LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Y. RAGHUVAMSI
Course Name & Code : CONTROL SYSTEMS – 23EE09
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem/Sec: B.Tech/ECE/IV/A **A.Y.:** 2024-25

Pre-requisites: Basic Engineering Mathematics
Course Educational Objectives: The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.
COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Derive the transfer function of physical systems using block diagram algebra and signal flow graphs. **(Apply-L3)**
CO2	Obtain the time response of first order and specifications of second order systems. **(Apply-L3).**
CO3	Analyze the stability of LTI systems using Routh's stability criterion and root locus method. **(Apply-L3)**
CO4	Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. **(Apply-L3)**
CO5	Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability. **(Apply-L3)**

Course Articulation Matrix - Correlation between COs, POs & PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3	PSO4
CO1	3	2	2													
CO2	3	2	2													
CO3	3	2	2													
CO4	3	2	2													3
CO5	3	2	2										2			2

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

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition.
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://archive.nptel.ac.in/courses/108/106/108106098/
3. https://nptelvideos.com/video.php?id=1423&c=14

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Mathematical Modelling of Control 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 to Subject and COs, Classification of control systems	1	09-12-2024		TLM2	
2.	Open loop and closed loop control systems	1	10-12-2024		TLM2	
3.	Tutorial-Feedback characteristics	1	11-12-2024		TLM3	
4.	Transfer function of linear system	1	13-12-2024		TLM1	
5.	Differential equations of electrical networks	1	16-12-2024		TLM1	
6.	Differential equations of electrical networks	1	17-12-2024		TLM1	
7.	Tutorial-Translational and rotational mechanical systems-Problems	1	18-12-2024		TLM3	
8.	Translational and rotational mechanical systems-Problems	1	20-12-2024		TLM1	
9.	Transfer function of DC servo motor	1	23-12-2024		TLM2	
10.	Block diagram representation	1	24-12-2024		TLM2	
11.	Block diagram representation	1	27-12-2024		TLM1	
12.	Signal flow graph representation	1	30-12-2024		TLM2	
13.	Signal flow graph representation	1	31-12-2024		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT – II: Time Response Analysis -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
14.	Standard test signals	1	03-01-2025		TLM2	
15.	Time response of first order system	1	06-01-2025		TLM1	
16.	Time response of second order system	1	07-01-2025		TLM1	
17.	Tutorial-Time response of second order system-Problems	1	08-01-2025		TLM3	
18.	Time domain specifications	1	10-01-2025		TLM1	
19.	Time domain specifications	1	17-01-2025		TLM1	
20.	Steady state errors and error constants	1	20-01-2025		TLM1	
21.	Steady state errors and error constants	1	21-01-2025		TLM1	
22.	Tutorial-Effects of proportional (P) – proportional integral (PI)	1	22-01-2025		TLM3	
23.	Effects of proportional derivative (PD) and proportional integral derivative (PID) systems	1	24-01-2025		TLM2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT – III: Time Response Analysis - 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
24.	The concept of stability	1	03-02-2025		TLM2	
25.	Routh's stability criterion	1	04-02-2025		TLM1	
26.	Tutorial-Routh's stability criterion, limitations	1	05-02-2025		TLM3	
27.	Root locus concept	1	07-02-2025		TLM2	
28.	Root locus concept	1	10-02-2025		TLM2	

29.	Construction of root loci - simple problems	1	11-02-2025		TLM1	
30.	Tutorial-Construction of root loci - simple problems	1	12-02-2025		TLM3	
31.	Construction of root loci - simple problems	1	14-02-2025		TLM1	
32.	Effect of addition of Poles and Zeros to the transfer function	1	17-02-2025		TLM2	
33.	Effect of addition of Poles and Zeros to the transfer function	1	18-02-2025		TLM1	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT – IV: Frequency Response Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Introduction to frequency domain specifications	1	19-02-2025		TLM2	
35.	Bode diagrams	1	21-02-2025		TLM2	
36.	Transfer function from the Bode diagram	1	24-02-2025		TLM1	
37.	Polar plots	1	25-02-2025		TLM2	
38.	Polar plots	1	28-02-2025		TLM1	
39.	Nyquist stability criterion	1	03-03-2025		TLM2	
40.	Nyquist stability criterion	1	04-03-2025		TLM1	
41.	Tutorial-Stability analysis using Bode plots	1	05-03-2025		TLM3	
42.	Stability analysis using Bode plots	1	07-03-2025		TLM1	
43.	Classical Control Design Techniques: Lag, lead, lag-lead compensators	1	10-03-2025		TLM2	
44.	Lag, lead, lag-lead compensators	1	11-03-2025		TLM1	
45.	Tutorial-Physical realization	1	12-03-2025		TLM3	
46.	Design of compensators using Bode plots	1	17-03-2025		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT – V: State Space Analysis of LTI 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
47.	Concepts of state - state variables and state model	1	18-03-2025		TLM2	
48.	Tutorial-State space representation of transfer function: Controllable Canonical Form	1	19-03-2025		TLM3	
49.	Observable Canonical Form, Diagonal Canonical Form	1	21-03-2025		TLM2	
50.	Observable Canonical Form, Diagonal Canonical Form	1	24-03-2025		TLM1	
51.	Diagonalization using linear transformation	1	25-03-2025		TLM1	
52.	Tutorial-Solving the time invariant state equations	1	26-03-2025		TLM3	
53.	State Transition Matrix and its properties	1	28-03-2025		TLM2	
54.	Concepts of controllability and observability	1	01-04-2025		TLM2	
55.	Tutorial-Concepts of controllability and observability	1	02-04-2025		TLM3	
56.	Revision	1	04-04-2025		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.	Simulation of transfer function and state space representation	1	04-04-2025		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 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): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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
PSO 1:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. Y. Raghuvamsi**	**Dr. K.R.L. Prasad**	**Dr. P. Sobha Rani**	**Dr. J.S.V.Prasad**
Signature				

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/Sem/Sec : B.Tech., ECE., IV-Sem., Section - A
Course Instructor : Dr. B.Poornaiah, Professor of ECE
Course Name & Code : Analog Communications – 23EC07
L-T-P-Cr Structure : 3-0-0-3
Academic Year : 2024-25

Course Objectives:

1	To provides the Knowledge on various analog modulation techniques in both time and frequency domains.
2	To understand the generation and demodulation methods of various analog modulation techniques.
3	To give the information regarding functions of AM and FM transmitters and receivers.
4	To understand the effect of noise on the performance of AM and FM receivers and the principles of PAM, PWM, and PPM, TDM and FDM techniques.

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

CO1	Describe the Modulation and Demodulation techniques of Amplitude Modulation.	L2
CO2	Interpret the generation and detection of Angle Modulation techniques.	L2
CO3	Summarize the concepts of Radio Transmitters and Receivers	L2
CO4	Illustrate the noise performance in Analog Modulation techniques and also the concepts of Pulse Analog Modulation and Demodulation techniques	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	2	2	1	-	-	-	-	-	-	-	-	2	1	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	2	-	-
CO3	2	2	1	1	-	-	-	-	-	-	-	2	3	-	-
CO4	2	3	1	1	-	-	-	-	-	-	-	3	3	-	-

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

TEXT BOOKS:

1. Communication Systems, Simon Haykin, Michael Moher, Wiley, 5th Edition, 2009.
2. Principles of Communication Systems, H Taub, D L Schilling, Gautam Sahe, TMH, 4th Edition, 2017.
3. Modern Digital and Analog Communication Systems, B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017.

REFERENCE BOOKS:

1. Electronics & Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna, TMH, 6th Edition, 2017.
2. Communication Systems, R P Singh, S D Sapre, TMH, 3nd Edition, 2017.
3. Communication Systems (Analog and Digital), Dr. Sanjay Sharma, Katson Books, 7th Reprint Edition, 2018

ONLINE LEARNING RESOURCES:

1. http://nptel.ac.in/courses/117102059/ Prof. Surendra Prasad.
2. https://nptel.ac.in/courses/117105143
3. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf.
4. https://www.scribd.com/document/266137872/sanjay-sharma-pdf.
5. http://bayanbox.ir/view/91440908351988908 6/Book-Modern-Digital-And-AnalogCommunication- Systems-4th-edition-by-Lathi.pdf.
6. https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20 BY%20GEORGE%20KENNEDY.pdf

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

UNIT-I: Amplitude Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Course	1	10-12-2024		TLM2	
2.	Course Objectives and Course Outcomes	1	11-12-2024		TLM2	
3.	Introduction to communication system	1	12-12-2024		TLM2	
4.	Tutorial	1	14-12-2024		TLM3	
5.	Need for modulation	1	17-12-2024		TLM1	
6.	Amplitude Modulation, Time domain and Frequency domain descriptions	1	18-12-2024		TLM1	
7.	Single tone modulation, Power relations in AM waves	1	19-12-2024		TLM1	
8.	Tutorial	1	21-12-2024		TLM3	
9.	Generation of AM waves: Square law Modulator, Switching modulator	1	24-12-2024		TLM2	
10.	Detection of AM Waves: Square law detector, Envelope detector	1	25-12-2024		TLM2	
No. of classes required to complete UNIT-I:10			No. of classes taken:			

UNIT-II: DSB & SSB Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Double sideband suppressed carrier modulator: Time domain and frequency domain description	1	26-12-2024		TLM2	
12.	Tutorial	1	28-12-2024		TLM3	

13.	Generation of DSBSC Waves: Balanced Modulator	1	31-12-2024		**TLM2**	
14.	Generation of DSBSC Waves: Ring Modulator	1	02-01-2025		**TLM2**	
15.	Detection of DSBSC Waves: Coherent detection, Quadrature Null Effect	1	04-01-2025		**TLM2**	
16.	Tutorial	1	07-01-2025		**TLM3**	
17.	Costas Loop, Time domain and Frequency domain description of SSBSC Signal	1	08-01-2025		**TLM1**	
18.	Generation of SSBSC Waves: Frequency discrimination method, Phase discrimination method	1	09-01-2025		**TLM1**	
19.	Demodulation of SSB Waves: Coherent Detection	1	11-01-2025		**TLM1**	
20.	Vestigial sideband modulation: Time domain description, Frequency domain description	1	18-01-2025		**TLM2**	
21.	Tutorial	1	21-01-2025		**TLM3**	
22.	Generation of VSB Modulated wave	1	22-01-2025		**TLM2**	
23.	Envelope detection of a VSB Wave pulse Carrier, Comparison of different AM Techniques	1	23-01-2025		**TLM2**	
24.	Applications of different AM Systems, Frequency Division Multiplexing, Related problems	1	25-01-2025		**TLM2**	
25.	Tutorial	1			**TLM3**	
No. of classes required to complete UNIT-II :15			**No. of classes taken:**			

UNIT-III: Angle Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction, Basic concept of phase modulation, Frequency Modulation	1	04-02-2025		**TLM1**	
27.	Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave	1	05-02-2025		**TLM1**	
28.	Narrow band FM, Wide band FM Constant Average Power, Transmission bandwidth of FM Wave	1	06-02-2025		**TLM1**	
29.	Generation of FM Waves: Direct Method, Indirect Method	1	08-02-2025		**TLM2**	
30.	Detection of FM Waves: Balanced Frequency discriminator, zero crossing detector,	1	11-02-2025		**TLM2**	
31.	Phase locked loop	1	12-02-2025		**TLM2**	
32.	Tutorial	1	13-02-2025		**TLM2**	
33.	Comparison of FM & AM, Related problems	1	15-02-2025		**TLM1/TLM2**	
No. of classes required to complete UNIT-III:8			**No. of classes taken:**			

UNIT-IV: Radio Transmitters & Radio Transmitters

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Classification of Transmitters	1	18-02-2025		TLM1/TLM2	
35.	AM Transmitter, Effect of feedback on performance of AM Transmitter	1	19-02-2025		TLM1/TLM2	
36.	Tutorial	1	20-02-2025		TLM3	
37.	FM Transmitter: Variable reactance type FM Transmitter, Frequency stability in FM Transmitter.	1	22-02-2025		TLM1/TLM2	
38.	Radio Receivers: Receiver Types	1	25-02-2025		TLM1/TLM2	
39.	Tuned radio frequency receiver	1	27-02-2025		TLM1/TLM2	
40.	Tutorial	1	01-03-2025		TLM1/TLM2	
41.	Super heterodyne receiver	1	04-03-2025		TLM1/TLM2	
42.	RF section and Characteristics, Frequency changing and tracking,	1	05-03-2025		TLM1/TLM2	
43.	Intermediate frequency, AGC	1	06-03-2025		TLM1/TLM2	
44.	FM Receiver, Amplitude limiting	1	08-03-2025		TLM1/TLM2	
No. of classes required to complete UNIT-IV:11			**No. of classes taken:**			

UNIT-V: Noise & Pulse Analog Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Noise in DSB Systems	1	11-03-2025		TLM1	
46.	Noise in SSB Systems	1	12-03-2025		TLM1	
47.	Tutorial	1	13-03-2025		TLM3	
48.	Noise in AM System and Noise in Angle Modulation Systems	1	15-03-2025		TLM1	
49.	Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis.	1	18-03-2025		TLM1	
50.	Pulse Analog Modulation: Types of Pulse modulation	1	19-03-2025		TLM2	
51.	Tutorial	1	20-03-2025		TLM3	
52.	PAM (Single polarity, double polarity),	1	22-03-2025		TLM2	
53.	PWM: Generation & Detection of PWM	1	25-03-2025		TLM2	
54.	PPM: Generation and Detection of PPM, Time Division Multiplexing	1	26-03-2025		TLM2	

55.	Tutorial	1	27-03-2025		**TLM3**	
No. of classes required to complete UNIT-V:11			**No. of classes taken**			

Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
56.	Recent Trends in Communication	**1**	29.04.2025	**TLM2**		

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

PART-C: EVALUATION PROCESS:

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	**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.

Date	Dr. B.Poornaiah	Dr. B.Poornaiah	Dr.M.V.Sudhakar	Dr.G.Srinivasulu
09.12.2025	**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., IV-Sem., Section – A
Academic Year: 2024-25
Course Name & Code : Electronic Circuit Analysis – 23EC06
L-T-P-Cr Structure: 3-0-0-3
Course Instructor : Dr E V Krishna Rao, Professor

Course Objectives:

1	To learn the concepts of single stage amplifiers, multistage amplifiers, feedback amplifiers, and oscillators.
2	To study the effect of negative feedback on amplifiers.
3	To analyze the characteristics of power amplifiers, tuned amplifiers
4	To design the small signal high frequency amplifiers, multistage amplifiers, differential amplifiers.

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

CO 1	Illustrate the concepts of cascading of single stage amplifiers, feedback amplifier and oscillator circuits	L2
CO 2	Analyze the effect of negative feedback on amplifier characteristics, Power amplifiers-Class A, B, C, AB and tuned amplifier circuits.	L4
CO 3	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept	L3
CO 4	Design and analysis of small signal high frequency transistor amplifiers, multistage amplifiers and Differential amplifier using BJT.	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															
CO 3															
CO 4															

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

Textbooks (T) and References (R):

T1: Integrated Electronics- J. Millman and C. C. Halkias, Tata McGraw-Hill, 2022.

T2: Electronic Devices and Circuit Theory –Robert L. Boylestad and Louis Nashelsky, Pearson/ Prentice Hall, Tenth Edition, 2009.

T3: Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006.

R1: Electronic Circuits Analysis and Design –Donald A. Neaman, Mc Graw Hill, 2010.

R2: Microelectronic Circuits - Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
R3 : Electronic Circuit Analysis-B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, Pearson Publications.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: BJT

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 Outcomes,	1	09-12-2024			
2.	UNIT-1: Introduction	1	12-12-2024			
3.	Transistor at high frequencies, Hybrid- π common Emitter transistor model	1	13-12-2024			
4.	Determination of high frequency parameters in terms of low-frequency parameters	1	13-12-2024			
5.	Derivation of Hybrid π Resistances	1	16-12-2024			
6.	TUTORIAL-1	1	19-12-2024			
7.	Hybrid π conductance, Hybrid π capacitance	1	20-12-2024			
8.	Validity of hybrid π model, Millers theorem	1	20-12-2024			
9.	CE short circuit current gain with resistive load	1	23-12-2024			
10.	TUTORIAL-2	1	26-12-2024			
11.	Cut-off frequencies, frequency response and gain bandwidth product.	1	27-12-2024			
12.	**FET:** Analysis of common Source circuits at high frequencies.	1	27-12-2024			
13.	Analysis of common Drain circuits at high frequencies.	1	30-12-2024			
No. of classes required to complete UNIT-I : 13			**No. of classes taken :**			

UNIT-II: MULTISTAGE AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	TUTORIAL-3	1	02-01-2025			
2.	Classification of amplifiers, methods of coupling	1	03-01-2025			
3.	Cascaded transistor amplifier	1	03-01-2025			
4.	Two stage RC coupled amplifier analysis	1	06-01-2025			
5.	TUTORIAL-4	1	09-01-2025			
6.	Cascode amplifier analysis	1	10-01-2025			
7.	High input resistance transistor amplifier circuits	1	10-01-2025			
8.	Darlington pair amplifier analysis	1	20-01-2025			
9.	TUTORIAL-5	1	23-01-2025			
10	Boot-strap emitter follower	1	24-01-2025			
11	Differential amplifier using BJT	1	24-01-2025			
No. of classes required to complete UNIT-II: 11			**No. of classes taken:**			

UNIT-III: FEEDBACK AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Feedback principle and concept, types of feedback	1	03-02-2025			
2.	TUTORIAL-6	1	06-02-2025			
3.	Classification of amplifiers, Characteristics of negative feedback amplifiers	1	07-02-2025			
4.	Feedback topologies	1	07-02-2025			
5.	Voltage series Feedback amplifier analysis	1	10-02-2025			
6.	TUTORIAL-7	1	13-02-2025			
7.	Current shunt Feedback amplifier analysis	1	14-02-2025			
8.	Current series Feedback amplifier analysis	1	14-02-2025			
9.	Performance comparison of feedback amplifiers	1	17-02-2025			
10	TUTORIAL-8	1	20-02-2025			
11	Voltage shunt Feedback amplifier analysis	1	21-02-2025			
No. of classes required to complete UNIT-III: 11			**No. of classes taken:**			

UNIT-IV: OSCILLATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Oscillator principle, condition for oscillations, Types of oscillators	1	21-02-2025			
2.	Analysis of RC- phase shift oscillator using BJT	1	24-02-2025			
3.	TUTORIAL-9	1	27-02-2025			
4.	Analysis of Wien bridge oscillator using BJT	1	28-02-2025			
5.	Generalized analysis of LC oscillators	1	28-02-2025			
6.	Hartley oscillator using BJT	1	03-03-2025			
7.	TUTORIAL-10	1	06-03-2025			
8.	Colpitt's oscillator using BJT	1	07-03-2025			
9.	Crystal oscillator	1	07-03-2025			
10.	Frequency and amplitude stability of oscillators	1	10-03-2025			
No. of classes required to complete UNIT-IV: 10			**No. of classes taken:**			

UNIT-V: POWER AMPLIFIERS, TUNED AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	TUTORIAL-11	1	13-03-2025			
2.	Classification of Power amplifiers (A to H)	1	14-03-2025			
3.	Class A power Amplifier (Series-fed, Transformer coupled)	1	14-03-2025			

4.	Class B Push-pull amplifier, Complementary symmetry push pull amplifier	1	17-03-2025		
5.	TUTORIAL-12	1	20-03-2025		
6.	Class AB Push-pull amplifier, Complementary symmetry push pull amplifier	1	21-03-2025		
7.	Class-C power amplifier, Thermal stability and Heat sinks.	1	21-03-2025		
8.	Tuned Amplifiers: Introduction, Q-Factor	1	24-03-2025		
9.	TUTORIAL-13	1	27-03-2025		
10.	Small signal tuned amplifier	1	28-03-2025		
11.	capacitance single tuned amplifier	1	28-03-2025		
12.	Double tuned amplifiers	1	31-03-2025		
13.	TUTORIAL-14	1	03-04-2025		
14	Staggered tuned amplifiers	1	04-04-2025		
No. of classes required to complete UNIT-V: 14			**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.	Applications of power amplifiers	1	04-04-2025			

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 (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: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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.
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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:

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P. Venkateswara Rao	Dr E V Krishna Rao	Dr.T. Satyanarayana	Dr. G. Srinivasulu

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College Code: 76

MASTER OF BUSINESS ADMINISTRATION
COURSE HANDOUT

PART-A

Name of Course Instructor : **Dr.A. Adisesha Reddy**
Course Name & Code : **MEFA-23HS02**
L-T-P Structure : 2-0-0 Credits: 2
Program/Sem/Sec : ECE., IV-Sem., A.Y : 2024-25

Prerequisite: Basic Knowledge in business activities.

Course Educational Objectives: In this course, the students will learn

1.	To impart the basic knowledge about the concepts of economics and to equip the students with the analytical tools of economics and apply the same to rational Managerial decision-making
2.	To delineate the role of demand and demand forecasting for effective decision making.
3.	To develop economic way of thinking while dealing with production and cost analysis to solve business problems and challenges.
4.	To understand the concept of market intelligence and to evaluate the nature of different Market structures for sensible economic managerial decisions.
5.	To infuse the basic knowledge about the concepts of macro-economic principles and the skills needed to apply them in making informed, strategic business decisions.

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

CO1:	Define the concepts related to Managerial Economics, Financial Accounting and Management (L2)
CO2:	Understand the Fundamentals of Economics viz., Demand, Production, Cost, Revenue and Markets (L2)
CO3:	Apply the Concept of Production cost and Revenues for effective Business Decision (L3).
CO4:	Evaluate the Capital Budgeting Techniques. (L3)
CO5:	Develop the Accounting Statements and Evaluate the Financial Performance of Business Entity (L4).

Co-Po Articulation Matrix:

Course Outcomes (COs)	**Program Outcomes (POs)**				
	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	2	-
CO2	2	3	2	1	1
CO3	3	2	1	2	2
CO4	3	2	1	2	1
CO5	2	3	2	1	3

1=Slight(low) 2=Moderate (Medium) 3=Substantial (High)

Text Books

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

REFERENCE BOOKS:

1. Ahuja H Managerial economics S Chand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Business Economics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion n	Actual Date of Completeon	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Orientation	1	09-12-2024		TLM1	CO1	T1,R2	
2.	Introduction to Economics	1	11-12-2024		TLM1	CO1	T1,R2	
3.	Definitions of Economics-Scarcity, Growth	1	11-12-2024		TLM1	CO1	T1,R2	
4.	Nature and Scope of Managerial Economics	1	13-12-2024		TLM1	CO1	T1,R2	
5.	Demand Function	1	16-12-2024		TLM1	CO1	T1,R2	
6.	-Law of demand		18-12-2024					
7.	Elasticity of demand	1	20-12-2024		TLM1	CO1	T1,R2	
8.	Types of Elasticity of Demand	1	23-12-2024		TLM1	CO1	T1,R2	
9.	Demand Forecasting - Methods of demand forecasting	1	27-12-2024		TLM3	CO1	T1,R2	
No. of classes required to complete UNIT-I		09		No. of classes taken:				

UNIT-II: Theory of Production and Cost analysis

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.	Production Function	1	30-12-2024		TLM1	CO2	T1,R2	
2.	Isoquant and Isocost, Least Cost Combination of inputs	1	03-01-2025		TLM1	CO2	T1,R2	
3.	Law of Variable Proportion	1	06-01-2025		TLM1	CO2	T1,R2	
4.	Law of Returns	1	08-01-2025		TLM1	CO2	T1,R2	
5.	Internal and External Economies of Scale	1	11-01-2025		TLM1	CO2	T1,R2	
6.	Cost, Cost Concepts	1	20-01-2025		TLM1	CO2	T1,R2	
7.	Cost Output Relationship	1	22-01-2025		TLM1	CO2	T1,R2	
8.	Break-even Analysis	1	24-01-2025		TLM1	CO2	T1,R2	

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

UNIT-III: Market Structures & Pricing Policies

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.	I Mid exam	1	27-01-25		TLM1	CO3	T2,R4	
2.	I Mid exam	1	29-01-25		TLM1	CO3	T2,R4	
3.	I Mid exam	1	31-01-25		TLM1	CO3	T2,R4	
4.	Market structures	1	02-02-25		TLM1	CO3	T2,R4	
5.	Types of markets, Features and price out determinations under Perfect competition	1	05-02-25		TLM1	CO3	T2,R4	
6.	Features and price out determinations under Perfect competition	1	07-02-25		TLM1	CO3	T2,R4	
7.	Features and price out determinations under Monopoly	1	09-02-25		TLM1	CO3	T2,R4	
8.	Features and price out determinations under Monopolistic competition	1	12-02-25		TLM1	CO3	T2,R4	
9.	Pricing –Pricing polices & its Objectives	1	14-02-25		TLM1	CO3	T2,R4	
10.	Pricing Methods and its applications in business.	1	16-02-2025		TLM1	CO3	T2,R4	
No. of classes required to complete UNIT-III		10		No. of classes taken:				

UNIT-IV: Capital and Capital Budgeting

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.	Nature and its significance	1	19-02-25		TLM2	CO4	T2,R4	
2.	Types of Capital, nature, Significance	1	21-02-25		TLM2	CO4	T2,R4	
3.	Sources of raising capital	1	23-02-25		TLM1	CO4	T2,R4	
4.	Capital budgeting Significance	1	26-02-25		TLM1	CO4	T2,R4	
5.	Capital budgeting Process	1	28-02-25		TLM1	CO4	T2,R4	
6.	Techniques of Capital Budgeting (non-discounted cash flow techniques	1	02-03-25		TLM1	CO4	T2,R4	
7.	Discounted cash flow of techniques).	1	05-03-2025		TLM1	CO4	T2,R4	
8.	Discounted cash flow of techniques).	1	07-03-2025		TLM1	CO4	T2,R4	
No. of classes required to complete UNIT-IV		08		No. of classes taken:				

UNIT-V: Financial Accounting and analysis

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.	Accounting – significance-	1	09-03-2025		TLM1	CO5	T2,R4	
2.	Book Keeping -Double entry system	1	12-03-2025		TLM1	CO5	T2,R4	
3.	Journal- Ledger	1	14-03-2025		TLM1	CO5	T2,R4	
4.	Trial Balance	1	16-03-2025		TLM1	CO5	T2,R4	
5.	Final Accounts with simple adjustments	1	19-03-2025		TLM1	CO5	T2,R4	
6.	Final Accounts with simple adjustments	1	21-03-2025		TLM1	CO5	T2,R4	
7.	Financial Statement Analysis through ratios	1	23-03-2025		TLM1	CO5	T2,R4	
8.	Financial Statement Analysis through ratios	1	26-03-2025		TLM1	CO5	T2,R4	
9.	Financial Statement Analysis through ratios Problems	1	28-03-2025		TLM1	CO5	T2,R4	
10.	Overview of the syllabus	1	02-04-2025		TLM1	CO5	T2,R4	
11.	Content beyond the syllabus	1	04-04-20255		TLM1	CO5	T2,R4	
12.	II Mid exams	1	07-04-2025		TLM1	CO5	T2,R4	
13.	II Mid exams	1	09-04-2025		TLM1	CO5	T2,R4	
No. of classes required to complete UNIT-V		11		No. of classes taken:				

Content beyond 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
1.	Financial Accounting	1	02-04-25					
2.	Behavioral economics	1	04-04-25					
		02						

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	COs	Marks
I-Mid Examination (Descriptive) =**A**	1,2	A=30

II-Mid Examination (Descriptive) =**B**	3,4,5	B=30
Evaluation of Mid Marks: **A+B**=80% of Max(A,B)+20% of Min(A,B)	1,2,3,4,5	A+B=30
Evaluation of Report Writing and Seminar Presentation =**C**	1,2,3,4,5	C=10
Cumulative Internal Examination : A+B+C	**1,2,3,4,5**	**A+B+C=40**
Semester End Examinations =D	**1,2,3,4,5**	**D=60**
Total Marks: A+B+C+D	**1,2,3,4,5**	**100**

PROGRAM EDUCATION OBJECTIVES (PEO's)

- To train the students of the management program for logical and practical approach to problem solving and function effectively as skilled managers who can respond to changing environment in a social and global context.
- To groom the students to work in multicultural and multidisciplinary teams for effective problem solving and understand the principles of group dynamics, Team work and growth of Management profession.
- To encourage and train the students as a way that they can pursue higher studies, start independent ventures, thereby contributing to the fields of Education and Business world.

PROGRAM OUTCOMES

1. Apply knowledge of management theories and practices to solve business problems.
2. Foster Analytical and critical thinking abilities for data-based decision making.
3. Ability to develop Value based Leadership ability.
4. Ability to understand, analyse and communicate global, economical, legal and ethical aspects of business.
5. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

Dr.A. Adisesha Reddy	Dr.A. Adisesha Reddy	Dr.A. Adisesha Reddy	Dr. A Adisesha reddy
Course Instructor	Course Coordinator	Module Coordinator	HOD

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. IV-Sem., ECE., Section–C
Academic Year : 2024-25
Course Name & Code : Electromagnetic Waves and Transmission Lines – 23EC04
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Ramesh Reddy

Course Objectives:

1	To understand the fundamentals of electric fields, coulomb's law and gauss law
2	To familiar with of Biot-Savart's Law, Ampere's Circuital Law and Maxwell equations
3	To know the electromagnetic wave propagation in dielectric and conducting media
4	To study the equivalent circuit and parameters of the transmission lines
5	To learn the working of smith chart and its usage in the calculation of transmission line parameters

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

CO 1	Describe the concepts of electromagnetic field intensities using coulomb's law, Gauss law, Biot-Savart's Law and Ampere's Circuital Law. (Understand – L2)
CO 2	Analyze the electromagnetic wave propagation in dielectric and conducting media. (Apply – L3)
CO 3	Summarize the primary and secondary constants of different types of transmission lines. (Understand – L2)
CO 4	Examine the parameters input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using Smith chart. (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
CO 1	3	1	2	-	-	-	-	-	-	-	-	1	2	-	-
CO 2	3	2	2	3	1	-	-	-	-	-	-	2	3	-	-
CO 3	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO 4	3	3	1	-	-	-	-	-	-	-	-	1	2	-	-

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

Textbooks (T) and References (R):

T1: Elements of Electromagnetics–Matthew N.O.Sadiku,Oxford University Press,7th Edition, 2018.

T2: Electromagnetic Waves and Radiating Systems–E.C.Jordan & K.G.Balmain,PHI,2nd Edition, 2008.

R1: Engineering Electromagnetics–William H.Hayt,John A.Buck, Jaleel M.Akhtar,TMH,9th Edn,2020.

R2: Electromagnetic Field Theory and Transmission Lines –G. S. N. Raju, Pearson Education 2006.

R3: Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao,Wiley India 2013.

R4: Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Co-ordinate Systems, Electrostatics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Course	1	09-12-2024			
2.	Review of Coordinate Systems- Vector Algebra	1	10-12-2024			
3.	Coordinate Systems, Vector Calculus	1	12-12-2024			
4.	Coulomb's Law, Electric Field Intensity (E) due to a Point Charge	1	16-07-2024			
5.	A Line Charge, A Surface Charge,A Volume Charge	1	17-12-2024			
6.	Electric Flux Density (D)	1	19-12-2024			
7.	Gauss's Law and Applications	1	21-12-2024			
8.	Electric Potential (V) and Potential Gradient (∇V)	1	23-12-2024			
9.	Maxwell's two Equations for Electrostatic Fields	1	24-12-2024			
10.	Electrostatic Energy and Energy Density	1	26-12-2024			
11.	Convection and Conduction Currents, Poisson's and Laplace's Equations	1	28-12-2024			
12.	Capacitance Parallel-Plate Capacitor	1	30-12-2024			
13.	Coaxial Capacitor	1	31-12-2024			
No. of classes required to complete UNIT-I : 13			**No. of classes taken :**			

UNIT-II: Magnetostatics

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.	Magnetic Field Intensity (H) and Biot-Savart's Law	1	03-01-2025			
2.	Ampere's Circuital Law and Applications	1	06-01-2025			
3.	Magnetic Flux Density (B), Maxwell's two Equations for Magnetostatic Fields	1	07-01-2025			
4.	Magnetic Scalar and Vector Potentials	1	08-01-2025			
5.	Force Due to Magnetic Field, Ampere's Force Law	1	10-01-2025			
6.	Inductance, Magnetic Energy and Energy Density	1	17-01-2025			
7.	Time Varying Fields, Faraday's Law and Transformer EMF	1	20-01-2025			
8.	Inconsistency of Ampere's Law and Displacement Current Density	1	21-01-2025			
9.	Maxwell's Equations in Different Final Forms and Word Statements	1	22-01-2025			
10.	Conditions at a Boundary Surface	1	24-01-2025			

No. of classes required to complete UNIT-II : 10	No. of classes taken :	

UNIT-III: EM Wave Characteristics

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.	Wave Equations for Conducting and Perfect Dielectric Media	1	03-02-2025			
2.	Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations	1	04-02-2025			
3.	Wave Propagation in Lossy dielectrics	1	05-02-2025			
4.	Wave Propagation in Lossless dielectrics	1	07-02-2025			
5.	Wave Propagation in free space	1	10-02-2025			
6.	Wave propagation in good conductors, skin depth	1	11-02-2025			
7.	Polarization & Types	1	12-02-2025			
8.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Dielectric Interface	1	14-02-2025			
9.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Conductor Interface	1	17-02-2025			
10.	Reflection and Refraction of Plane Waves at Oblique Incidences for Parallel Polarization-Brewster Angle	1	18-02-2025			
11.	Reflection and Refraction of Plane Waves at Oblique Incidences for Perpendicular Polarization	1	19-02-2025			
12.	Critical Angle and Total Internal Reflection, Surface Impedance	1	21-02-2025			
13.	Poynting Vector and Poynting Theorem	1	24-02-2025			
14.	Problem Solving Session	1	25-02-2025			
15.	Problem Solving Session	1	28-02-2025			
No. of classes required to complete UNIT-III : 15			No. of classes taken :			

UNIT-IV: Transmission Lines - 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.	Types of Transmission Lines, Equivalent Circuit, Transmission Line Equations	1	03-03-2025			
2.	Secondary Constants of Transmission Lines, Primary Constants of Transmission Lines	1	04-03-2025			
3.	Expressions for Characteristic Impedance, Propagation Constant, Phase Velocity	1	05-03-2025			
4.	Infinite Line, Lossless Line, Distortion less Line	1	07-03-2025			
5.	Problem Solving Session	1	10-03-2025			
6.	Problem Solving Session	1	11-03-2025			
7.	Problem Solving Session	1	12-03-2025			
8.	Problem Solving Session	1	17-03-2025			
No. of classes required to complete UNIT-IV : 8			No. of classes taken :			

UNIT-V: Transmission Lines - 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.	Input Impedance Relations	1	18-03-2025			
2.	Reflection Coefficient, VSWR, Average Power	1	19-03-2025			
3.	Shorted Lines, Open Circuited Lines, and Matched Lines, UHF Lines as Circuit Elements	1	21-03-2025			
4.	Smith Chart – Construction and Applications	1	24-03-2025			
5.	Quarter wave transformer, Introduction to Stub Matching	1	25-03-2025			
6.	Problem Solving Session	1	26-03-2025			
7.	Problem Solving Session	1	28-03-2025			
No. of classes required to complete UNIT-V : 7			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 Antenna and Wave Propagation	1	01-04-2025			
2.	Introduction to Mobile Communication	1	02-04-2025			
3.	Introduction to Satellite Communication	1	04-04-2025			

Teaching Learning Methods

TLM 1	Chalk and Talk	**TLM 6**	Assignment or Quiz
TLM 2	PPT	**TLM 7**	Seminar or GD
TLM 3	Tutorial	**TLM 8**	Lab
TLM 4	Problem Solving	**TLM 9**	Case Study
TLM 5	Programming	**TLM 10**	Others

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:

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

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : M.Hema Latha
Course Name & Code : PYTHON PROGRAMMING & 23CSS1
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech/IV/ECE-A,ECE-C **A.Y.:** 2024-25

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:

The main objectives of this course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES (CO):

CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**

CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**

CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**

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

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
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	Topic to be covered	No. of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python	1	09-12-2024		
2.	Python Installation, Variables, Data types. Reading Input, Print output,Comments	3	12-12-2024		
3.	Types of operators, Working on Operators	1	16-12-2024		
4.	Sample Programs, Type Conversion, Control stmts if, else, nestedif, elif	3	19-12-2024		
5.	Loop statements	1	23-12-2024		
6.	Programs on Loop statements, pass, continue and break	3	26-12-2024		
7.	Exception Handling	1	30-12-2024		
8.	Programs on exception handling.	3	02-01-2025		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	06-01-2025		
10.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.	3	09-01-2025		
11.	Strings Introduction, Basic String Operations	1	20-01-2025		
12.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	23-01-2025		
13.	Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists	1	27-01-2025		
14.	**Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	30-01-2025		
15.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	1	03-02-2025		
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	06-02-2025		

17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	1	10-02-2025		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	13-02-2025		
19.	**Unit-4**: Introduction to files,Types of Files, Creating and Reading Text Data	1	17-02-2025		
20.	File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	20-02-2025		
21.	Pickle Module	1	24-02-2025		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	27-02-2025		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	03-03-2025		
24.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	06-03-2025		
25.	Encapsulation, Inheritance, Polymorphism,	1	10-03-2025		
26.	Sample Python programs on object-oriented programming.	3	13-03-2025		
27.	**Unit 5: Introduction to Data Science**: Functional Programming,JSON and XML in Python	1	17-03-2025		
28.	NumPy with Python, Example Programs on Numpy	3	20-03-2025		
29.	Pandas	1	24-03-2025		
30.	Example Programs on pandas.	3	27-03-2025		
31.	RIVISION	1	27-03-2025		
32.	**Internal Exam**	3	03-04-2025		

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

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.
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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	**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	Organize, Analyze and Interpret the data to extract meaningful conclusions..
PSO 2	Design, Implement and evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Signature				
Name of the Faculty	**M.Hema Latha**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.V.B Reddy**	*Dr B.Srinivasa Rao*

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)
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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., IV-Sem., Section - A
Course Instructor : Mr. T.Anil Raju, Professor of ECE
Course Name & Code : Signals and Systems Lab – 23EC54
L-T-P-Cr Structure : 0-0-3-1.5
Academic Year : 2024-25

Course Objectives:

1	To understand the basics of MATLAB Programming
2	To get hands on experience on handling numerous signals and datasets
3	To visualize real time signals

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

CO1	Understand the basics of MATLAB Programming.	L2
CO2	Perform basic operations on Signals	L3
CO3	Obtain the spectral representation of given signal	L3
CO4	Adapt effective Communication, presentation and report writing skills.	L3

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

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

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

TEXT BOOKS:

1. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers - Rudra Pratap, Oxford University Press

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

UNIT-I: Amplitude Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to MATLAB (Variables, loops)	3	11.12.2024			
2.	Introduction to MATLAB (Functions, File handling)	3	18.12.2024			
3.	Generation of Basic Signals (Analog and Discrete)	3	25.12.2024			
4.	Operations on signals	3	08.01.2025			
5.	Estimation of energy and power of signals	3	22.01.2025			
6.	Obtain the response of a system using convolution	3	29.01.2025			
7.	Perform correlation between signals	3	05.02.2025			
8.	Estimation of Fourier coefficients of a given periodic signal	3	12.02.2025			
9.	Analysis of Fourier spectrum using Fourier Transform	3	19.02.2025			
10.	Estimation of Laplace transform of an arbitrary function	3	27.02.2025			
11.	Estimation of Z- transform of an arbitrary function	3	05.03.2025			
12.	Estimation of power Spectral density for noise signals	3	12.03.2025			
13.	Content Beyond Syllabus: Working with real time data handling	3	19.03.2025			
14.	Content Beyond Syllabus: Working with real time data handling	3	26.03.2025			
15.	Internal Exam	3	02.04.2025			
No. of weeks required to complete experiments :12			**No. of classes taken:**			

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

PART-C: EVALUATION PROCESS:

Evaluation Task	Experiment Nos.	Marks
Day to Day work	1,2,3,4,5,6,7,8,9,10	A1 =10
Record and observation	1,2,3,4,5,6,7,8,9,10	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8,9,10	C1=15
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8,9,10	30
Semester End Examination (SEE)	1,2,3,4,5,6,7,8,9,10	70
Total Marks=CIE+SEE 100	1,2,3,4,5,6,7,8,9,10	30
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.
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Program Outcomes(POs):

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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.

Date	Mr.T.Anil Raju	Dr. G L N Murthy	Dr. G L N Murthy	Dr.G.Srinivasulu
09.12.2024	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution, Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. E V Krishna Rao, Dr. B V N R Siva Kumar
Course Name & Code : Design Thinking & Innovation (23ME57)
Regulation : R23
L-T-P Structure **:** 1-0-2 **Credits:** 02
Program/Sem/Sec : B. Tech – IV Semester – A Section **A.Y.:** 2024-25

PREREQUISITE: None

COURSE OBJECTIVES:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process

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

CO1	Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**
CO2	Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**
CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions**. (Analyzing-L4)**
CO4	Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**
CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. **(Evaluating-L5)**

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

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.

2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

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
	UNIT–I: INTRODUCTION TO DESIGN THINKING					
1	Introduction to elements and principles of Design	1	14-12-2024		TLM2	
	Activity: To understand the importance of design	2	14.12.2024		TLM6	
2	History of Design Thinking, New materials in Industry	1	21.12.2024		TLM2	
	Activity: To understand the importance of team work	2	21.12.2024		TLM6	
3	Basics of design-dot, line, shape, form as fundamental design components	1	28.12.2024		TLM2	
	Activity: Developing sketches using dot, line and form	2	28.12.2024		TLM6	
	UNIT–II: DESIGN THINKING PROCESS					
4	Design thinking process: Empathy	1	04.1.2025		TLM2	
	Activity: To understand the significance of Empathy	2	04.1.2025		TLM6	
5	Design thinking process: Define or Analyze	1	08.2.2025		TLM2	
	Activity: To understand the significance of Define/analyze	2	08.2.2025		TLM6	
6	Design thinking process: Ideate	1	15.2.2025		TLM2	
	Activity: To understand the significance of Ideate	2	15.2.2025		TLM6	

7	Design thinking process: Prototype	1	22.2.2025		TLM2	
	Activity: To understand the significance of Prototype	2	22.2.2025		TLM6	
8	Tools of design thinking in social innovations	1	01.3.2025		TLM2	
	Activity: Students should present their understanding of DTI elements using example	2	01.3.2025		TLM6	
	UNIT – III: INNOVATION					
9	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	1	08.3.2025		TLM2	
	Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation	2	08.3.2025		TLM6	
	UNIT – IV: PRODUCT DESIGN					
10	Problem formation, introduction to product design, Product strategies, Product value	1	15.3.2025		TLM2	
	Activity: Development of Business models, setting of specifications	2	15.3.2025		TLM6	
11	Product planning, product specifications. Innovation towards product design Case studies.	1	22.3.2025		TLM2	
	Activity: Explaining their own product and model design, case studies	2	22.3.2025		TLM6	
	UNIT – V: DESIGN THINKING IN BUSINESS PROCESSES					
12	Business & Strategic Innovation, Business challenges, Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes	1	29.3.2025		TLM2	
	Activity: Marketing strategies of our own product, its maintenance, Reliability and plan for startup	2	29.3.2025		TLM6	
I Mid Exams: 27-01-2025 to 01-02-2025						
II Mid Exams: 07-04-2025 to 12-04-2025						
No. of classes required to complete: 36				**No. of classes taken:**		

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

PART-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Internal Examination	30
Semester End Examination	70
Total Marks:	**100**

ACADEMIC CALENDAR

Commencement of IV Semester Classwork	09-12-2024		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	**27-01-2025**	**01-02-2025**	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	**07-04-2025**	**12-04-2025**	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	**21-04-2025**	**03-05-2025**	2 W
Internship	05-05-2025	28-06-2025	8 W
Commencement of V Semester Classwork	**30 –06–2025**		

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
PEO 2	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
PEO 3	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design

	system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering
PSO 2	Possesses ability to plan, examine and analyze the various laboratory test required for the professional demands
PSO 3	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain

Signature				
Name of the Faculty	Dr. E V Krishna Rao Dr. B V N R Siva Kumar	Dr B Rambabu	Dr B Poornaiah	Dr. G Srinivasulu
Designation	**Course Instructors**	**Course Coordinator**	**Module Coordinator**	**HOD**

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/Sem/Sec : B.Tech., ECE., IV-Sem., Section – A
Academic Year: 2024-25
Course Name & Code : Electronic Circuit Analysis – 23EC06
L-T-P-Cr Structure: 3-0-0-3
Course Instructor : Dr E V Krishna Rao, Professor

Course Objectives:

1	To learn the concepts of single stage amplifiers, multistage amplifiers, feedback amplifiers, and oscillators.
2	To study the effect of negative feedback on amplifiers.
3	To analyze the characteristics of power amplifiers, tuned amplifiers
4	To design the small signal high frequency amplifiers, multistage amplifiers, differential amplifiers.

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

CO 1	Illustrate the concepts of cascading of single stage amplifiers, feedback amplifier and oscillator circuits	L2
CO 2	Analyze the effect of negative feedback on amplifier characteristics, Power amplifiers-Class A, B, C, AB and tuned amplifier circuits.	L4
CO 3	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept	L3
CO 4	Design and analysis of small signal high frequency transistor amplifiers, multistage amplifiers and Differential amplifier using BJT.	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															
CO 3															
CO 4															

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

Textbooks (T) and References (R):

T1: Integrated Electronics- J. Millman and C. C. Halkias, Tata McGraw-Hill, 2022.

T2: Electronic Devices and Circuit Theory –Robert L. Boylestad and Louis Nashelsky, Pearson/ Prentice Hall, Tenth Edition, 2009.

T3: Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006.

R1: Electronic Circuits Analysis and Design –Donald A. Neaman, Mc Graw Hill, 2010.

R2: Microelectronic Circuits - Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
R3 : Electronic Circuit Analysis-B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, Pearson Publications.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: BJT

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 Outcomes,	1	09-12-2024			
2.	UNIT-1: Introduction	1	12-12-2024			
3.	Transistor at high frequencies, Hybrid- π common Emitter transistor model	1	13-12-2024			
4.	Determination of high frequency parameters in terms of low-frequency parameters	1	13-12-2024			
5.	Derivation of Hybrid π Resistances	1	16-12-2024			
6.	TUTORIAL-1	1	19-12-2024			
7.	Hybrid π conductance, Hybrid π capacitance	1	20-12-2024			
8.	Validity of hybrid π model, Millers theorem	1	20-12-2024			
9.	CE short circuit current gain with resistive load	1	23-12-2024			
10.	TUTORIAL-2	1	26-12-2024			
11.	Cut-off frequencies, frequency response and gain bandwidth product.	1	27-12-2024			
12.	**FET:** Analysis of common Source circuits at high frequencies.	1	27-12-2024			
13.	Analysis of common Drain circuits at high frequencies.	1	30-12-2024			
No. of classes required to complete UNIT-I : 13			**No. of classes taken :**			

UNIT-II: MULTISTAGE AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	TUTORIAL-3	1	02-01-2025			
2.	Classification of amplifiers, methods of coupling	1	03-01-2025			
3.	Cascaded transistor amplifier	1	03-01-2025			
4.	Two stage RC coupled amplifier analysis	1	06-01-2025			
5.	TUTORIAL-4	1	09-01-2025			
6.	Cascode amplifier analysis	1	10-01-2025			
7.	High input resistance transistor amplifier circuits	1	10-01-2025			
8.	Darlington pair amplifier analysis	1	20-01-2025			
9.	TUTORIAL-5	1	23-01-2025			
10	Boot-strap emitter follower	1	24-01-2025			
11	Differential amplifier using BJT	1	24-01-2025			
No. of classes required to complete UNIT-II: 11			**No. of classes taken:**			

UNIT-III: FEEDBACK AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Feedback principle and concept, types of feedback	1	03-02-2025			
2.	TUTORIAL-6	1	06-02-2025			
3.	Classification of amplifiers, Characteristics of negative feedback amplifiers	1	07-02-2025			
4.	Feedback topologies	1	07-02-2025			
5.	Voltage series Feedback amplifier analysis	1	10-02-2025			
6.	TUTORIAL-7	1	13-02-2025			
7.	Current shunt Feedback amplifier analysis	1	14-02-2025			
8.	Current series Feedback amplifier analysis	1	14-02-2025			
9.	Performance comparison of feedback amplifiers	1	17-02-2025			
10	TUTORIAL-8	1	20-02-2025			
11	Voltage shunt Feedback amplifier analysis	1	21-02-2025			
No. of classes required to complete UNIT-III: 11			**No. of classes taken:**			

UNIT-IV: OSCILLATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Oscillator principle, condition for oscillations, Types of oscillators	1	21-02-2025			
2.	Analysis of RC- phase shift oscillator using BJT	1	24-02-2025			
3.	TUTORIAL-9	1	27-02-2025			
4.	Analysis of Wien bridge oscillator using BJT	1	28-02-2025			
5.	Generalized analysis of LC oscillators	1	28-02-2025			
6.	Hartley oscillator using BJT	1	03-03-2025			
7.	TUTORIAL-10	1	06-03-2025			
8.	Colpitt's oscillator using BJT	1	07-03-2025			
9.	Crystal oscillator	1	07-03-2025			
10.	Frequency and amplitude stability of oscillators	1	10-03-2025			
No. of classes required to complete UNIT-IV: 10			**No. of classes taken:**			

UNIT-V: POWER AMPLIFIERS, TUNED AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	TUTORIAL-11	1	13-03-2025			
2.	Classification of Power amplifiers (A to H)	1	14-03-2025			
3.	Class A power Amplifier (Series-fed, Transformer coupled)	1	14-03-2025			

4.	Class B Push-pull amplifier, Complementary symmetry push pull amplifier	1	17-03-2025		
5.	TUTORIAL-12	1	20-03-2025		
6.	Class AB Push-pull amplifier, Complementary symmetry push pull amplifier	1	21-03-2025		
7.	Class-C power amplifier, Thermal stability and Heat sinks.	1	21-03-2025		
8.	Tuned Amplifiers: Introduction, Q-Factor	1	24-03-2025		
9.	TUTORIAL-13	1	27-03-2025		
10.	Small signal tuned amplifier	1	28-03-2025		
11.	capacitance single tuned amplifier	1	28-03-2025		
12.	Double tuned amplifiers	1	31-03-2025		
13.	TUTORIAL-14	1	03-04-2025		
14	Staggered tuned amplifiers	1	04-04-2025		
No. of classes required to complete UNIT-V: 14			**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.	Applications of power amplifiers	1	04-04-2025			

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 (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: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date:

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P. Venkateswara Rao	Dr E V Krishna Rao	Dr.T. Satyanarayana	Dr. G. Srinivasulu

MASTER OF BUSINESS ADMINISTRATION
COURSE HANDOUT

PART-A

Name of Course Instructor : **M r s . Y N A G A M A N I**
Course Name & Code : **MEFA-23HS02**
L-T-P Structure : 2-0-0 Credits: 2
Program/Sem/Sec : ECE B&C., IV-Sem. A. Y : 2024-25

Prerequisite: Basic Knowledge in business activities.

COURSE EDUCATIONAL OBJECTIVES(CEO):

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview of investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements

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

CO1	Define the concepts related to Managerial Economics, Financial Accounting and Management. **(Understand-L2)**
CO2	Understand the fundament also Economics viz., Demand, Production, cost, revenue and markets. **(Understand-L2)**
CO3	Apply the Concept of Production cost and revenues for effective Business decision **(Apply-L3)**
CO4	Evaluate the capital budgeting techniques **(Analyze-L4)**
CO5	Develop accounting statements and evaluate the financial performance of business entity. **(Analyze-L4)**

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

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

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi. 4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Business Economics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion n	Actual Date of Completeon	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Orientation	1	10-12-24		TLM1	CO1	T1,R2	
2.	Orientation	1	12-12-24		TLM1	CO1	T1,R2	
3.	Introduction to Economics	1	14-12-24		TLM1	CO1	T1,R2	
4.	Explaining about CO-PO	1	17-12-24		TLM1	CO1	T1,R2	
5.	Definitions of Economics-Scarcity, Growth	1	19-12-24		TLM1	CO1	T1,R2	
6.	Nature and Scope of Economics	1	21-12-24		TLM1	CO1	T1,R2	
7.	Demand-Law of demand	1	24-12-24		TLM1	CO1	T1,R2	
8.	Elasticity of demand	1	26-12-24		TLM1	CO1	T1,R2	
9.	Types of Elasticity of demand	1	28-12-24		TLM1	CO1	T1,R2	
10	Demand Forecasting -	1	07-1-2025		TLM3	CO1	T1,R2	
11	Methods of demand forecasting	1	07-1-2025					
No. of classes required to complete UNIT-I		12		No. of classes taken:				

UNIT-II: Theory of Production and Cost analysis

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.	Production Function	1	16-01-25		TLM1	CO2	T1,R2	
2.	Isoquant and Isocost	1	18-02-25		TLM1	CO2	T1,R2	
3.	Least Cost Combination of inputs	1	21-01-25		TLM1	CO2	T1,R2	
4.	Law of Returns	1	23-01-25		TLM1	CO2	T1,R2	
5.	Internal and External Economies of Scale	1	25-01-25		TLM1	CO2	T1,R2	
6.	Cost Concepts	1	15-02-25		TLM1	CO2	T1,R2	
7.	Break-even Analysis	1	18-02-25		TLM1	CO2	T1,R2	
No. of classes required to complete UNIT-II		07		No. of classes taken:				

UNIT-III: Markets & Pricing Policies

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.	I Mid exam		27-01-25		TLM1	CO3		
2.	I Mid exam		22-02-25		TLM1	CO3		
3.	I Mid exam		25-02-25		TLM1	CO3		
4.	I Mid exam		01-02-25		TLM1	CO3		
5.	Market structures	1	04-03-25		TLM1	CO3	T2,R4	
6.	Markets-Types of markets	1	06-03-25		TLM1	CO3		
7.	Features and price out determinations under Perfect competition	1	08-03-25		TLM2	CO3		
8.	Features and price out determinations under Monopoly	1	11-03-25		TLM1	CO3		
9.	Features and price out determinations under Monopolistic competition	1	13-03-25		TLM1	CO3		
10.	Pricing –Pricing polices & its Objectives	1	15-03-25		TLM1	CO3	T2,R4	
11.	Pricing Methods and its applications in business.	1	22-03-25		TLM2	CO3	T2,R4	
No. of classes required to complete UNIT-III		11		No. of classes taken:				

UNIT-IV: Capital and Capital Budgeting

S. No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Nature and its significance	1	05-03-25		TLM2	CO4	T2,R4	
2.	Types of Capital	1	06-03-25		TLM2	CO4	T2,R4	
3.	Sources of raising capital	1	06-03-25		TLM1	CO4	T2,R4	
4.	Capital budgeting Significance	1	19-03-25		TLM1	CO4	T2,R4	
5.	Capital budgeting Process	1	29-03-25		TLM1	CO4	T2,R4	
6.	Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).	2	29-03-25		TLM1	CO4	T2,R4	
No. of classes required to complete UNIT-IV		7		No. of classes taken:				

UNIT-V: Financial Accounting and analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completi on	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Week ly
1.	Accounting – significance- Book Keeping -Double entry system	2	01-04-25		TLM1	CO5	T2,R4	
2.	Journal- Ledger	2	02-04-25		TLM1	CO5	T2,R4	
3.	Trial Balance	1	03-04-25		TLM1	CO5	T2,R4	
5	Final Accounts with simple adjustments	2	04-04-25		TLM1	CO5	T2,R4	
6.	Financial Statement Analysis through ratios	1	05-04-25		TLM1	CO5	T2,R4	
08.	II Mid exams		07-04-25					
09.	II Mid exams		08-04-25					
10	II Mid exams		9-04-25					
11.	II Mid exams		10-04-25					
No. of classes required to complete UNIT-V		08		No. of classes taken:				

Content beyond 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 Week ly
1.	Financial accounting	1						
2.	Behavioral economics	1						
		02						

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 (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: PROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date:

Mrs. Y NAGAMANI			
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Y. RAGHUVAMSI
Course Name & Code : CONTROL SYSTEMS – 23EE09
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem/Sec: B.Tech/ECE/IV/A **A.Y.:** 2024-25

Pre-requisites: Basic Engineering Mathematics
Course Educational Objectives: The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.
COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Derive the transfer function of physical systems using block diagram algebra and signal flow graphs. **(Apply-L3)**
CO2	Obtain the time response of first order and specifications of second order systems. **(Apply-L3).**
CO3	Analyze the stability of LTI systems using Routh's stability criterion and root locus method. **(Apply-L3)**
CO4	Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. **(Apply-L3)**
CO5	Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability. **(Apply-L3)**

Course Articulation Matrix - Correlation between COs, POs & PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3	PSO4
CO1	3	2	2													
CO2	3	2	2													
CO3	3	2	2													
CO4	3	2	2													3
CO5	3	2	2										2			2

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

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition.
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://archive.nptel.ac.in/courses/108/106/108106098/
3. https://nptelvideos.com/video.php?id=1423&c=14

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Mathematical Modelling of Control 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 to Subject and COs, Classification of control systems	1	09-12-2024		TLM2	
2.	Open loop and closed loop control systems	1	10-12-2024		TLM2	
3.	Tutorial-Feedback characteristics	1	11-12-2024		TLM3	
4.	Transfer function of linear system	1	13-12-2024		TLM1	
5.	Differential equations of electrical networks	1	16-12-2024		TLM1	
6.	Differential equations of electrical networks	1	17-12-2024		TLM1	
7.	Tutorial-Translational and rotational mechanical systems-Problems	1	18-12-2024		TLM3	
8.	Translational and rotational mechanical systems-Problems	1	20-12-2024		TLM1	
9.	Transfer function of DC servo motor	1	23-12-2024		TLM2	
10.	Block diagram representation	1	24-12-2024		TLM2	
11.	Block diagram representation	1	27-12-2024		TLM1	
12.	Signal flow graph representation	1	30-12-2024		TLM2	
13.	Signal flow graph representation	1	31-12-2024		TLM1	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT – II: Time Response Analysis -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
14.	Standard test signals	1	03-01-2025		TLM2	
15.	Time response of first order system	1	06-01-2025		TLM1	
16.	Time response of second order system	1	07-01-2025		TLM1	
17.	Tutorial-Time response of second order system-Problems	1	08-01-2025		TLM3	
18.	Time domain specifications	1	10-01-2025		TLM1	
19.	Time domain specifications	1	17-01-2025		TLM1	
20.	Steady state errors and error constants	1	20-01-2025		TLM1	
21.	Steady state errors and error constants	1	21-01-2025		TLM1	
22.	Tutorial-Effects of proportional (P) – proportional integral (PI)	1	22-01-2025		TLM3	
23.	Effects of proportional derivative (PD) and proportional integral derivative (PID) systems	1	24-01-2025		TLM2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT – III: Time Response Analysis - 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
24.	The concept of stability	1	03-02-2025		TLM2	
25.	Routh's stability criterion	1	04-02-2025		TLM1	
26.	Tutorial-Routh's stability criterion, limitations	1	05-02-2025		TLM3	
27.	Root locus concept	1	07-02-2025		TLM2	
28.	Root locus concept	1	10-02-2025		TLM2	

29.	Construction of root loci - simple problems	1	11-02-2025		TLM1	
30.	Tutorial-Construction of root loci - simple problems	1	12-02-2025		TLM3	
31.	Construction of root loci - simple problems	1	14-02-2025		TLM1	
32.	Effect of addition of Poles and Zeros to the transfer function	1	17-02-2025		TLM2	
33.	Effect of addition of Poles and Zeros to the transfer function	1	18-02-2025		TLM1	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT – IV: Frequency Response Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Introduction to frequency domain specifications	1	19-02-2025		TLM2	
35.	Bode diagrams	1	21-02-2025		TLM2	
36.	Transfer function from the Bode diagram	1	24-02-2025		TLM1	
37.	Polar plots	1	25-02-2025		TLM2	
38.	Polar plots	1	28-02-2025		TLM1	
39.	Nyquist stability criterion	1	03-03-2025		TLM2	
40.	Nyquist stability criterion	1	04-03-2025		TLM1	
41.	Tutorial-Stability analysis using Bode plots	1	05-03-2025		TLM3	
42.	Stability analysis using Bode plots	1	07-03-2025		TLM1	
43.	Classical Control Design Techniques: Lag, lead, lag-lead compensators	1	10-03-2025		TLM2	
44.	Lag, lead, lag-lead compensators	1	11-03-2025		TLM1	
45.	Tutorial-Physical realization	1	12-03-2025		TLM3	
46.	Design of compensators using Bode plots	1	17-03-2025		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT – V: State Space Analysis of LTI 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
47.	Concepts of state - state variables and state model	1	18-03-2025		TLM2	
48.	Tutorial-State space representation of transfer function: Controllable Canonical Form	1	19-03-2025		TLM3	
49.	Observable Canonical Form, Diagonal Canonical Form	1	21-03-2025		TLM2	
50.	Observable Canonical Form, Diagonal Canonical Form	1	24-03-2025		TLM1	
51.	Diagonalization using linear transformation	1	25-03-2025		TLM1	
52.	Tutorial-Solving the time invariant state equations	1	26-03-2025		TLM3	
53.	State Transition Matrix and its properties	1	28-03-2025		TLM2	
54.	Concepts of controllability and observability	1	01-04-2025		TLM2	
55.	Tutorial-Concepts of controllability and observability	1	02-04-2025		TLM3	
56.	Revision	1	04-04-2025		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.	Simulation of transfer function and state space representation	1	04-04-2025		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 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): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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	**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
PSO 1:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. Y. Raghuvamsi**	**Dr. K.R.L. Prasad**	**Dr. P. Sobha Rani**	**Dr. J.S.V.Prasad**
Signature				

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)
NIRF-2024 (Positioned in the Band of 201-300 in the Engineering 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. IV-Sem., ECE., Section–B
Academic Year : 2024-25
Course Name & Code : Electromagnetic Waves and Transmission Lines – 23EC04
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. V.Ravi Sekhara Reddy

Course Objectives:

1	To understand the fundamentals of electric fields, coulomb's law and gauss law
2	To familiar with of Biot-Savart's Law, Ampere's Circuital Law and Maxwell equations
3	To know the electromagnetic wave propagation in dielectric and conducting media
4	To study the equivalent circuit and parameters of the transmission lines
5	To learn the working of smith chart and its usage in the calculation of transmission line parameters

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

CO 1	Describe the concepts of electromagnetic field intensities using coulomb's law, Gauss law, Biot-Savart's Law and Ampere's Circuital Law. (Understand – L2)
CO 2	Analyze the electromagnetic wave propagation in dielectric and conducting media. (Apply – L3)
CO 3	Summarize the primary and secondary constants of different types of transmission lines. (Understand – L2)
CO 4	Examine the parameters input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using Smith chart. (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
CO 1	3	1	2	-	-	-	-	-	-	-	-	1	2	-	-
CO 2	3	2	2	3	1	-	-	-	-	-	-	2	3	-	-
CO 3	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO 4	3	3	1	-	-	-	-	-	-	-	-	1	2	-	-

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

Textbooks (T) and References (R):

T1: Elements of Electromagnetics–Matthew N.O.Sadiku,Oxford University Press,7th Edition, 2018.

T2: Electromagnetic Waves and Radiating Systems–E.C.Jordan & K.G.Balmain,PHI,2nd Edition, 2008.

R1: Engineering Electromagnetics–William H.Hayt,John A.Buck, Jaleel M.Akhtar,TMH,9th Edn,2020.

R2: Electromagnetic Field Theory and Transmission Lines –G. S. N. Raju, Pearson Education 2006.

R3: Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao,Wiley India 2013.

R4: Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Co-ordinate Systems, Electrostatics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Course	1	09-12-2024			
2.	Review of Coordinate Systems- Vector Algebra	1	10-12-2024			
3.	Coordinate Systems, Vector Calculus	1	11-12-2024			
4.	Coulomb's Law, Electric Field Intensity (E) due to a Point Charge	1	16-12-2024			
5.	A Line Charge, A Surface Charge,A Volume Charge Electric Flux Density (D)	1	17-12-2024			
6.	Gauss's Law and Applications	1	18-12-2024			
7.	Electric Potential (V) and Potential Gradient (∇V)	1	21-12-2024			
8.	Maxwell's two Equations for Electrostatic Fields	1	23-12-2024			
9.	Electrostatic Energy and Energy Density	1	24-12-2024			
10.	Convection and Conduction Currents, Poisson's and Laplace's Equations	1	28-12-2024			
11.	Capacitance Parallel-Plate Capacitor	1	30-12-2024			
12.	Coaxial Capacitor	1	31-12-2024			
No. of classes required to complete UNIT-I : 12			**No. of classes taken :**			

UNIT-II: Magnetostatics

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.	Magnetic Field Intensity (H) and Biot-Savart's Law	1	04-01-2025			
2.	Ampere's Circuital Law and Applications	1	06-01-2025			
3.	Magnetic Flux Density (B), Maxwell's two Equations for Magnetostatic Fields	1	07-01-2025			
4.	Magnetic Scalar and Vector Potentials, Force Due to Magnetic Field	1	08-01-2025			
5.	Ampere's Force Law ,Inductance, Magnetic Energy and Energy Density	1	18-01-2025			
6.	Time Varying Fields, Faraday's Law and Transformer EMF	1	20-01-2025			
7.	Inconsistency of Ampere's Law and Displacement Current Density	1	21-01-2025			
8.	Maxwell's Equations in Different Final Forms and Word Statements	1	22-01-2025			
9.	Conditions at a Boundary Surface	1	25-01-2025			
No. of classes required to complete UNIT-II : 9			**No. of classes taken :**			

UNIT-III: EM Wave Characteristics

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.	Wave Equations for Conducting and Perfect Dielectric Media	1	03-02-2025			
2.	Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations	1	04-02-2025			
3.	Wave Propagation in Lossy dielectrics	1	05-02-2025			
4.	Wave Propagation in Lossless dielectrics	1	08-02-2025			
5.	Wave Propagation in free space	1	10-02-2025			
6.	Wave propagation in good conductors, skin depth	1	11-02-2025			
7.	Polarization & Types	1	12-02-2025			
8.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Dielectric Interface	1	15-02-2025			
9.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Conductor Interface	1	17-02-2025			
10.	Reflection and Refraction of Plane Waves at Oblique Incidences for Parallel Polarization-Brewster Angle	1	18-02-2025			
11.	Reflection and Refraction of Plane Waves at Oblique Incidences for Perpendicular Polarization	1	19-02-2025			
12.	Critical Angle and Total Internal Reflection, Surface Impedance	1	22-02-2025			
13.	Poynting Vector and Poynting Theorem	1	24-02-2025			
14.	Problem Solving Session	1	25-02-2025			
15.	Problem Solving Session	1	1-03-2025			
No. of classes required to complete UNIT-III : 15			**No. of classes taken :**			

UNIT-IV: Transmission Lines - 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.	Types of Transmission Lines, Equivalent Circuit, Transmission Line Equations	1	03-03-2025			
2.	Secondary Constants of Transmission Lines, Primary Constants of Transmission Lines	1	04-03-2025			
3.	Expressions for Characteristic Impedance, Propagation Constant, Phase Velocity	1	05-03-2025			
4.	Infinite Line, Lossless Line, Distortion less Line	1	08-03-2025			
5.	Problem Solving Session	1	10-03-2025			
6.	Problem Solving Session	1	11-03-2025			
7.	Problem Solving Session	1	12-03-2025			
8.	Problem Solving Session	1	15-03-2025			
9.	Problem Solving Session	1	17-03-2025			
No. of classes required to complete UNIT-IV : 9			**No. of classes taken :**			

UNIT-V: Transmission Lines - 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.	Input Impedance Relations	1	18-03-2025			
2.	Reflection Coefficient, VSWR, Average Power	1	19-03-2025			
3.	Shorted Lines, Open Circuited Lines, and Matched Lines, UHF Lines as Circuit Elements	1	22-03-2025			
4.	Smith Chart – Construction and Applications	1	24-03-2025			
5.	Quarter wave transformer, Introduction to Stub Matching	1	25-03-2025			
6.	Problem Solving Session	1	26-03-2025			
7.	Problem Solving Session	1	29-03-2025			
No. of classes required to complete UNIT-V : 7			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 Antenna and Wave Propagation	1	01-04-2025			
2.	Introduction to Mobile Communication	1	02-04-2025			
3.	Introduction to Satellite Communication	1	05-04-2025			

Teaching Learning Methods

TLM 1	Chalk and Talk	**TLM 6**	Assignment or Quiz
TLM 2	PPT	**TLM 7**	Seminar or GD
TLM 3	Tutorial	**TLM 8**	Lab
TLM 4	Problem Solving	**TLM 9**	Case Study
TLM 5	Programming	**TLM 10**	Others

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:

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. V. Ravi Sekhara Reddy	Dr. V. Ravi Sekhara Reddy	Dr. M. Venkata Sudhakar	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/Sem/Sec : B.Tech., ECE., IV-Sem., Section – B
Academic Year : 2024-25
Course Name & Code : Electronic Circuit Analysis – 23EC06
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Mr.P.Venkateswara Rao

Course Objectives:

1	To learn the concepts of single stage amplifiers, multistage amplifiers, feedback amplifiers, and oscillators.
2	To study the effect of negative feedback on amplifiers.
3	To analyze the characteristics of power amplifiers, tuned amplifiers
4	To design the small signal high frequency amplifiers, multistage amplifiers, differential amplifiers.

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

CO 1	Illustrate the concepts of cascading of single stage amplifiers, feedback amplifier and oscillator circuits	L2
CO 2	Analyze the effect of negative feedback on amplifier characteristics, Power amplifiers-Class A, B, C, AB and tuned amplifier circuits.	L4
CO 3	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept	L3
CO 4	Design and analysis of small signal high frequency transistor amplifiers, multistage amplifiers and Differential amplifier using BJT.	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	3	1	-	-	-	-	-	-	-	-	1	2	-	2	-
CO 2	3	3	1	-	-	-	-	-	-	-	-	3	-	2	-
CO 3	3	3	1	-	-	-	-	-	-	-	-	3	-	3	-
CO 4	3	3	2	-	-	-	-	-	-	2	1	2	-	3	-

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

Textbooks (T) and References (R):

T1: Integrated Electronics- J. Millman and C. C. Halkias, Tata McGraw-Hill, 2022.

T2: Electronic Devices and Circuit Theory –Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.

T3: Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006.

R1: Electronic Circuits Analysis and Design –Donald A. Neaman, Mc Graw Hill, 2010.

R2: Microelectronic Circuits - Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.

R3 : Electronic Circuit Analysis-B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, Pearson Publications.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: BJT

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 Outcomes, UNIT-1	1	09-12-2024			
2.	Transistor at high frequencies, Hybrid- π common Emitter transistor model	1	10-12-2024			
3.	TUTORIAL-1	1	11-12-2024			
4.	Determination of high frequency parameters in terms of low-frequency parameters	1	12-12-2024			
5.	Derivation of Hybrid π Resistances	1	16-12-2024			
6.	Hybrid π conductance, Hybrid π capacitance	1	17-12-2024			
7.	TUTORIAL-2	1	18-12-2024			
8.	Validity of hybrid π model, Millers theorem	1	19-12-2024			
9.	CE short circuit current gain	1	23-12-2024			
10.	CE current gain with resistive load	1	24-12-2024			
11.	Cut-off frequencies, frequency response and gain bandwidth product.	1	26-12-2024			
12.	**FET:** Analysis of common Source circuits at high frequencies.	1	30-12-2024			
13.	Analysis of common Drain circuits at high frequencies.	1	31-12-2024			
No. of classes required to complete UNIT-I : 13			**No. of classes taken :**			

UNIT-II: MULTISTAGE AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Classification of amplifiers, methods of coupling	1	02-01-2025			
2.	Cascaded transistor amplifier, two stage RC coupled amplifier analysis	1	06-01-2025			
3.	Cascode amplifier analysis	1	07-01-2025			
4.	TUTORIAL-3	1	08-01-2025			
5.	High input resistance transistor amplifier circuits	1	09-01-2025			
6.	Darlington pair amplifier analysis	1	20-01-2025			
7.	Boot-strap emitter follower	1	21-01-2025			
8.	TUTORIAL-4	1	22-01-2025			
9.	Differential amplifier using BJT	1	23-01-2025			
No. of classes required to complete UNIT-II: 9			**No. of classes taken:**			

UNIT-III: FEEDBACK AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Feedback principle and concept, types of feedback	1	03-02-2025			
2.	Classification of amplifiers, Characteristics of negative feedback amplifiers	1	04-02-2025			
3.	TUTORIAL-5	1	05-02-2025			
4.	Feedback topologies	1	06-02-2025			
5.	Voltage series Feedback amplifier analysis	1	10-02-2025			
6.	Current shunt, current series Feedback amplifier analysis	1	11-02-2025			
7.	TUTORIAL-6	1	12-02-2025			
8.	Voltage shunt Feedback amplifier analysis	1	13-02-2025			
9.	Performance comparison of feedback amplifiers	1	17-02-2025			
No. of classes required to complete UNIT-III: 9			**No. of classes taken:**			

UNIT-IV: OSCILLATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Oscillator principle, condition for oscillations, Types of oscillators	1	18-02-2025			
2.	TUTORIAL-7	1	19-02-2025			
3.	Analysis of RC- phase shift oscillator using BJT	1	20-02-2025			
4.	Analysis of Wien bridge oscillator using BJT	1	24-02-2025			
5.	Generalized analysis of LC oscillators	1	25-02-2025			
6.	Hartley oscillator using BJT	1	27-02-2025			
7.	Colpitt's oscillator using BJT	1	03-03-2025			
8.	Crystal oscillator	1	04-03-2025			
9.	TUTORIAL-8	1	05-03-2025			
10.	Frequency and amplitude stability of oscillators.	1	06-03-2025			
No. of classes required to complete UNIT-IV: 10			**No. of classes taken:**			

UNIT-V: POWER AMPLIFIERS, TUNED AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Classification of Power amplifiers (A to H)	1	10-03-2025			
2.	Class A power Amplifier (Series-fed, Transformer coupled)	1	11-03-2025			
3.	TUTORIAL-9	1	12-03-2025			
4.	Class B Push-pull amplifier, Complementary symmetry push pull amplifier	1	13-03-2025			

5.	Class AB Push-pull amplifier, Complementary symmetry push pull amplifier	1	17-03-2025		
6.	Class-C power amplifier, Thermal stability and Heat sinks.	1	18-03-2025		
7.	TUTORIAL-10	1	19-03-2025		
8.	Tuned Amplifiers: Introduction, Q-Factor	1	20-03-2025		
9.	small signal tuned amplifier	1	24-03-2025		
10.	capacitance single tuned amplifier	1	25-03-2025		
11.	TUTORIAL-11	1	26-03-2025		
12.	Double tuned amplifiers	1	27-03-2025		
13.	staggered tuned amplifiers	1	01-04-2025		
14	TUTORIAL-12	1	02-04-2025		
No. of classes required to complete UNIT-V: 14			**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 Integrated circuits, operational amplifiers	1	03-04-2025			

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 (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: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date:

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P. Venkateswara Rao	Dr.EV Krishna Rao	Dr.T. Satyanarayana	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., IV-Sem., Section - B
Course Instructor : Dr. G. L. N. Murthy, Professor of ECE
Course Name & Code : Signals and Systems Lab – 23EC54
L-T-P-Cr Structure : 0-0-3-1.5
Academic Year : 2024-25

Course Objectives:

1	To understand the basics of MATLAB Programming
2	To get hands on experience on handling numerous signals and datasets
3	To visualize real time signals

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

CO1	Understand the basics of MATLAB Programming.	L2
CO2	Perform basic operations on Signals	L3
CO3	Obtain the spectral representation of given signal	L3
CO4	Adapt effective Communication, presentation and report writing skills.	L3

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

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

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

TEXT BOOKS:

1. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers - Rudra Pratap, Oxford University Press

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

UNIT-I: Amplitude Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to MATLAB (Variables, loops)	3	12.12.2024			
2.	Introduction to MATLAB (Functions, File handling)	3	19.12.2024			
3.	Generation of Basic Signals (Analog and Discrete)	3	26.12.2024			
4.	Operations on signals	3	02.01.2025			
5.	Estimation of energy and power of signals	3	09.01.2025			
6.	Obtain the response of a system using convolution	3	23.01.2025			
7.	Perform correlation between signals	3	06.02.2025			
8.	Estimation of Fourier coefficients of a given periodic signal	3	13.02.2025			
9.	Analysis of Fourier spectrum using Fourier Transform	3	20.02.2025			
10.	Estimation of Laplace transform of an arbitrary function	3	27.02.2025			
11.	Estimation of Z- transform of an arbitrary function	3	06.03.2025			
12.	Estimation of power Spectral density for noise signals	3	06.03.2025			
13.	Content Beyond Syllabus: Working with real time data handling	3	26.03.2025			
14.	Content Beyond Syllabus: Working with real time data handling	3	27.03.2025			
15.	Internal Exam	3	03.04.2025			
No. of weeks required to complete experiments :12			**No. of classes taken:**			

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

PART-C: EVALUATION PROCESS:

Evaluation Task	Experiment Nos.	Marks
Day to Day work	1,2,3,4,5,6,7,8,9,10	A1 =10
Record and observation	1,2,3,4,5,6,7,8,9,10	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8,9,10	C1=15
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8,9,10	30
Semester End Examination (SEE)	1,2,3,4,5,6,7,8,9,10	70
Total Marks=CIE+SEE 100	1,2,3,4,5,6,7,8,9,10	30
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.

Date	Dr. G L N Murthy	Dr. G L N Murthy	Dr. G L N Murthy	Dr.G.Srinivasulu
09.12.2024	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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. IV-Sem., ECE., Section–B
Academic Year : 2024-25
Course Name & Code : Electronic Circuit Analysis Lab – 23EC55
L-T-P-Cr : 0-0-3-1.5
Course Instructors : Mr.P. Venkateswara Rao, Dr.B. Poornaiah, Mr.M. SivaSankara Rao, Mr.Ch.Siva Rama Krishna

Course Objectives:

1.To demonstrate the characteristics of amplifiers, oscillators, and their applications.
2. To analyze the effect of resistance and capacitance on frequency response and gain of amplifiers and oscillators.
3. To design the feedback amplifiers, power amplifiers, tuned amplifiers, and oscillator circuits.

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

CO 1	Demonstrate the characteristics of amplifiers, oscillators and its applications.	L2
CO 2	Apply the knowledge of Resistance and capacitance effects on frequency response and gain of amplifiers and oscillator circuits.	L3
CO 3	Design different types of feedback amplifiers, Power amplifier, Tuned amplifiers, Oscillators with different characteristics	L3
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	1	2	-	-	-	2	1	2	-	1	-	2	-
CO 2	2	3	1	1	-	-	-	2	1	2	-	1	-	2	-
CO 3	2	3	1	2	-	-	-	2	1	2	-	1	-	3	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-

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

PART-B: COURSE DELIVERY PLAN (LESSON PLAN): BATCH-I

S.No.	Topics to be covered. (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to ECA Lab experiments, Cos ,Pos and PSOs.	3	13-12-2024		TLM4	
2.	**HARDWARE:** Determination of Voltage gain of an amplifier using its frequency response.	3	20-12-2024		TLM4	
3.	Determination of Gain and Bandwidth of two stage RC Coupled amplifier from the frequency response.	3	27-12-2024		TLM4	
4.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier	3	03-01-2025		TLM4	
5.	Analysis of stabilization of Gain of Transistorized Current-Shunt Feedback Amplifier.	3	10-01-2025		TLM4	
6.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	24-01-2025		TLM4	
7.	Design and Realization of Transistorized Colpitt's Oscillator to generate a sinusoidal signal.	3	07-02-2025		TLM4	
8.	**SOFTWARE:** Determination of Gain and Bandwidth of Darlington Pair Amplifier from the frequency response.	3	14-02-2025		TLM4	
9.	Design of Class A Series-fed Power Amplifier.	3	21-02-2025		TLM4	
10.	Design of Transformer-coupled Class A Power Amplifier.	3	28-02-2025		TLM4	
11.	Design of Class B Push-Pull Power Amplifier.	3	07-03-2025		TLM4	
12.	Design of Complementary Symmetry Class B Push-Pull Power Amplifier	3	21-03-2025		TLM4	
13.	Determination of Gain and Bandwidth of Single Tuned, doubled tuned Voltage Amplifier.	3	28-03-2025		TLM4	
14.	Lab Internal Examination	3	04-04-2025			
No. of classes required:42				**No. of classes taken:**		

PART-B: COURSE DELIVERY PLAN (LESSON PLAN):BATCH-II

S.No.	Topics to be covered. (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to ECA Lab experiments, Cos, Pos and PSOs.	3	13-12-2024		TLM4	
2	**SOFTWARE:** Determination of Gain and Bandwidth of Darlington Pair Amplifier from the frequency response.	3	20-12-2024		TLM4	
3	Design of Class A Series-fed Power Amplifier.	3	27-12-2024		TLM4	
4	Design of Transformer-coupled Class A Power Amplifier.	3	03-01-2025		TLM4	
5	Design of Class B Push-Pull Power Amplifier.	3	10-01-2025		TLM4	
6	Design of Complementary Symmetry Class B Push-Pull Power Amplifier	3	24-01-2025		TLM4	
7	Determination of Gain and Bandwidth of Single Tuned, doubled tuned Voltage Amplifier.	3	07-02-2025		TLM4	
8	**HARDWARE:** Determination of Voltage gain of an amplifier using its frequency response.	3	14-02-2025		TLM4	
9	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier	3	21-02-2025		TLM4	
10	Analysis of stabilization of Gain of Transistorized Current-Shunt Feedback Amplifier.	3	28-02-2025		TLM4	
11	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	07-03-2025		TLM4	
12	Design and Realization of Transistorized Colpitt's Oscillator to generate a sinusoidal signal.	3	21-03-2025		TLM4	
13	Determination of Gain and Bandwidth of two stage RC Coupled amplifier from the frequency response.	3	28-03-2025		TLM4	
14	Lab Internal Examination	3	04-04-2025		TLM4	
No. of classes required:42				**No. of classes taken:**		

Teaching Learning Methods

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

PART-C

EVALUATION PROCESS (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
Mr.P. Venkateswara Rao Dr.B. Poornaiah Mr.M. Sivasankara Rao Mr.Ch.Siva Rama Krishna	Mr.P.Venkateswara Rao	Dr.T.Satyanarayana	Dr. G. Srinivasulu

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: SAMBASIVARAO CHINDAM
Course Name & Code : PYTHON PROGRAMMING **(SEC-B)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/ECE/IV/B **A.Y.:** 2024-25

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
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	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction- Course Outcomes Python Installation, Variables, Data types, Reading Input, Print output, Comments	3	10-12-2024		
2.	Types of operators	1	11-12-2024		
3.	Working on operators, Sample Programs, Type Conversion, Control statements – if, else, nestedif, elif	3	17-12-2024		
4.	Introduction to Loop statements	1	18-12-2024		
5.	Programs on Loop statements, pass, continue and break	3	24-12-2024		
6.	Exception Handling	1	31-12-2024		
7.	Programs on exception handling.	3	07-01-2025		
8.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	08-01-2025		
9.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.	3	21-01-2025		
10.	Strings Introduction, Basic String Operations	1	22-01-2025		
11.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	04-02-2025		
12.	List introduction, operations	1	05-02-2025		
13.	Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists	1	11-02-2025		
14.	**Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Sample programs on dictionaries.	3	12-02-2025		

15.	Creating Tuples, Basic Tuple Operations, tuple() Function, Tuple Indexing and Slicing, Built-In Functions Used on Tuples, Sample Programs on tuples.	1	18-02-2025		
16.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	1	19-02-2025		
17.	Programs on Tuples, Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	25-02-2025		
18.	**Unit-4**: Introduction to files	1	04-03-2025		
19.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	05-03-2025		
20.	Pickle Module	1	11-03-2025		
21.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	12-03-2025		
22.	**Object-Oriented Programming**: Creating Classes and Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	18-03-2025		
23.	Concept of Encapsulation, Inheritance, Polymorphism	1	19-03-2025		
24.	Sample Python programs on object-oriented programming.	3	25-03-2025		
25.	**Unit 5: Introduction to Data Science**: Functional Programming	1	25-03-2025		
26.	JSON and XML in Python, NumPy with Python, Pandas. Example Programs on Numpy and pandas.	3	26-03-2025		
27.	Practice Programs on Pandas.	1	01-04-2025		
28.	**Internal Exam**	3	02-04-2025		

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ch.Sambasivarao**	**M.Hema Latha**	**Dr K.Phaneendra**	**Dr. B.Srinivasa Rao**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor	**:** Dr.M.Venkata Sudhakar, Mr.V.V.Rama Krishna	
Course Name & Code	**:** Design Thinking & Innovation (23ME57)	
Regulation	: R23	
L-T-P Structure	**:** 1-0-2	**Credits:** 02
Program/Sem/Sec	: B.Tech – IV Semester – B Section	**A.Y.:** 2024-25

PREREQUISITE: None

COURSE OBJECTIVES:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process

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

CO1	Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**
CO2	Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**
CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions**. (Analyzing-L4)**
CO4	Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**
CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. **(Evaluating-L5)**

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

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

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
	UNIT–I: INTRODUCTION TO DESIGN THINKING					
1	Introduction to elements and principles of Design	1	09-12-2024		TLM2	
	Activity: To understand the importance of design	2	09.12.2024		TLM6	
2	Principles of design, Introduction to design thinking, History of Design Thinking, New materials in Industry	1	16.12.2024		TLM2	
	Activity: To understand the importance of team work	2	16.12.2024		TLM6	
3	Basics of design-dot, line, shape, form as fundamental design components	1	23.12.2024		TLM2	
	Activity: Developing sketches using dot, line and form	2	23.12.2024		TLM6	
	UNIT–II: DESIGN THINKING PROCESS					
4	Design thinking process: Empathy, Define or Analyze	1	30.12.2024		TLM2	
	Activity: To understand the significance of Empathy and Define/Analyze	2	30.12.2024		TLM6	
5	Design thinking process: Ideate, Prototype, implementing the process in driving inventions	1	06.01.2025		TLM2	

	Activity: To understand the significance of Ideate and Prototype	2	06.01.2025		TLM6	
6	Design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development	1	20.01.2025		TLM2	
	Activity: Students should present their understanding of DTI elements using example	2	20.01.2025		TLM6	
	UNIT – III: INNOVATION					
7	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	3	27.01.2025		TLM2/TLM6	
8	Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.	3	03.02.2025		TLM2/TLM6	
9	**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation	3	10.02.2025		TLM6	
	UNIT – IV: PRODUCT DESIGN					
10	Problem formation, introduction to product design, Product strategies, Product value	1	17.02.2025		TLM2	
	Activity: Development of Business models, setting of specifications	2	17.02.2025		TLM6	
11	Product planning, product specifications. Innovation towards product design Case studies.	1	24.02.2025		TLM2	
	Activity: Explaining their own product and model design, case studies	2	24.02.2025		TLM6	
	UNIT – V: DESIGN THINKING IN BUSINESS PROCESSES					
12	Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that	3	03.03.2025		TLM2/TLM6	

	redefine business					
13	Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization	3	10.03.2025		TLM2/TLM6	
14	Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.	3	17.03.2025		TLM2/TLM6	
15	**Activity:** Marketing strategies of our own product, its maintenance, Reliability and plan for startup	3	24.03.2025		TLM6	
I Mid Exams: 27-01-2025 to 01-02-2025						
II Mid Exams: 07-04-2025 to 12-04-2025						
No. of classes required to complete: 45				**No. of classes taken:**		

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

PART-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Internal Examination	30
Semester End Examination	70
Total Marks:	**100**

ACADEMIC CALENDAR

Commencement of IV Semester Classwork	**09-12-2024**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	**27-01-2025**	**01-02-2025**	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	**07-04-2025**	**12-04-2025**	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	**21-04-2025**	**03-05-2025**	2 W
Internship	05-05-2025	28-06-2025	8 W
Commencement of V Semester Classwork	**30 –06–2025**		

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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.

Signature				
Name of the Faculty	Dr.M.V.Sudhakar, Mr.V.V.Rama Krishna	Dr.B.Rambabu	Dr.B.Poornaiah	Dr.G.Srinivasulu
Designation	**Course Instructors**	**Course Coordinator**	**Module Coordinator**	**HoD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE, IT, ECE, EEE & ME) under Tier - I
College Code: 76

MASTER OF BUSINESS ADMINISTRATION
COURSE HANDOUT

PART-A

Name of Course Instructor : **M r s . Y N A G A M A N I**
Course Name & Code : **MEFA-23HS02**
L-T-P Structure : 2-0-0 Credits: 2
Program/Sem/Sec : ECE B&C., IV-Sem. A. Y : 2024-25

Prerequisite: Basic Knowledge in business activities.

COURSE EDUCATIONAL OBJECTIVES(CEO):

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview of investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements

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

CO1	Define the concepts related to Managerial Economics, Financial Accounting and Management. **(Understand-L2)**
CO2	Understand the fundament also Economics viz., Demand, Production, cost, revenue and markets. **(Understand-L2)**
CO3	Apply the Concept of Production cost and revenues for effective Business decision **(Apply-L3)**
CO4	Evaluate the capital budgeting techniques **(Analyze-L4)**
CO5	Develop accounting statements and evaluate the financial performance of business entity. **(Analyze-L4)**

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

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

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi. 4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Business Economics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion n	Actual Date of Completeon	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Orientation	1	10-12-24		TLM1	CO1	T1,R2	
2.	Orientation	1	12-12-24		TLM1	CO1	T1,R2	
3.	Introduction to Economics	1	14-12-24		TLM1	CO1	T1,R2	
4.	Explaining about CO-PO	1	17-12-24		TLM1	CO1	T1,R2	
5.	Definitions of Economics-Scarcity, Growth	1	19-12-24		TLM1	CO1	T1,R2	
6.	Nature and Scope of Economics	1	21-12-24		TLM1	CO1	T1,R2	
7.	Demand-Law of demand	1	24-12-24		TLM1	CO1	T1,R2	
8.	Elasticity of demand	1	26-12-24		TLM1	CO1	T1,R2	
9.	Types of Elasticity of demand	1	28-12-24		TLM1	CO1	T1,R2	
10	Demand Forecasting -	1	07-1-2025		TLM3	CO1	T1,R2	
11	Methods of demand forecasting	1	07-1-2025					
No. of classes required to complete UNIT-I		12		No. of classes taken:				

UNIT-II: Theory of Production and Cost analysis

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.	Production Function	1	16-01-25		TLM1	CO2	T1,R2	
2.	Isoquant and Isocost	1	18-02-25		TLM1	CO2	T1,R2	
3.	Least Cost Combination of inputs	1	21-01-25		TLM1	CO2	T1,R2	
4.	Law of Returns	1	23-01-25		TLM1	CO2	T1,R2	
5.	Internal and External Economies of Scale	1	25-01-25		TLM1	CO2	T1,R2	
6.	Cost Concepts	1	15-02-25		TLM1	CO2	T1,R2	
7.	Break-even Analysis	1	18-02-25		TLM1	CO2	T1,R2	
No. of classes required to complete UNIT-II		07		No. of classes taken:				

UNIT-III: Markets & Pricing Policies

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.	I Mid exam		27-01-25		TLM1	CO3		
2.	I Mid exam		22-02-25		TLM1	CO3		
3.	I Mid exam		25-02-25		TLM1	CO3		
4.	I Mid exam		01-02-25		TLM1	CO3		
5.	Market structures	1	04-03-25		TLM1	CO3	T2,R4	
6.	Markets-Types of markets	1	06-03-25		TLM1	CO3		
7.	Features and price out determinations under Perfect competition	1	08-03-25		TLM2	CO3		
8.	Features and price out determinations under Monopoly	1	11-03-25		TLM1	CO3		
9.	Features and price out determinations under Monopolistic competition	1	13-03-25		TLM1	CO3		
10.	Pricing –Pricing polices & its Objectives	1	15-03-25		TLM1	CO3	T2,R4	
11.	Pricing Methods and its applications in business.	1	22-03-25		TLM2	CO3	T2,R4	
No. of classes required to complete UNIT-III		11		No. of classes taken:				

UNIT-IV: Capital and Capital Budgeting

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.	Nature and its significance	1	05-03-25		TLM2	CO4	T2,R4	
2.	Types of Capital	1	06-03-25		TLM2	CO4	T2,R4	
3.	Sources of raising capital	1	06-03-25		TLM1	CO4	T2,R4	
4.	Capital budgeting Significance	1	19-03-25		TLM1	CO4	T2,R4	
5.	Capital budgeting Process	1	29-03-25		TLM1	CO4	T2,R4	
6.	Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).	2	29-03-25		TLM1	CO4	T2,R4	
No. of classes required to complete UNIT-IV		7		No. of classes taken:				

UNIT-V: Financial Accounting and analysis

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.	Accounting – significance- Book Keeping -Double entry system	2	01-04-25		TLM1	CO5	T2,R4	
2.	Journal- Ledger	2	02-04-25		TLM1	CO5	T2,R4	
3.	Trial Balance	1	03-04-25		TLM1	CO5	T2,R4	
5	Final Accounts with simple adjustments	2	04-04-25		TLM1	CO5	T2,R4	
6.	Financial Statement Analysis through ratios	1	05-04-25		TLM1	CO5	T2,R4	
08.	II Mid exams		07-04-25					
09.	II Mid exams		08-04-25					
10	II Mid exams		9-04-25					
11.	II Mid exams		10-04-25					
No. of classes required to complete UNIT-V		08		No. of classes taken:				

Content beyond 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 Week ly
1.	Financial accounting	1						
2.	Behavioral economics	1						
		02						

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 (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: PROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date:

Mrs. Y NAGAMANI			
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A.V.RAVIKUMAR
Course Name & Code : CONTROL SYSTEMS – 23EE09
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem/Sec : B.Tech/ECE/IV/C **A.Y.:** 2024-25

Pre-requisites: Basic Engineering Mathematics

Course Objectives:

The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.

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

CO1	Derive the transfer function of physical systems using block diagram algebra and signal flow graphs (Apply-L3).
CO2	Obtain the time response of first order and specifications of second order systems (Apply-L3).
CO3	Analyze the stability of LTI systems using Routh's stability criterion and root locus method. (Apply-L3)
CO4	Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. (Apply-L3)
CO5	Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability (Apply-L3)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3	PSO4
CO1	3	2	2													
CO2	3	2	2													
CO3	3	2	2													
CO4	3	2	2													3
CO5	3	2	2										2			2

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1.Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL MODELLING OF CONTROL 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.	Classification of Control Systems	1	09-12-2024		TLM2	
2.	Open and Closed Loop control systems	1	10-12-2024		TLM2	
3.	Feedback Characteristics	1	11-12-2024		TLM2	
4.	Feedback Characteristics	1	12-12-2024		TLM2	
5.	Transfer function of linear systems	1	16-12-2024		TLM1	
6.	Differential equations of electrical networks	1	17-12-2024		TLM1	
7.	Translational & rotational mechanical systems	1	18-12-2024		TLM2	
8.	TF of DC servo motor	1	19-12-2024		TLM2	
9.	Block diagram algebra	1	23-12-2024		TLM2	
10.	Signal flow graph – Mason's gain formula	1	24-12-2024		TLM2	
11.	Problems (Tutorial-I)	1	26-12-2024		TLM3	
12.	Problems	1	30-12-2024		TLM1	
13.	Problems(Tutorial-II)	1	31-12-2024		TLM1	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT – II: TIME RESPONSE ANALYSIS-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
14.	Standard test signals	1	02-01-2025		TLM2	
15.	Step response of first order systems	1	06-01-2025		TLM2	
16.	Step response of second order systems	1	07-01-2025		TLM2	
17.	Problems (Tutorial-III)	1	08-01-2025		TLM3	
18.	Time domain specifications	1	09-01-2025		TLM2	
19.	Time response specifications of second order systems	1	20-01-2025		TLM1	
20.	steady state errors and error constants	1	21-01-2025		TLM1	
21.	Effects of Controllers	1	22-01-2025		TLM2	
22.	Problems (Tutorial-IV)	1	23-01-2025		TLM1	
No. of classes required to complete UNIT-II: 09				**No. of classes taken:**		

UNIT – III: TIME RESPONSE ANALYSIS-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
23.	Concepts of stability	1	03-02-2025		TLM2	
24.	Routh stability criterion	1	04-02-2025		TLM2	
25.	limitations	1	05-02-2025		TLM2	
26.	Problems	1	06-02-2025		TLM3	
27.	Root locus concept	1	10-02-2025		TLM1	
28.	Problems(Tutorial-V)	1	11-02-2025		TLM2	
29.	Construction of root loci	1	12-02-2025		TLM2	
30.	Problems	1	13-02-2025		TLM1	
31.	Problems	1	17-02-2025		TLM1	
32.	Problems(Tutorial-VI)	1	18-02-2025		TLM1	
33.	Effect of adding poles and zeros	1	19-02-2025		TLM2	
34.	Problems	1	20-02-2025		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT – IV: FREQUENCY RESPONSE ANALYSIS

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.	Frequency domain specifications	1	24-02-2025		TLM2	
36.	Bode Plot	1	25-02-2025		TLM1	
37.	Bode Plot	1	27-02-2025		TLM1	
38.	determination of frequency domain specifications	1	03-03-2025		TLM2	
39.	phase margin and gain margin (Tutorial-VII)	1	04-03-2025		TLM2	
40.	Transfer function from the Bode Plot	1	05-03-2025		TLM2	
41.	Problems	1	06-03-2025		TLM3	
42.	Polar plot	1	10-03-2025		TLM1	
43.	Nyquist Stability criteria	1	11-03-2025		TLM2	
44.	Lag, Lead, Lead-Lag Compensator	1	12-03-2025		TLM1	
45.	Design using Bode plot	1	13-03-2025		TLM1	
46.	Problems(Tutorial-VIII)	1	17-03-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT – V: STATE SPACE ANALYSIS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Concept of state, state variables	1	18-03-2025		TLM2	
48.	State space from TF	1	19-03-2025		TLM2	
49.	Canonical forms	1	20-03-2025		TLM1	
50.	Problems (Tutorial-IX)	1	24-03-2025		TLM3	
51.	Diagonalization	1	25-03-2025		TLM1	
52.	Solution of state equations	1	26-03-2025		TLM1	
53.	State transition matrix and it's properties	1	27-03-2025		TLM1	
54.	Concepts of controllability	1	01-04-2025		TLM2	
55.	Concepts of observability	1	02-04-2025		TLM2	
No. of classes required to complete UNIT-V: 09				**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
1.	Simulation of state space	1	03-04-2025		TLM1	

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

PART-C

EVALUATION PROCESS (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): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr A.V.RAVIKUMAR**	**Dr. K.R.L. PRASAD**	**Dr. P.SOBHARANI**	**Dr.J.S.V.PRASAD**
Signature				

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. IV-Sem., ECE., Section–C
Academic Year : 2024-25
Course Name & Code : Electromagnetic Waves and Transmission Lines – 23EC04
L-T-P-Cr : 3-0-0-3
Course Instructure : Dr. B. Ramesh Reddy

Course Objectives:

1	To understand the fundamentals of electric fields, coulomb's law and gauss law
2	To familiar with of Biot-Savart's Law, Ampere's Circuital Law and Maxwell equations
3	To know the electromagnetic wave propagation in dielectric and conducting media
4	To study the equivalent circuit and parameters of the transmission lines
5	To learn the working of smith chart and its usage in the calculation of transmission line parameters

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

CO 1	Describe the concepts of electromagnetic field intensities using coulomb's law, Gauss law, Biot-Savart's Law and Ampere's Circuital Law. (Understand – L2)
CO 2	Analyze the electromagnetic wave propagation in dielectric and conducting media. (Apply – L3)
CO 3	Summarize the primary and secondary constants of different types of transmission lines. (Understand – L2)
CO 4	Examine the parameters input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using Smith chart. (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
CO 1	3	1	2	-	-	-	-	-	-	-	-	1	2	-	-
CO 2	3	2	2	3	1	-	-	-	-	-	-	2	3	-	-
CO 3	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO 4	3	3	1	-	-	-	-	-	-	-	-	1	2	-	-

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

Textbooks (T) and References (R):

T1: Elements of Electromagnetics–Matthew N.O.Sadiku,Oxford University Press,7th Edition, 2018.

T2: Electromagnetic Waves and Radiating Systems–E.C.Jordan & K.G.Balmain,PHI,2nd Edition, 2008.

R1: Engineering Electromagnetics–William H.Hayt,John A.Buck, Jaleel M.Akhtar,TMH,9th Edn,2020.

R2: Electromagnetic Field Theory and Transmission Lines –G. S. N. Raju, Pearson Education 2006.

R3: Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao,Wiley India 2013.

R4: Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Review of Co-ordinate Systems, Electrostatics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Course	1	09-12-2024			
2.	Review of Coordinate Systems- Vector Algebra	1	10-12-2024			
3.	Coordinate Systems, Vector Calculus	1	11-12-2024			
4.	Coulomb's Law, Electric Field Intensity (E) due to a Point Charge	1	13-07-2024			
5.	A Line Charge, A Surface Charge,A Volume Charge	1	16-12-2024			
6.	Electric Flux Density (D)	1	17-12-2024			
7.	Gauss's Law and Applications	1	18-12-2024			
8.	Electric Potential (V) and Potential Gradient (∇V)	1	20-12-2024			
9.	Maxwell's two Equations for Electrostatic Fields	1	23-12-2024			
10.	Electrostatic Energy and Energy Density	1	24-12-2024			
11.	Convection and Conduction Currents, Poisson's and Laplace's Equations	1	27-12-2024			
12.	Capacitance Parallel-Plate Capacitor	1	30-12-2024			
13.	Coaxial Capacitor	1	31-12-2024			
No. of classes required to complete UNIT-I : 13			**No. of classes taken :**			

UNIT-II: Magnetostatics

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.	Magnetic Field Intensity (H) and Biot-Savart's Law	1	03-01-2025			
2.	Ampere's Circuital Law and Applications	1	06-01-2025			
3.	Magnetic Flux Density (B), Maxwell's two Equations for Magnetostatic Fields	1	07-01-2025			
4.	Magnetic Scalar and Vector Potentials	1	08-01-2025			
5.	Force Due to Magnetic Field, Ampere's Force Law	1	10-01-2025			
6.	Inductance, Magnetic Energy and Energy Density	1	17-01-2025			
7.	Time Varying Fields, Faraday's Law and Transformer EMF	1	20-01-2025			
8.	Inconsistency of Ampere's Law and Displacement Current Density	1	21-01-2025			
9.	Maxwell's Equations in Different Final Forms and Word Statements	1	22-01-2025			
10.	Conditions at a Boundary Surface	1	24-01-2025			
No. of classes required to complete UNIT-II : 10			**No. of classes taken :**			

UNIT-III: EM Wave Characteristics

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.	Wave Equations for Conducting and Perfect Dielectric Media	1	03-02-2025			
2.	Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations	1	04-02-2025			
3.	Wave Propagation in Lossy dielectrics	1	05-02-2025			
4.	Wave Propagation in Lossless dielectrics	1	07-02-2025			
5.	Wave Propagation in free space	1	10-02-2025			
6.	Wave propagation in good conductors, skin depth	1	11-02-2025			
7.	Polarization & Types	1	12-02-2025			
8.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Dielectric Interface	1	14-02-2025			
9.	Reflection and Refraction of Plane Waves at Normal Incidences for Perfect Dielectric-Conductor Interface	1	17-02-2025			
10.	Reflection and Refraction of Plane Waves at Oblique Incidences for Parallel Polarization-Brewster Angle	1	18-02-2025			
11.	Reflection and Refraction of Plane Waves at Oblique Incidences for Perpendicular Polarization	1	19-02-2025			
12.	Critical Angle and Total Internal Reflection, Surface Impedance	1	21-02-2025			
13.	Poynting Vector and Poynting Theorem	1	24-02-2025			
14.	Problem Solving Session	1	25-02-2025			
15.	Problem Solving Session	1	28-02-2025			
No. of classes required to complete UNIT-III : 15			**No. of classes taken :**			

UNIT-IV: Transmission Lines - 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.	Types of Transmission Lines, Equivalent Circuit, Transmission Line Equations	1	03-03-2025			
2.	Secondary Constants of Transmission Lines, Primary Constants of Transmission Lines	1	04-03-2025			
3.	Expressions for Characteristic Impedance, Propagation Constant, Phase Velocity	1	05-03-2025			
4.	Infinite Line, Lossless Line, Distortion less Line	1	07-03-2025			
5.	Problem Solving Session	1	10-03-2025			
6.	Problem Solving Session	1	11-03-2025			
7.	Problem Solving Session	1	12-03-2025			
8.	Problem Solving Session	1	17-03-2025			
No. of classes required to complete UNIT-IV : 8			**No. of classes taken :**			

UNIT-V: Transmission Lines - 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.	Input Impedance Relations	1	18-03-2025			
2.	Reflection Coefficient, VSWR, Average Power	1	19-03-2025			
3.	Shorted Lines, Open Circuited Lines, and Matched Lines, UHF Lines as Circuit Elements	1	21-03-2025			
4.	Smith Chart – Construction and Applications	1	24-03-2025			
5.	Quarter wave transformer, Introduction to Stub Matching	1	25-03-2025			
6.	Problem Solving Session	1	26-03-2025			
7.	Problem Solving Session	1	28-03-2025			
No. of classes required to complete UNIT-V : 7			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 Antenna and Wave Propagation	1	01-04-2025			
2.	Introduction to Mobile Communication	1	02-04-2025			
3.	Introduction to Satellite Communication	1	04-04-2025			

Teaching Learning Methods

TLM 1	Chalk and Talk	**TLM 6**	Assignment or Quiz
TLM 2	PPT	**TLM 7**	Seminar or GD
TLM 3	Tutorial	**TLM 8**	Lab
TLM 4	Problem Solving	**TLM 9**	Case Study
TLM 5	Programming	**TLM 10**	Others

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:

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. Ramesh Reddy	Dr. V. Ravi Sekhara Reddy	Dr. M. Venkata Sudhakar	Dr. G. Srinivasulu

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART: A

Program/Sem/Sec : B.Tech., ECE., IV-Sem., Section – C
Academic Year : 2024-25
Course Name & Code : Electronic Circuit Analysis – 23EC06
L-T-P-Cr Structure : 3-0-0-3
Course Instructor : Mr. M. Sivasankara Rao

Course Objectives:

1	To learn the concepts of single stage amplifiers, multistage amplifiers, feedback amplifiers, and oscillators.
2	To study the effect of negative feedback on amplifiers.
3	To analyze the characteristics of power amplifiers, tuned amplifiers
4	To design the small signal high frequency amplifiers, multistage amplifiers, differential amplifiers.

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

CO 1	Illustrate the concepts of cascading of single stage amplifiers, feedback amplifier and oscillator circuits	L2
CO 2	Analyze the effect of negative feedback on amplifier characteristics, Power amplifiers-Class A, B, C, AB and tuned amplifier circuits.	L4
CO 3	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept	L3
CO 4	Design and analysis of small signal high frequency transistor amplifiers, multistage amplifiers and Differential amplifier using BJT.	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	3	1									1	2		2	
CO 2	3	3	1									3		2	
CO 3	3	3	1									3		3	
CO 4	3	3	2							2	1	2		3	

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

Textbooks (T) and References (R):

T1: Integrated Electronics- J. Millman and C. C. Halkias, Tata McGraw-Hill, 2022.

T2: Electronic Devices and Circuit Theory –Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.

T3: Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006.
R1: Electronic Circuits Analysis and Design –Donald A. Neaman, Mc Graw Hill, 2010.
R2: Microelectronic Circuits - Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
R3 : Electronic Circuit Analysis-B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, Pearson Publications.

PART-B: COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: BJT

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 Outcomes, UNIT-1	1	09-12-2024			
2.	Transistor at high frequencies, Hybrid- π common Emitter transistor model	1	11-12-2024			
3.	Determination of high frequency parameters in terms of low-frequency parameters	1	12-12-2024			
4.	Determination of high frequency parameters in terms of low-frequency parameters		14-12-2024			
5.	TUTORIAL-1	1	16-12-2024			
6.	Derivation of Hybrid π Resistances	1	18-12-2024			
7.	Hybrid π conductance, Hybrid π capacitance	1	19-12-2024			
8.	Validity of hybrid π model, Millers theorem	1	21-12-2024			
9.	CE short circuit current gain	1	23-12-2024			
10.	CE current gain with resistive load	1	26-12-2024			
11.	TUTORIAL-2	1	27-12-2024			
12.	Cut-off frequencies, frequency response and gain bandwidth product.	1	30-12-2024			
13.	**FET:** Analysis of common Source circuits at high frequencies.	1	02-01-2025			
14.	Analysis of common Drain circuits at high frequencies.	1	04-01-2025			
No. of classes required to complete UNIT-I : 14			**No. of classes taken :**			

UNIT-II: MULTISTAGE AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Classification of amplifiers, methods of coupling	1	06-01-2025			
2.	Cascaded transistor amplifier	1	08-01-2025			
3.	two stage RC coupled amplifier analysis	1	09-01-2025			
4.	Cascode amplifier analysis	1	11-01-2025			
5.	TUTORIAL-3		20-01-2025			
6.	High input resistance transistor amplifier circuits	1	22-01-2025			
7.	Darlington pair amplifier analysis	1	23-01-2025			
8.	Boot-strap emitter follower	1	25-01-2025			
9.	TUTORIAL-4	1	01-02-2025			
10.	Differential amplifier using BJT	1	03-02-2025			
No. of classes required to complete UNIT-II: 10			**No. of classes taken:**			

UNIT-III: FEEDBACK AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Feedback principle and concept, types of feedback	1				
2.	Classification of amplifiers, Characteristics of negative feedback amplifiers	1	05-02-2025			
3.	Characteristics of negative feedback amplifiers	1	06-02-2025			
4.	TUTORIAL-5		08-02-2025			
5.	Feedback topologies	1	10-02-2025			
6.	Voltage series Feedback amplifier analysis	1	12-02-2025			
7.	Current shunt, current series Feedback amplifier analysis	1	13-02-2025			
8.	TUTORIAL-6	1	15-02-2025			
9.	Voltage shunt Feedback amplifier analysis	1	17-02-2025			
10.	Performance comparison of feedback amplifiers	1	19-02-2025			
No. of classes required to complete UNIT-III: 10			**No. of classes taken:**			

UNIT-IV: OSCILLATORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Oscillator principle, condition for oscillations, Types of oscillators	1	20-02-2025			
2.	TUTORIAL-7	1	22-02-2025			
3.	Analysis of RC- phase shift oscillator using BJT	1	24-02-2025			
4.	Analysis of RC- phase shift oscillator using BJT	1	27-02-2025			
5.	Analysis of Wien bridge oscillator using BJT	1	01-03-2025			
6.	Generalized analysis of LC oscillators	1	03-03-2025			
7.	Hartley oscillator using BJT	1	05-03-2025			
8.	Colpitt's oscillator using BJT	1	06-03-2025			
9.	Crystal oscillator, Frequency and amplitude stability of oscillators.		08-03-2025			
10.	TUTORIAL-8	1	10-03-2025			
No. of classes required to complete UNIT-IV: 10			**No. of classes taken:**			

UNIT-V: POWER AMPLIFIERS, TUNED AMPLIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Classification of Power amplifiers (A to H)	1	12-03-2025			
2.	Class A power Amplifier (Series-fed, Transformer coupled)	1	13-03-2025			

3.	TUTORIAL-9	1	15-03-2025		
4.	Class B Push-pull amplifier, Complementary symmetry push pull amplifier	1	17-03-2025		
5.	Class AB Push-pull amplifier, Complementary symmetry push pull amplifier	1	19-03-2025		
6.	Class-C power amplifier, Thermal stability and Heat sinks.	1	20-03-2025		
7.	TUTORIAL-10	1	22-03-2025		
8.	Tuned Amplifiers: Introduction, Q-Factor	1	24-03-2025		
9.	small signal tuned amplifier	1	26-03-2025		
10.	capacitance single tuned amplifier	1	27-03-2025		
11.	TUTORIAL-11	1	29-03-2025		
12.	Double tuned amplifiers	1	31-03-2025		
13.	staggered tuned amplifiers	1	02-04-2025		
14	TUTORIAL-12	1	03-04-2025		
No. of classes required to complete UNIT-V: 14			**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 the Op-Amps	1	05-04-2025			

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 (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: ROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Date:06-12-2024

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M. Sivasankara Rao	Dr. E V Krishna Rao	Dr.T. Satyanarayana	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/Sem/Sec : B.Tech., ECE., IV-Sem., Section - C
Course Instructor : Dr. K. Ravi Kumar, Associate Professor
Course Name & Code : Analog Communications – 23EC07
L-T-P-Cr Structure : 3-0-0-3
Academic Year : 2024-25

Course Objectives:

1	To provides the Knowledge on various analog modulation techniques in both time and frequency domains.
2	To understand the generation and demodulation methods of various analog modulation techniques.
3	To give the information regarding functions of AM and FM transmitters and receivers.
4	To understand the effect of noise on the performance of AM and FM receivers and the principles of PAM, PWM, and PPM, TDM and FDM techniques.

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

CO	Course Outcome	BL
CO1	Describe the Modulation and Demodulation techniques of Amplitude Modulation.	L2
CO2	Interpret the generation and detection of Angle Modulation techniques.	L2
CO3	Summarize the concepts of Radio Transmitters and Receivers	L2
CO4	Illustrate the noise performance in Analog Modulation techniques and also the concepts of Pulse Analog Modulation and Demodulation techniques	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	2	2	1	-	-	-	-	-	-	-	-	2	1	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	2	-	-
CO3	2	2	1	1	-	-	-	-	-	-	-	2	3	-	-
CO4	2	3	1	1	-	-	-	-	-	-	-	3	3	-	-

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

TEXT BOOKS:

1. Communication Systems, Simon Haykin, Michael Moher, Wiley, 5th Edition, 2009.
2. Principles of Communication Systems, H Taub, D L Schilling, Gautam Sahe, TMH, 4th Edition, 2017.
3. Modern Digital and Analog Communication Systems, B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017.

REFERENCE BOOKS:

1. Electronics & Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna, TMH, 6th Edition, 2017.
2. Communication Systems, R P Singh, S D Sapre, TMH, 3nd Edition, 2017.
3. Communication Systems (Analog and Digital), Dr. Sanjay Sharma, Katson Books, 7th Reprint Edition, 2018

ONLINE LEARNING RESOURCES:

1. http://nptel.ac.in/courses/117102059/ Prof. Surendra Prasad.
2. https://nptel.ac.in/courses/117105143
3. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf.
4. https://www.scribd.com/document/266137872/sanjay-sharma-pdf.
5. http://bayanbox.ir/view/91440908351988908 6/Book-Modern-Digital-And-AnalogCommunication- Systems-4th-edition-by-Lathi.pdf.
6. https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20 BY%20GEORGE%20KENNEDY.pdf

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

UNIT-I: Amplitude Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to the Course	1	12.12.2024			
2.	Course Objectives and Course Outcomes	1	13.12.2024			
3.	Introduction to communication system	1	13.12.2024			
4.	Need for modulation	1	14.12.2024			
5.	Tutorial	1	19.12.2024		TLM3	
6.	Amplitude Modulation, Time domain and Frequency domain descriptions	1	20.12.2024			
7.	Single tone modulation, Power relations in AM waves	1	20.12.2024			
8.	Generation of AM waves: Square law Modulator, Switching modulator	1	21.12.2024			
9.	Tutorial	1	26.12.2024		TLM3	
10.	Detection of AM Waves: Square law detector	1	27.12.2024			
11.	Envelope detector	1	27.12.2024			
No. of classes required to complete UNIT-I:11			No. of classes taken:			

UNIT-II: DSB & SSB Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Double sideband suppressed carrier modulator: Time domain and frequency domain description	1	28.12.2024			
13.	Generation of DSBSC Waves: Balanced Modulator	1	02.01.2025			
14.	Tutorial	1	03.01.2025		TLM3	

15.	Generation of DSBSC Waves: Ring Modulator	1	03.01.2025			
16.	Detection of DSBSC Waves: Coherent detection, Quadrature Null Effect	1	04.01.2025			
17.	Costas Loop, Time domain and Frequency domain description of SSBSC Signal	1	09.01.2025			
18.	Tutorial	1	10.01.2025		**TLM3**	
19.	Generation of SSBSC Waves: Frequency discrimination method, Phase discrimination method	1	10.01.2025			
20.	Demodulation of SSB Waves: Coherent Detection	1	11.01.2025			
21.	Vestigial sideband modulation: Time domain description, Frequency domain description	1	17.01.2025			
22.	Generation of VSB Modulated wave	1	17.01.2025			
23.	Envelope detection of a VSB Wave pulse Carrier, Comparison of different AM Techniques	1	18.01.2025			
24.	Applications of different AM Systems, Frequency Division Multiplexing	1	23.01.2025			
25.	Tutorial	1	24.01.2025		**TLM3**	
26.	Related problems	1	24.01.2025			
No. of classes required to complete UNIT-II :15			**No. of classes taken:**			

UNIT-III: Angle Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Introduction, Basic concept of phase modulation, Frequency Modulation	1	25.01.2025			
28.	Tutorial	1	06.02.2025		**TLM3**	
29.	Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave	1	07.02.2025			
30.	Narrow band FM, Wide band FM Constant Average Power, Transmission bandwidth of FM Wave	1	07.02.2025			
31.	Generation of FM Waves: Direct Method, Indirect Method	1	08.02.2025			
32.	Turorial	1	13.02.2025		**TLM3**	
33.	Detection of FM Waves: Balanced Frequency discriminator, zero crossing detector,	1	14.02.2025			
34.	Phase locked loop	1	14.02.2025			
35.	Comparison of FM & AM, Related problems	1	15.02.2025			
No. of classes required to complete UNIT-III: 9			**No. of classes taken:**			

UNIT-IV: Radio Transmitters & Radio Transmitters

S.No.	Topic/s	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
36.	Classification of Transmitters	1	20.02.2025			
37.	AM Transmitter, Effect of feedback on performance of AM Transmitter	1	21.02.2025			
38.	FM Transmitter: Variable reactance type FM Transmitter, Frequency stability in FM Transmitter.	1	21.02.2025			
39.	Radio Receivers: Receiver Types	1	22.02.2025			
40.	Tutorial	1	27.02.2025		**TLM3**	
41.	Tuned radio frequency receiver	1	28.02.2025			
42.	Super heterodyne receiver	1	28.02.2025			
43.	RF section and Characteristics, Frequency changing and tracking,	1	01.03.2025			
44.	Tutorial	1	06.03.2025		**TLM3**	
45.	Intermediate frequency, AGC	1	07.03.2025			
46.	FM Receiver, Amplitude limiting	1	07.03.2025			
47.	Problems	1	08.03.2025			
No. of classes required to complete UNIT-IV: 12			**No. of classes taken:**			

UNIT-V: Noise & Pulse Analog Modulation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Introduction	1	13.03.2025			
49.	Noise in DSB Systems	1	15.03.2025			
50.	Tutorial	1	20.03.2025		**TLM3**	
51.	Noise in SSB Systems	1	21.03.2025			
52.	Noise in AM System and Noise in Angle Modulation Systems	1	21.03.2025			
53.	Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis.	1	22.03.2025			
54.	Tutoraial	1	27.03.2025		**TLM3**	
55.	Pulse Analog Modulation: Types of Pulse modulation	1	28.03.2025			
56.	PAM (Single polarity, double polarity),	1	28.03.2025			
57.	PWM: Generation & Detection of PWM	1	29.02.2025			
58.	Tutorial	1	03.04.2025		**TLM3**	
59.	PPM: Generation and Detection of PPM, Time Division Multiplexing	1	04.04.2025			
60.	Problems	1	04.04.2025			
No. of classes required to complete UNIT-V: 13			**No. of classes taken**			

Contents beyond the Syllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	Recent Trends in Communication	**1**	05.04.2025		**TLM2**	

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

PART-C: EVALUATION PROCESS:

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	**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.
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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	Dr. K. Ravi Kumar	Dr. B.Poornaiah	Dr.M.V.Sudhakar	Dr.G.Srinivasulu
07.12.2025	**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., IV-Sem., Section - C
Course Instructor : Dr. K. Ravi Kumar, Associate Professor of ECE
Course Name & Code : Signals and Systems Lab – 23EC54
L-T-P-Cr Structure : 0-0-3-1.5
Academic Year : 2024-25

Course Objectives:

1	To understand the basics of MATLAB Programming
2	To get hands on experience on handling numerous signals and datasets
3	To visualize real time signals

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

CO1	Understand the basics of MATLAB Programming.	L2
CO2	Perform basic operations on Signals	L3
CO3	Obtain the spectral representation of given signal	L3
CO4	Adapt effective Communication, presentation and report writing skills.	L3

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

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

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

TEXT BOOKS:

1. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers - Rudra Pratap, Oxford University Press

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

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 MATLAB (Variables, loops)	3	09.12.2024			
2.	Introduction to MATLAB (Functions, File handling)	3	16.12.2024			
3.	Generation of Basic Signals (Analog and Discrete)	3	23.12.2024			
4.	Operations on signals	3	30.12.2024			
5.	Estimation of energy and power of signals	3	06.01.2025			
6.	Obtain the response of a system using convolution	3	20.01.2025			
7.	Perform correlation between signals	3	03.02.2025			
8.	Estimation of Fourier coefficients of a given periodic signal	3	10.02.2025			
9.	Analysis of Fourier spectrum using Fourier Transform	3	17.02.2025			
10.	Estimation of Laplace transform of an arbitrary function	3	24.02.2025			
11.	Estimation of Z- transform of an arbitrary function	3	3.03.2025			
12.	Estimation of power Spectral density for noise signals	3	10.03.2025			
13.	Content Beyond Syllabus: Working with real time data handling	3	17.03.2025			
14.	Content Beyond Syllabus: Working with real time data handling	3	24.03.2025			
15.	Internal Exam	3	31.03.2025			
No. of weeks required to complete experiments :12			**No. of classes taken:**			

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

PART-C: EVALUATION PROCESS:

Evaluation Task	Experiment Nos.	Marks
Day to Day work	1,2,3,4,5,6,7,8,9,10	A1 =10
Record and observation	1,2,3,4,5,6,7,8,9,10	B1 = 5
Internal Exam	1,2,3,4,5,6,7,8,9,10	C1=15
Cumulative Internal Examination (CIE): (A1+B1+C1)	1,2,3,4,5,6,7,8,9,10	30
Semester End Examination (SEE)	1,2,3,4,5,6,7,8,9,10	70
Total Marks=CIE+SEE 100	1,2,3,4,5,6,7,8,9,10	30
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.
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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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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.
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Date	Dr. K. Ravi Kumar	Dr. G L N Murthy	Dr. G L N Murthy	Dr.G.Srinivasulu
09.12.2024	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**HOD**

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program : B.Tech. IV-Sem., ECE., Section–C
Academic Year : 2024-25
Course Name & Code : Electronic Circuit Analysis Lab – 23EC55
L-T-P-Cr : 0-0-3-1.5
Course Instructure : Mr. M. Sivasankara Rao, Dr. B. Poornaiah, Mr. P. Venkateswara Rao, Mr. Ch. Siva Rama Krishna

Course Objectives:

1.To demonstrate the characteristics of amplifiers, oscillators, and their applications.
2. To analyze the effect of resistance and capacitance on frequency response and gain of amplifiers and oscillators.
3. To design the feedback amplifiers, power amplifiers, tuned amplifiers, and oscillator circuits.

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

CO 1	Demonstrate the characteristics of amplifiers, oscillators and its applications.	L2
CO 2	Apply the knowledge of Resistance and capacitance effects on frequency response and gain of amplifiers and oscillator circuits.	L3
CO 3	Design different types of feedback amplifiers, Power amplifier, Tuned amplifiers, Oscillators with different characteristics	L3
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	1	2				2	1	2		1		2	
CO 2	2	3	1	1				2	1	2		1		2	
CO 3	2	3	1	2				2	1	2		1		3	
CO 4										3					

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

PART-B: COURSE DELIVERY PLAN (LESSON PLAN): Batch-I

S.No.	Topics to be covered. (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to ECA Lab experiments, Cos ,Pos and PSOs.	3	14-12-2024		TLM4	
2.	**HARDWARE:** Determination of Voltage gain of an amplifier using its frequency response.	3	21-12-2024		TLM4	
3.	Determination of Gain and Bandwidth of two stage RC Coupled amplifier from the frequency response.	3	28-12-2024		TLM4	
4.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier	3	04-01-2025		TLM4	
5.	Analysis of stabilization of Gain of Transistorized Current-Shunt Feedback Amplifier.	3	11-01-2025		TLM4	
6.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	25-01-2025		TLM4	
7.	Design and Realization of Transistorized Colpitt's Oscillator to generate a sinusoidal signal.	3	01-02-2025		TLM4	
8.	Repetition Lab for Hardware Experiments	3	08-02-2025		TLM4	
9.	**SOFTWARE:** Determination of Gain and Bandwidth of Darlington Pair Amplifier from the frequency response.	3	15-02-2025		TLM4	
10.	Design of Class A Series-fed Power Amplifier.	3	22-02-2025		TLM4	
11.	Design of Transformer-coupled Class A Power Amplifier.	3	01-03-2025		TLM4	
12.	Design of Class B Push-Pull Power Amplifier.	3	08-03-2025		TLM4	
13.	Design of Complementary Symmetry Class B Push-Pull Power Amplifier	3	15-03-2025		TLM4	
14.	Determination of Gain and Bandwidth of Single Tuned, doubled tuned Voltage Amplifier.	3	22-03-2025		TLM4	
15.	Repetition Lab for Software Experiments	3	29-03-2025		TLM4	
16.	Lab Internal Examination	3	05-04-2025		TLM4	
No. of classes required:48				**No. of classes taken:**		

PART-B: COURSE DELIVERY PLAN (LESSON PLAN): Batch-II

S.No.	Topics to be covered. (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Introduction to ECA Lab experiments, Cos ,Pos and PSOs.	3	14-12-2024		TLM4	
18.	**HARDWARE:** Determination of Voltage gain of an amplifier using its frequency response.	3	21-12-2024		TLM4	
19.	Determination of Gain and Bandwidth of two stage RC Coupled amplifier from the frequency response.	3	28-12-2024		TLM4	
20.	Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier	3	04-01-2025		TLM4	
21.	Analysis of stabilization of Gain of Transistorized Current-Shunt Feedback Amplifier.	3	11-01-2025		TLM4	
22.	Design and Realization of Transistorized RC Phase shift Oscillator to generate a sinusoidal signal	3	25-01-2025		TLM4	
23.	Design and Realization of Transistorized Colpitt's Oscillator to generate a sinusoidal signal.	3	01-02-2025		TLM4	
24.	Repetition Lab for Hardware Experiments	3	08-02-2025		TLM4	
25.	**SOFTWARE:** Determination of Gain and Bandwidth of Darlington Pair Amplifier from the frequency response.	3	15-02-2025		TLM4	
26.	Design of Class A Series-fed Power Amplifier.	3	22-02-2025		TLM4	
27.	Design of Transformer-coupled Class A Power Amplifier.	3	01-03-2025		TLM4	
28.	Design of Class B Push-Pull Power Amplifier.	3	08-03-2025		TLM4	
29.	Design of Complementary Symmetry Class B Push-Pull Power Amplifier	3	15-03-2025		TLM4	
30.	Determination of Gain and Bandwidth of Single Tuned, doubled tuned Voltage Amplifier.	3	22-03-2025		TLM4	
31.	Repetition Lab for Software Experiments	3	29-03-2025		TLM4	
32.	Lab Internal Examination	3	05-04-2025		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.
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. M. Sivasankara Rao Dr. B. Poornaiah Mr. P. Venkateswara Rao Mr. Ch. Siva Rama Krishna	Mr. P. Venkateswara Rao	Dr. T. Satyanarayana	Dr. G. Srinivasulu

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http://lbrce.ac.in/it/index.php,hodit@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : M.Hema Latha
Course Name & Code : PYTHON PROGRAMMING & 23CSS1
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech/IV/ECE-C **A.Y.:** 2024-25

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of this course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES (CO):

CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**

CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**

CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**

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

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	
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	Topic to be covered	No. of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python	1	10-12-2024		
2.	Python Installation, Variables, Data types. Reading Input, Print output,Comments	3	11-12-2024		
3.	Types of operators, Working on Operators	1	17-12-2024		
4.	Sample Programs, Type Conversion, Control stmts if, else, nestedif, elif	3	18-12-2024		
5.	Loop statements	1	24-12-2024		
6.	Programs on Loop statements, pass, continue and break	3	25-12-2024		
7.	Exception Handling	1	31-12-2024		
8.	Programs on exception handling.	3	01-01-2025		
9.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	1	01-01-2025		
10.	Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.	3	08-01-2025		
11.	Strings Introduction, Basic String Operations	1	21-01-2025		
12.	Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings., Sample Programs on strings	3	22-01-2025		
13.	Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on Lists	1	28-01-2025		
14.	**Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries,	3	29-01-2025		
15.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	1	04-02-2025		
16.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	3	05-02-2025		

17.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	1	11-02-2025		
18.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	3	12-02-2025		
19.	**Unit-4**: Introduction to files,Types of Files, Creating and Reading Text Data	1	18-02-2025		
20.	File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	3	19-02-2025		
21.	Pickle Module	1	25-02-2025		
22.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs.	3	26-02-2025		
23.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	1	04-03-2025		
24.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	3	05-03-2025		
25.	Encapsulation, Inheritance, Polymorphism,	1	11-03-2025		
26.	Sample Python programs on object-oriented programming.	3	12-03-2025		
27.	**Unit 5: Introduction to Data Science**: Functional Programming,JSON and XML in Python	1	18-03-2025		
28.	NumPy with Python, Example Programs on Numpy	3	19-03-2025		
29.	Pandas	1	25-03-2025		
30.	Example Programs on pandas.	3	26-03-2025		
31.	RIVISION	1	01-04-2025		
32.	**Internal Exam**	3	02-04-2025		

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

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 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	Organize, Analyze and Interpret the data to extract meaningful conclusions..
PSO 2	Design, Implement and evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Signature				
Name of the Faculty	**M.Hema Latha**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.V.B Reddy**	*Dr B.Srinivasa Rao*

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor	**:** Dr. B. Rambabu, Dr. T. Satyanarayana	
Course Name & Code	**:** Design Thinking & Innovation (23ME57)	
Regulation	: R23	
L-T-P Structure	**:** 1-0-2	**Credits:** 02
Program/Sem/Sec	: B.Tech – IV Semester – C Section	**A.Y.:** 2024-25

PREREQUISITE: None

COURSE OBJECTIVES:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process

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

CO1	Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**
CO2	Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**
CO3	Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions**. (Analyzing-L4)**
CO4	Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**
CO5	Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. **(Evaluating-L5)**

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

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

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
	UNIT–I: INTRODUCTION TO DESIGN THINKING					
1	Introduction to elements and principles of Design	1	13-12-2024		TLM2	
	Activity: To understand the importance of design	2	13.12.2024		TLM6	
2	History of Design Thinking, New materials in Industry	1	20.12.2024		TLM2	
	Activity: To understand the importance of team work	2	20.12.2024		TLM6	
3	Basics of design-dot, line, shape, form as fundamental design components	1	27.12.2024		TLM2	
	Activity: Developing sketches using dot, line and form	2	27.12.2024		TLM6	
	UNIT–II: DESIGN THINKING PROCESS					
4	Design thinking process: Empathy	1	03.1.2025		TLM2	
	Activity: To understand the significance of Empathy	2	03.1.2025		TLM6	
5	Design thinking process: Define or Analyze	1	10.1.2025		TLM2	
	Activity: To understand the significance of Define/analyze	2	10.1.2025		TLM6	
6	Design thinking process: Ideate	1	24.1.2025		TLM2	
	Activity: To understand the significance of Ideate	2	24.1.2025		TLM6	

7	Design thinking process: Prototype	1	07.2.2025		TLM2	
	Activity: To understand the significance of Prototype	2	07.2.2025		TLM6	
8	Tools of design thinking in social innovations	1	14.2.2025		TLM2	
	Activity: Students should present their understanding of DTI elements using example	2	14.2.2025		TLM6	
	UNIT – III: INNOVATION					
9	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	1	21.2.2025		TLM2	
	Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation	2	21.2.2025		TLM6	
	UNIT – IV: PRODUCT DESIGN					
10	Problem formation, introduction to product design, Product strategies, Product value	1	28.2.2025		TLM2	
	Activity: Development of Business models, setting of specifications	2	28.2.2025		TLM6	
11	Product planning, product specifications. Innovation towards product design Case studies.	1	07.3.2025		TLM2	
	Activity: Explaining their own product and model design, case studies	2	07.3.2025		TLM6	
	UNIT – V: DESIGN THINKING IN BUSINESS PROCESSES					
12	Business & Strategic Innovation, Business challenges, Startups.	1	14.3.2025		TLM2	
	Activity: Marketing strategies of our own product, its maintenance, Reliability and plan for startup	2	14.3.2025		TLM6	
13	Defining and testing Business Models and	1	21.3.2025		TLM2	

	Business Cases. Developing & testing prototypes					
	Activity: Marketing strategies of our own product, its maintenance, Reliability and plan for startup	2	21.3.2025		TLM6	
I Mid Exams: 27-01-2025 to 01-02-2025						
II Mid Exams: 07-04-2025 to 12-04-2025						
No. of classes required to complete: 39				**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-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Internal Examination	30
Semester End Examination	70
Total Marks:	**100**

ACADEMIC CALENDAR

Commencement of IV Semester Classwork	**09-12-2024**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	09-12-2024	25-01-2025	7 W
I Mid Examinations	**27-01-2025**	**01-02-2025**	1 W
II Phase of Instructions	03-02-2025	05-04-2025	9 W
II Mid Examinations	**07-04-2025**	**12-04-2025**	1 W
Preparation and Practicals	14-04-2025	19-04-2025	1 W
Semester End Examinations	**21-04-2025**	**03-05-2025**	2 W
Internship	05-05-2025	28-06-2025	8 W
Commencement of V Semester Classwork	**30 –06–2025**		

PART-C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To possess knowledge in both fundamental and application aspects of mathematical, scientific, engineering principles to analyze complex engineering problems for meeting the national and international requirements and demonstrating the need for sustainable development.
PEO 2	To adapt to the modern engineering tools for planning, analysis, design, implementation of analytical data and assess their relevant significance in societal and legal issues necessary in their professional career.
PEO 3	To exhibit professionalism, ethical attitude, communication, managerial skills, team work and social responsibility in their profession and adapt to current trends by engaging in continuous learning.

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.
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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	**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.
PO10	**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.
PO11	**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.
PO12	**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	Possesses necessary skill set to analyze and design various systems using analytical and software tools related to civil engineering
PSO 2	Possesses ability to plan, examine and analyze the various laboratory test required for the professional demands
PSO 3	Possesses basic technical skills to pursue higher studies and professional practice in civil engineering domain

Signature				
Name of the Faculty	Dr. B. Rambabu, Dr. T. Satyanarayana	Dr. B. Rambabu		Dr. G. Srinivasulu
Designation	**Course Instructors**	**Course Coordinator**	**Module Coordinator**	**HoD**