PS6 Harmony of the self with the body-ASSOCIATIVE LEARNING.**	1	**24-8-2026**		TLM3	
No. of classes required to complete UNIT-II : 8+3			**No. of classes taken :**			

UNIT-III: Harmony in the Family and Society

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.	Harmony in the Family-Basic unit of Human Interaction	**1**	27-8-2026		TLM2	
2.	Harmony in the Family-Basic unit of Human Interaction	1	28-8-2026		TLM2	
3.	'Trust' the Foundational Value in Relationship	1	31-8-2026		TLM2	
4.	'Trust' the Foundational Value in Relationship	**1**	02-09-2026		TLM2	
5.	**Tutorial PS7 Exploring the Feeling of Trust PLAYING A VIDEO.**	1	**03-09-2026**		TLM3	
6.	'Respect' as the Right Evaluation	1	10-09-2026		TLM2	
7.	**Tutorial PS8 Exploring the Feeling of Respect**	1	**11-09-2026**		TLM2	
8.	Other Feelings, Justice in Human-to-Human Relationship	**1**	16-09-2026		TLM2	
9.	Understanding Harmony in the Society	1	17-09-2026		TLM2	
10.	Vision for the Universal Human Order	1	18-09-2026		TLM2	
11.	**Tutorial PS9 Exploring systems to fufil Human Goal CHART PREPARATION.**	1	**21-09-2026**		TLM3	
No. of classes required to complete UNIT-III : 8+3			**No. of classes taken :**			

UNIT-IV : Harmony in the Nature/Existence

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.	Understanding Harmony in the Nature	1	23-09-2026		TLM2	
2.	Understanding Harmony in the Nature	1	24-09-2026		TLM2	
3.	Interconnectedness, self-regulation	1	25-09-2026		TLM2	
4.	Mutual Fulfilment among the Four Orders of Nature	1	28-09-2026		TLM2	
5.	**Tutorial PS10 Exploring Four Orders of Nature ROLE PLAY**	**1**	**30-09-2026**		TLM3	
6.	Realizing Existence as Co- existence at All Levels	1	01-10-2026		TLM2	
7.	Realizing Existence as Co-existence at All Levels	1	05-10-2026		TLM2	
8.	The Holistic Perception of Harmony in Existence	1	07-10-2026		TLM2	
9.	The Holistic Perception of Harmony in Existence	1	08-10-2026		TLM2	
10.	**Tutorial PS11 Exploring Co-existence in Existence PLAYING A VIDEO**	1	**09-10-2026**		TLM3	
No. of classes required to complete UNIT-IV : 8+2			**No. of classes taken :**			

UNIT-V : Implications of the Holistic Understanding

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.	Natural acceptance of human values	1	12-10-2026		TLM2	
2.	Definitiveness of (Ethical) Human Conduct	1	14-10-2026		TLM2	
3.	**TUTORIAL PS12 Exploring Ethical Human Conduct ROLE PLAY**	1	**15-10-2026**		TLM3	
4.	Basis for Humanistic Education	**1**	16-10-2026		TLM2	
5.	Humanistic Constitution and Universal Human Order	1	26-10-2026		TLM2	
6.	Humanistic Constitution and Universal Human Order	1	28-10-2026		TLM2	
7.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	29-10-2026		TLM2	
8.	Competence in professional ethics	1	30-10-2026		TLM2	
9.	**TUTORIAL PS13 Exploring Humanistic Models in Education VIDEO PLAY**	**1**	**02-11-2026**		TLM3	
10.	Holistic Technologies, Production Systems and Management Models	1	04-11-2026		TLM2	
11.	Strategies for Transition towards Value-based Life and Profession	1	05-11-2026		TLM2	
12.	**TUTORIAL PS14 Exploring Steps of Transition towards Universal Human order CHART PREPARATION**	1	**06-11-2026**		TLM3	
No. of classes required to complete UNIT-V : 9+3			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transitions in the universal human order in the current society	1	09-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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**

ACADEMIC CALENDAR: A.Y 2026-27

Description	From	To	Weeks
I Phase of Instructions	13-07-2026	05-09-2026	8W
I Mid Examinations	07-09-2026	09-09-2026	**3 Days**
II Phase of Instructions	10-09-2026	17-10-2026	5 ½ W
Dussehra Holidays	19-10-2026	24-10-2026	1 W
II Phase of Instructions Cont.	26-10-2026	11-11-2026	2 ½ W
II Mid Examinations	12-11-2026	15-11-2026	**3 Days**
Preparation and Practical	16-11-2026	21-11-2026	1 W
Semester End Examinations	23-11-2026	05-11-2026	**2 W**

PART-D: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	43	
	Tutorial **Case study-5** **Think-pair-Share Learning-5** **Cooperative Group Learning-5**	**T**	15	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (5 Hrs)	**SL**	35	
		Total	**93**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.S.Muarahari.	MrS.B.Rajeswari.	Dr. B.Srinivasa Rao.	Dr. G. Srinivasulu.

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–A
Academic Year : 2026-27
Course Name & Code : Signals and Systems – 23EC02
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Ramesh Reddy

Course Objectives:

1	To study about signals and systems
2	To analyze the spectral characteristics of signals
3	To understand the characteristics of systems
4	To introduce the concept of sampling process
5	To know various transform techniques to analyze the signals and systems

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

CO 1	Summarize the basic concepts of signals, systems and sampling	L2
CO 2	Examine the operations on signals and approximate using orthogonal functions	L3
CO 3	Apply the concept of impulse response to analyze the LTI systems	L3
CO 4	Analyze both continuous time and discrete time signals and systems using Fourier series, Fourier transform, Laplace transforms and Z-Transforms	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
CO 1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO 3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO 4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

Textbooks (T) and References (R):

T1: B P Lathi, Signals, Systems and Communications, BSP, 3rd Edition, 2003.
T2: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI, 2nd Edition, 1997.
T3: Simon Haykin and Van Veen, Signals and Systems, Wiley, 2nd Edition 2007.
R1: B P Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2015.
R2: TK Rawat, Oxford University Press, 2011.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to course	1	13-07-2026			
2.	Introduction to Unit-I	1	14-07-2026			
3.	Definition and Classification of signals	1	15-07-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**17-07-2026**			
5.	Definition and Classification of systems	1	20-07-2026			
6.	Singularity and Related signals	1	21-07-2026			
7.	Complex exponential and sinusoidal signals	1	22-07-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**24-07-2026**			
9.	Operations on signals	1	27-07-2026			
10.	Properties of signals	1	28-07-2026			
11.	Analogy between vectors and signals	1	29-07-2026			
12.	**Tutorial (Cooperative Group Learning)**	**1**	**31-07-2026**			
13.	Approximation of a signal by another signal	1	03-08-2026			
14.	Orthogonal signal space, Approximation of a signal by a set of mutually another signals	1	04-08-2026			
15.	Orthogonality in complex signals	1	05-08-2026			
16.	**Tutorial (Flipped Classroom Learning)**	**1**	**07-08-2026**			
No. of classes required to complete UNIT-I : 12+4			**No. of classes taken :**			

UNIT-II: Fourier Series & Fourier Transforms

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.	Fourier series representation of continuous time periodic signals, Dirichlet's conditions	1	10-08-2026			
2.	Trigonometric Fourier series	1	11-08-2026			
3.	Exponential Fourier series	1	12-08-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**14-08-2026**			
5.	Relation between Trigonometric and Exponential Fourier series	1	17-08-2026			
6.	Properties of Fourier series	1	18-08-2026			
7.	Complex Fourier spectrum, Deriving Fourier transform from Fourier series	1	19-08-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**21-08-2026**			
9.	Fourier transform of arbitrary signals	1	24-08-2026			
10.	Fourier transform of standard signals	1	25-08-2026			
11.	**Tutorial (Cooperative Group Learning)**	**1**	**28-08-2026**			
12.	Fourier transform of periodic signals, Introduction to Hilbert Transform	1	31-08-2026			
13.	Properties of Fourier transforms	1	01-09-2026			
14.	Properties of Fourier transforms	1	02-09-2026			
No. of classes required to complete UNIT-II : 11+3			**No. of classes taken :**			

UNIT-III: Analysis of Linear Systems

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.	**Tutorial (Problem Based Learning)**	**1**	**11-09-2026**			
2.	Introduction, Linear and Non-linear systems	1	15-09-2026			
3.	Time invariant and Variant systems	1	16-09-2026			
4.	**Tutorial (Think-Pair-Share Learning)**	**1**	**18-09-2026**			
5.	Concept of convolution in time and frequency domain. Graphical representation of convolution	1	21-09-2026			
6.	Response of a LTI system	1	22-09-2026			
7.	System bandwidth, Signal bandwidth and Rise time, Distortion less transmission through a system	1	23-09-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**25-09-2026**			
9.	Filter characteristics of linear systems, Ideal and practical characteristics of LPF, HPF, BPF, BSF	1	28-09-2026			
10.	Causality and Poly-Wiener criterion for physical realization	1	29-09-2026			
No. of classes required to complete UNIT-III : 7+3			**No. of classes taken :**			

UNIT-IV : Correlation and Sampling Theorem

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.	Auto-correlation function and properties	1	30-09-2026			
2.	Energy spectral density, Power spectral density, Parseval's theorem	1	05-10-2026			
3.	Cross-correlation function and properties, Relation between Convolution and correlation	1	06-10-2026			
4.	Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering	1	07-10-2026			
5.	**Tutorial (Problem Based Learning)**	**1**	**09-10-2026**			
6.	Sampling Theorem, Graphical analysis of Sampling Theorem- Impulse sampling, Analytical analysis of Sampling Theorem	1	12-10-2026			
7.	Sampling Theorem for band limited signal- Band Pass sampling, Reconstruction of signal from its samples, Statement of Sampling theorem	1	13-10-2026			
8.	Effect of under sampling-Aliasing effect, Natural and Flat top Sampling	1	14-10-2026			
No. of classes required to complete UNIT-IV : 7+1			**No. of classes taken :**			

UNIT-V : Laplace Transforms and Z-Transforms

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, Concept of Laplace transform, Relation between Laplace and Fourier transform, Existence of Laplace transform	1	26-10-2026			
2.	Laplace transform of various classes of signals	1	27-10-2026			
3.	Region of convergence in s- Transform and Properties	1	28-10-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**30-10-2026**			
5.	Properties of Laplace transform	1	02-11-2026			
6.	Inverse Laplace transform	1	03-11-2026			
7.	Introduction to Z-Transform, Z-transform of various classes of signals Region of convergence in z- Transform and Properties	1	04-11-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**06-11-2026**			
9.	Properties of Z-transforms	1	09-11-2026			
10.	Inverse Z- transform	1	10-11-2026			
No. of classes required to complete UNIT-V : 8+2			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transform Techniques	1	11-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program 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.

Program Outcomes (POs):

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

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-4, Cooperative Group Learning-3, Flipped Classroom Learning-1**	**T**	13	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (2 Hrs)	**SL**	32	
		Total	**91**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. B. Ramesh Reddy	Dr. B. Rambabu	Dr. G.L.N Murthy	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART: A

Program : B.Tech. III-Sem., ECE., Section–A
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design – 23EC04
L-T-P-Cr : 3-0-0-3
Course Instructure : Ms. M V L Bhavani

Course Objectives:

1	To solve a typical number base conversion and analyze new error coding techniques.
2	Theorems and functions of Boolean algebra and behavior of logic gates
3	To optimize logic gates for digital circuits using various techniques
4	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
5	To understand concepts of combinational circuits.
6	To develop advanced sequential circuits.

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

CO 1	Summarize the key differences between number systems and their usage in Digital Circuits.	L2
CO 2	Identify the minimization techniques of Boolean expressions to implement Digital Circuits using basic logic gates and logic circuits	L3
CO 3	Apply the minimization and realization methods for designing the Combinational & Sequential logic circuits	L3
CO 4	Analyze the Combinational, Sequential, Finite State Machines for implementation of digital logic circuits	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
CO 1	2	3	1	-	-	-	-	2	-	-	-	1	-	3	-
CO 2	2	3	3	-	-	-	-	2	-	-	-	1	-	3	-
CO 3	2	3	3	1	-	-	-	2	-	-	-	1	-	3	-
CO 4	2	3	3	2	-	-	-	2	-	-	-	3	-	3	-

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

Textbooks (T) and References (R):

T1: Switching and finite automata theory Zvi.KOHAVI, Niraj. K. Jha 3rd Edition, Cambridge University Press, 2009.

T2: Digital Design by M. Morris Mano, Michael D Ciletti, 4th edition PHI publication, 2008.

T3: Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

R1: Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006

R2: Digital electronics by R S Sedha. S. Chand &company limited,2010

R3 : Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: REVIEW OF NUMBER SYSTEMS & CODES, BOOLEAN THEOREMS AND LOGIC 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.	Introduction, Representation of numbers of different radix.	1	13.07.2026		TLM1	
2.	conversation from one radix to another radix	1	15.07.2026		TLM1	
3.	r- 1's compliments and r's compliments of signed numbers	1	16.07.2026		TLM1	
4.	**Tutorial (Think-Pair-Share Learning)**	**1**	**17.07.2026**		TLM1	
5.	2421 & 84-2-1 code	1	20.07.2026		TLM1	
6.	Error detection codes: parity checking, even parity, odd parity	1	22.07.2026		TLM1	
7.	Error correction codes: Hamming code.	1	23.07.2026		TLM1	
8.	**Tutorial (Flipped Classroom Learning)**	**1**	**24-07-2026**		TLM3	
9.	Boolean theorems	1	27.07.2026		TLM1	
10.	Principle of complementation & duality, De-Morgan theorems.	1	29.07.2026		TLM1	
11.	Logic operations; Universal Logic operations, EX-OR, EX- NOR operations.	1	30.07.2026		TLM1	
12.	**Tutorial (Problem Based Learning)**	1	**31-07-2026**		TLM3	
13.	Standard SOP and POS Forms	1	03.08.2026		TLM1	
14.	NAND-NAND and NOR-NOR realizations	1	05.08.2026		TLM1	
15.	Realization of three level logic circuits.	1	06.08.2026		TLM1	
No. of classes required to complete UNIT-I: 12+3			**No. of classes taken:**			

UNIT-II: MINIMIZATION TECHNIQUES, COMBINATIONAL LOGIC CIRCUITS DESIGN.

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.	**Tutorial (Cooperative Group Learning)**	1	**07-08-2026**		TLM3	
2.	Minimization and realization of switching functions using Boolean theorems	1	10.08.2026		TLM1	
3.	Minimization and realization of switching functions using Boolean theorems	1	12.08.2026		TLM1	
4.	K-Map(2,3 variables)	1	13.08.2026		TLM1	
5.	**Tutorial (Problem Based Learning)**	1	**14.08.2026**		TLM3	
6.	K-Map(4,5,6 variables)	1	17.08.2026		TLM1	

7.	Tabular method (Quine-McCluskey method) with only four variables and single function.	1	19.08.2026		TLM1	
8.	Tabular method (Quine-McCluskey method) with only four variables and single function.	1	20.08.2026		TLM1	
9.	**Tutorial (Flipped Classroom Learning)**	1	**21.08.2026**		TLM3	
10.	Design of Full Adder, half subtractor	1	24.08.2026		TLM1	
11.	full subtractor, applications of full adders	1	26.08.2026		TLM1	
12.	4- bit adder-sub tractor circuit	1	27.08.2026		TLM1	
13.	**Tutorial (Think-Pair-Share Learning)**	1	**28.08.2026**		TLM3	
14.	BCD adder circuit , Excess 3 adder circuit	1	31.08.2026		TLM1	
15.	Carry look-a- head adder circuit	1	02.09.2026		TLM2	
16.	Design code converts using Karnaugh method and draw the complete circuit diagrams	1	03.09.2026		TLM1	
No. of classes required to complete UNIT-II: 12+4			**No. of classes taken:**			

UNIT-III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI, INTRODUCTION OF PLD's

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.	Design of encoder, decoder	1	10.09.2026		TLM1	
2.	**Tutorial (Cooperative Group Learning)**	1	**11.09.2026**		TLM3	
3.	multiplexer and de-multiplexers	1	16.09.2026		TLM1	
4.	Implementation of higher order circuits using lower order circuits	1	17.09.2026		TLM1	
5.	**Tutorial (Problem Based Learning)**	1	**18.09.2026**		TLM3	
6.	Realization of Boolean functions using decoders	1	21.09.2026		TLM1	
7.	Realization of Boolean functions using multiplexers	1	23.09.2026		TLM1	
8.	Design of Priority encoder, 4-bit digital comparator	1	24.09.2026		TLM1	
9.	**Tutorial (Think-Pair-Share Learning)**	1	**25.09.2026**		TLM3	
10.	seven segment decoder	1	28.09.2026		TLM1	
11.	PROM-Basics structures, realization of Boolean functions, Programming table.	1	30.09.2026		TLM1	
No. of classes required to complete UNIT-III: 08+03			**No. of classes taken:**			

UNIT-IV: SEQUENTIAL CIRCUITS-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.	Classification of sequential circuits (synchronous and asynchronous),operation of NAND & NOR Latches	1	01.10.2026		TLM1	
2.	Flip-Flops: Truth tables and excitation tables of RS flip-flop, JK flip- flop, with reset and clear terminals	1	05.10.2026		TLM1	
3.	Flip-Flops: Truth tables and excitation tables of T-flip-flop, D flip- flop, with reset and clear terminals	1	07.10.2026		TLM1	
4.	Conversion from one flip-flop to another flip- flop.	1	08.10.2026		TLM1	
5.	**Tutorial (Problem Based Learning)**	1	**09.10.2026**		TLM3	
6.	Design of ripple counters, design of synchronous counters, Johnson counter, ring counter.	1	12.10.2026		TLM1	

7.	Design of registers - Buffer register, control buffer register, Shift register.	1	14.10.2026		TLM1	
8.	Bi- directional shift register, universal shift, register.	1	15.10.2026		TLM1	
9.	**Tutorial (Flipped Classroom Learning)**	1	**16.10.2026**		TLM3	
10.	Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.	1	26.10.2026		TLM1	
No. of classes required to complete UNIT-III: 08+02			**No. of classes taken:**			

UNIT-V: SEQUENTIAL CIRCUITS-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
1.	Finite state machine: state diagrams, state tables	1	28.10.2026		TLM1	
2.	Reduction of state tables	1	29.10.2026		TLM1	
3.	**Tutorial (Cooperative Group Learning)**	1	**30.10.2026**		TLM3	
4.	Reduction of state tables	1	02.11.2026		TLM1	
5.	Analysis of clocked sequential circuits Mealy to Moore conversion	1	04.11.2026		TLM1	
6.	Analysis of clocked sequential circuits Moore to Mealy to conversion	1	05.11.2026		TLM1	
7.	**Tutorial (Problem Based Learning)**	1	**06.11.2026**		TLM3	
8.	Realization of sequence generator	1	09.11.2026		TLM1	
9.	Design of Clocked Sequential Circuit to detect the given sequence (with and without overlapping)	1	11.11.2026		TLM1	
No. of classes required to complete UNIT-V: 07+02			**No. of classes taken :**			

Content beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to HDL, Verilog HDL	1	11.11.2026		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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	47	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-3, Cooperative Group Learning-3, Flipped Classroom Learning-3**	**T**	14	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs)	**SL**	30	
		Total	**91**	

Dt: 09-07-2026

Course Instructor	Course Coordinator	Module Coordinator	HOD
Ms. M V L Bhavani	Ms. M V L Bhavani	Dr. P. Lachi Reddy	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

PART-A:

COURSE HANDOUT

Program : B.Tech. III-Sem., ECE., Section– A
Academic Year : 2026-27
Course Name & Code : **Electronic Devices and Circuits** – 23EC03
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B.V.N.R.Siva Kumar

Course Objectives:

1	To learn and understand the basic concepts of semiconductor physics.
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3	To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5	To learn and understand the purpose of transistor biasing and its significance
6	Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

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

CO 1	Recall the fundamentals of semiconductor physics necessary for electronic devices and circuits (Remember)	L1
CO 2	Illustrate the structure and operation of Diodes, Bipolar Junction Transistors, Field Effect Transistors and biasing of BJT & FET using fundamental circuits. (Understand)	L2
CO 3	Apply the knowledge of Diodes, Transistors and Filters for designing the Rectifiers, Regulators and Amplifier circuits using basic components. (Apply)	L3
CO 4	Analyze the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using V-I Characteristics. (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
CO 1	2	3	1	-	-	3	1	-	-	-	1	2	1	1	-
CO 2	2	1	2	1	-	3	1	-	-	-	-	1	1	1	-
CO 3	3	1	1	-	-	-	1	-	-	-	-	-	2	2	-
CO 4	1	3	-	-	-	-	-	-	-	-	1	1	2	2	-

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

Textbooks (T) and References (R):

T1: Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015..

T2: Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.

T3: Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

R1: Basic Electronics-Principles and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly Cambridge University Press, 1st edition, 2018.

R2: Electronics devices & circuit theory- Robert L.Boylestad and Louis Nashelsky, Pearson, 11th edition, 2015.

R3: Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.

Online Learning Resources:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Semiconductor Physics, Junction Diode Characteristics & Special Semiconductor Devices

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Methods	HOD
1	TUTORIAL: QUIZ on Basics	1	13-07-26			
2	Introduction to COs and Outcomes. Unit-I Introduction	1	14-07-26			
3	Mobility and conductivity, Intrinsic and Extrinsic Semiconductors	1	15-07-26			
4	Continuity Equation, Law of Junction.	1	17-07-26			
5	TUTORIAL: Problem Based Learning	1	20-07-26			
6	Open circuited p-n junction, Biased p-n junction, p-n junction diode, Current components in p-n junction Diode	1	21-07-26			
7	Diode equation, V-I Characteristics, Temperature dependence on V-I characteristics	1	22-07-26			
8	Diode resistance, Diode capacitance.	1	24-07-26			
9	TUTORIAL: Think, Pair & Share Learning	1	27-07-26			
10	Special Semiconductor Devices: Zener Diode, Breakdown Mechanisms and Applications	1	28-07-26			
11	Varactor Diode, LED	1	29-07-26			
12	Photodiode, Tunnel Diode	1	31-07-26			
13	TUTORIAL: Think Pair & Share learning	1	03-08-26			
14	UJT Operation and V-I characteristics	1	04-08-26			
15	PNPN Diode	1	05-08-26			
16	SCR Operation and V-I characteristics	1	07-08-26			
17	TUTORIAL: Cooperative Group Learning	1	10-08-26			
No. of classes required to complete UNIT-I : 12+5=17			No. of classes taken :			

UNIT-II: Diode Circuits

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	Diode Circuits: The Diode as a circuit element. The Load-Line concept.	1	11-08-26			
2	Piecewise Linear Diode Model, Clipping Circuits.	1	12-08-26			
3	Clipping at Two Independent Levels.	1	14-08-26			
4	TUTORIAL: Think Pair and Share	1	17-08-26			
5	Peak Detector, Clamping circuits	1	18-08-26			
6	Basic Rectifier Setup, Half Wave Rectifier	1	19-08-26			
7	Full Wave Rectifier, Bridge Rectifier	1	21-08-26			
8	TUTORIAL: Flipped Class Learning	1	24-08-26			
9	Derivations of Characteristics of Rectifiers	1	26-08-26			
10	Filters, Inductor Filter	1	28-08-26			
11	TUTORIAL: Problem Based learning		31-08-26			
12	Capacitor Filter, π-Section Filter	1	01-09-26			
13	Comparison of various Filter Circuits in terms of Ripple Factors.		02-09-26			
14	REVISION		04-09-26			
No. of classes required to complete UNIT-II : 11+3			No. of classes taken :			

UNIT-III: Transistor Characteristics, Biasing and Thermal Stabilization

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	**Transistor Characteristics**: Junction transistor, Transistor current components, CB configuration, Transistor as an amplifier	1	11-09-26			
2	TUTORIAL: Flipped Class Learning	1	14-09-26			
3	Characteristics of transistor in CB, CE,CC configurations	1	16-09-26			
4	Ebers - Moll model of a transistor, Punch through/ Reach through. Photo transistor, typical transistor junction voltage values.	1	18-09-26			
5	TUTORIAL: Flipped Class Learning	1	21-09-26			
6	Transistor Biasing and Thermal Stabilization : Need for biasing,	1	22-09-26			

	operating point, load line analysis					
7	BJT biasing- methods, basic stability, fixed bias, collector to base bias	1	23-09-26			
8	Self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S,S',S''),	1	25-09-26			
9	TUTORIAL: Flipped Class Learning	1	28-09-26			
10	Bias Compensation, Thermal Runaway, Thermal Stability	1	29-09-26			
No. of classes required to complete UNIT-III : 07+03			No. of classes taken :			

UNIT-IV : Small Signal Low Frequency Transistor Amplifier Models

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	BJT: Two port network, Transistor hybrid model, Determination of h-parameters for a BJT amplifier, Conversion of h-parameters	1	30-09-26			
2	TUTORIAL: Flipped Class Learning	1	05-10-26			
3	Generalized analysis of transistor amplifier model using h-parameters	1	06-10-26			
4	Analysis of CB amplifiers using exact and approximate analysis.	1	07-10-26			
5	Analysis of CE & CC amplifiers using exact and approximate analysis	1	09-10-26			
6	TUTORIAL: Problem Based learning	1	12-10-26			
7	Comparison of transistor amplifiers	1	13-10-26			
8	Generalized analysis of transistor amplifier model using h-parameters	1	14-10-26			
9	Problem Solving Session	1	16-10-26			
No. of classes required to complete UNIT-III : 07+02 = 09				No. of classes taken :		

UNIT- V: FET, MOSFET and CMOS Amplifiers

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	TUTORIAL: Cooperative Group Learning	1	26-10-26			
2	FET types, JFET operation, Characteristics, Small signal model of JFET	1	27-10-26			
3	MOSFET Structure, Operation of MOSFET in triode region	1	28-10-26			

4	Operation in saturation region, MOSFET as a variable resistor,	1	30-10-26			
5	TUTORIAL: Flipped Class Learning	**1**	02-11-26			
6	Channel length modulation, MOS trans conductance	1	03-11-26			
7	MOS device models: MOS small signal model, PMOS Transistor,	1	04-11-26			
8	CMOS Technology, Comparison of Bipolar and MOS devices, CMOS amplifiers: General Considerations	1	06-11-26			
9	TUTORIAL: Flipped Class Learning	1	09-10-26			
10	Common Source Stage,Common Gate Stage, Source Follower, comparison of FET amplifiers.	1	10-10-26			
No. of classes required to complete UNIT-III : 07+03				No. of classes taken :		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. ofClasses Required	TentativeDate of Completion	ActualDate of Completion	TeachingLearning Methods	HOD Sign Weekly
1.	Realization of Universal gates with CMOS transistor	1	11-10-26			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	45	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	16	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Virtual Labs Simulation of Circuits Assignment Data Sheets	**SL**	07 12 08 02	
		Total	90	

PART-E: PEOs, POs and PSOs

Program Educational Objectives (PEOs):

PEO 1:	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
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PEO 3:	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.
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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.
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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.

Program Specific Outcomes (PSOs):

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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.B.V.N.R. Siva kumar	Mr K V Ashok	Dr. B.V.N.R. Siva kumar	Dr. G. Srinivasulu

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L.B. Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Date: 11-07-2026

Name of Course Instructor : Dr BVNR Siva Kumar, Mr K V Ashok, Dr B Y V N R Swamy, Dr V Ravi sekhara Reddy
Course Name & Code : Electronic Devices and Circuits Lab -23EC52
L-T-P Structure : 0-0-3 **Credits**: 1.5
Program/Sem/Sec : B.Tech., ECE. /III/ A **A.Y.** : 2026-27

Course Objectives: This course introduces the characteristics and applications of semiconductor devices. Emphasis is placed on characteristics and testing practically to strengthen the knowledge.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	Demonstrate the characteristics of BJT, FET, SCR, UJT and applications of diode. **(Apply-L3)**
CO2	Model the Rectifiers, filters and Amplifiers used in electronic circuits. **(Apply-L3)**
CO3	Analyze the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. **(Analyze – L4).**
CO4	Adapt effective Communication, presentation and report writing skills. **(Apply-L3)**

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

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

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

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 EDC Lab experiments, COs, POs and PSOs.	3	18-07-2026		TLM4	
2.	BJT Characterstics – CB,CE configurations	3	25-07-2026		TLM4	
3.	Estimation of ripple factor and regulation without and with LC filter. Half-wave & Full-wave Rectifier	3	01-08-2026		TLM4	
4.	Design of Clipper circuit using diode	3	08-08-2026		TLM4	
5.	Design of Clamping circuit using diode	3	22-08-2026		TLM4	
6.	Determination of Break over voltage of SCR using V-I Characteristics	3	29-08-2026		TLM4	
7.	UJT Characterstics	3	05-09-2026		TLM4	
8.	Revision	3	12-09-2026		TLM4	
9.	Determination of h-parameter of a BJT in CE configuration	3	19-09-2026		TLM4	
10.	Estimation of Stability factor for a transistor - self biasing circuit	3	26-09-2026		TLM 4	
11.	Frequency response of BJT-CE Amplifier	3	03-10-2026		TLM4	
12.	FET Characteristics – Drain & Transfer	3	10-10-2026		TLM4	
13.	Design of FET –CS Amplifier		17-10-2026		TLM4	
14.	Demonstration		31-10-2026		TLM4	
15.	Lab Internal Examination		07-11-2026			
No. of classes required: 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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

PART-D

Program 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.

Program Outcomes (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3:	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4:	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5:	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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PO 7:	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9:	**Individual and 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.

Program 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. B.V.N.R. Siva kumar	**Mr. P Venkateswara Rao**	**Dr. B.V.N.R. Siva kumar**	**Dr. G. Srinivasulu**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–A
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design Lab – 23EC53
L-T-P-Cr : 0-0-3-1.5
Course Instructure : Dr. B Rambabu, Dr. B Siva Hari Prasad, Ms. M V L Bhavani, Mr. Ch Siva Rama Krishna

Course Objectives:

This course gives the ability to design and verify digital logic circuits like; logic gates, combinational and sequential logic circuits using discrete components and Integrated Circuits.

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

CO 1	Demonstrate the functionality of Logic gates, Flip-flops, Shift registers and Counters	L2
CO 2	Apply the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates	L3
CO 3	Analyze the behavior of Combinational and Sequential logic circuits	L4
CO 4	Adapt effective Communication, presentation and report writing skills	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
CO 1	2	3	3	1	2	3	-	2	-	-	-	1	-	3	-
CO 2	2	1	1	1	1	3	-	2	-	-	-	1	-	3	-
CO 3	2	1	1	-	1	3	-	2	-	-	-	1	-	3	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-

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

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 STLD Lab, COs, Pos and PSOs.	3	16-07-2026		TLM4	
2.	Implementation of the following Logic gates using Universal Gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR	3	23-07-2026		TLM4	
3.	Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.	3	30-07-2026		TLM4	
4.	Verification of functional table of 3 to 8-line Decoder /De-multiplexer	3	06.08.2026		TLM4	
5.	4 variable logic function verification using 8 to1 multiplexer.	3	13.08.2026		TLM4	
6.	Design full adder circuit and verify its functional table.	3	20.08.2026		TLM4	
7.	Verification of functional tables of (i) JK Master Slave Flip–Flop (ii) D Flip-Flop	3	27.08.2026		TLM4	
8.	Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output	3	03.09.2026		TLM4	
9.	Verify the operation of 4-bit Universal Shift Register for different Modes of operation	3	10.09.2026		TLM4	
10.	Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test It with a low frequency clock and sketch the output waveforms	3	17.09.2026		TLM4	
11.	Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.	3	24.09.2026		TLM4	
12.	Draw the circuit diagram of a single bit comparator and test the output	3	01.10.2026		TLM4	
13.	Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.	3	08.10.2026		TLM4	
14.	Design of any combinational circuit, sequential circuit using Hardware Description Language (Additional Experiments)	3	15.10.2026		TLM4	
15.	Revision	3	29.10.2026		TLM4	
16.	Lab Internal Exam	3	05.11.2026		TLM4	
No. of classes required: 48				**No. of classes taken:**		

Teaching Learning Methods

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

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE):(A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

Program 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.

Program 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.
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.

Program 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

Dt: 09-07-2026

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. B Rambabu Dr. B Siva Hari Prasad Ms. M V L Bhavani Mr. Ch Siva Rama Krishna	Mr. Ch Siva Rama Krishna	Dr. P.Lachi Reddy	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **Dr. G. Sambi Reddy**
Course Name & Code **: DATA STRUCTURES LAB & 20CSS3**
L-T-P Structure **: 0-1-**3 **Credits:** 2
Program/Sem/Sec : B.Tech/III/ECE-A **A.Y.:** 2026-27

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 various searching & sorting techniques. **(Apply-L3)**

CO2: Implement Linked List, Stack & Queue data structures. **(Apply-L3)**

CO3: Design and implement algorithms for operations on binary trees and binary search trees. **(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	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		
CO3	3	2											2		
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.	**UNIT1**: 1. Program to find min & max element in an array. 2. Program to implement matrix multiplication.	4	14-07-2026 15-07-2026		
2.	3.Find an element in given list of sorted elements in an array using Binary search.	4	21-07-2026 22-07-2026		
3.	4.Implement Selection and Quick sort techniques	4	28-07-2026 29-07-2026		
4.	**UNIT:2** Write a program to implement the following operations. a. Insert b. Deletion c. Traversal	4	04-08-2026 05-08-2026		
5.	Write a program to store name, roll no, and marks of students in a class using circular double linked list	4	11-08-2026 12-08-2026		
6.	Write a program to perform addition of given two polynomial expressions using linked list	4	18-08-2026 19-08-2026		
7.	**UNIT:3** Implement stack operations using a. Arrays b. Linked list	3	25-08-2026		
8.	Convert given infix expression into post fix expression using stacks.	4	01-09-2026 02-09-2026		

9.	Evaluate given post fix expression using stack.	4	15-09-2026 16-09-2026		
10.	4.Write a program to reverse given linked list using stack	4	22-09-2026 23-09-2026		
11.	UNIT 4: 1.ImplementQueue operations using a. Arrays b. Linked list.	4	29-09-2026 30-9-2026		
12.	2. Implement Circular Queue using a. Arrays b. Linked list. 3.Implement Dequeue using linked list.	7	06-10-2026 07-10-2026 13-10-2026		
13.	**UNIT5:** 1. Implement binary tree traversals using linked list.	4	14-10-2026 27-10-2026		
14.	Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations	5	28-10-2026 03-11-2026 04-11-2026		
15.	Lab Internal Exam	3	10-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work& Record	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
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	Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry
PSO 2	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools.
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. G. Sambi Reddy**	**Dr. G. Sambi Reddy**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., ECE-A
ACADEMIC YEAR : 2026-27
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. Shaheda Niloufer
COURSE COORDINATOR : Dr. Shaheda Niloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	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	3	-	-	-	3	3	3	-	-	-	3	-	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	-	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-
CO5	3	3	3	3	-	3	3	3	-	-	-	3	-	-	-

Note: Enter Correlation Levels **1** or **2** or **3.**
If there is no correlation, **put '-',** Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.

T2. Palaniswamy, Environmental Studies,2/e, Pearson education,2014.

T3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company,2021.

T4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

R1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.

R2. Deeksha Daveand E. Sai Baba Reddy, Text book of Environmental Science,2/e, Cengage Publications, 2012.

R3. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication, 2014.

R4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications,2006.

R5. J. Glynn Henryand GaryW. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.

R6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

R7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science,1/e, Prentice Hall of India Private limited, 1991.

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	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	13-07-2026		TLM2			
2.	Multidisciplinary Nature ofEnvironmental Studies	1	13-07-2026		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	18-07-2026		TLM1	CO1	T1, T2	
4.	Water resources	1	20-07-2026		TLM2	CO1	T1, T2	
5.	Mineral resources	1	25-07-2026		TLM1	CO1	T1, T2	
6.	Food resources	1	27-07-2026		TLM2	CO1	T1, T2	
7.	Energy resources	1	01-08-2026		TLM2			
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
8.	Ecosystems – Structure & Functions	1	03-08-2026		TLM4	CO2	T1, T2	
9.	Ecological succession &	1	10-08-2026		TLM1	CO2	T1, T2	
10.	Food chains, Food webs & Ecological Pyramids	1	17-08-2026		TLM4	CO2	T1, T2	
11.	Types of ecosystems	1	22-08-2026		TLM1	CO2	T1, T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	24-08-2026		TLM2	CO2	T1, T2	
13.	Values of Biodiversity, India as mega diversity nation, Threats to biodiversity and Conservation of biodiversity	1	29-08-2026		TLM2	CO2	T1, T2	
14.	Revision		31-08-2026					
No. of classes required to complete UNIT-II		06			No. of classes taken:			

I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)

UNIT-III: Environmental Pollution

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Environmental pollution -Air pollution	1	29-08-2026		TLM1	CO3	T1, T2	
16.	Water pollution, Marine pollution, Thermal pollution	1	31-08-2026		TLM1	CO3	T1, T2	
17.	Soil pollution	1	05-09-2026		TLM1	CO3	T1, T2	
18.	Solid waste management	1	19-09-2026		TLM1	CO3	T1, T2	
19.	Disaster management	1	21-09-2026		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
20.	From Unsustainable to Sustainable development	1	19-09-2026		TLM1	CO4	T1, T2	
21.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	21-09-2026		TLM1	CO4	T1, T2	
22.	Environmental ethics, Climate change	1	26-09-2026		TLM6	CO4	T1, T2	

23.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	28-09-2026		TLM1	CO4	T1, T2	
24.	Environmental Acts	1	03-10-2026		TLM1	CO4	T1, T2	
25.	Environmental Acts	1	05-10-2026		TLM1	CO4	T1, T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	12-10-2026		TLM1	CO5	T1, T2	
27.	Environment and human health –Human Rights –	1	17-10-2026		TLM1	CO5	T1, T2	
28.	Value Education		26-10-2026				T1, T2	
29.	HIV/AIDS – Women and Child Welfare	1	31-10-2026		TLM1	CO5	T1, T2	
30.	Role of information Technology in Environment and human health	1	02-11-2026		TLM1	CO5	T1, T2	
31.	Revision	1	07-11-2026		TLM3	CO5	T1, T2	
No. of classes required to complete UNIT-V		06			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
32.	Awareness on ozone layer Case studies	2	05-09-2026 09-11-2026		TLM2	CO2	T1, T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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.

Dr. Shaheda Niloufer	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – B
Academic Year : 2026-27
Course Name & Code : Probability Theory and Stochastic Processes – 23FE12
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr. G. L. N. Murthy, Professor of ECE

Course Objectives:

1	To get basic understanding of random variables and operations that can be performed on them.
2	To know the Spectral and temporal characteristics of Random Process.
3	To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

CO1	Summarize the concepts of Probability and random processes.	L2
CO2	Examine the Temporal and Spectral characteristics of Random Signals.	L3
CO3	Analyze Linear Time Invariant systems driven by stationary random process by using Auto correlation function and Power spectral Density.	L4
CO4	Interpret the concepts of Noise and Information theory in Communication systems.	L2

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	-	-

Correlation Levels: **1.** Slight (Low),**2**-Moderate(Medium), **3**-Substantial (High).

Textbooks (T):

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

T2 Taub and Schilling - Principles of Communication systems, TMH, 2008

Reference Books(R)

R1 B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003

R2 Y Mallikarjuna Reddy, "Probability theory and Stochastic Processes", Universities Press (India), Pvt Ltd.

R3 Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002

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

UNIT-I: Probability & 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 PTSP Course	1	15.07.2026			
2.	Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces	1	16.07.2026			
3.	Discrete and Continuous Sample Spaces	1	17.07.2026			
4.	Events, Probability Definitions and Axioms	1	18.07.2026			
5.	**Tutorial(Context mapping)**	1	22.07.2026			
6.	Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events	1	23.07.2026			
7.	Concept of Random Variable, Conditions for a function to be a Random Variable, Classification of Random Variable	1	24.07.2026			
8.	Cumulative Distribution Function (CDF) and Properties	1	25.07.2026			
9.	**Tutorial (Problem Based Learning)**		29.07.2026			
10.	Cumulative Distribution Function (CDF) Properties, Probability Density Function (PDF) and Properties	1	30.07.2026			
11.	Probability Density Function (PDF) and Properties	1	31.07.2026			
12.	Pre-Defined Distributions	1	01.08.2026			
13.	**Tutorial (Cooperative Group Learning)**	1	05.08.2026			
No. of classes required to complete UNIT-I: 10+3			**No. of classes taken:**			

UNIT-II: Operations on Single & Multiple Random Variables-Expectations

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin	1	06.08.2026			
15.	Central Moments, Variance and Skew	1	07.08.2026			
16.	**Tutorial (Problem Based Learning)**	1	12.08.2026			
17.	Chebychev's Inequality, Characteristic Function	1	13.08.2026			
18.	Moment Generating Function, Vector random variables	1	14.08.2026			
19.	**Tutorial (Think-Pair-Share Learning)**	1	19.08.2026			

20.	Joint Distribution Function and Properties	1	20.08.2026			
21.	Joint Distribution Function Properties, Marginal Distribution Function	1	21.08.2026			
22.	Joint Density Function and Properties	1	22.08.2026			
23.	Joint Density Function and Properties, Marginal Density Function	1	27.08.2026			
24.	Statistical Independence, Sum of Two Random Variables, Distribution and Density of Sum of Random Variables	1	28.08.2026			
25.	Central Limit Theorem ,Unequal Distribution, Equal Distributions	1	29.08.2026			
26.	**Tutorial (Context mapping)**	1	02.09.2026			
27.	Joint Central Moments	1	03.09.2026			
28.	Joint Characteristic Function	1	05.09.2026			
No. of classes required to complete UNIT-II: 12+3			**No. of classes taken:**			

UNIT-III: Random 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
29.	The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes	1	10.09.2026			
30.	Distribution and Density Functions, concept of Stationarity and Statistical Independence	1	11.09.2026			
31.	**Tutorial (Context mapping)**	1	16.09.2026			
32.	First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity	1	17.09.2026			
33.	Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes	1	18.09.2026			
34.	Autocorrelation Function and Its Properties	1	19.09.2026			
35.	**Tutorial (Problem Based Learning)**	1	23.09.2026			
36.	Cross-Correlation Function and Its Properties	1	24.09.2026			
37.	Covariance Functions	1	25.09.2026			

38.	Convolution, Mean and Mean-squared Value of System Response	1	26.09.2026			
39.	**Tutorial (Think-Pair-Share Learning)**	1	30.09.2026			
40.	Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output	1	01.10.2026			
No. of classes required to complete UNIT-III -9+3			**No. of classes taken:**			

UNIT-IV: Random Processes – Spectral Characteristics

S. No.	Topic/s	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign
41.	The Power Spectrum: Properties	1	01.10.2026			
42.	Relationship between Power Spectrum and Autocorrelation	1	03.10.2026			
43.	**Tutorial (Cooperative Group Learning)**	1	07.10.2026			
44.	The Cross-Power Density Spectrum, Properties	1	08.10.2026			
45.	Relationship between Cross-Power Spectrum and Cross-Correlation	1	09.10.2026			
46.	**Tutorial (Problem Based Learning)**	1	14.10.2026			
47.	Spectral Characteristics of System Response: Power Density Spectrum	1	15.10.2026			
48.	Cross-Power Density Spectrums of Input and Output	1	16.10.2026			
No. of classes required to complete UNIT-IV: 6+2			**No. of classes taken:**			

UNIT-V: Noise Sources & Information Theory

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	Resistive/Thermal Noise Source, Arbitrary Noise Sources	1	17.10.2026			
50.	**Tutorial (Context mapping)**	1	28.10.2026			
51.	Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures	1	29.10.2026			
52.	Average Noise Figure of cascaded networks, Narrow Band noise	1	30.10.2026			
53.	Quadrature representation of narrow band noise & its properties, Entropy	1	31.10.2026			
54.	**Tutorial(Problem Based Learning)**	1	04.11.2026			
55.	Information rate, Source coding: Huffman coding	1	05.11.2026			
56.	Source coding: Shannon Fano coding, Mutual information	1	06.11.2026			
57.	Channel capacity of discrete channel, Shannon-Hartley law;	1	07.11.2026			

	Trade -off between bandwidth and SNR					
No. of classes required to complete UNIT-V: 7+2			**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
58.	Stochastic Signal Processing (SSP)	**1**	11.11.2026			

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)	**A1=5**
I-Descriptive Examination (Units-I, II)	**M1=15**
I-Quiz Examination (Units-I, II)	**Q1=10**
Assignment-II (Unit-III ,IV & V)	**A2=5**
II- Descriptive Examination (UNIT-III , IV & V)	**M2=15**
II-Quiz Examination (UNIT-III,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:

Program 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.

Program 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
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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.
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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.

Program 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.

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	45	
	Tutorial **Problem Based Learning-5** **Think-Pair-Share Learning-2** **Cooperative Group Learning-2** **Context mapping-4**	**T**	13	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns)-24 Hours Virtual Lab (10 Hrs)	**SL**	34	
		Total	**92**	

Date	Dr. G L N Murthy	Dr. K.Ravi Kumar	Dr. G L N Murthy	Dr.G.Srinivasulu
13.07.2026	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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Department of Electronics and Communication Engineering

COURSE HANDOUT

DATE: 09-07-2026

PART-A

Program : B.Tech. III-Sem., ECE., Section–B
Academic Year : 2026-27
Course Name & Code : **UHV-2:** Understanding Harmony and Ethical Human Conduct (23HS01)
L-T-P-Cr : 2-1-0-3
Course Instructure : **Mrs. B. Rajeswari**

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (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							
CO2			2					3							
CO3						2		3	2						
CO4						1		2							
CO5							2	3				1			

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999
R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004
R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Value Education

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, Cos and Syllabus overview	1	13.07.2026		TLM2	
2.	Process for self exploration: Natural Acceptance	1	14.07.2026		TLM.2	
3.	Right Understanding, Relationship and Physical Facility	1	16.07.2026		TLM2	
4.	Understanding Value Education	1	18.07.2026		TLM2	
5.	**Tutorial-PS1**: Sharing about Oneself	1	20.07.2026			
6.	Self-exploration as the Process for Value Education	1	21.07.2026		TLM3	
7.	Continuous Happiness and Prosperity- Basic Human Aspirations	1	23.07.2026		TLM2	
8.	Happiness and Prosperity- Current Scenario	1	25.07.2026		TLM2	
9.	**Tutorial-PS2**: Exploring Human Consciousness: **CHART PREPARATION**	1	27.07.2026		TLM3	
10.	Method to Fulfill the Basic Human Aspirations	1	28.07.2026		TLM2	
11.	Method to Fulfill the Basic Human Aspirations	1	30.07.2026		TLM2	
12.	**Tutorial-PS3:** Exploring Natural Acceptance: **DEBATE**	1	01.08.2026		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Harmony in the Human Being

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.	Understanding Human being as the Co-existence of the self and the body	1	03.08.2026		TLM2	
14.	Distinguishing between the Needs of the self and the body	1	04.08.2026		TLM2	
15.	**Tutorial-PS4:** Exploring the difference between the needs of the self and the body **CHART PREPARATION**	1	06.08.2026		TLM3	
16.	The body as an Instrument of the self	1	08.08.2026		TLM2	

17.	Understanding Harmony in the self	1	10.08.2026		TLM2	
18.	**Tutorial-PS5**: Sources of Imagination in the self	1	11.08.2026		TLM3	
19.	Harmony of the self with the body	1	13.08.2026		TLM2	
20.	Programme to ensure self-regulation and Health	1	17.08.2026		TLM2	
21.	Programme to ensure self-regulation and Health	1	18.08.2026		TLM2	
22.	**Tutorial -PS6** : Harmony of the self with the body **ASSOCIATIVE LEARNING**	1	20.08.2026		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT III: Harmony in the Family and Society

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.	Harmony in the Family-Basic unit of Human Interaction	1	22.08.2026		TLM2	
24.	'Trust' – the Foundational Value in Relationship	1	24.08.2026		TLM2	
25.	'Trust' – the Foundational Value in Relationship	1	25.08.2026		TLM2	
26.	**Tutorial-PS7:** Exploring the Feeling of Trust **PLAYING A VIDEO**	1	27.08.2026		TLM3	
27.	'Respect' – as the Right Evaluation	1	29.08.2026		TLM1	
28.	'Respect' – as the Right Evaluation	1	31.08.2026		TLM1	
29.	**Tutorial -PS8:** Exploring the Feeling of Respect	1	01.09.2026		TLM2	
30.	Other Feelings, Justice in Human-to-Human Relationship	1	03.09.2026		TLM2	
31.	Other Feelings, Justice in Human-to-Human Relationship	1	05.09.2026		TLM2	
32.	Understanding Harmony in the Society	1	10.09.2026		TLM2	
33.	Vision for the Universal Human Order	1	12.09.2026		TLM2	
34.	**Tutorial- PS9**: Exploring systems to fulfil Human Goal **CHART PREPARATION**	1	15.09.2026		TLM3	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Harmony in the Nature/Existence

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.	Understanding Harmony in the Nature	1	17.09.2026		TLM2	

36.	Understanding Harmony in the Nature	1	19.09.2026		TLM2	
37.	Interconnectedness, self-regulation	1	21.09.2026		TLM2	
38.	Mutual Fulfilment among the Four Orders of Nature	1	22.09.2026		TLM2	
39.	Mutual Fulfilment among the Four Orders of Nature	1	24.09.2026		TLM2	
40.	**Tutorial -PS10** :Exploring Four Orders of Nature: **ROLE PLAY**	1	26.09.2026		TLM3	
41.	Realizing Existence as Co-existence at All Levels	1	28.09.2026		TLM2	
42.	Realizing Existence as Co-existence at All Levels	1	29.09.2026		TLM2	
43.	The Holistic Perception of Harmony in Existence	1	01.10.2026		TLM2	
44.	The Holistic Perception of Harmony in Existence	1	03.10.2026		TLM2	
45.	**Tutorial-PS11** :Exploring Co-existence in Existence: **PLAYING A VIDEO**	1	05.10.2026		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Implications of the Holistic Understanding

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.	Natural acceptance of human values	1	06.10.2026		TLM2	
47.	Definitiveness of ethical human conduct	1	08.10.2026		TLM2	
48.	**Tutorial-PS12**: Exploring Ethical human conduct: **ROLE PLAY**	1	10.10.2026		TLM3	
49.	Basis for humanistic education	1	12.10.2026		TLM2	
50.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human order	1	13.10.2026		TLM2	
51.	Competence in professional ethics	1	15.10.2026		TLM2	
52.	Competence in professional ethics	1	17.10.2026		TLM2	
53.	**Tutorial-PS13:** Exploring Humanistic models in education-**Video Play**	1	26.10.2026		TLM3	
54.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	27.10.2026		TLM2	
55.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	29.10.2026		TLM2	

56.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	31.10.2026		TLM2	
57.	Strategy for transition towards value based life and profession	1	02.11.2026		TLM2	
58.	Strategy for transition towards value based life and profession	1	03.11.2026		TLM2	
59.	**Tutorial PS14** :Steps of transition towards Universal Human Order : **CHART PREPARATION**	1	05.11.2026		TLM3	
60.	Conclusion and Reflections on UHV-2	1	07.11.2026		TLM3	
61.	Conclusion and Reflections UHV-2	1	09.11.2026		TLM3	
No. of classes required to complete UNIT-V: 15				No. of classes taken:		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transitions in the universal human order in the current society	1	10-11-2026			

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

PART-C: Evaluation Process (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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

ACADEMIC CALENDAR: A.Y 2026-27

Description	From	To	Weeks
I Phase of Instructions	13-07-2026	05-09-2026	8W
I Mid Examinations	07-09-2026	09-09-2026	**3 Days**
II Phase of Instructions	10-09-2026	17-10-2026	5 ½ W
Dussehra Holidays	19-10-2026	24-10-2026	1 W
II Phase of Instructions Cont.	26-10-2026	11-11-2026	2 ½ W
II Mid Examinations	12-11-2026	15-11-2026	**3 Days**
Preparation and Practical	16-11-2026	21-11-2026	1 W
Semester End Examinations	23-11-2026	05-11-2026	**2 W**

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Case study-5** **Think-pair-Share Learning-5** **Cooperative Group Learning-5**	**T**	15	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (5 Hrs)	**SL**	35	
		Total	**96**	

Course Instructors	Course Coordinator	Module Coordinator	Head of the Department
Mrs. B. Rajeswari	Mrs. B. Rajeswari	Dr. B. Srinivasa Rao	Dr. G. Srinivasulu

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–B
Academic Year : 2026-27
Course Name & Code : Signals and Systems – 23EC02
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Ramesh Reddy

Course Objectives:

1	To study about signals and systems
2	To analyze the spectral characteristics of signals
3	To understand the characteristics of systems
4	To introduce the concept of sampling process
5	To know various transform techniques to analyze the signals and systems

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

CO 1	Summarize the basic concepts of signals, systems and sampling	L2
CO 2	Examine the operations on signals and approximate using orthogonal functions	L3
CO 3	Apply the concept of impulse response to analyze the LTI systems	L3
CO 4	Analyze both continuous time and discrete time signals and systems using Fourier series, Fourier transform, Laplace transforms and Z-Transforms	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
CO 1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO 3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO 4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

Textbooks (T) and References (R):

T1: B P Lathi, Signals, Systems and Communications, BSP, 3rd Edition, 2003.
T2: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI, 2nd Edition, 1997.
T3: Simon Haykin and Van Veen, Signals and Systems, Wiley, 2nd Edition 2007.
R1: B P Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2015.
R2: TK Rawat, Oxford University Press, 2011.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to course	1	13-07-2026			
2.	**Tutorial (Problem Based Learning)**	**1**	14-07-2026			
3.	Introduction to Unit-I	1	15-07-2026			
4.	Definition and Classification of signals	1	17-07-2026			
5.	Definition and Classification of systems	1	20-07-2026			
6.	**Tutorial (Think-Pair-Share Learning)**	**1**	21-07-2026			
7.	Singularity and Related signals	1	22-07-2026			
8.	Complex exponential and sinusoidal signals	1	24-07-2026			
9.	Operations on signals	1	27-07-2026			
10.	**Tutorial (Cooperative Group Learning)**	**1**	28-07-2026			
11.	Properties of signals	1	29-07-2026			
12.	Analogy between vectors and signals	1	31-07-2026			
13.	Approximation of a signal by another signal	1	03-08-2026			
14.	**Tutorial (Flipped Classroom Learning)**	**1**	04-08-2026			
15.	Orthogonal signal space, Approximation of a signal by a set of mutually another signals	1	05-08-2026			
16.	Orthogonality in complex signals	1	07-08-2026			
No. of classes required to complete UNIT-I : 12+4			**No. of classes taken :**			

UNIT-II: Fourier Series & Fourier Transforms

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.	Fourier series representation of continuous time periodic signals, Dirichlet's conditions	1	10-08-2026			
2.	**Tutorial (Problem Based Learning)**	**1**	11-08-2026			
3.	Trigonometric Fourier series	1	12-08-2026			
4.	Exponential Fourier series	1	14-08-2026			
5.	Relation between Trigonometric and Exponential Fourier series	1	17-08-2026			
6.	**Tutorial (Think-Pair-Share Learning)**	**1**	18-08-2026			
7.	Properties of Fourier series	1	19-08-2026			
8.	Complex Fourier spectrum, Deriving Fourier transform from Fourier series	1	21-08-2026			
9.	Fourier transform of arbitrary signals	1	24-08-2026			
10.	**Tutorial (Cooperative Group Learning)**	**1**	25-08-2026			
11.	Fourier transform of standard signals	1	28-08-2026			
12.	Fourier transform of periodic signals, Introduction to Hilbert Transform	1	31-08-2026			
13.	**Tutorial (Flipped Classroom Learning)**	**1**	01-09-2026			
14.	Properties of Fourier transforms	1	02-09-2026			
No. of classes required to complete UNIT-II : 10+4			**No. of classes taken :**			

UNIT-III: Analysis of Linear Systems

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, Linear and Non-linear systems	1	11-09-2026			
2.	**Tutorial (Problem Based Learning)**	**1**	15-09-2026			
3.	Time invariant and Variant systems	1	16-09-2026			
4.	Concept of convolution in time and frequency domain. Graphical representation of convolution	1	18-09-2026			
5.	Response of a LTI system	1	21-09-2026			
6.	**Tutorial (Think-Pair-Share Learning)**	**1**	22-09-2026			
7.	System bandwidth, Signal bandwidth and Rise time, Distortion less transmission through a system	1	23-09-2026			
8.	Filter characteristics of linear systems, Ideal and practical characteristics of LPF, HPF, BPF, BSF	1	25-09-2026			
9.	Causality and Poly-Wiener criterion for physical realization	1	28-09-2026			
10.	**Tutorial (Cooperative Group Learning)**	**1**	29-09-2026			
No. of classes required to complete UNIT-III : 7+3			**No. of classes taken :**			

UNIT-IV : Correlation and Sampling Theorem

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.	Auto-correlation function and properties	1	30-09-2026			
2.	Energy spectral density, Power spectral density, Parseval's theorem	1	05-10-2026			
3.	**Tutorial (Problem Based Learning)**	**1**	06-10-2026			
4.	Cross-correlation function and properties, Relation between Convolution and correlation	1	07-10-2026			
5.	Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering	1	09-10-2026			
6.	Sampling Theorem, Graphical analysis of Sampling Theorem- Impulse sampling, Analytical analysis of Sampling Theorem	1	12-10-2026			
7.	**Tutorial (Think-Pair-Share Learning)**	**1**	13-10-2026			
8.	Sampling Theorem for band limited signal- Band Pass sampling, Reconstruction of signal from its samples, Statement of Sampling theorem	1	14-10-2026			
9.	Effect of under sampling-Aliasing effect, Natural and Flat top Sampling	1	16-10-2026			
No. of classes required to complete UNIT-IV : 7+2			**No. of classes taken :**			

UNIT-V : Laplace Transforms and Z-Transforms

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, Concept of Laplace transform, Relation between Laplace and Fourier transform, Existence of Laplace transform	1	26-10-2026			
2.	**Tutorial (Problem Based Learning)**	**1**	27-10-2026			
3.	Laplace transform of various classes of signals Region of convergence in s- Transform and Properties	1	28-10-2026			
4.	Properties of Laplace transform	1	30-10-2026			
5.	Inverse Laplace transform	1	02-11-2026			
6.	**Tutorial (Think-Pair-Share Learning)**	**1**	03-11-2026			
7.	Introduction to Z-Transform, Z-transform of various classes of signals Region of convergence in z- Transform and Properties	1	04-11-2026			
8.	Properties of Z-transforms	1	06-11-2026			
9.	Inverse Z- transform	1	09-11-2026			
10.	**Tutorial (Cooperative Group Learning)**	**1**	10-11-2026			
No. of classes required to complete UNIT-V : 7+3			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transform Techniques	1	11-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	44	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-5, Cooperative Group Learning-4, Flipped Classroom Learning-2**	**T**	16	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (2 Hrs)	**SL**	32	
		Total	**92**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. B. Ramesh Reddy	Dr. B. Rambabu	Dr. G.L.N Murthy	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

PART-A:

COURSE HANDOUT

Program : B.Tech. III-Sem., ECE., Section– B
Academic Year : 2026-27
Course Name & Code : Electronic Devices and Circuits – 23EC03
L-T-P-Cr : 3-0-0-3
Course Instructure : Mr.P. Venkateswara Rao

Course Objectives:

1	To learn and understand the basic concepts of semiconductor physics.
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3	To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5	To learn and understand the purpose of transistor biasing and its significance
6	Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

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

CO 1	Recall the fundamentals of semiconductor physics necessary for electronic devices and circuits (Remember)	L1
CO 2	Illustrate the structure and operation of Diodes, Bipolar Junction Transistors, Field Effect Transistors and biasing of BJT & FET using fundamental circuits. (Understand)	L2
CO 3	Apply the knowledge of Diodes, Transistors and Filters for designing the Rectifiers, Regulators and Amplifier circuits using basic components. (Apply)	L3
CO 4	Analyze the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using V-I Characteristics. (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
CO 1	2	3	1	-	-	3	1	-	-	-	1	2	1	1	-
CO 2	2	1	2	1	-	3	1	-	-	-	-	1	1	1	-
CO 3	3	1	1	-	-	-	1	-	-	-	-	-	2	2	-
CO 4	1	3	-	-	-	-	-	-	-	-	1	1	2	2	-

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

Textbooks (T) and References (R):

T1: Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015..

T2: Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.

T3: Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

R1: Basic Electronics-Principles and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly Cambridge University Press, 1st edition, 2018.

R2: Electronics devices & circuit theory- Robert L.Boylestad and Louis Nashelsky, Pearson, 11th edition, 2015.

R3: Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.

Online Learning Resources:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Semiconductor Physics, Junction Diode Characteristics & Special Semiconductor Devices

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Methods	HOD
1	TUTORIAL: QUIZ on Basics	1	13-07-2026			
2	Introduction to COs and Outcomes. Unit-I Introduction	1	14-07-2026			
3	Mobility and conductivity, Intrinsic and Extrinsic	1	17-07-2026			
4	Continuity Equation, Law of Junction.	1	18-07-2026			
5	TUTORIAL: Problem Based Learning	1	20-07-2026			
6	Open circuited p-n junction, Biased p-n junction, p-n junction	1	21-07-2026			
7	Diode equation, V-I Characteristics, Temperature	1	24-07-2026			
8	Diode resistance, Diode capacitance.	1	25-07-2026			
9	TUTORIAL: Think, Pair & Share Learning	1	27-07-2026			
10	Special Semiconductor Devices: Zener Diode, Breakdown	1	28-07-2026			
11	Varactor Diode, LED	1	31-07-2026			
12	Photodiode, Tunnel Diode	1	01-08-2026			
13	TUTORIAL: Think Pair & Share learning	1	03-08-2026			
14	UJT Operation and V-I characteristics	1	04-08-2026			
15	PNPN Diode, SCR Operation and V-I characteristics	1	07-08-2026			
16	TUTORIAL: Cooperative Group Learning	1	10-08-2026			
No. of classes required to complete UNIT-I : 11+5=16			No. of classes taken :			

UNIT-II: Diode Circuits

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	Diode Circuits: The Diode as a circuit element. The Load-Line concept.	1	11-08-2026			
2	Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two	1	14-08-2026			
4	TUTORIAL: Think Pair and Share	1	17-08-2026			
5	Peak Detector, Clamping circuits	1	18-08-2026			
6	Basic Rectifier Setup, Half Wave Rectifier	1	21-08-2026			
7	Full Wave Rectifier, Bridge Rectifier	1	22-08-2026			
8	TUTORIAL: Flipped Class Learning	1	24-08-2026			
9	Derivations of Characteristics of Rectifiers	1	25-08-2026			
10	Filters, Inductor Filter	1	28-08-2026			
11	Capacitor Filter, π-Section Filter	1	29-08-2026			
11	TUTORIAL: Problem Based learning	1	31-08-2026			
12	Comparison of various Filter Circuits in terms of Ripple Factors.	1	01-09-2026			
13	REVISION	1	05-09-2026			
No. of classes required to complete UNIT-II :10+3=13			No. of classes taken :			

UNIT-III: Transistor Characteristics, Biasing and Thermal Stabilization

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	**Transistor Characteristics**: Junction transistor, Transistor current components, CB configuration, Transistor as an amplifier	1	11-09-2026			
2	Characteristics of transistor in CB, CE,CC configurations	1	15-09-2026			
3	Ebers - Moll model of a transistor, Punch through/ Reach through. Photo transistor, typical transistor junction voltage values.	1	18-09-2026			
4	Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis	1	19-09-2026			

5	TUTORIAL: Flipped Class Learning	1	21-09-2026			
6	BJT biasing- methods, basic stability, fixed bias, collector to base bias	1	22-09-2026			
7	Self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S,S',S''),	1	25-09-2026			
8	Bias Compensation, Thermal Runaway, Thermal Stability	1	26-09-2026			
9	TUTORIAL: Flipped Class Learning	1	28-09-2026			
No. of classes required to complete UNIT-III : 07+02=09			No. of classes taken :			

UNIT-IV : Small Signal Low Frequency Transistor Amplifier Models

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	BJT: Two port network, Transistor hybrid model, Determination of h-	1	29-09-2026			
2	Generalized analysis of transistor amplifier model using h-parameters	1	03-10-2026			
3	TUTORIAL: Flipped Class Learning	1	05-10-2026			
4	Analysis of CB amplifiers using exact and approximate analysis.	1	06-10-2026			
5	Analysis of CE & CC amplifiers using exact and approximate analysis	1	09-10-2026			
6	TUTORIAL: Problem Based learning	1	12-10-2026			
7	Comparison of transistor amplifiers	1	13-10-2026			
8	Generalized analysis of transistor amplifier model using h-parameters	1	16-10-2026			
9	Problem Solving Session	1	17-10-2026			
No. of classes required to complete UNIT-IV : 07+02 = 09				No. of classes taken :		

UNIT- V: FET, MOSFET and CMOS Amplifiers

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	TUTORIAL: Cooperative Group Learning	1	26-10-2026			
2	FET types, JFET operation, Characteristics, Small signal model of JFET	1	27-10-2026			
3	MOSFET Structure, Operation of	1	30-10-2026			

	MOSFET in triode region					
4	Operation in saturation region, MOSFET as a variable resistor, Channel length modulation, MOS trans conductance	1	31-10-2026			
5	TUTORIAL: Flipped Class Learning	1	02-11-2026			
6	MOS device models: MOS small signal model, PMOS Transistor	1	03-11-2026			
7	CMOS Technology, Comparison of Bipolar and MOS devices, CMOS amplifiers: General Considerations	1	06-11-2026			
8	Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.	1	07-11-2026			
9	TUTORIAL: Flipped Class Learning	1	09-11-2026			
No. of classes required to complete UNIT-V : 06+03=09				No. of classes taken :		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. ofClasses Required	TentativeDate of Completion	ActualDate of Completion	TeachingLearning Methods	HOD Sign Weekly
1.	Realization of Universal gates with CMOS transistor	1	10-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	42	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	15	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Virtual Labs Simulation of Circuits Assignment Data Sheets	**SL**	10 12 10 02	
		Total	91	

PART-E: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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.P.Venkateswara Rao	Mr.K V Ashok	Dr. B.V.N.R. Siva kumar	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
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Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART: A

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – B
Course Name & Code : Switching Theory and Logic Design – 23EC04
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr Y AMAR BABU

Course Objectives:

1	To solve a typical number base conversion and analyze new error coding techniques.
2	Theorems and functions of Boolean algebra and behavior of logic gates
3	To optimize logic gates for digital circuits using various techniques
4	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
5	To understand concepts of combinational circuits.
6	To develop advanced sequential circuits.

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

CO 1	Summarize the key differences between number systems and their usage in Digital Circuits.	L2
CO 2	Apply the minimization techniques of Boolean expressions to implement Digital Circuits using basic logic gates and logic circuits	L3
CO 3	Apply the minimization and realization methods for designing the Combinational & Sequential logic circuits	L3
CO 4	Analyze the Combinational, Sequential, Finite State Machines for implementation of digital logic circuits	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
CO 1	2	3	1	-	-	-	-	-	-	-	-	1	-	3	-
CO 2	2	3	3	-	-	-	-	-	-	-	-	1	-	3	-
CO 3	2	3	3	1	-	-	-	-	-	-	-	1	-	3	-
CO 4	2	3	3	2	-	-	-	-	-	-	-	3	-	3	-

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

Textbooks (T) and References (R):

T1: Switching and finite automata theory Zvi.KOHAVI, Niraj. K. Jha 3rd Edition, Cambridge University Press, 2009.

T2: Digital Design by M. Morris Mano, Michael D Ciletti, 4th edition PHI publication, 2008.

T3: Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

R1: Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006

R2: Digital electronics by R S Sedha. S. Chand &company limited,2010

R3 : Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: REVIEW OF NUMBER SYSTEMS & CODES, BOOLEAN THEOREMS AND LOGIC 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.	Introduction, Representation of numbers of different radix.	1	14.07.2026		TLM1	
2.	**Tutorial: Problem Based Learning**	1	15.07.2026		TLM3	
3.	conversation from one radix to another radix	1	16.07.2026		TLM2	
4.	r- 1's compliments and r's compliments of signed numbers , 2421 & 84-2-1 code	1	18.07.2026		TLM2	
5.	Error detection codes: parity checking, even parity, odd parity	1	21.07.2026		TLM2	
6.	**Tutorial: Think-Pair-Share Learning**	1	22.07.2026		TLM3	
7.	Boolean theorems, Error correction codes: Hamming code.	1	23.07.2026		TLM1	
8.	Principle of complementation & duality, De-Morgan theorems.	1	25.07.2026		TLM2	
9.	Logic operations; Universal Logic operations, EX-OR, EX- NOR operations.	1	28.07.2026		TLM2	
10.	**Tutorial: Cooperative Group Learning**	1	29.07.2026		TLM3	
11.	NAND-NAND and NOR-NOR realizations Standard SOP and POS Forms	1	30.07.2026		TLM1	
12.	Realization of three level logic circuits.	1	01.08.2026		TLM1	
No. of classes required to complete UNIT-I: 12			**No. of classes taken:**			

UNIT-II: MINIMIZATION TECHNIQUES, COMBINATIONAL LOGIC CIRCUITS DESIGN.

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.	Minimization and realization of switching functions using Boolean theorems	1	04.08.2026		TLM1	
2.	**Tutorial: Flipped Classroom Learning**	1	05.08.2026		TLM3	
3.	Minimization and realization of switching functions using Boolean theorems, K-Map(2,3 variables)	1	06.08.2026		TLM1	
4.	K-Map(4,5,6 variables)	1	11.08.2026		TLM1	
5.	**Tutorial: Problem Based Learning**	1	12.08.2026		TLM3	

6.	Tabular method (Quine-McCluskey method) with only four variables and single function.	1	13.08.2026		TLM2	
7.	Design of Full Adder, half subtractor	1	18.08.2026		TLM2	
8.	**Tutorial: Think- Pair-Share Learning**	1	19.08.2026		TLM3	
9.	full subtractor, applications of full adders	1	20.08.2026		TLM2	
10.	4- bit adder-sub tractor circuit , BCD adder circuit , Excess 3 adder circuit	1	22.08.2026		TLM2	
11.	Carry look-a- head adder circuit	1	25.08.2026		TLM2	
12.	Design code converts using Karnaugh method and draw the complete circuit diagrams	1	27.08.2026		TLM1	
No. of classes required to complete UNIT-II: 12			**No. of classes taken:**			

UNIT-III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI, INTRODUCTION OF PLD's

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.	Design of encoder, decoder	1	29.08.2026		TLM1	
2.	multiplexer and de-multiplexers	1	01.09.2026		TLM1	
3.	**Tutorial: Cooperative Group Learning**	1	02.09.2026		TLM3	
4.	Implementation of higher order circuits using lower order circuits	1	03.09.2026		TLM2	
5.	Realization of Boolean functions using decoders	1	05.09.2026		TLM2	
6.	Realization of Boolean functions using multiplexers	1	10.09.2026		TLM2	
7.	Design of Priority encoder, 4-bit digital comparator	1	15.09.2026		TLM2	
8.	**Tutorial: Flipped Classroom Learning**	1	16.09.2026		TLM3	
9.	seven segment decoder	1	17.09.2026		TLM1	
10.	PROM-Basics structures, realization of Boolean functions, Programming table.	1	19.09.2026		TLM2	
11.	PLA, PAL-Basics structures, realization of Boolean functions, Programming table.	1	22.09.2026		TLM2	
12.	**Tutorial: Problem Based Learning**	1	23.09.2026		TLM3	
No. of classes required to complete UNIT-III: 12			**No. of classes taken:**			

UNIT-IV: SEQUENTIAL CIRCUITS-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.	Classification of sequential circuits (synchronous and asynchronous),operation of NAND & NOR Latches	1	24.09.2026		TLM2	
2.	Flip-Flops: Truth tables and excitation tables of RS flip-flop, JK flip- flop, with reset and clear terminals	1	26.09.2026		TLM2	

3.	Flip-Flops: Truth tables and excitation tables of T-flip-flop,	1	29.09.2026		TLM2	
4.	**Tutorial: Think-Pair-share Learning**	1	30.09.2026		TLM3	
5.	D flip- flop, with reset and clear terminals	1	01.10.2026		TLM2	
6.	Conversion from one flip-flop to another flip- flop.	1	03.10.2026		TLM2	
7.	Design of ripple counters, design of synchronous counters, Johnson counter, ring counter.	1	06.10.2026		TLM2	
8.	**Tutorial: Cooperative Group Learning**	1	07.10.2026		TLM3	
9.	Design of registers - Buffer register, control buffer register, Shift register.	1	08.10.2026		TLM2	
10.	Bi- directional shift register, universal shift, register.	1	13.10.2026		TLM2	
11.	**Tutorial: Flipped Classroom Learning**	1	14.10.2026		TLM3	
12.	Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.	1	15.10.2026		TLM2	
No. of classes required to complete UNIT-III: 12			**No. of classes taken:**			

UNIT-V: SEQUENTIAL CIRCUITS-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
1.	Finite state machine: state diagrams, state tables	1	17.10.2026		TLM1	
2.	Reduction of state tables	1	27.10.2026		TLM1	
3.	**Tutorial: Problem Based Learning**	1	28.10.2026		TLM3	
4.	Reduction of state tables	1	29.10.2026		TLM1	
5.	Analysis of clocked sequential circuits Mealy to Moore conversion	1	31.10.2026		TLM2	
6.	Analysis of clocked sequential circuits Mealy to Moore conversion	1	03.11.2026		TLM2	
7.	**Tutorial: Think-Pair-Share Learning**	1	04.11.2026		TLM2	
8.	Analysis of clocked sequential circuits Moore to Mealy to conversion	1	05.11.2026		TLM2	
9.	Realization of sequence generator	1	07.11.2026		TLM2	
10.	Design of Clocked Sequential Circuit to detect the given sequence (with and without overlapping)	1	10.11.2026		TLM2	
No. of classes required to complete UNIT-V: 10			**No. of classes taken :**			

Content beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of 8 bit ALU	1	11.11.2026		TLM2	
2.	Introduction to HDL, Verilog HDL	1	11.11.2026		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 (R23)

Evaluation Task	**Marks**
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			**No. of Hrs Required**	**No. of Hrs Conducted**
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	14	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Assignments (15 Qns x 2 Hrs)	**SL**	30	
		Total	90	

PART-E: PEOs, POs and PSOs

Program Educational Objectives (PEOs):

PEO 1:	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
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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.

Program 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. Y. Amar Babu	Ms. M V L Bhavani	Dr.P.Lachi Reddy	Dr. G. Srinivasulu

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(Positioned in the Band of 251-300 in the Engineering Category) NIRF-2023
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L.B. Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Venkateswara Rao, Dr.BVNR Siva Kumar
Mr K V Ashok , Mrs.Y.Padma,
Course Name & Code : Electronic Devices and Circuits Lab -23EC52
L-T-P Structure : 0-0-3 **Credits**: 1.5
Program/Sem/Sec : B.Tech., ECE. /III/ B **A.Y.** : 2026-27

Course Objectives: This course introduces the characteristics and applications of semiconductor devices. Emphasis is placed on characteristics and testing practically to strengthen the knowledge.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	Demonstrate the characteristics of BJT, FET, SCR, UJT and applications of diode. **(Apply-L3)**
CO2	Model the Rectifiers, filters and Amplifiers used in electronic circuits**. (Apply-L3)**
CO3	Analyze the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. **(Analyze – L4).**
CO4	Adapt effective Communication, presentation and report writing skills. **(Apply-L3)**

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

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

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

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 EDC Lab experiments, COs, POs and PSOs.	3	15-07-2026		TLM4	
2.	BJT Characterstics – CB,CE configurations	3	22-07-2026		TLM4	
3.	Estimation of ripple factor and regulation without and with LC	3	29-07-2026		TLM4	
4.	Design of Clipper circuit using diode	3	05-08-2026		TLM4	
5.	Design of Clamping circuit using diode	3	12-08-2026		TLM4	
6.	Determination of Break over voltage of SCR using V-I	3	19-08-2026		TLM4	
7.	UJT Characterstics	3	02-09-2026		TLM4	
8.	Revision	3	16-09-2026		TLM4	
9.	Determination of h-parameter of a BJT in CE configuration	3	23-09-2026		TLM4	
10.	Estimation of Stability factor for a transistor - self biasing circuit	3	30-09-2026		TLM 4	
11.	Frequency response of BJT-CE Amplifier	3	07-10-2026		TLM4	
12.	FET Characteristics – Drain & Transfer	3	14-10-2026		TLM4	
13.	Design of FET –CS Amplifier	3	28-10-2026		TLM4	
14.	Demonstration	3	04-11-2026		TLM4	
15.	Lab Internal Examination	3	11-11-2026			
No. of classes required: 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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

PART-D

Program 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.

Program 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.

Program 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. P Venkateswara Rao	**Mr. P Venkateswara Rao**	**Dr. B.V.N.R. Siva kumar**	**Dr. G. Srinivasulu**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.

Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–B
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design Lab – 23EC53
L-T-P-Cr : 0-0-3-1.5
Course Instructure : Dr. Y. Amar Babu, Mrs. B. Rajeswari, Mrs. M. V. L. Bhavani, Mr. J. Durga Prasad

Course Objectives:

This course gives the ability to design and verify digital logic circuits like; logic gates, combinational and sequential logic circuits using discrete components and Integrated Circuits.

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

CO 1	Demonstrate the functionality of Logic gates, Flip-flops, Shift registers and Counters	L3
CO 2	Apply the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates	L3
CO 3	Analyze the behavior of Combinational and Sequential logic circuits	L4
CO 4	Adapt effective Communication, presentation and report writing skills	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
CO 1	2	3	3	1	2	-	-	-	-	-	-	1	-	3	-
CO 2	2	1	1	1	1	-	-	-	-	-	-	1	-	3	-
CO 3	2	1	1	-	1	-	-	-	-	-	-	1	-	3	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-

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

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 STLD Lab, COs, Pos and PSOs.	3	13-07-2026		TLM4	
2.	Implementation of the following Logic gates using Universal Gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR	3	20-07-2026		TLM4	
3.	Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.	3	27-07-2026		TLM4	
4.	Verification of functional table of 3 to 8-line Decoder /De-multiplexer	3	03.08.2026		TLM4	
5.	4 variable logic function verification using 8 to1 multiplexer.	3	10.08.2026		TLM4	
6.	Design full adder circuit and verify its functional table.	3	17.08.2026		TLM4	
7.	Verification of functional tables of (i) JK Master Slave Flip–Flop (ii) D Flip-Flop	3	24.08.2026		TLM4	
8.	Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output	3	31.08.2026		TLM4	
9.	Verify the operation of 4-bit Universal Shift Register for different Modes of operation	3	21.09.2026		TLM4	
10.	Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test It with a low frequency clock and sketch the output waveforms	3	28.09.2026		TLM4	
11.	Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.	3	05.10.2026		TLM4	
12.	Draw the circuit diagram of a single bit comparator and test the output	3	12.10.2026		TLM4	
13.	Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.	3	26.10.2026		TLM4	
14.	Design of any combinational circuit,sequential circuit using Hardware Description Language (Additional Experiments)	3	02.11.2026		TLM4	
15.	Lab Internal Examination	3	09.11.2026			
No. of classes required: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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE):(A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

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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.Y. Amar Babu Mrs. B Rajeswari Mrs. M V L Bhavani Mr. J. Durga Prasad	Mr. Ch Siva Rama Krishna	Dr. P.Lachi Reddy	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.O.Venkata Siva
Course Name & Code : DATA STRUCTURES LAB & 20CSS3
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech/III/ECE-B **A.Y.:** 2026-27

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 various searching & sorting techniques. **(Apply-L3)**

CO2: Implement Linked List, Stack & Queue data structures. **(Apply-L3)**

CO3: Design and implement algorithms for operations on binary trees and binary search trees. **(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	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		
CO3	3	2											2		
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.	**UNIT1**: 1.Program to find min & max element in an array. 2.Program to implement matrix multiplication.	4	14-07-2026 16-07-2026		
2.	3.Find an element in given list of sorted elements in an array using Binary search.	4	21-07-2026 23-07-2026		
3.	4.Implement Selection and Quick sort techniques	4	28-07-2026 30-07-2026		
4.	**UNIT:2** Write a program to implement the following operations. a. Insert b. Deletion c. Traversal	4	04-08-2026 06-08-2026		
5.	Write a program to store name, roll no, and marks of students in a class using circular double linked list	4	11-08-2026 13-08-2026		
6.	Write a program to perform addition of given two polynomial expressions using linked list	4	18-08-2026 20-08-2026		
7.	**UNIT:3** Implement stack operations using a. Arrays b. Linked list	4	25-08-2026 27-08-2026		
8.	Convert given infix expression into post fix expression using stacks.	5	01-09-2026 03-09-2026 15-09-2026		

9.	Evaluate given post fix expression using stack.	7	17-09-2026 22-09-2026 24-09-2026		
10.	4.Write a program to reverse given linked list using stack	5	29-09-2026 01-10-2026 06-10-2026		
11.	UNIT 4: 1.ImplementQueue operations using a. Arrays b. Linked list.	4	08-10-2026 13-10-2026		
12.	2. Implement Circular Queue using a. Arrays b. Linked list. 3.Implement Dequeue using linked list.	7	15-10-2026 27-10-2026 29-10-2026		
13.	**UNIT5:** 1.Implement binary tree traversals using linked list. 2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.	4	03-11-2026 05-11-2026		
14.	Lab Internal Exam	3	10-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work& Record	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
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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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.O.V.SIVA**	**Mr.R.Ashok**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr.S.Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

Phone: 08659-222933, **Fax**: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM	**:** II B. Tech., III-Sem., ECE-B
ACADEMIC YEAR	**:** 2026-27
COURSE NAME & CODE	**: Environmental Science**
L-T-P STRUCTURE	**:** 2-0-0
COURSE CREDITS	**:** 0
COURSE INSTRUCTOR	**:** Dr. Shaheda Niloufer
COURSE COORDINATOR	**:** Dr. Shaheda Niloufer
PRE-REQUISITES	**:** Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To develop an understanding of Earth's environmental systems, ecological processes, biogeochemical cycles, and the interactions among living organisms and their environment.
2	To enable students to understand the impact of human activities on air, water, soil, climate, and natural resources, and to promote the principles of environmental conservation and sustainable resource management.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	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	3	-	-	-	3	3	3	-	-	-	3	-	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	-	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-
CO5	3	3	3	3	-	3	3	3	-	-	-	3	-	-	-

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

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

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.

T2. Palaniswamy, Environmental Studies,2/e, Pearson education,2014.

T3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company,2021.

T4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

R1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.

R2. Deeksha Daveand E. Sai Baba Reddy, Text book of Environmental Science,2/e, Cengage Publications, 2012.

R3. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication, 2014.

R4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications,2006.

R5. J. Glynn Henryand GaryW. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.

R6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

R7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science,1/e, Prentice Hall of India Private limited, 1991.

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	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	14-07-2026		TLM2			
2.	Multidisciplinary Nature of Environmental Studies	1	17-07-2026		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	21-07-2026		TLM1	CO1	T1, T2	
4.	Water resources	1	24-07-2026		TLM2	CO1	T1, T2	
5.	Mineral resources	1	28-07-2026		TLM1	CO1	T1, T2	
6.	Food resources	1	31-07-2026		TLM2	CO1	T1, T2	
7.	Energy resources	1	04-08-2026		TLM2			
No. of classes required to complete UNIT-I		07			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
8.	Ecosystems – Structure & Functions	1	07-08-2026		TLM4	CO2	T1, T2	
9.	Ecological succession &	1	11-08-2026		TLM1	CO2	T1, T2	
10.	Food chains, Food webs & Ecological Pyramids	1	14-08-2026		TLM4	CO2	T1, T2	
11.	Types of ecosystems	1	18-08-2026		TLM1	CO2	T1, T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	21-08-2026		TLM2	CO2	T1, T2	
13.	Values of Biodiversity, India as mega diversity nation, Threats to biodiversity and Conservation of biodiversity	1	25-08-2026		TLM2	CO2	T1, T2	
No. of classes required to complete UNIT-II		06			No. of classes taken:			

I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)

UNIT-III: Environmental Pollution

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Environmental pollution -Air pollution	1	11-09-2026		TLM1	CO3	T1, T2	
15.	Water pollution, Marine pollution, Thermal pollution	1	15-09-2026		TLM1	CO3	T1, T2	
16.	Soil pollution	1	18-09-2026		TLM1	CO3	T1, T2	
17.	Solid waste management	1	22-09-2026		TLM1	CO3	T1, T2	
18.	Disaster management	1	25-09-2026		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
19.	From Unsustainable to Sustainable development	1	29-09-2026		TLM1	CO4	T1, T2	
20.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	06-10-2026		TLM1	CO4	T1, T2	
21.	Environmental ethics, Climate change	1	09-10-2026		TLM6	CO4	T1, T2	

22.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	13-10-2026		TLM1	CO4	T1, T2	
23.	Environmental Acts	1	16-10-2026		TLM1	CO4	T1, T2	
24.	Environmental Acts	1	27-10-2026		TLM1	CO4	T1, T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	30-10-2026		TLM1	CO5	T1, T2	
26.	Environment and human health –Human Rights – Value Education	1	03-11-2026		TLM1	CO5	T1, T2	
27.	HIV/AIDS – Women and Child Welfare	1	06-11-2026		TLM1	CO5	T1, T2	
28.	Role of information Technology in Environment and human health	1	10-11-2026		TLM1	CO5	T1, T2	
29.	Revision	1	10-11-2026		TLM3	CO5	T1, T2	
No. of classes required to complete UNIT-V		06			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
30.	Awareness on ozone layer Case studies	2	19-09-2026 26-03-2026		TLM2	CO2	T1, T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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.

Dr. Shaheda Niloufer	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

Schedule of Association Activities

Program : B.Tech. III-Sem., ECE., Section–A
Academic Year : 2026-27
Course Name : Association of Electronics and Communication Engineering
Instructors : Ms. M V L Bhavani/ Mr. M. Sivasankara Rao

S.No	Date	Activity	Description
1.	17.07.26	Self-Introduction	Build stage confidence and self-introduction skills
2.	24.07.26	Just A Minute (JAM)	**Students pick a topic randomly and speak continuously for one minute.** ➢ Artificial Intelligence ➢ Friendship ➢ Success ➢ Time Management ➢ Mobile Addiction ➢ My Dream Company ➢ Technology ➢ Cricket ➢ Books ➢ Leadership
3.	31.07.26	Storytelling Competition	Moral stories, Inspirational stories, Creative stories, Personal Experience etc.,
4.	07.08.26	Storytelling Competition	Moral stories, Inspirational stories, Creative stories, Personal Experience etc.,
5.	14.08.26	Teach a Topic	**Each student teaches a simple concept for 5 minutes.** ➢ Bluetooth, Wi-Fi, GPS, Semiconductor, 5G, Solar Energy etc.,
6.	21.08.26	Teach a Topic	**Each student teaches a simple concept for 5 minutes.** Bluetooth, Wi-Fi, GPS, Semiconductor, 5G, Solar Energy etc.,
7.	28.08.26	TED Talk Style Presentation	**Students prepare a short inspirational talk.** ➢ My Biggest Failure, What Success

			Means, A Lesson from My Childhood, My Role Model etc.
8.	11.09.26	TED Talk Style Presentation	**Students prepare a short inspirational talk.** My Biggest Failure, What Success Means, A Lesson from My Childhood, My Role Model etc.
9.	18.09.26	Debate	Topics: • AI is Good or Bad • Online vs Offline Education • Mobile Phones in Classrooms • Social Media • Electric Vehicles
10.	25.09.26	Debate	Topics: • AI is Good or Bad • Online vs Offline Education • Mobile Phones in Classrooms • Social Media • Electric Vehicles
11.	09.10.26	Interview Simulation	One student act as the HR interviewer. Another student answers. Audience members ask follow-up questions.
12.	16.10.26	Interview Simulation	One student act as the HR interviewer. Another student answers. Audience members ask follow-up questions.
13.	30.10.26	My Opinion	Students speak for 2–3 minutes on current issues. • Should AI replace teachers? • Is coding necessary for all engineers? • Is social media useful? • India's future in space technology
14.	06.11.26	My Opinion	Students speak for 2–3 minutes on current issues. • Should AI replace teachers? • Is coding necessary for all engineers? • Is social media useful? • India's future in space technology

Instructors
Ms. M V L Bhavani
Mr. M. Siva Sankara Rao

HOD
Dr. G. Srinivasulu

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – C
Academic Year : 2026-27
Course Name & Code : Probability Theory and Stochastic Process – 23FE12
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr. K. Ravi Kumar, Professor of ECE

Course Objectives:

1	To get basic understanding of random variables and operations that can be performed on them.
2	To know the Spectral and temporal characteristics of Random Process.
3	To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

CO1	Summarize the concepts of Probability and random processes.	L2
CO2	Examine the Temporal and Spectral characteristics of Random Signals.	L3
CO3	Analyze Linear Time Invariant systems driven by stationary random process by using Auto correlation function and Power spectral Density.	L4
CO4	Interpret the concepts of Noise and Information theory in Communication systems.	L2

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	-	-

Correlation Levels: **1.** Slight (Low),**2**-Moderate(Medium), **3**-Substantial (High).

Textbooks (T):

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

T2 Taub and Schilling - Principles of Communication systems, TMH, 2008

Reference Books(R)

R1 B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003

R2 Y Mallikarjuna Reddy, "Probability theory and Stochastic Processes", Universities Press (India), Pvt Ltd.

R3 Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002

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

UNIT-I: Probability & 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 PTSP Course	1	13.07.2026			
2.	Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces	1	14.07.2026			
3.	**Tutorial(Context mapping)**	1	15.07.2026			
4.	Discrete and Continuous Sample Spaces	1	18.07.2026			
5.	Events, Probability Definitions and Axioms	1	20.07.2026			
6.	Joint Probability, Conditional Probability, Total Probability, Baye's Theorem, Independent Events	1	21.07.2026			
7.	**Tutorial (Problem Based Learning)**	1	22.07.2026			
8.	Concept of Random Variable, Conditions for a function to be a Random Variable, Classification of Random Variable	1	25.07.2026			
9.	Cumulative Distribution Function (CDF) and Properties		27.07.2026			
10.	Cumulative Distribution Function (CDF) Properties, Probability Density Function (PDF) and Properties	1	28.07.2026			
11.	**Tutorial (Cooperative Group Learning)**	1	29.07.2026			
12.	Probability Density Function (PDF) and Properties	1	01.08.2026			
13.	Pre-Defined Distributions	1	03.08.2026			
No. of classes required to complete UNIT-I: 10+3			**No. of classes taken:**			

UNIT-II: Operations on Single & Multiple Random Variables-Expectations

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin	1	04.08.2026			
15.	Central Moments, Variance and Skew	1	04.08.2026			
16.	**Tutorial (Problem Based Learning)**	1	05.08.2026			
17.	Chebychev's Inequality, Characteristic Function	1	10.08.2026			
18.	Moment Generating Function, Vector random variables	1	11.08.2026			
19.	**Tutorial (Think-Pair-Share)**	1	12.08.2026			
20.	Joint Distribution Function Properties, Marginal Distribution Function	1	17.08.2026			

21.	Joint Distribution Function and Properties	1	18.08.2026			
22.	**Tutorial (Context mapping)**	1	19.08.2026			
23.	Joint Density Function and Properties	1	22.08.2026			
24.	Joint Density Function and Properties, Marginal Density Function	1	24.08.2026			
25.	Statistical Independence, Sum of Two Random Variables, Distribution and Density of Sum of Random Variables	1	25.08.2026			
26.	Central Limit Theorem ,Unequal Distribution, Equal Distributions	1	29.08.2026			
27.	Joint Central Moments	1	31.08.2026			
28.	Joint Characteristic Function	1	01.09.2026			
29.	**Tutorial (Think Pair Share)**	1	02.09.2026			
No. of classes required to complete UNIT-II: 12+4			**No. of classes taken:**			

UNIT-III: Random 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
30.	The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes	1	05.09.2026			
31.	Distribution and Density Functions, concept of Stationarity and Statistical Independence	1	15.09.2026			
32.	**Tutorial (Context mapping)**	1	16.09.2026			
33.	First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity	1	19.09.2026			
34.	Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes	1	21.09.2026			
35.	Autocorrelation Function and Its Properties	1	22.09.2026			
36.	**Tutorial (Problem Based Learning)**	1	23.09.2026			
37.	Cross-Correlation Function and Its Properties	1	26.09.2026			
38.	Covariance Functions	1	28.09.2026			
39.	Convolution, Mean and Mean-squared Value of System Response	1	29.09.2026			

40.	**Tutorial (Think-Pair-Share)**	1	30.09.2026			
41.	Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output	1	03.10.2026			
No. of classes required to complete UNIT-III -9+3			**No. of classes taken:**			

UNIT-IV: Random Processes – Spectral Characteristics

S. No.	Topic/s	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign
42.	The Power Spectrum: Properties	1	05.10.2026			
43.	Relationship between Power Spectrum and Autocorrelation Function	1	06.10.2026			
44.	**Tutorial (Cooperative Group Learning)**	1	07.10.2026			
45.	The Cross-Power Density Spectrum Properties	1	12.10.2026			
46.	Relationship between Cross-Power Spectrum and Cross-Correlation Function	1	13.10.2026			
47.	**Tutorial (Problem Based Learning)**	1	14.10.2026			
48.	Spectral Characteristics of System Response: Power Density Spectrum	1	17.10.2026			
49.	Cross-Power Density Spectrums of Input and Output	1	18.10.2026			
No. of classes required to complete UNIT-IV: 6+2			**No. of classes taken:**			

UNIT-V: Noise Sources & Information Theory

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Resistive/Thermal Noise Source, Arbitrary Noise Sources	1	26.10.2026			
51.	Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures	1	27.10.2026			
52.	**Tutorial (Context mapping)**	1	28.10.2026			
53.	Average Noise Figure of cascaded networks, Narrow Band noise	1	31.10.2026			
54.	Quadrature representation of narrow band noise & its properties, Entropy	1	02.11.2026			
55.	Information rate, Source coding: Huffman coding	1	03.11.2026			
56.	**Tutorial(Problem Based Learning)**	1	04.11.2026			
57.	Source coding: Shannon Fano coding, Mutual information	1	07.11.2026			

58.	Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR	1	9.11.2026			
No. of classes required to complete UNIT-V: 7+2			**No. of classes taken:**			

Contents beyond the Syllabus

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
59.	Stochastic Signal Processing (SSP)	**1**	11.11.2026			

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)	**A1=5**
I-Descriptive Examination (Units-I, II)	**M1=15**
I-Quiz Examination (Units-I, II)	**Q1=10**
Assignment-II (Unit-III ,IV & V)	**A2=5**
II- Descriptive Examination (UNIT-III , IV & V)	**M2=15**
II-Quiz Examination (UNIT-III,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:

Program 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.

Program 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.

Program 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.

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	45	
	Tutorial **Problem Based Learning-5** **Think-Pair-Share Learning-2** **Cooperative Group Learning-2** **Context mapping-4**	**T**	14	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns)-24 Hours Virtual Lab (10 Hrs)	**SL**	34	
		Total	**93**	

Date	Dr. K.Ravi Kumar	Dr. K.Ravi Kumar	Dr. G L N Murthy	Dr.G.Srinivasulu
13.07.2026	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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Department of Electronics and Communication Engineering

COURSE HANDOUT

DATE: 09-07-2026

PART-A

Program : B.Tech. III-Sem., ECE., Section–C
Academic Year : 2026-27
Course Name & Code : **UHV-2:** Understanding Harmony and Ethical Human Conduct (23HS01)
L-T-P-Cr : 2-1-0-3
Course Instructure : **Mrs. B. Rajeswari**

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity (L2)
CO2	Identify one's self, and one's surroundings (family, society nature) (L2)
CO3	Relate human values with human relationship and human society. (L2)
CO4	Illustrate the need for universal human values and harmonious existence (L2)
CO5	Develop as socially and ecologically responsible engineers (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							
CO2			2					3							
CO3						2		3	2						
CO4						1		2							
CO5							2	3				1			

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999
R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004
R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Value Education

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, Cos and Syllabus overview	1	14.07.2026		TLM2	
2.	Process for self exploration: Natural Acceptance	1	15.07.2026		TLM.2	
3.	Right Understanding, Relationship and Physical Facility	1	15.07.2026		TLM2	
4.	Understanding Value Education	1	17.07.2026		TLM2	
5.	Self-exploration as the Process for Value Education	1	21.07.2026		TLM3	
6.	Tutorial-PS1: Sharing about oneself	1	22.07.2026			
7.	Continuous Happiness and Prosperity- Basic Human Aspirations	1	22.07.2026		TLM2	
8.	Happiness and Prosperity- Current Scenario	1	24.07.2026		TLM2	
9.	Tutorial-PS2 Exploring Human Consciousness: **CHART PREPARATION**	1	28.07.2026		TLM3	
10.	Method to Fulfill the Basic Human Aspirations	1	29.07.2026		TLM2	
11.	Method to Fulfill the Basic Human Aspirations	1	29.07.2026		TLM2	
12.	Tutorial-PS3 Exploring Natural Acceptance: **DEBATE**	1	31.07.2026		TLM3	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Harmony in the Human Being

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.	Understanding Human being as the Co-existence of the self and the body	1	04.08.2026		TLM2	
14.	Distinguishing between the Needs of the self and the body	1	05.08.2026		TLM2	
15.	Tutorial-PS4 Distinguishing between the Needs of the self and the body : **CHART PREPARATION**	1	05.08.2026		TLM3	

16.	The body as an Instrument of the self	1	07.08.2026		TLM2	
17.	Understanding Harmony in the self	1	11.08.2026		TLM2	
18.	Tutorial-5-PS5 Sources of Imagination in the self	1	12.08.2026		TLM3	
19.	Harmony of the self with the body	1	12.08.2026		TLM2	
20.	Programme to ensure self-regulation and Health	1	14.08.2026		TLM2	
21.	Programme to ensure self-regulation and Health	1	18.08.2026		TLM2	
22.	Tutorial -PS6 Harmony of the self with the body: **ASSOCIATIVE LEARNING**	1	19.08.2026		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT III: Harmony in the Family and Society

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.	Harmony in the Family-Basic unit of Human Interaction	1	19.08.2026		TLM2	
24.	'Trust' – the Foundational Value in Relationship	1	21.08.2026		TLM2	
25.	'Trust' – the Foundational Value in Relationship	1	25.08.2026		TLM2	
26.	Tutorial-PS7 Exploring the Feeling of Trust: **PLAYING A VIDEO**	1	28.08.2026		TLM3	
27.	'Respect' – as the Right Evaluation	1	01.09.2026		TLM1	
28.	'Respect' – as the Right Evaluation	1	02.09.2026		TLM1	
29.	Tutorial PS8 Exploring the Feeling of Respect	1	02.09.2026		TLM2	
30.	Other Feelings, Justice in Human-to-Human Relationship	1	11.09.2026		TLM2	
31.	Other Feelings, Justice in Human-to-Human Relationship	1	15.09.2026		TLM2	
32.	Understanding Harmony in the Society	1	16.09.2026		TLM2	
33.	Vision for the Universal Human Order	1	16.09.2026		TLM2	
34.	Tutorial -PS9 Exploring systems to fulfill Human Goal: **CHART PREPARATION**	1	18.09.2026		TLM3	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Harmony in the Nature/Existence

S. No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
35.	Understanding Harmony in the Nature	1	22.09.2026		TLM2	
36.	Understanding Harmony in the Nature	1	23.09.2026		TLM2	
37.	Interconnectedness, self-regulation	1	23.09.2026		TLM2	
38.	Mutual Fulfilment among the Four Orders of Nature	1	25.09.2026		TLM2	
39.	Mutual Fulfilment among the Four Orders of Nature	1	29.09.2026		TLM2	
40.	Tutorial -PS10 Exploring Four Orders of Nature: **ROLE PLAY**	1	30.09.2026		TLM3	
41.	Realizing Existence as Co-existence at All Levels	1	30.09.2026		TLM2	
42.	Realizing Existence as Co-existence at All Levels	1	02.10.2026		TLM2	
43.	The Holistic Perception of Harmony in Existence	1	06.10.2026		TLM2	
44.	The Holistic Perception of Harmony in Existence	1	07.10.2026		TLM2	
45.	Tutorial-PS11 Exploring Co-existence in Existence: **PLAYING A VIDEO**	1	07.10.2026		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Implications of the Holistic Understanding

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.	Natural acceptance of human values	1	09.10.2026		TLM2	
47.	Definitiveness of ethical human conduct	1	13.10.2026		TLM2	
48.	Tutorial-PS12 Exploring Ethical human conduct: **ROLE PLAY**	1	14.10.2026		TLM3	
49.	Basis for humanistic education	1	14.10.2026		TLM2	
50.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human order	1	16.10.2026		TLM2	
51.	Competence in professional ethics	1	27.10.2026		TLM2	
52.	Competence in professional ethics	1	28.10.2026		TLM2	
53.	Tutorial PS13 Exploring Humanistic models in education	1	28.10.2026		TLM3	
54.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	30.10.2026		TLM2	
55.	Holistic Technologies, Production Systems and	1	03.11.2026		TLM2	

	Management Models-Typical Case					
56.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	04.11.2026		TLM2	
57.	Strategy for transition towards value based life and profession	1	04.11.2026		TLM2	
58.	Strategy for transition towards value based life and profession	1	06.11.2026		TLM2	
59.	Tutorial PS14 Steps of transition towards Universal Human Order : **CHART PREPARATION**	1	10.11.2026		TLM3	
60.	Conclusion and Reflections on UHV-2	1	11.11.2026		TLM3	
61.	Conclusion and Reflections UHV-2	1	11.11.2026		TLM3	
62.	Conclusion on UHV-2	1			TLM3	
No. of classes required to complete UNIT-V: 15				No. of classes taken:		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transitions in the universal human order in the current society	1	11-11-2026			

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

PART-C: Evaluation Process (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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

ACADEMIC CALENDAR: A.Y 2026-27

Description	From	To	Weeks
I Phase of Instructions	13-07-2026	05-09-2026	8W
I Mid Examinations	07-09-2026	09-09-2026	**3 Days**
II Phase of Instructions	10-09-2026	17-10-2026	5 ½ W
Dussehra Holidays	19-10-2026	24-10-2026	1 W
II Phase of Instructions Cont.	26-10-2026	11-11-2026	2 ½ W
II Mid Examinations	12-11-2026	15-11-2026	**3 Days**
Preparation and Practical	16-11-2026	21-11-2026	1 W
Semester End Examinations	23-11-2026	05-11-2026	**2 W**

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Case study-5** **Mingle-pair-Share Learning-5** **Cooperative Group Learning-5**	**T**	15	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (5 Hrs)	**SL**	35	
		Total	**96**	

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs. B. Rajeswari	Mrs. B. Rajeswari	Dr. B. SRINIVASA RAO	Dr. G. Srinivasulu
Signature				

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–C
Academic Year : 2026-27
Course Name & Code : Signals and Systems – 23EC02
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Rambabu

Course Objectives:

1	To study about signals and systems
2	To analyze the spectral characteristics of signals
3	To understand the characteristics of systems
4	To introduce the concept of sampling process
5	To know various transform techniques to analyze the signals and systems

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

CO 1	Summarize the basic concepts of signals, systems and sampling	L2
CO 2	Examine the operations on signals and approximate using orthogonal functions	L3
CO 3	Apply the concept of impulse response to analyze the LTI systems	L3
CO 4	Analyze both continuous time and discrete time signals and systems using Fourier series, Fourier transform, Laplace transforms and Z-Transforms	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
CO 1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO 3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO 4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

Textbooks (T) and References (R):

T1: B P Lathi, Signals, Systems and Communications, BSP, 3rd Edition, 2003.
T2: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI, 2nd Edition, 1997.
T3: Simon Haykin and Van Veen, Signals and Systems, Wiley, 2nd Edition 2007.
R1: B P Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2015.
R2: TK Rawat, Oxford University Press, 2011.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to course	1	13-07-2026			
2.	Introduction to Unit-I	1	14-07-2026			
3.	Definition and Classification of signals	1	16-07-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**18-07-2026**			
5.	Definition and Classification of systems	1	20-07-2026			
6.	Singularity and Related signals	1	21-07-2026			
7.	Complex exponential and sinusoidal signals	1	22-07-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**25-07-2026**			
9.	Operations on signals	1	27-07-2026			
10.	Properties of signals	1	28-07-2026			
11.	Analogy between vectors and signals	1	29-07-2026			
12.	**Tutorial (Cooperative Group Learning)**	**1**	**01-08-2026**			
13.	Approximation of a signal by another signal	1	03-08-2026			
14.	Orthogonal signal space, Approximation of a signal by a set of mutually another signals	1	04-08-2026			
15.	Orthogonality in complex signals	1	05-08-2026			
16.	**Tutorial (Flipped Classroom Learning)**	**1**	**08-08-2026**			
No. of classes required to complete UNIT-I : 12+4			**No. of classes taken :**			

UNIT-II: Fourier Series & Fourier Transforms

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.	Fourier series representation of continuous time periodic signals, Dirichlet's conditions	1	10-08-2026			
2.	Trigonometric Fourier series	1	11-08-2026			
3.	Exponential Fourier series	1	12-08-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**17-08-2026**			
5.	Relation between Trigonometric and Exponential Fourier series	1	18-08-2026			
6.	Properties of Fourier series	1	19-08-2026			
7.	Complex Fourier spectrum, Deriving Fourier transform from Fourier series	1	19-08-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**22-08-2026**			
9.	Fourier transform of arbitrary signals	1	24-08-2026			
10.	Fourier transform of standard signals	1	25-08-2026			
11.	**Tutorial (Cooperative Group Learning)**	**1**	**29-08-2026**			
12.	Fourier transform of periodic signals, Introduction to Hilbert Transform	1	31-08-2026			
13.	Properties of Fourier transforms	1	01-09-2026			
14.	Properties of Fourier transforms	1	02-09-2026			
No. of classes required to complete UNIT-II : 11+3			**No. of classes taken :**			

UNIT-III: Analysis of Linear Systems

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.	**Tutorial (Problem Based Learning)**	**1**	**12-09-2026**			
2.	Introduction, Linear and Non-linear systems	1	15-09-2026			
3.	Time invariant and Variant systems	1	16-09-2026			
4.	**Tutorial (Think-Pair-Share Learning)**	**1**	**19-09-2026**			
5.	Concept of convolution in time and frequency domain. Graphical representation of convolution	1	21-09-2026			
6.	Response of a LTI system	1	22-09-2026			
7.	System bandwidth, Signal bandwidth and Rise time, Distortion less transmission through a system	1	23-09-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**26-09-2026**			
9.	Filter characteristics of linear systems, Ideal and practical characteristics of LPF, HPF, BPF, BSF	1	28-09-2026			
10.	Causality and Poly-Wiener criterion for physical realization	1	29-09-2026			
No. of classes required to complete UNIT-III : 7+3			**No. of classes taken :**			

UNIT-IV : Correlation and Sampling Theorem

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.	Auto-correlation function and properties	1	30-09-2026			
2.	Energy spectral density, Power spectral density, Parseval's theorem	1	03-10-2026			
3.	Cross-correlation function and properties, Relation between Convolution and correlation	1	05-10-2026			
4.	Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering	1	06-10-2026			
5.	**Tutorial (Problem Based Learning)**	**1**	**07-10-2026**			
6.	Sampling Theorem, Graphical analysis of Sampling Theorem- Impulse sampling, Analytical analysis of Sampling Theorem	1	12-10-2026			
7.	Sampling Theorem for band limited signal- Band Pass sampling, Reconstruction of signal from its samples, Statement of Sampling theorem	1	13-10-2026			
8.	Effect of under sampling-Aliasing effect, Natural and Flat top Sampling	1	14-10-2026			
No. of classes required to complete UNIT-IV : 7+1			**No. of classes taken :**			

UNIT-V : Laplace Transforms and Z-Transforms

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, Concept of Laplace transform, Relation between Laplace and Fourier transform, Existence of Laplace transform	1	26-10-2026			
2.	Laplace transform of various classes of signals	1	27-10-2026			
3.	Region of convergence in s- Transform and Properties	1	28-10-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**31-10-2026**			
5.	Properties of Laplace transform	1	02-11-2026			
6.	Inverse Laplace transform	1	03-11-2026			
7.	Introduction to Z-Transform, Z-transform of various classes of signals Region of convergence in z- Transform and Properties	1	04-11-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**07-11-2026**			
9.	Properties of Z-transforms	1	09-11-2026			
10.	Inverse Z- transform	1	10-11-2026			
No. of classes required to complete UNIT-V : 8+2			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transform Techniques	1	11-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-4, Cooperative Group Learning-3, Flipped Classroom Learning-1**	**T**	13	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (2 Hrs)	**SL**	32	
		Total	**91**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. B.Rambabu	Dr. B. Rambabu	Dr. G.L.N Murthy	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

PART-A:

COURSE HANDOUT

Program : B.Tech. III-Sem., ECE., Section– C
Academic Year : 2026-27
Course Name & Code : Electronic Devices and Circuits – 23EC03
L-T-P-Cr : 3-0-0-3
Course Instructure : Mr.K.V Ashok

Course Objectives:

1	To learn and understand the basic concepts of semiconductor physics.
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3	To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5	To learn and understand the purpose of transistor biasing and its significance
6	Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

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

CO 1	Recall the fundamentals of semiconductor physics necessary for electronic devices and circuits (Remember)	L1
CO 2	Illustrate the structure and operation of Diodes, Bipolar Junction Transistors, Field Effect Transistors and biasing of BJT & FET using fundamental circuits. (Understand)	L2
CO 3	Apply the knowledge of Diodes, Transistors and Filters for designing the Rectifiers, Regulators and Amplifier circuits using basic components. (Apply)	L3
CO 4	Analyze the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using V-I Characteristics. (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
CO 1	2	3	1	-	-	3	1	-	-	-	1	2	1	1	-
CO 2	2	1	2	1	-	3	1	-	-	-	-	1	1	1	-
CO 3	3	1	1	-	-	-	1	-	-	-	-	-	2	2	-
CO 4	1	3	-	-	-	-	-	-	-	-	1	1	2	2	-

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

Textbooks (T) and References (R):

T1: Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015..

T2: Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.

T3: Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

R1: Basic Electronics-Principles and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly Cambridge University Press, 1st edition, 2018.

R2: Electronics devices & circuit theory- Robert L.Boylestad and Louis Nashelsky, Pearson, 11th edition, 2015.

R3: Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.

Online Learning Resources:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Semiconductor Physics, Junction Diode Characteristics & Special Semiconductor Devices

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Methods	HOD
1	Introduction to COs and Outcomes. Unit-I Introduction	1	13-07-2026			
2	TUTORIAL: QUIZ on Basics	1	15-07-2026			
3	Mobility and conductivity, Intrinsic and Extrinsic	1	17-07-2026			
4	Continuity Equation, Law of Junction.	1	18-07-2026			
5	Open circuited p-n junction, Biased p-n junction, p-n junction	1	20-07-2026			
6	TUTORIAL: Problem Based Learning diode, Current	1	22-07-2026			
7	Diode equation, V-I Characteristics, Temperature	1	24-07-2026			
8	Diode resistance, Diode capacitance.	1	25-07-2026			
9	Special Semiconductor Devices: Zener Diode, Breakdown	1	27-07-2026			
10	TUTORIAL: Think, Pair & Share Learning Mechanisms and	1	29-07-2026			
11	Varactor Diode, LED	1	31-07-2026			
12	Photodiode, Tunnel Diode	1	01-08-2026			
13	UJT Operation and V-I characteristics	1	03-08-2026			
14	TUTORIAL: Think Pair & Share learning	1	05-08-2026			
15	PNPN Diode, SCR Operation and V-I characteristics	1	07-08-2026			
No. of classes required to complete UNIT-I : 11+4=15			No. of classes taken :			

UNIT-II: Diode Circuits

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	Diode Circuits: The Diode as a circuit element. The Load-Line concept.	1	10-08-2026			
2	TUTORIAL: Cooperative Group Learning	1	12-08-2026			
3	Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two	1	14-08-2026			

4	Peak Detector, Clamping circuits	1	17-08-2026			
5	TUTORIAL: Think Pair and Share	1	19-08-2026			
6	Basic Rectifier Setup, Half Wave Rectifier	1	21-08-2026			
7	Full Wave Rectifier, Bridge Rectifier	1	22-08-2026			
8	Derivations of Characteristics of Rectifiers	1	24-08-2026			
9	Filters, Inductor Filter	1	28-08-2026			
10	Capacitor Filter, π-Section Filter	1	29-08-2026			
11	Comparison of various Filter Circuits in terms of Ripple Factors.	1	31-08-2026			
12	TUTORIAL: Problem Based learning	1	02-09-2026			
13	REVISION	1	05-09-2026			
No. of classes required to complete UNIT-II : 10+3=13			No. of classes taken :			

UNIT-III: Transistor Characteristics, Biasing and Thermal Stabilization

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	**Transistor Characteristics**: Junction transistor, Transistor current components, CB configuration, Transistor as an amplifier	1	11-09-2026			
2	TUTORIAL: Flipped Class Learning	1	16-09-2026			
3	Characteristics of transistor in CB, CE,CC configurations	1	18-09-2026			
4	Ebers - Moll model of a transistor, Punch through/ Reach through. Photo transistor, typical transistor junction voltage values.	1	19-09-2026			
5	Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis	1	21-09-2026			
6	TUTORIAL: Flipped Class Learning	1	23-09-2026			
7	BJT biasing- methods, basic stability, fixed bias, collector to base bias	1	25-09-2026			
8	Self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S,S',S''),	1	26-09-2026			
9	Bias Compensation, Thermal Runaway, Thermal Stability	1	28-09-2026			

10	TUTORIAL: Flipped Class Learning	1	30-09-2026			
No. of classes required to complete UNIT-III : 07+03=10			No. of classes taken :			

UNIT-IV : Small Signal Low Frequency Transistor Amplifier Models

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	BJT: Two port network, Transistor hybrid model, Determination of h-	1	03-10-2026			
2	Generalized analysis of transistor amplifier model using h-parameters	1	05-10-2026			
3	TUTORIAL: Flipped Class Learning	1	07-10-2026			
4	Analysis of CB amplifiers using exact and approximate analysis.	1	09-10-2026			
5	Analysis of CE & CC amplifiers using exact and approximate analysis	1	12-10-2026			
6	TUTORIAL: Problem Based learning	1	14-10-2026			
7	Comparison of transistor amplifiers	1	16-10-2026			
8	Generalized analysis of transistor amplifier model using h-parameters	1	17-10-2026			
No. of classes required to complete UNIT-IV : 06+02 = 08				No. of classes taken :		

UNIT- V: FET, MOSFET and CMOS Amplifiers

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	FET types, JFET operation, Characteristics, Small signal model of JFET	1	26-10-2026			
2	TUTORIAL: Cooperative Group Learning	1	28-10-2026			
3	MOSFET Structure, Operation of MOSFET in triode region	1	30-10-2026			
4	Operation in saturation region, MOSFET as a variable resistor, Channel length modulation, MOS trans conductance	1	31-10-2026			
5	MOS device models: MOS small signal model, PMOS Transistor,	1	02-11-2026			
6	TUTORIAL: Flipped Class Learning	1	04-11-2026			
7	CMOS Technology, Comparison of Bipolar and MOS devices, CMOS amplifiers: General Considerations	1	06-11-2026			

8	Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.	1	07-11-2026			
9	TUTORIAL: Flipped Class Learning	1	09-11-2026			
No. of classes required to complete UNIT-V : 06+03=09				No. of classes taken :		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. ofClasses Required	TentativeDate of Completion	ActualDate of Completion	TeachingLearning Methods	HOD Sign Weekly
1.	Realization of Universal gates with CMOS transistor	1	11-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	41	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	15	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Virtual Labs	**SL**	10	
	Simulation of Circuits		12	
	Assignment		10	
	Data Sheets		02	
		Total	90	

PART-E: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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.K V Ashok	Mr. P. Venkateswara Rao	Dr. B.V.N.R. Siva kumar	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART: A

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – C
Course Name & Code : Switching Theory and Logic Design – 23EC04
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr Y AMAR BABU

Course Objectives:

1	To solve a typical number base conversion and analyze new error coding techniques.
2	Theorems and functions of Boolean algebra and behavior of logic gates
3	To optimize logic gates for digital circuits using various techniques
4	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
5	To understand concepts of combinational circuits.
6	To develop advanced sequential circuits.

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

CO 1	Summarize the key differences between number systems and their usage in Digital Circuits.	L2
CO 2	Apply the minimization techniques of Boolean expressions to implement Digital Circuits using basic logic gates and logic circuits	L3
CO 3	Apply the minimization and realization methods for designing the Combinational & Sequential logic circuits	L3
CO 4	Analyze the Combinational, Sequential, Finite State Machines for implementation of digital logic circuits	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
CO 1	2	3	1	-	-	-	-	-	-	-	-	1	-	3	-
CO 2	2	3	3	-	-	-	-	-	-	-	-	1	-	3	-
CO 3	2	3	3	1	-	-	-	-	-	-	-	1	-	3	-
CO 4	2	3	3	2	-	-	-	-	-	-	-	3	-	3	-

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

Textbooks (T) and References (R):

T1: Switching and finite automata theory Zvi.KOHAVI, Niraj. K. Jha 3rd Edition, Cambridge University Press, 2009**.**

T2: Digital Design by M. Morris Mano, Michael D Ciletti, 4th edition PHI publication, 2008.

T3: Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

R1: Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006

R2: Digital electronics by R S Sedha. S. Chand &company limited,2010

R3 : Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: REVIEW OF NUMBER SYSTEMS & CODES, BOOLEAN THEOREMS AND LOGIC 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.	Introduction, Representation of numbers of different radix.	1	15.07.2026		TLM1	
2.	**Tutorial: Problem Based Learning**	1	16.07.2026		TLM3	
3.	conversation from one radix to another radix	1	17.07.2026		TLM2	
4.	r- 1's compliments and r's compliments of signed numbers , 2421 & 84-2-1 code	1	18.07.2026		TLM2	
5.	Error detection codes: parity checking, even parity, odd parity	1	22.07.2026		TLM2	
6.	**Tutorial: Think-Pair-Share Learning**	1	23.07.2026		TLM3	
7.	Boolean theorems, Error correction codes: Hamming code.	1	24.07.2026		TLM1	
8.	Principle of complementation & duality, De-Morgan theorems.	1	25.07.2026		TLM2	
9.	Logic operations; Universal Logic operations, EX-OR, EX- NOR operations.	1	29.07.2026		TLM2	
10.	**Tutorial: Cooperative Group Learning**	1	30.07.2026		TLM3	
11.	NAND-NAND and NOR-NOR realizations Standard SOP and POS Forms	1	31.07.2026		TLM1	
12.	Realization of three level logic circuits.	1	01.08.2026		TLM1	
No. of classes required to complete UNIT-I: 12			**No. of classes taken:**			

UNIT-II: MINIMIZATION TECHNIQUES, COMBINATIONAL LOGIC CIRCUITS DESIGN.

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.	Minimization and realization of switching functions using Boolean theorems	1	05.08.2026		TLM1	
2.	**Tutorial: Flipped Classroom Learning**	1	06.08.2026		TLM3	
3.	Minimization and realization of switching functions using Boolean theorems, K-Map(2,3 variables)	1	07.08.2026		TLM1	
4.	K-Map(4,5,6 variables)	1	12.08.2026		TLM1	
5.	**Tutorial: Problem Based Learning**	1	13.08.2026		TLM3	

6.	Tabular method (Quine-McCluskey method) with only four variables and single function.	1	14.08.2026		TLM2	
7.	Design of Full Adder, half subtractor	1	19.08.2026		TLM2	
8.	**Tutorial: Think- Pair-Share Learning**	1	20.08.2026		TLM3	
9.	full subtractor, applications of full adders	1	21.08.2026		TLM2	
10.	4- bit adder-sub tractor circuit , BCD adder circuit , Excess 3 adder circuit	1	22.08.2026		TLM2	
11.	Carry look-a- head adder circuit	1	27.08.2026		TLM2	
12.	Design code converts using Karnaugh method and draw the complete circuit diagrams	1	28.08.2026		TLM1	
No. of classes required to complete UNIT-II: 12			**No. of classes taken:**			

UNIT-III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI, INTRODUCTION OF PLD's

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.	Design of encoder, decoder	1	29.08.2026		TLM1	
2.	multiplexer and de-multiplexers	1	02.09.2026		TLM1	
3.	**Tutorial: Cooperative Group Learning**	1	03.09.2026		TLM3	
4.	Implementation of higher order circuits using lower order circuits	1	05.09.2026		TLM2	
5.	Realization of Boolean functions using decoders	1	10.09.2026		TLM2	
6.	Realization of Boolean functions using multiplexers	1	11.09.2026		TLM2	
7.	Design of Priority encoder, 4-bit digital comparator	1	12.09.2026		TLM2	
8.	**Tutorial: Flipped Classroom Learning**	1	16.09.2026		TLM3	
9.	seven segment decoder	1	17.09.2026		TLM1	
10.	PROM-Basics structures, realization of Boolean functions, Programming table.	1	18.09.2026		TLM2	
11.	PLA, PAL-Basics structures, realization of Boolean functions, Programming table.	1	19.09.2026		TLM2	
12.	**Tutorial: Problem Based Learning**	1	23.09.2026		TLM3	
No. of classes required to complete UNIT-III: 12			**No. of classes taken:**			

UNIT-IV: SEQUENTIAL CIRCUITS-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.	Classification of sequential circuits (synchronous and asynchronous),operation of NAND & NOR Latches	1	24.09.2026		TLM2	
2.	Flip-Flops: Truth tables and excitation tables of RS flip-flop, JK flip- flop, with reset and clear terminals	1	25.09.2026		TLM2	

3.	Flip-Flops: Truth tables and excitation tables of T-flip-flop,	1	26.09.2026		TLM2	
4.	**Tutorial: Think-Pair-share Learning**	1	30.09.2026		TLM3	
5.	D flip- flop, with reset and clear terminals	1	01.10.2026		TLM2	
6.	Conversion from one flip-flop to another flip- flop.	1	03.10.2026		TLM2	
7.	Design of ripple counters, design of synchronous counters, Johnson counter, ring counter.	1	07.10.2026		TLM2	
8.	**Tutorial: Cooperative Group Learning**	1	08.10.2026		TLM3	
9.	Design of registers - Buffer register, control buffer register, Shift register.	1	09.10.2026		TLM2	
10.	Bi- directional shift register, universal shift, register.	1	14.10.2026		TLM2	
11.	**Tutorial: Flipped Classroom Learning**	1	15.10.2026		TLM3	
12.	Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.	1	16.10.2026		TLM2	
No. of classes required to complete UNIT-III: 12			**No. of classes taken:**			

UNIT-V: SEQUENTIAL CIRCUITS-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
1.	Finite state machine: state diagrams, state tables	1	17.10.2026		TLM1	
2.	Reduction of state tables	1	28.10.2026		TLM1	
3.	**Tutorial: Problem Based Learning**	1	28.10.2026		TLM3	
4.	Reduction of state tables	1	29.10.2026		TLM1	
5.	Analysis of clocked sequential circuits Mealy to Moore conversion	1	30.10.2026		TLM2	
6.	Analysis of clocked sequential circuits Mealy to Moore conversion	1	31.10.2026		TLM2	
7.	**Tutorial: Think-Pair-Share Learning**	1	04.11.2026		TLM2	
8.	Analysis of clocked sequential circuits Moore to Mealy to conversion	1	05.11.2026		TLM2	
9.	Realization of sequence generator	1	06.11.2026		TLM2	
10.	Design of Clocked Sequential Circuit to detect the given sequence (with and without overlapping)	1	07.11.2026		TLM2	
No. of classes required to complete UNIT-V: 10			**No. of classes taken :**			

Content beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Design of 8 bit ALU	1	11.11.2026		TLM2	
2.	Introduction to HDL, Verilog HDL	1	11.11.2026		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 (R23)

Evaluation Task	**Marks**
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			**No. of Hrs Required**	**No. of Hrs Conducted**
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	14	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Assignments (15 Qns x 2 Hrs)	**SL**	30	
		Total	90	

PART-E: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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. Y. Amar Babu	Ms. M V L Bhavani	Dr.P.Lachi Reddy	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr K V Ashok Mr.P.Venkateswara Rao, Mrs.Y.Padma,Ms.B.Lakshmi Thirupathamma
Course Name & Code : Electronic Devices and Circuits Lab -23EC52
L-T-P Structure : 0-0-3 **Credits**: 1.5
Program/Sem/Sec : B.Tech., ECE. /III/ C **A.Y.** : 2026-27

Course Objectives: This course introduces the characteristics and applications of semiconductor devices. Emphasis is placed on characteristics and testing practically to strengthen the knowledge.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	Demonstrate the characteristics of BJT, FET, SCR, UJT and applications of diode. **(Apply-L3)**
CO2	Model the Rectifiers, filters and Amplifiers used in electronic circuits**. (Apply-L3)**
CO3	Analyze the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. **(Analyze – L4).**
CO4	Adapt effective Communication, presentation and report writing skills. **(Apply-L3)**

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

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

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

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 EDC Lab experiments, COs, POs and PSOs.	3	16-07-2026		TLM4	
2.	BJT Characterstics – CB,CE configurations	3	23-07-2026		TLM4	
3.	Estimation of ripple factor and regulation without and with LC	3	30-07-2026		TLM4	
4.	Design of Clipper circuit using diode	3	06-08-2026		TLM4	
5.	Design of Clamping circuit using diode	3	13-08-2026		TLM4	
6.	Determination of Break over voltage of SCR using V-I	3	20-08-2026		TLM4	
7.	UJT Characterstics	3	27-08-2026		TLM4	
8.	Revision	3	03-09-2026		TLM4	
9.	Determination of h-parameter of a BJT in CE configuration	3	10-09-2026		TLM4	
10.	Estimation of Stability factor for a transistor - self biasing circuit	3	17-09-2026		TLM4	
11.	Frequency response of BJT-CE Amplifier	3	24-09-2026		TLM 4	
12.	FET Characteristics – Drain & Transfer	3	01-10-2026		TLM4	
13.	Design of FET –CS Amplifier	3	08-10-2026		TLM4	
14.	Demonstration	3	15-10-2026		TLM4	
15.	Revision	3	29-10-2026		TLM4	
16.	Lab Internal Examination	3	05-11-2026			
No. of classes required: 48				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

PART-D

Program 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.

Program Outcomes (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2:	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3:	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4:	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5:	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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PO 7:	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9:	**Individual and 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.

Program 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. K. V Ashok	Mr. K. V Ashok	Dr. B.V.N.R. Siva kumar	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–C
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design Lab – 23EC53
L-T-P-Cr : 0-0-3-1.5
Course Instructure : B. Rajeswari, Ch. S.R. Krishna, T. Kalpana, M. V. L. Bhavani,

Course Objectives:

This course gives the ability to design and verify digital logic circuits like; logic gates, combinational and sequential logic circuits using discrete components and Integrated Circuits.

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

CO 1	Demonstrate the functionality of Logic gates, Flip-flops, Shift registers and Counters	L3
CO 2	Apply the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates	L3
CO 3	Analyze the behavior of Combinational and Sequential logic circuits	L4
CO 4	Adapt effective Communication, presentation and report writing skills	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
CO 1	2	3	3	1	2	-	-	-	-	-	-	1	-	3	-
CO 2	2	1	1	1	1	-	-	-	-	-	-	1	-	3	-
CO 3	2	1	1	-	1	-	-	-	-	-	-	1	-	3	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-

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

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 STLD Lab, COs, Pos and PSOs.	3	14-07-2026		TLM4	
2.	Implementation of the following Logic gates using Universal Gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR	3	21-07-2026		TLM4	
3.	Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.	3	28-07-2026		TLM4	
4.	Verification of functional table of 3 to 8-line Decoder /De-multiplexer	3	04.08.2026		TLM4	
5.	4 variable logic function verification using 8 to1 multiplexer.	3	11.08.2026		TLM4	
6.	Design full adder circuit and verify its functional table.	3	18.08.2026		TLM4	
7.	Verification of functional tables of (i) JK Master Slave Flip–Flop (ii) D Flip-Flop	3	25.08.2026		TLM4	
8.	Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output	3	01.09.2026		TLM4	
9.	Verify the operation of 4-bit Universal Shift Register for different Modes of operation	3	08.09.2026		TLM4	
10.	Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test It with a low frequency clock and sketch the output waveforms	3	15.09.2026		TLM4	
11.	Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.	3	22.09.2026		TLM4	
12.	Draw the circuit diagram of a single bit comparator and test the output	3	29.09.2026		TLM4	
13.	Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.	3	06.10.2026		TLM4	
14.	Design of any combinational circuit, sequential circuit using Hardware Description Language (Additional Experiments)	3	13.10.2026		TLM4	
15.	Lab Repetetion	3	27.10.2026		TLM4	
16.	Lab Repetetion	3	03.11.2026		TLM4	
17.	Lab Internal Examination	3	10.11.2026		TLM4	
No. of classes required:51				**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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE):(A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

Program Educational Objectives (PEOs):

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Program 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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs. B Rajeswari Mr.S.R.Krishna Mrs.T.Kalpana Mrs. M V L Bhavani	Mr. Ch Siva Rama Krishna	Dr. P. Lachi Reddy	Dr. G. Srinivasulu

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Narasimha Rao
Course Name & Code : DATA STRUCTURES LAB & 23CSS3
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech/III/ECE-C **A.Y.:** 2026-27

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 various searching & sorting techniques. **(Apply-L3)**

CO2: Implement Linked List, Stack & Queue data structures. **(Apply-L3)**

CO3: Design and implement algorithms for operations on binary trees and binary search trees. **(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	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		
CO3	3	2											2		
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.	**UNIT1**: 1. Program to find min & max element in an array. 2. Program to implement matrix multiplication.	4	13-07-2026 17-07-2026		
2.	3.Find an element in given list of sorted elements in an array using Binary search.	4	20-07-2026 24-07-2026		
3.	4.Implement Selection and Quick sort techniques	4	27-07-2026 31-07-2026		
4.	**UNIT:2** Write a program to implement the following operations. a. Insert b. Deletion c. Traversal	4	03-08-2026 07-08-2026		
5.	Write a program to store name, roll no, and marks of students in a class using circular double linked list	4	10-08-2026 14-08-2026		
6.	Write a program to perform addition of given two polynomial expressions using linked list	4	17-08-2026 21-08-2026		
7.	**UNIT:3** Implement stack operations using a. Arrays b. Linked list	4	24-08-2026 28-08-2026		
8.	Convert given infix expression into post fix expression using stacks.	7	31-08-2026 04-09-2026 07-09-2026		

9.	Evaluate given post fix expression using stack.	7	11-09-2026 14-09-2026 18-09-2026		
10.	4.Write a program to reverse given linked list using stack	7	21-09-2026 25-09-2026 28-09-2026		
11.	UNIT 4: 1.ImplementQueue operations using a. Arrays b. Linked list.	4	02-10-2026 05-10-2026		
12.	2. Implement Circular Queue using a. Arrays b. Linked list. 3. Implement Dequeue using linked list.	7	09-10-2026 12-10-2026 16-10-2026		
13.	**UNIT5:** 1. Implement binary tree traversals using linked list. 2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.	7	19-10-2026 23-10-2026 26-10-2026		
14.	Lab Internal Exam	3	09-11-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work& Record	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
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

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	**Mr. P. Narasimha Rao**	**Dr. G.Sambi Reddy**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr.S.Nagarjuna Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., ECE-C
ACADEMIC YEAR : 2026-27
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. Shaheda Niloufer
COURSE COORDINATOR : Dr. Shaheda Niloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	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	3	-	-	-	3	3	3	-	-	-	3	-	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	-	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-
CO5	3	3	3	3	-	3	3	3	-	-	-	3	-	-	-

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.

T2. Palaniswamy, Environmental Studies,2/e, Pearson education,2014.

T3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company,2021.

T4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

R1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.

R2. Deeksha Daveand E. Sai Baba Reddy, Text book of Environmental Science,2/e, Cengage Publications, 2012.

R3. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication, 2014.

R4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications,2006.

R5. J. Glynn Henryand GaryW. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.

R6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

R7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science,1/e, Prentice Hall of India Private limited, 1991.

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	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	16-07-2026		TLM2			
2.	Multidisciplinary Nature of Environmental Studies	1	17-07-2026		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	23-07-2026		TLM1	CO1	T1, T2	
4.	Water resources	1	24-07-2026		TLM2	CO1	T1, T2	
5.	Mineral resources	1	30-07-2026		TLM1	CO1	T1, T2	
6.	Food resources	1	31-07-2026		TLM2	CO1	T1, T2	
7.	Energy resources	1	06-08-2026		TLM2			
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
8.	Ecosystems – Structure & Functions	1	07-08-2026		TLM4	CO2	T1, T2	
9.	Ecological succession &	1	13-08-2026		TLM1	CO2	T1, T2	
10.	Food chains, Food webs & Ecological Pyramids	1	14-08-2026		TLM4	CO2	T1, T2	
11.	Types of ecosystems	1	20-08-2026		TLM1	CO2	T1, T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	21-08-2026		TLM2	CO2	T1, T2	
13.	Values of Biodiversity, India as mega diversity nation, Threats to biodiversity and Conservation of biodiversity	1	28-08-2026		TLM2	CO2	T1, T2	
No. of classes required to complete UNIT-II		06			No. of classes taken:			

I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)

UNIT-III: Environmental Pollution

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Environmental pollution -Air pollution	1	10-09-2026		TLM1	CO3	T1, T2	
15.	Water pollution, Marine pollution, Thermal pollution	1	11-09-2026		TLM1	CO3	T1, T2	
16.	Soil pollution	1	17-09-2026		TLM1	CO3	T1, T2	
17.	Solid waste management	1	18-09-2026		TLM1	CO3	T1, T2	
18.	Disaster management	1	24-09-2026		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
19.	From Unsustainable to Sustainable development	1	25-09-2026		TLM1	CO4	T1, T2	
20.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	01-10-2026		TLM1	CO4	T1, T2	
21.	Environmental ethics, Climate change	1	08-10-2026		TLM6	CO4	T1, T2	

22.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	09-10-2026		TLM1	CO4	T1, T2	
23.	Environmental Acts	1	15-10-2026		TLM1	CO4	T1, T2	
24.	Environmental Acts	1	16-10-2026		TLM1	CO4	T1, T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	29-10-2026		TLM1	CO5	T1, T2	
26.	Environment and human health –Human Rights – Value Education	1	30-10-2026		TLM1	CO5	T1, T2	
27.	HIV/AIDS – Women and Child Welfare	1	05-11-2026		TLM1	CO5	T1, T2	
28.	Role of information Technology in Environment and human health	1	06-11-2026		TLM1	CO5	T1, T2	
29.	Revision	1	06-11-2026		TLM3	CO5	T1, T2	
No. of classes required to complete UNIT-V		06			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
30.	Awareness on ozone layer Case studies	2	19-09-2026 26-03-2026		TLM2	CO2	T1, T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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.

Dr. Shaheda Niloufer	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., III-Sem., Section – D
Academic Year : 2026-27
Course Name & Code : Probability Theory and Stochastic Process – 23FE12
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Dr. K. Ravi Kumar, Professor of ECE

Course Objectives:

1	To get basic understanding of random variables and operations that can be performed on them.
2	To know the Spectral and temporal characteristics of Random Process.
3	To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

CO1	Summarize the concepts of Probability and random processes.	L2
CO2	Examine the Temporal and Spectral characteristics of Random Signals.	L3
CO3	Analyze Linear Time Invariant systems driven by stationary random process by using Auto correlation function and Power spectral Density.	L4
CO4	Interpret the concepts of Noise and Information theory in Communication systems.	L2

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	-	-

Correlation Levels: **1.** Slight (Low),**2**-Moderate(Medium), **3**-Substantial (High).

Textbooks (T):

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

T2 Taub and Schilling - Principles of Communication systems, TMH, 2008

Reference Books(R)

R1 B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003

R2 Y Mallikarjuna Reddy, "Probability theory and Stochastic Processes", Universities Press (India), Pvt Ltd.

R3 Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002

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

UNIT-I: Probability & 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 PTSP Course	1	13.07.2026			
2.	Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces	1	14.07.2026			
3.	Discrete and Continuous Sample Spaces	1	15.07.2026			
4.	Events, Probability Definitions and Axioms	1	16.07.2026			
5.	**Tutorial(Context mapping)**	1	20.07.2026			
6.	Joint Probability, Conditional Probability, Total Probability, Baye's Theorem, Independent Events	1	21.07.2026			
7.	Concept of Random Variable, Conditions for a function to be a Random Variable, Classification of Random Variable	1	22.07.2026			
8.	Cumulative Distribution Function (CDF) and Properties	1	23.07.2026			
9.	**Tutorial (Problem Based Learning)**		27.07.2026			
10.	Cumulative Distribution Function (CDF) Properties, Probability Density Function (PDF) and Properties	1	28.07.2026			
11.	Probability Density Function (PDF) and Properties	1	29.07.2026			
12.	Pre-Defined Distributions	1	30.08.2026			
13.	**Tutorial (Cooperative Group Learning)**	1	03.08.2026			
No. of classes required to complete UNIT-I: 10+3			**No. of classes taken:**			

UNIT-II: Operations on Single & Multiple Random Variables-Expectations

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin	1	04.08.2026			
15.	Central Moments, Variance and Skew	1	05.08.2026			
16.	Chebychev's Inequality, Characteristic Function	1	06.08.2026			
17.	**Tutorial (Problem Based Learning)**	1	10.08.2026			
18.	Moment Generating Function, Vector random variables	1	11.08.2026			
19.	Joint Distribution Function Properties, Marginal Distribution Function	1	12.08.2026			
20.	Joint Distribution Function and Properties	1	13.08.2026			

21.	**Tutorial (Think-Pair-Share)**	1	17.08.2026			
22.	Joint Density Function and Properties	1	18.08.2026			
23.	Joint Density Function and Properties, Marginal Density Function	1	19.08.2026			
24.	Statistical Independence, Sum of Two Random Variables, Distribution and Density of Sum of Random Variables	1	20.08.2026			
25.	**Tutorial (Context mapping)**	1	24.08.2026			
26.	Central Limit Theorem ,Unequal Distribution, Equal Distributions	1	25.08.2026			
27.	Joint Central Moments	1	27.08.2026			
28.	**Tutorial (Think Pair Share)**	1	31.08.2026			
29.	Joint Characteristic Function	1	01.09.2026			
No. of classes required to complete UNIT-II: 12+4			**No. of classes taken:**			

UNIT-III: Random 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
30.	The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes	1	02.09.2026			
31.	Distribution and Density Functions, concept of Stationarity and Statistical Independence	1	03.09.2026			
32.	First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity	1	10.09.2026			
33.	**Tutorial (Context mapping)**	1	15.09.2026			
34.	Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes	1	16.09.2026			
35.	Autocorrelation Function and Its Properties	1	17.09.2026			
36.	**Tutorial (Problem Based Learning)**	1	21.09.2026			
37.	Cross-Correlation Function and Its Properties	1	22.09.2026			
38.	Covariance Functions	1	23.09.2026			
39.	Convolution, Mean and Mean-squared Value of System Response	1	24.09.2026			
40.	**Tutorial (Think-Pair-Share)**	1	28.09.2026			

41.	Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output	1	29.09.2026			
No. of classes required to complete UNIT-III -9+3			**No. of classes taken:**			

UNIT-IV: Random Processes – Spectral Characteristics

S. No.	Topic/s	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign
42.	The Power Spectrum: Properties	1	30.09.2026			
43.	Relationship between Power Spectrum and Autocorrelation Function	1	01.10.2026			
44.	**Tutorial (Cooperative Group Learning)**	1	05.10.2026			
45.	The Cross-Power Density Spectrum	1	06.10.2026			
46.	Properties	1	07.10.2026			
47.	Relationship between Cross-Power Spectrum and Cross-Correlation Function	1	08.10.2026			
48.	**Tutorial (Problem Based Learning)**	1	12.10.2026			
49.	Spectral Characteristics of System Response: Power Density Spectrum	1	13.10.2026			
50.	Cross-Power Density Spectrums of Input and Output	1	14.10.2026			
No. of classes required to complete UNIT-IV: 7+2			**No. of classes taken:**			

UNIT-V: Noise Sources & Information Theory

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Resistive/Thermal Noise Source, Arbitrary Noise Sources	1	15.10.2026			
52.	**Tutorial (Context mapping)**	1	26.10.2026			
53.	Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures	1	27.10.2026			
54.	Average Noise Figure of cascaded networks, Narrow Band noise	1	28.10.2026			
55.	Quadrature representation of narrow band noise & its properties, Entropy	1	29.10.2026			
56.	**Tutorial(Problem Based Learning)**	1	02.11.2026			
57.	Information rate, Source coding: Huffman coding	1	04.11.2026			
58.	Source coding: Shannon Fano coding, Mutual information	1	05.11.2026			
59.	Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and	1	09.11.2026			

	SNR					
No. of classes required to complete UNIT-V: 7+2			**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**	11.11.2026			

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)	**A1=5**
I-Descriptive Examination (Units-I, II)	**M1=15**
I-Quiz Examination (Units-I, II)	**Q1=10**
Assignment-II (Unit-III ,IV & V)	**A2=5**
II- Descriptive Examination (UNIT-III , IV & V)	**M2=15**
II-Quiz Examination (UNIT-III,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:

Program 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.

Program 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.

Program 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.

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	45	
	Tutorial **Problem Based Learning-5** **Think-Pair-Share Learning-2** **Cooperative Group Learning-2** **Context mapping-4**	**T**	14	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns)-24 Hours Virtual Lab (10 Hrs)	**SL**	34	
		Total	**93**	

Date	Dr. K.Ravi Kumar	Dr. K.Ravi Kumar	Dr. G L N Murthy	Dr.G.Srinivasulu
13.07.2026	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–D
Academic Year : 2026-27
Course Name & Code : **UHV2**-Understanding Harmony and Ethical Human Conduct(23HS01).
L-T-P-Cr : **2**-1-0-3
Course Instructure : Mr.S.Murahari.

Course Objectives:

1.	To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO 1	Describe the terms like Natural Acceptance, Happiness and Prosperity	L2
CO 2	Identify one's self, and one's surroundings (family, society nature)	L2
CO 3	Relate human values with human relationship and human society.	L2
CO 4	Illustrate the need for universal human values and harmonious existence.	L2
CO 5	Develop as socially and ecologically responsible engineers	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
CO 1															
CO 2			2												
CO 3						**2**		**3**	**2**						
CO 4						**1**		**2**							
CO 5							**2**	**3**				**1**			

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

Textbooks (T) and References (R):

TEXTBOOKS:

TI: R R Gaur, R Singal, G P Bagaria, “Human Values and Professional Ethics”, Excel Books, New Delhi 2010.

REFERENCE BOOKS:

R1: Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
R2: Human values, A N Tripathi, New Age Publishers, New Delhi, 2004.
R3: The story of my experiments with Truth, Mohandas Karamchand Gandhi.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction to Value Education

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	1	13-07-2026		TLM2	
2.	Introduction to Unit-I	1	14-07-2026		TLM2	
3.	Process for self exploration: Natural Acceptance	1	16-07-2026		TLM2	
4.	**Tutorial-PS1**: Sharing about Oneself	1	**17-07-2026**		TLM2	
5.	Right Understanding, Relationship and Physical Facility	**1**	20-07-2026		TLM3	
6.	Right Understanding, Relationship and Physical Facility	1	21-07-2026		TLM2	
7.	Understanding Value Education	1			TLM2	
8.	Continuous Happiness and Prosperity- Basic Human Aspirations	1	23-07-2026		TLM2	
9.	Happiness and Prosperity-Current Scenario	1	24-07-2026		TLM2	
10.	**Tutorial-PS2**: Exploring Human Consciousness: **CHART PREPARATION**	**1**	**27-07-2026**		TLM2	
11.	Method to Fulfill the Basic Human Aspirations	1	28-07-2026		TLM2	
12.	Method to Fulfill the Basic Human Aspirations	1	30-07-2026		TLM2	
13.	**Tutorial-PS3:** Exploring Natural Acceptance: **DEBATE**	1	**31-07-2026**		TLM3	
No. of classes required to complete UNIT-I :10+3			**No. of classes taken :**			

UNIT-II: Harmony in the Human Being

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.	Understanding Human being as the Co-existence of the self and the body	1	03-08-2026		TLM2	
2.	Understanding Human being as the Co-existence of the self and the body	1	04-08-2026		TLM2	
3.	Distinguishing between the Needs of the self and the body	1	06-08-2026		TLM2	
4.	**Tutorial PS4 Distinguishing between the Needs of the self and the body-CHART PREPARATION.**	1	**07-08-2026**		TLM3	
5.	The body as an Instrument of the self	**1**	10-08-2026		TLM2	
6.	Understanding Harmony in the self	1	11-08-2026		TLM2	
7.	**Tutorial PS5 Sources of Imagination in the self**	1	**13-08-2026**		TLM3	
8.	Harmony of the self with the body	1	14-08-2026		TLM2	
9.	Programme to ensure self-regulation and Health	**1**	17-08-2026		TLM2	
10.	Programme to ensure self-regulation and Health	1	18-08-2026		TLM2	
11.	**Tutorial -PS6 Harmony of the self with the body-ASSOCIATIVE LEARNING.**	1	**20-08-2026**		TLM3	
No. of classes required to complete UNIT-II : 8+3			**No. of classes taken :**			

UNIT-III: Harmony in the Family and Society

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.	Harmony in the Family-Basic unit of Human Interaction	**1**	21-8-2026		TLM2	
2.	Harmony in the Family-Basic unit of ~~H~~uman Interaction	1	24-8-2026		TLM2	
3.	'Trust' the Foundational Value in Relationship	1	25-8-2026		TLM2	
4.	'Trust' the Foundational Value in Relationship	**1**	27-8-2026		TLM2	
5.	**Tutorial PS7 Exploring the Feeling of Trust PLAYING A VIDEO.**	1	**28-8-2026**		TLM3	
6.	'Respect' as the Right Evaluation	1	31-8--2026		TLM2	
7.	**Tutorial PS8 Exploring the Feeling of Respect**	1	**01-09-2026**		TLM2	
8.	Other Feelings, Justice in Human-to-Human Relationship	**1**	03-09-2026		TLM2	
9.	Understanding Harmony in the Society	1	10-09-2026		TLM2	
10.	Vision for the Universal Human Order	1	11-09-2026		TLM2	
11.	**Tutorial PS9 Exploring systems to fufil Human Goal CHART PREPARATION.**	1	**15-09-2026**		TLM3	
No. of classes required to complete UNIT-III : 8+3			**No. of classes taken :**			

UNIT-IV : Harmony in the Nature/Existence

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.	Understanding Harmony in the Nature	1	17-09-2026		TLM2	
2.	Understanding Harmony in the Nature	1	18-09-2026		TLM2	
3.	Interconnectedness, self-regulation	1	21-09-2026		TLM2	
4.	Mutual Fulfilment among the Four Orders of Nature	1	**22-09-2026**		TLM2	
5.	**Tutorial PS10 Exploring Four Orders of Nature ROLE PLAY**	**1**	**24-09-2026**		TLM3	
6.	Realizing Existence as Co- existence at All Levels	1	25-09-2026		TLM2	
7.	Realizing Existence as Co-existence at All Levels	1	28-09-2026		TLM2	
8.	The Holistic Perception of Harmony in Existence	1	29-10-2026		TLM2	
9.	The Holistic Perception of Harmony in Existence	1	01-10-2026		TLM2	
10.	**Tutorial PS11 Exploring Co-existence in Existence PLAYING A VIDEO**	1	**05-10-2026**		TLM3	
No. of classes required to complete UNIT-IV : 8+2			**No. of classes taken :**			

UNIT-V : Implications of the Holistic Understanding

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.	Natural acceptance of human values	1	**06-10-2026**		TLM2	
2.	Definitiveness of (Ethical) Human Conduct	1	08-10-2026		TLM2	
3.	**TUTORIAL PS12 Exploring Ethical Human Conduct ROLE PLAY**	1	09-10-2026		TLM3	
4.	Basis for Humanistic Education	**1**	12-10-2026		TLM2	
5.	Humanistic Constitution and Universal Human Order	1	**13-10-2026**		TLM2	
6.	Humanistic Constitution and Universal Human Order	1	15-10-2026		TLM2	
7.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order	1	16-10-2026		TLM2	
8.	Competence in professional ethics	1	26-10-2026		TLM2	
9.	**TUTORIAL PS13 Exploring Humanistic Models in Education VIDEO PLAY**	**1**	28-10-2026		TLM3	
10.	Holistic Technologies, Production Systems and Management Models	1	**29-10-2026**		TLM2	
11.	Strategies for Transition towards Value-based Life and Profession	1	30-11-2026		TLM2	
12.	**TUTORIAL PS14 Exploring Steps of Transition towards Universal Human order CHART PREPARATION**	1	02-11-2026		TLM3	
No. of classes required to complete UNIT-V : 9+3			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transitions in the universal human order in the current society	1	03-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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**

ACADEMIC CALENDAR: A.Y 2026-27

Description	From	To	Weeks
I Phase of Instructions	13-07-2026	05-09-2026	8W
I Mid Examinations	07-09-2026	09-09-2026	**3 Days**
II Phase of Instructions	10-09-2026	17-10-2026	5 ½ W
Dussehra Holidays	19-10-2026	24-10-2026	1 W
II Phase of Instructions Cont.	26-10-2026	11-11-2026	2 ½ W
II Mid Examinations	12-11-2026	15-11-2026	**3 Days**
Preparation and Practical	16-11-2026	21-11-2026	1 W
Semester End Examinations	23-11-2026	05-11-2026	**2 W**

PART-D: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	43	
	Tutorial **Case study-5** **Think-pair-Share Learning-5** **Cooperative Group Learning-5**	**T**	15	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (5 Hrs)	**SL**	35	
		Total	**93**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.S.Muarahari.	Dr.B.Rajeswari.	Dr. B.Srinivasa Rao.	Dr. G. Srinivasulu.

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–D
Academic Year : 2026-27
Course Name & Code : Signals and Systems – 23EC02
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Rambabu

Course Objectives:

1	To study about signals and systems
2	To analyze the spectral characteristics of signals
3	To understand the characteristics of systems
4	To introduce the concept of sampling process
5	To know various transform techniques to analyze the signals and systems

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

CO 1	Summarize the basic concepts of signals, systems and sampling	L2
CO 2	Examine the operations on signals and approximate using orthogonal functions	L3
CO 3	Apply the concept of impulse response to analyze the LTI systems	L3
CO 4	Analyze both continuous time and discrete time signals and systems using Fourier series, Fourier transform, Laplace transforms and Z-Transforms	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
CO 1	2	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	2	1	1	-	-	-	-	-	-	-	-	-	1	-	2
CO 3	3	1	1	1	-	-	-	-	-	-	-	1	-	-	2
CO 4	3	2	1	1	-	-	-	-	-	-	-	2	2	-	3

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

Textbooks (T) and References (R):

T1: B P Lathi, Signals, Systems and Communications, BSP, 3rd Edition, 2003.
T2: AV Oppenheim, AS Wilsky and IT Young, Signals and Systems, PHI, 2nd Edition, 1997.
T3: Simon Haykin and Van Veen, Signals and Systems, Wiley, 2nd Edition 2007.
R1: B P Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2015.
R2: TK Rawat, Oxford University Press, 2011.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to course	1	13-07-2026			
2.	Introduction to Unit-I	1	15-07-2026			
3.	Definition and Classification of signals	1	16-07-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**17-07-2026**			
5.	Definition and Classification of systems	1	20-07-2026			
6.	Singularity and Related signals	1	22-07-2026			
7.	Complex exponential and sinusoidal signals	1	23-07-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**24-07-2026**			
9.	Operations on signals	1	27-07-2026			
10.	Properties of signals	1	29-07-2026			
11.	Analogy between vectors and signals	1	30-07-2026			
12.	**Tutorial (Cooperative Group Learning)**	**1**	**31-07-2026**			
13.	Approximation of a signal by another signal	1	03-08-2026			
14.	Orthogonal signal space, Approximation of a signal by a set of mutually another signals	1	05-08-2026			
15.	Orthogonality in complex signals	1	06-08-2026			
16.	**Tutorial (Flipped Classroom Learning)**	**1**	**07-08-2026**			
No. of classes required to complete UNIT-I : 12+4			**No. of classes taken :**			

UNIT-II: Fourier Series & Fourier Transforms

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.	Fourier series representation of continuous time periodic signals, Dirichlet's conditions	1	10-08-2026			
2.	Trigonometric Fourier series	1	12-08-2026			
3.	Exponential Fourier series	1	13-08-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**14-08-2026**			
5.	Relation between Trigonometric and Exponential Fourier series	1	17-08-2026			
6.	Properties of Fourier series	1	19-08-2026			
7.	Complex Fourier spectrum, Deriving Fourier transform from Fourier series	1	20-08-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**21-08-2026**			
9.	Fourier transform of arbitrary signals	1	24-08-2026			
10.	Fourier transform of standard signals	1	26-08-2026			
11.	**Tutorial (Cooperative Group Learning)**	**1**	**27-08-2026**			
12.	Fourier transform of periodic signals, Introduction to Hilbert Transform	1	28-08-2026			
13.	Properties of Fourier transforms	1	31-08-2026			
14.	Properties of Fourier transforms	1	02-09-2026			
No. of classes required to complete UNIT-II : 11+3			**No. of classes taken :**			

UNIT-III: Analysis of Linear Systems

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.	**Tutorial (Problem Based Learning)**	**1**	**14-09-2026**			
2.	Introduction, Linear and Non-linear systems	1	16-09-2026			
3.	Time invariant and Variant systems	1	17-09-2026			
4.	**Tutorial (Think-Pair-Share Learning)**	**1**	**18-09-2026**			
5.	Concept of convolution in time and frequency domain. Graphical representation of convolution	1	21-09-2026			
6.	Response of a LTI system	1	23-09-2026			
7.	System bandwidth, Signal bandwidth and Rise time, Distortion less transmission through a system	1	24-09-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**25-09-2026**			
9.	Filter characteristics of linear systems, Ideal and practical characteristics of LPF, HPF, BPF, BSF	1	28-09-2026			
10.	Causality and Poly-Wiener criterion for physical realization	1	30-09-2026			
No. of classes required to complete UNIT-III : 7+3			**No. of classes taken :**			

UNIT-IV : Correlation and Sampling Theorem

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.	Auto-correlation function and properties	1	30-09-2026			
2.	Energy spectral density, Power spectral density, Parseval's theorem	1	01-10-2026			
3.	Cross-correlation function and properties, Relation between Convolution and correlation	1	05-10-2026			
4.	Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering	1	07-10-2026			
5.	**Tutorial (Problem Based Learning)**	**1**	**08-10-2026**			
6.	Sampling Theorem, Graphical analysis of Sampling Theorem- Impulse sampling, Analytical analysis of Sampling Theorem	1	09-10-2026			
7.	Sampling Theorem for band limited signal- Band Pass sampling, Reconstruction of signal from its samples, Statement of Sampling theorem	1	12-10-2026			
8.	Effect of under sampling-Aliasing effect, Natural and Flat top Sampling	1	14-10-2026			
No. of classes required to complete UNIT-IV : 7+1			**No. of classes taken :**			

UNIT-V : Laplace Transforms and Z-Transforms

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, Concept of Laplace transform, Relation between Laplace and Fourier transform, Existence of Laplace transform	1	26-10-2026			
2.	Laplace transform of various classes of signals	1	28-10-2026			
3.	Region of convergence in s- Transform and Properties	1	29-10-2026			
4.	**Tutorial (Problem Based Learning)**	**1**	**30-10-2026**			
5.	Properties of Laplace transform	1	02-11-2026			
6.	Inverse Laplace transform	1	04-11-2026			
7.	Introduction to Z-Transform, Z-transform of various classes of signals Region of convergence in z- Transform and Properties	1	05-11-2026			
8.	**Tutorial (Think-Pair-Share Learning)**	**1**	**06-11-2026**			
9.	Properties of Z-transforms	1	09-11-2026			
10.	Inverse Z- transform	1	11-11-2026			
No. of classes required to complete UNIT-V : 8+2			**No. of classes taken :**			

Content Beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Transform Techniques	1	11-11-2026			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program Educational Objectives (PEOs):

PEO 1:	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
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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.
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PO 8:	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
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PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-4, Cooperative Group Learning-3, Flipped Classroom Learning-1**	**T**	13	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (15 Qns x 2 Hrs) Seminar (2 Hrs)	**SL**	32	
		Total	**91**	

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. B. Rambabu	Dr. B. Rambabu	Dr. G.L.N Murthy	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Department of Electronics and Communication Engineering

PART-A:

COURSE HANDOUT

Program : B.Tech. III-Sem., ECE., Section– D
Academic Year : 2026-27
Course Name & Code : **Electronic Devices and Circuits** – 23EC03
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B.V.N.R.Siva Kumar

Course Objectives:

1	To learn and understand the basic concepts of semiconductor physics.
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3	To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5	To learn and understand the purpose of transistor biasing and its significance
6	Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

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

CO 1	Recall the fundamentals of semiconductor physics necessary for electronic devices and circuits (Remember)	L1
CO 2	Illustrate the structure and operation of Diodes, Bipolar Junction Transistors, Field Effect Transistors and biasing of BJT & FET using fundamental circuits. (Understand)	L2
CO 3	Apply the knowledge of Diodes, Transistors and Filters for designing the Rectifiers, Regulators and Amplifier circuits using basic components. (Apply)	L3
CO 4	Analyze the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using V-I Characteristics. (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
CO 1	2	3	1	-	-	3	1	-	-	-	1	2	1	1	-
CO 2	2	1	2	1	-	3	1	-	-	-	-	1	1	1	-
CO 3	3	1	1	-	-	-	1	-	-	-	-	-	2	2	-
CO 4	1	3	-	-	-	-	-	-	-	-	1	1	2	2	-

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

Textbooks (T) and References (R):

T1: Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015..

T2: Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.

T3: Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

R1: Basic Electronics-Principles and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly Cambridge University Press, 1st edition, 2018.

R2: Electronics devices & circuit theory- Robert L.Boylestad and Louis Nashelsky, Pearson, 11th edition, 2015.

R3: Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.

Online Learning Resources:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Semiconductor Physics, Junction Diode Characteristics & Special Semiconductor Devices

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Methods	HOD
1	Introduction to COs and Outcomes. Unit-I Introduction	1	13-07-26			
2	Mobility and conductivity, Intrinsic and Extrinsic Semiconductors	1	15-07-26			
3	Continuity Equation, Law of Junction.	1	16-07-26			
4	TUTORIAL: Problem Based Learning	1	17-07-26			
5	Open circuited p-n junction, Biased p-n junction, p-n junction diode	1	20-07-26			
6	Current components in p-n junction Diode	1	22-07-26			
7	Diode equation, V-I Characteristics, Temperature dependence on V-I characteristics	1	23-07-26			
8	TUTORIAL: Think, Pair & Share Learning	1	24-07-26			
9	Diode resistance, Diode capacitance.	1	27-07-26			
10	Special Semiconductor Devices: Zener Diode, Breakdown Mechanisms and Applications	1	29-07-26			
11	Varactor Diode, LED	1	30-07-26			
12	TUTORIAL: Think Pair & Share learning	1	31-07-26			
13	Photodiode, Tunnel Diode	1	03-08-26			
14	UJT Operation and V-I characteristics	1	04-08-26			
15	PNPN Diode	1	05-08-26			
16	TUTORIAL: Cooperative Group Learning	1	07-08-26			
17	SCR Operation and V-I characteristics	1	10-08-26			
No. of classes required to complete UNIT-I : 13+4=17			No. of classes taken :			

UNIT-II: Diode Circuits

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	Diode Circuits: The Diode as a circuit element. The Load-Line concept.	1	12-08-26			
2	Piecewise Linear Diode Model, Clipping Circuits.	1	13-08-26			
3	TUTORIAL: Think Pair and Share	1	14-08-26			
4	Clipping at Two Independent Levels	1	17-08-26			
5	Peak Detector, Clamping circuits	1	19-08-26			
6	Basic Rectifier Setup, Half Wave Rectifier	1	20-08-26			
7	TUTORIAL: Flipped Class Learning	1	21-08-26			
8	Full Wave Rectifier, Bridge Rectifier	1	24-08-26			
9	Derivations of Characteristics of Rectifiers	1	26-08-26			
10	TUTORIAL: Problem Based learning	1	27-08-26			
11	Filters, Inductor Filter		28-08-26			
12	Capacitor Filter, π-Section Filter	1	31-08-26			
13	Comparison of various Filter Circuits in terms of Ripple Factors.	1	02-09-26			
14	REVISION	1	03-09-26			
15	TUTORIAL: Problem Based Learning	1	04-09-26			
No. of classes required to complete UNIT-II : 11+4=15			No. of classes taken :			

UNIT-III: Transistor Characteristics, Biasing and Thermal Stabilization

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	**Transistor Characteristics**: Junction transistor, Transistor current components	1	10-09-26			
2	TUTORIAL: Flipped Class Learning		11-09-26			
3	CB configuration, Transistor as an amplifier	1	14-09-26			
4	Characteristics of transistor in CB, CE configurations	1	16-09-26			
5	Characteristics of transistor in CE,CC configurations		17-09-26			
6	TUTORIAL: Flipped Class Learning	1	18-09-26			

7	Ebers - Moll model of a transistor, Punch through/ Reach through. Photo transistor, typical transistor junction voltage values.	1	21-09-26			
8	Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis	1	23-09-26			
9	BJT biasing- methods, basic stability, fixed bias, collector to base bias	1	24-09-26			
10	TUTORIAL: Flipped Class Learning	1	25-09-26			
11	Self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S,S',S'')	1	28-09-26			
12	Bias Compensation, Thermal Runaway, Thermal Stability	1	30-09-26			
No. of classes required to complete UNIT-III : 09+03			No. of classes taken :			

UNIT-IV : Small Signal Low Frequency Transistor Amplifier Models

S.No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	BJT: Two port network, Transistor hybrid model,	1	01-10-26			
2	Determination of h-parameters for a BJT amplifier, Conversion of h-parameters	1	05-10-26			
3	Generalized analysis of transistor amplifier model using h-parameters	1	07-10-26			
4	Analysis of CB amplifiers using exact and approximate analysis.	1	08-10-26			
5	TUTORIAL: Problem Based learning	1	09-10-26			
6	Analysis of CE & CC amplifiers using exact and approximate analysis	1	12-10-26			
7	Comparison of transistor amplifiers	1	14-10-26			
8	Generalized analysis of transistor amplifier model using h-parameters	1	15-10-26			
9	TUTORIAL: Problem Based learning	1	16-10-26			
No. of classes required to complete UNIT-III : 07+02 = 09				No. of classes taken :		

UNIT- V: FET, MOSFET and CMOS Amplifiers

S. No	Topics to be covered	No. of Classes required	Tentative Date of completion	Actual Date of completion	T / L Method	HOD
1	FET types, JFET operation,	1	26-10-26			

	Characteristics, Small signal model of JFET					
2	MOSFET Structure, Operation of MOSFET in triode region	1	28-10-26			
3	Operation in saturation region, MOSFET as a variable resistor	1	29-10-26			
4	TUTORIAL: Cooperative Group Learning	1	30-10-26	T		
5	Channel length modulation, MOS trans conductance	**1**	02-11-26			
6	MOS device models: MOS small signal model, PMOS Transistor,	1	04-11-26			
7	CMOS Technology, Comparison of Bipolar and MOS devices	1	05-11-26			
8	TUTORIAL: Flipped Class Learning	1	06-11-26	T		
9	CMOS amplifiers: General Considerations, Common Source Stage	1	09-10-26			
10	Common Gate Stage, Source follower, Comparison of FET amplifiers.	1	11-10-26			
No. of classes required to complete UNIT-III : 08+02=10				No. of classes taken :		

Content Beyond the Syllabus

S.No.	Topics to be covered	No. ofClasses Required	TentativeDate of Completion	ActualDate of Completion	TeachingLearning Methods	HOD Sign Weekly
1.	Realization of Universal gates with CMOS transistor	1	12-10-26			

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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	49	
	Tutorial **(Problem Based Learning, Think-Pair-Share Learning, Cooperative Group Learning, Flipped Classroom Learning)**	**T**	15	
Laboratory Instruction (LI): Experiments/practical performances /problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self Learning (SL):** Self Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure.	Virtual Labs Simulation of Circuits Assignment Data Sheets	**SL**	06 10 08 02	
		Total	90	

PART-E: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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.B.V.N.R. Siva kumar	Mr K V Ashok	Dr. B.V.N.R. Siva kumar	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART: A

Program : B.Tech. III-Sem., ECE., Section–D
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design – 23EC04
L-T-P-Cr : 3-0-0-3
Course Instructure : Mr. Ch. Siva Rama Krishna

Course Objectives:

1	To solve a typical number base conversion and analyze new error coding techniques.
2	Theorems and functions of Boolean algebra and behavior of logic gates
3	To optimize logic gates for digital circuits using various techniques
4	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
5	To understand concepts of combinational circuits.
6	To develop advanced sequential circuits.

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

CO 1	Summarize the key differences between number systems and their usage in Digital Circuits.	L2
CO 2	Identify the minimization techniques of Boolean expressions to implement Digital Circuits using basic logic gates and logic circuits	L3
CO 3	Apply the minimization and realization methods for designing the Combinational & Sequential logic circuits	L3
CO 4	Analyze the Combinational, Sequential, Finite State Machines for implementation of digital logic circuits	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
CO 1	2	3	1	-	-	-	-	2	-	-	-	1	-	3	-
CO 2	2	3	3	-	-	-	-	2	-	-	-	1	-	3	-
CO 3	2	3	3	1	-	-	-	2	-	-	-	1	-	3	-
CO 4	2	3	3	2	-	-	-	2	-	-	-	3	-	3	-

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

Textbooks (T) and References (R):

T1: Switching and finite automata theory Zvi.KOHAVI, Niraj. K. Jha 3rd Edition, Cambridge University Press, 2009.

T2: Digital Design by M. Morris Mano, Michael D Ciletti, 4th edition PHI publication, 2008.

T3: Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

R1: Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006

R2: Digital electronics by R S Sedha. S. Chand &company limited,2010

R3 : Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: REVIEW OF NUMBER SYSTEMS & CODES, BOOLEAN THEOREMS AND LOGIC 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.	Introduction to course	1	13-07-2026		TLM1	
2.	**Tutorial (Think-Pair-Share Learning)**	1	**16-07-2026**		TLM3	
3.	Introduction to Unit-I	1	17-07-2026		TLM1	
4.	Representation & conversions of different radix.	1	18-07-2026		TLM1	
5.	compliments of signed numbers	1	20-07-2026		TLM1	
6.	**Tutorial (Flipped Classroom Learning)**	1	**23-07-2026**		TLM3	
7.	Error detection and Error correction codes	1	24-07-2026		TLM1	
8.	Boolean theorems	1	25-07-2026		TLM1	
9.	Universal Logic operations	1	27-07-2026		TLM1	
10.	**Tutorial (Problem Based Learning)**	1	**30-07-2026**		TLM3	
11.	Standard SOP and POS Forms	1	31-07-2026		TLM1	
12.	NAND-NAND and NOR-NOR realizations	1	01-08-2026		TLM1	
13.	Realization of three level logic circuits.	1	03-08-2026		TLM1	
14.	**Tutorial (Cooperative Group Learning)**	1	**06-08-2026**		TLM3	
No. of classes required to complete UNIT-I: 10+4			**No. of classes taken:**			

UNIT-II: MINIMIZATION TECHNIQUES, COMBINATIONAL LOGIC CIRCUITS DESIGN.

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.	Minimization using Boolean theorems	1	07.08.2026		TLM1	
2.	Realization of switching functions using Boolean theorems	1	10.08.2026		TLM1	
3.	**Tutorial (Problem Based Learning)**	1	**13.08.2026**		TLM3	
4.	K-Map minimizations	1	14.08.2026		TLM1	
5.	Tabular method (Quine-McCluskey method)	1	17.08.2026		TLM1	
6.	**Tutorial (Flipped Classroom Learning)**	1	**20.08.2026**		TLM3	
7.	Design of Adders	1	21.08.2026		TLM1	
8.	Design of Sub tractors	1	22.08.2026		TLM1	
9.	4- bit adder-sub tractor circuit	1	24.08.2026		TLM1	
10.	**Tutorial (Think-Pair-Share Learning)**	1	**27.08.2026**		TLM3	
11.	Design of BCD adder circuit	1	28.08.2026		TLM1	
12.	Design of Excess 3 adder circuit	1	29.08.2026		TLM1	
13.	Carry look-a- head adder circuit	1	31.08.2026		TLM1	

14.	**Tutorial (Cooperative Group Learning)**	1	**03.09.2026**		TLM3	
15.	Design of code converts	1	05.09.2026		TLM1	
No. of classes required to complete UNIT-I: 12+3		**No. of classes taken:**				

UNIT-III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI, INTRODUCTION OF PLD's

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.	**Tutorial (Cooperative Group Learning)**	1	**10.09.2026**		TLM3	
2.	Design of encoder, decoder	1	11.09.2026		TLM1	
3.	multiplexer and de-multiplexers	1	12.09.2026		TLM1	
4.	**Tutorial (Problem Based Learning)**	1	**17.09.2026**		TLM3	
5.	Realization of Boolean functions using decoders	1	18.09.2026		TLM1	
6.	Realization of Boolean functions using mux	1	19.09.2026		TLM1	
7.	Design of Priority encoder, 4-bit digital comparator	1	21.09.2026		TLM1	
8.	**Tutorial (Think-Pair-Share Learning)**	1	**24.09.2026**		TLM3	
9.	seven segment decoder	1	25.09.2026		TLM1	
10.	PROM-Basics structures, realization of Boolean functions, Programming table.	**1**	26.09.2026		TLM1	
No. of classes required to complete UNIT-III: 8+3			**No. of classes taken:**			

UNIT-IV: SEQUENTIAL CIRCUITS-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.	Classification of sequential circuits	1	28.09.2026		TLM1	
2.	**Tutorial (Problem Based Learning)**	1	**01.10.2026**		TLM3	
3.	Flip-Flops: Truth tables and excitation tables	1	03.10.2026		TLM1	
4.	Flip-Flops conversions	1	05.10.2026		TLM1	
5.	**Tutorial (Flipped Classroom Learning)**	1	**08.10.2026**		TLM3	
6.	Conversion from one flip-flop to another flip- flop.	1	09.10.2026		TLM1	
7.	Design of ripple counters	1	12.10.2026		TLM1	
8.	**Tutorial (Cooperative Group Learning)**	1	**15.10.2026**		TLM3	
9.	Design of registers - Buffer register, control buffer register, Shift register.	1	16.10.2026		TLM1	
10.	Bi-directional, universal shift register.	1	17.10.2026		TLM1	
No. of classes required to complete UNIT-III: 7+3			**No. of classes taken:**			

UNIT-V: SEQUENTIAL CIRCUITS-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
1.	Finite state machine: state diagrams, state tables	1	26.10.2026		TLM1	
2.	**Tutorial (Problem Based Learning)**	1	**29.10.2026**		TLM3	
3.	Reduction of state tables	1	30.10.2026		TLM1	

4.	Mealy to Moore conversion	1	31.10.2026		TLM1
5.	Moore to Mealy to conversion	1	02.11.2026		TLM1
6.	**Tutorial (Think-Pair-Share Learning)**	1	**05.11.2026**		TLM3
7.	Realization of sequence generator	1	06.11.2026		TLM1
8.	Design of Clocked Sequential Circuit (with and without overlapping)	1	07.11.2026		TLM1
No. of classes required to complete UNIT-V: 05+2			**No. of classes taken :**		

Content beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to HDL, Verilog HDL	1	09.11.2026		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 (R23)

Evaluation Task	Marks
Assignment-I (Unit-I & Unit-II)	**A1=5**
I-Descriptive Examination (Units-I & Unit-II)	**M1=15**
I-Quiz Examination (Unit-I & Unit-II)	**Q1=10**
Assignment-II (Unit-III, Unit-IV & Unit-V)	**A2=5**
II- Descriptive Examination (Unit-III, Unit-IV & Unit-V)	**M2=15**
II-Quiz Examination (Unit-III, Unit-IV & Unit-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: PEOs, POs and PSOs

Program 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.

Program 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.

Program 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

PART-E: Teaching and Learning Scheme:

Type of Teaching and Learning Method			No. of Hrs Required	No. of Hrs Conducted
Classroom Instruction (CI): Lecture, Tutorial, Case method, Demonstrations, Video demonstration, Problem based learning, etc.	Lecture	**L**	46	
	Tutorial **Problem Based Learning-5, Think-Pair-Share Learning-4, Cooperative Group Learning-4, Flipped Classroom Learning-4**	**T**	17	
Laboratory Instruction (LI): Experiments/ practical performances/ problem-based experiences in laboratory, workshop, field, etc.	NA	**P**	NA	NA
Term Work (TW): Assignments, Seminars, Micro projects, Industrial visits, etc. **Self-Learning (SL):** Self-Learning, MOOCs, Spoken tutorials, Online educational resources, etc. (If provided in curriculum structure)	Assignments (13 Qns x 2 Hrs) Seminar (2 Hrs)	**SL**	28	
		Total	**91**	

Date:10-07-2026

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. Ch. Siva Rama Krishna	Ms. M V L Bhavani	Dr.P.Lachi Reddy	Dr. G. Srinivasulu

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

Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Date: 11-07-2026

Name of Course Instructor : Dr BVNR Siva Kumar, Mrs Y Padma, Mr K V Ashok, Mr PV Rao
Course Name & Code : Electronic Devices and Circuits Lab -23EC52
L-T-P Structure : 0-0-3 **Credits**: 1.5
Program/Sem/Sec : B.Tech., ECE. /III/ D **A.Y.** : 2026-27

Course Objectives: This course introduces the characteristics and applications of semiconductor devices. Emphasis is placed on characteristics and testing practically to strengthen the knowledge.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	Demonstrate the characteristics of BJT, FET, SCR, UJT and applications of diode. **(Apply-L3)**
CO2	Model the Rectifiers, filters and Amplifiers used in electronic circuits**. (Apply-L3)**
CO3	Analyze the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. **(Analyze – L4).**
CO4	Adapt effective Communication, presentation and report writing skills. **(Apply-L3)**

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

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

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

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 EDC Lab experiments, COs, POs and PSOs.	3	14-07-2026		TLM4	
2.	BJT Characterstics – CB,CE configurations	3	21-07-2026		TLM4	
3.	Estimation of ripple factor and regulation without and with LC filter. Half-wave & Full-wave Rectifier	3	28-07-2026		TLM4	
4.	Design of Clipper circuit using diode	3	04-08-2026		TLM4	
5.	Design of Clamping circuit using diode	3	11-08-2026		TLM4	
6.	Determination of Break over voltage of SCR using V-I Characteristics	3	18-08-2026		TLM4	
7.	UJT Characterstics	3	01-09-2026		TLM4	
8.	Revision	3	15-09-2026		TLM4	
9.	Determination of h-parameter of a BJT in CE configuration	3	22-09-2026		TLM4	
10.	Estimation of Stability factor for a transistor - self biasing circuit	3	29-09-2026		TLM 4	
11.	Frequency response of BJT-CE Amplifier	3	06-10-2026		TLM4	
12.	FET Characteristics – Drain & Transfer	3	13-10-2026		TLM4	
13.	Design of FET –CS Amplifier	3	27-10-2026		TLM4	
14.	Demonstration	3	03-11-2026		TLM4	
15.	Lab Internal Examination	3	10-11-2026			
No. of classes required: 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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

PART-D

Program Educational Objectives (PEOs):

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

Program 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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Program 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. B.V.N.R. Siva kumar	**Mr. P Venkateswara Rao**	**Dr. B.V.N.R. Siva kumar**	**Dr. G. Srinivasulu**

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. III-Sem., ECE., Section–D
Academic Year : 2026-27
Course Name & Code : Switching Theory and Logic Design Lab – 23EC53
L-T-P-Cr : 0-0-3-1.5
Course Instructure : Dr. K R Rudrama, Mr. Ch Siva Rama Krishna, Mrs. B Rajeswari, Ms. M V L Bhavani

Course Objectives:

This course gives the ability to design and verify digital logic circuits like; logic gates, combinational and sequential logic circuits using discrete components and Integrated Circuits.

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

CO 1	Demonstrate the functionality of Logic gates, Flip-flops, Shift registers and Counters	L2
CO 2	Apply the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates	L3
CO 3	Analyze the behavior of Combinational and Sequential logic circuits	L4
CO 4	Adapt effective Communication, presentation and report writing skills	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
CO 1	2	3	3	1	2	3	-	2	-	-	-	1	-	3	-
CO 2	2	1	1	1	1	3	-	2	-	-	-	1	-	3	-
CO 3	2	1	1	-	1	3	-	2	-	-	-	1	-	3	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-

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

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 STLD Lab, COs, Pos and PSOs.	3	18-07-2026		TLM4	
2.	Implementation of the following Logic gates using Universal Gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR	3	25-07-2026		TLM4	
3.	Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.	3	01-08-2026		TLM4	
4.	Verification of functional table of 3 to 8-line Decoder /De-multiplexer	3	22.08.2026		TLM4	
5.	4 variable logic function verification using 8 to1 multiplexer.	3	29.08.2026		TLM4	
6.	Design full adder circuit and verify its functional table.	3	05.09.2026		TLM4	
7.	Verification of functional tables of (i) JK Master Slave Flip–Flop (ii) D Flip-Flop	3	12.09.2026		TLM4	
8.	Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output	3	19.09.2026		TLM4	
9.	Verify the operation of 4-bit Universal Shift Register for different Modes of operation	3	26.09.2026		TLM4	
10.	Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test It with a low frequency clock and sketch the output waveforms	3	03.10.2026		TLM4	
11.	Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.	3	10.10.2026		TLM4	
12.	Draw the circuit diagram of a single bit comparator and test the output	3	17.10.2026		TLM4	
13.	Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.	3	31.10.2026		TLM4	
14.	Design of any combinational circuit, sequential circuit using Hardware Description Language (Additional Experiments)	3	01.11.2026		TLM4	
15.	Lab Internal Examination	3	08.11.2026			
No. of classes required: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 (R23 Regulation):

Evaluation Task	Expt. no's	Marks
Day to Day work	1,2,3,4,5,6,7,8…	A1 =10
Record and observation	1,2,3,4,5,6,7,8…	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8…	**C1=15**
Cumulative Internal Examination (CIE):(A1+B1+C1)	1,2,3,4,5,6,7,8…	**30**
Semester End Examination (SEE)	1,2,3,4,5,6,7,8…	**70**
Total Marks=CIE+SEE		**100**

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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: 10-07-2026

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. K R Rudrama Mr. Ch Siva Rama Krishna Mrs. B Rajeswari Ms. M V L Bhavani	Mr. Ch Siva Rama Krishna	Dr. P.Lachi Reddy	Dr. G. Srinivasulu

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **Mr. Y. Babu / Ms. Md. Sajeena**
Course Name & Code **: Data Structures using C & 23CSS3**
L-T-P Structure **: 0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/III/D-Sec. **A.Y.:** 2026-27

PREREQUISITE: **Introduction to Programming**

COURSE OBJECTIVES: The main objectives of the course are to

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

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

CO1: Implement Various Searching & Sorting Techniques. (**Apply - L3**)

CO2: Implement Linked List, Stack & Queue data structures. (**Apply - L3**)

CO3: Design and implement algorithms for operations on binary trees and binary search trees. (**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	3	2													
CO2	3	2													
CO3	3	2													
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	Teaching Learning Method	HOD Sign
1.	Introduction to Arrays, Searching Techniques	3	14-07-2026 15-07-2026		TLM3 TLM4	
2.	Sorting Techniques	3	21-07-2026 22-07-2026		TLM3 TLM4	
3.	Linked List Programs	4	28-07-2026 29-07-2026 11-08-2026		TLM3 TLM4 TLM3	
4.	Circular Double Linked List Program	5	12-08-2026 18-08-2026 19-08-2026		TLM4 TLM3 TLM4	
5.	Stack using Arrays and Linked List	4	25-08-2026 01-09-2026 02-09-2026		TLM3 TLM3 TLM4	
6.	Infix to Postfix, Evaluation of Postfix Expression using Stack	4	15-09-2026 16-09-2026 22-09-2026		TLM3 TLM4 TLM3	
7.	Queue using Arrays and Linked List	5	23-09-2026 29-09-2026 30-09-2026		TLM4 TLM3 TLM4	
8.	Circular Queue using Arrays and Linked List Dequeue using Linked List	4	06-10-2026 07-10-2026 13-10-2026		TLM3 TLM4 TLM3	

9.	Binary Search Tree	5	14-10-2026 27-10-2026 28-10-2026		TLM4 TLM3 TLM4	
10.	Binary Tree Traversals	4	03-11-2026 04-11-2026 10-11-2026		TLM3 TLM4 TLM3	
11.	Lab Internal Exam	3	11-11-2026		TLM4	

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

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
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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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.Y.Babu**	**Dr. G. Sambi Reddy**	**Dr. Y. V. Bhaskar Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 21001:2018,50001:2018,14001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., ECE-D
ACADEMIC YEAR : 2026-27
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. V. Bhagya Lakshmi
COURSE COORDINATOR : Dr. Shaheda Niloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	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	3	-	-	-	3	3	3	-	-	-	3	-	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	-	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-
CO5	3	3	3	3	-	3	3	3	-	-	-	3	-	-	-

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.

T2. Palaniswamy, Environmental Studies,2/e, Pearson education,2014.

T3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company,2021.

T4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

R1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.

R2. Deeksha Daveand E. Sai Baba Reddy, Text book of Environmental Science,2/e, Cengage Publications, 2012.

R3. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication, 2014.

R4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications,2006.

R5. J. Glynn Henryand GaryW. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.

R6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

R7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science,1/e, Prentice Hall of India Private limited, 1991.

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	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	13-07-2026		TLM2			
2.	Multidisciplinary Nature ofEnvironmental Studies	1	16-07-2026		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	20-07-2026		TLM1	CO1	T1,T2	
4.	Water resources	1	23-07-2026		TLM2	CO1	T1,T2	
5.	Mineral resources	1	27-07-2026		TLM1	CO1	T1,T2	
6.	Food resources	1	30-07-2026		TLM2	CO1	T1,T2	
7.	Energy resources	1	03-08-2026		TLM2			
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
8.	Ecosystems – Structure & Functions	1	06-08-2026		TLM4	CO2	T1,T2	
9.	Ecological succession &	1	10-08-2026		TLM1	CO2	T1,T2	
10.	Food chains, Food webs & Ecological Pyramids	1	13-08-2026		TLM4	CO2	T1,T2	
11.	Types of ecosystems	1	17-08-2026		TLM1	CO2	T1,T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	20-08-2026		TLM2	CO2	T1,T2	
13.	Values of Biodiversity, India as mega diversity nation	1	24-08-2026		TLM2	CO2	T1,T2	
14.	, Threats to biodiversity and Conservation of biodiversity	1	27-08-2026					
15.	Revision	1	31-08-2026					
No. of classes required to complete UNIT-II		08			No. of classes taken:			

I MID EXAMINATIONS (07-09-2026 TO 09-09-2026)

UNIT-III: Environmental Pollution

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
16.	Environmental pollution -Air pollution	1	10-09-2026		TLM1	CO3	T1,T2	
17.	Water pollution, Marine pollution, Thermal pollution	1	17-09-2026		TLM1	CO3	T1,T2	
18.	Soil pollution	1	21-09-2026		TLM1	CO3	T1,T2	
19.	Solid waste management	1	24-09-2026		TLM1	CO3	T1,T2	
20.	Disaster management	1	28-09-2026		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
21.	From Unsustainable to Sustainable development	1	01-10-2026		TLM1	CO4	T1,T2	
22.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	05-10-2026		TLM1	CO4	T1,T2	
23.	Environmental ethics, Climate change	1	08-10-2026		TLM6	CO4	T1,T2	

24.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	12-10-2026		TLM1	CO4	T1,T2	
25.	Environmental Acts	1	15-10-2026		TLM1	CO4	T1,T2	
26.	Environmental Acts	1	26-10-2026		TLM1	CO4	T1,T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	29-10-2026		TLM1	CO5	T1,T2	
28.	Environment and human health –Human Rights – Value Education	1	02-11-2026		TLM1	CO5	T1,T2	
29.	HIV/AIDS – Women and Child Welfare	1	05-11-2026		TLM1	CO5	T1,T2	
30.	Role of information Technology in Environment and human health	1	09-11-2026		TLM1	CO5	T1,T2	
31.	Revision	1	09-11-2026		TLM3	CO5	T1,T2	
No. of classes required to complete UNIT-V		06			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
32.	Awareness on ozone layer Case studies	1	03-09-2026		TLM2	CO2	T1,T2	
II MID EXAMINATIONS (12-11-2026 TO 14-11-2026)								

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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.

Dr. V. Bhagya Lakshmi	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD