LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
L.B. Reddy Nagar , Mylavaram-521 230. Andhra Pradesh, INDIA
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
New Delhi & Certified by ISO 9001:2015, http://www.lbrce.ac.in
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Phone: 08659-222933/Extn: 203 hodeee@lbrce.ac.in, eee.lbrce@gmail.com

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P.Sobha Rani
Course Name & Code **:** 20EE25: Renewable and Distributed Generation Technologies
L-T-P Structure **:** 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech VII sem A/S **A.Y.:** 2022-23

PREREQUISITE: Fundamentals of Electrical Engineering, Power system-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the students to acquire knowledge on solar radiation data, Maximum power point techniques in solar PV and Wind energy conversion systems. It also introduces the concepts of impact of distributed generation on transmission and distribution system.

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

CO1	Understand fundamentals of solar energy systems
CO2	Understand wind energy conversion systems
CO3	Analyze the need of distributed generation in grid integration

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											2			
CO2	3	2										2	2			2
CO3	3	2										1	3			

TEXTBOOKS:

T1 John Twidell and Tony Weir, "Renewable Energy Resources", Taylor and Francis -3rd Edition, 2015

T2 H. Lee Willis, Walter G. Scott , "Distributed Power Generation – Planning and Evaluation", Marcel Decker Press, 2000

REFERENCE BOOKS:

R1	John Andrews and Nick Jelly, "Energy Science**:** Principles, Technologies and Impacts", Oxford University Press,4th Edition,2022
R2	S. P. Sukhatme and J. K. Nayak, "Solar Energy**:** Principles of Thermal Collection and Storage",4th Edition, TMH, New Delhi,2017
R3	Godfrey Boyle, "Renewable Energy", oxford university press, 3rd edition, 2012
R4	Ahmed and Zobaa, Ramesh C Bansal, "Handbook of renewable technology", World scientific, Singapore,2021
R5	Ramesh & Kumar, "Renewable Energy Technologies", Narosa Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Fundamentals of Energy Systems, Solar Energy and Solar Thermal 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, COs	1	10-7-23		TLM1	
2.	Energy conservation principle, Energy scenario (world and India)	1	11-7-23		TLM2	
3.	various forms of renewable energy	1	12-7-23		TLM2	
4.	Solar radiation**:** Outside earth's atmosphere ,Earth surface	1	13-7-23		TLM2	
5.	Analysis of solar radiation data , Geometry	2	15-7-23 17-7-23		TLM2	
6.	Radiation on tilted surfaces	1	18-7-23		TLM2	
7.	Liquid flat plate collectors**:** Performance analysis	1	19-7-23		TLM2	
8.	Transmissivity- Absorptivity product	1	20-7-23		TLM2	
9.	collector efficiency factor , Collector heat removal factor	1	22-7-23		TLM2	
10.	Introduction to solar air heaters	1	24-7-23		TLM2	
11.	Concentrating collectors	1	25-7-23		TLM2	
12.	solar pond, solar thermal plants	2	26-7-23 27-7-23		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Solar Photovoltaic 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
13.	Solar photovoltaic cell, module, array	1	31-7-23		TLM2	
14.	construction , Efficiency of solar cells	1	1-8-23		TLM2	
15.	Developing technologies	1	2-8-23		TLM2	
16.	Cell I-V characteristics , Equivalent circuit of solar cell	2	3-8-23 5-8-23		TLM2	
17.	Series resistance ,Shunt resistance	1	7-8-23		TLM2	
18.	Applications and systems	1	8-8-23		TLM2	
19.	Balance of system components	1	9-8-23		TLM2	
20.	System Design**:** storage sizing , PV system sizing	1	10-8-23		TLM2	
21.	Maximum power point techniques**:** Perturb and observe (P&O) technique	1	14-8-23		TLM2	
22.	Incremental conduction Technique	1	16-8-23		TLM2	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: Wind Energy

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.	Sources of wind energy	1	17-8-23		TLM2	
24.	Wind patterns	1	18-8-23		TLM2	
25.	Types of turbines –Horizontal axis and vertical axis machines	2	19-8-23 21-8-23		TLM2	
26.	Kinetic energy of wind – Betz coefficient	2	22-8-23 23-8-23		TLM2	
27.	Tip–speed ratio , Efficiency	1	24-8-23		TLM2	
28.	Power output of wind turbine	1	26-8-23		TLM2	
29.	I-Mid examinations		28-8-23 to 2-9-23			
30.	Selection of generator (synchronous, induction)	1	4-9-23		TLM2	
31.	Maximum power point tracking	1	5-9-23		TLM2	
32.	Wind farms – Power generation for utility grids.	2	7-9-23 11-9-23		TLM2	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Need for Distributed Generation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Renewable sources in distributed generation	1	12-9-23		TLM2	
34.	Current scenario in distributed generation	2	13-9-23 14-9-23		TLM2	
35.	Planning of DGs	2	15-9-23 16-9-23		TLM2	
36.	Siting and sizing of DGs	1	19-9-23		TLM2	
37.	Optimal placement of DG sources in distribution systems	2	20-9-23 21-9-23		TLM2	
38.	Assignment		23-9-23			
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Grid Integration of DGs and Technical Impacts of DGs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Different types of interfaces	3	25-9-23 26-9-23 27-9-23		TLM2	
40.	Inverter based DGs	2	30-9-23 3-10-23		TLM2	
41.	rotating machine-based interfaces	1	4-10-23		TLM2	
42.	Aggregation of multiple DG units	2	5-10-23 7-10-23		TLM2	

43.	Energy storage elements – Batteries, ultra capacitors, flywheels	3	9-10-23 10-10-23 11-10-23		TLM2	
44.	DG Impact on - Transmission and Distribution systems	2	12-10-23 16-10-23		TLM2	
45.	DG Impact on De-regulation	2	17-10-23 18-10-23		TLM2	
46.	Impact of DGs upon protective relaying	1	19-10-23		TLM2	
47.	Impact of DGs upon transient and dynamic stability of existing distribution systems.	2	21-10-23 24-10-23		TLM2	
48.	Revision	3	25-10-23 26-10-23 28-10-23			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Dr.P.Sobha Rani	Dr.M.S.Giridhar	Dr.J.Sivavara Prasad
Signature			

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COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P.Sobha Rani
Course Name & Code : 20EE25: Renewable and Distributed Generation Technologies
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech VII sem B/S **A.Y.:** 2022-23

PREREQUISITE: Fundamentals of Electrical Engineering, Power system-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the students to acquire knowledge on solar radiation data, Maximum power point techniques in solar PV and Wind energy conversion systems. It also introduces the concepts of impact of distributed generation on transmission and distribution system.

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

CO1	Understand fundamentals of solar energy systems
CO2	Understand wind energy conversion systems
CO3	Analyze the need of distributed generation in grid integration

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2											2			
CO2	3	2										2	2			2
CO3	3	2										1	3			

TEXTBOOKS:

T1 John Twidell and Tony Weir, "Renewable Energy Resources", Taylor and Francis -3rd Edition, 2015

T2 H. Lee Willis, Walter G. Scott , "Distributed Power Generation – Planning and Evaluation", Marcel Decker Press, 2000

REFERENCE BOOKS:

R1	John Andrews and Nick Jelly, "Energy Science**:** Principles, Technologies and Impacts", Oxford University Press,4th Edition,2022
R2	S. P. Sukhatme and J. K. Nayak, "Solar Energy**:** Principles of Thermal Collection and Storage",4th Edition, TMH, New Delhi,2017
R3	Godfrey Boyle, "Renewable Energy", oxford university press, 3rd edition, 2012
R4	Ahmed and Zobaa, Ramesh C Bansal, "Handbook of renewable technology", World scientific, Singapore,2021
R5	Ramesh & Kumar, "Renewable Energy Technologies", Narosa Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Fundamentals of Energy Systems, Solar Energy and Solar Thermal 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, COs	1	10-7-23		TLM1	
2.	Energy conservation principle, Energy scenario (world and India)	1	12-7-23		TLM2	
3.	various forms of renewable energy	1	13-7-23		TLM2	
4.	Solar radiation**:** Outside earth's atmosphere ,Earth surface	1	14-7-23		TLM2	
5.	Analysis of solar radiation data , Geometry	2	15-7-23 17-7-23		TLM2	
6.	Radiation on tilted surfaces	1	19-7-23		TLM2	
7.	Liquid flat plate collectors**:** Performance analysis	1	20-7-23		TLM2	
8.	Transmissivity- Absorptivity product	1	21-7-23		TLM2	
9.	collector efficiency factor , Collector heat removal factor	1	22-7-23		TLM2	
10.	Introduction to solar air heaters	1	24-7-23		TLM2	
11.	Concentrating collectors	1	26-7-23		TLM2	
12.	solar pond, solar thermal plants	2	27-7-23 28-7-23		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Solar Photovoltaic 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
13.	Solar photovoltaic cell, module, array	1	31-7-23		TLM2	
14.	construction , Efficiency of solar cells	1	2-8-23		TLM2	
15.	Developing technologies	1	3-8-23		TLM2	
16.	Cell I-V characteristics , Equivalent circuit of solar cell	2	4-8-23 5-8-23		TLM2	
17.	Series resistance ,Shunt resistance	1	7-8-23		TLM2	
18.	Applications and systems	1	9-8-23		TLM2	
19.	Balance of system components	1	10-8-23		TLM2	
20.	System Design**:** storage sizing , PV system sizing	1	11-8-23		TLM2	
21.	Maximum power point techniques**:** Perturb and observe (P&O) technique	1	14-8-23		TLM2	
22.	Incremental conduction Technique	1	16-8-23		TLM2	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: Wind Energy

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.	Sources of wind energy	1	17-8-23		TLM2	
24.	Wind patterns	1	18-8-23		TLM2	
25.	Types of turbines –Horizontal axis and vertical axis machines	2	19-8-23 21-8-23		TLM2	
26.	Kinetic energy of wind – Betz coefficient	2	23-8-23 24-8-23		TLM2	
27.	Tip–speed ratio , Efficiency	1	25-8-23		TLM2	
28.	Power output of wind turbine	1	26-8-23		TLM2	
29.	I-Mid examinations		28-8-23 to 2-9-23			
30.	Selection of generator (synchronous, induction)	1	4-9-23		TLM2	
31.	Maximum power point tracking	1	7-9-23		TLM2	
32.	Wind farms – Power generation for utility grids.	2	8-9-23 11-9-23		TLM2	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Need for Distributed Generation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Renewable sources in distributed generation	1	13-9-23		TLM2	
34.	Current scenario in distributed generation	2	14-9-23 15-9-23		TLM2	
35.	Planning of DGs	2	16-9-23 20-9-23		TLM2	
36.	Siting and sizing of DGs	1	21-9-23		TLM2	
37.	Optimal placement of DG sources in distribution systems	2	22-9-23 23-9-23		TLM2	
38.	Assignment		25-9-23			
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Grid Integration of DGs and Technical Impacts of DGs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Different types of interfaces	3	27-9-23 29-9-23 30-9-23		TLM2	
40.	Inverter based DGs	2	4-10-23 5-10-23		TLM2	
41.	rotating machine-based interfaces	1	6-10-23		TLM2	
42.	Aggregation of multiple DG units	2	7-10-23 9-10-23		TLM2	

43.	Energy storage elements – Batteries, ultra capacitors, flywheels	3	11-10-23 12-10-23 13-10-23		TLM2	
44.	DG Impact on - Transmission and Distribution systems	2	16-10-23 18-10-23		TLM2	
45.	DG Impact on De-regulation	2	19-10-23 20-10-23		TLM2	
46.	Impact of DGs upon protective relaying	1	21-10-23		TLM2	
47.	Impact of DGs upon transient and dynamic stability of existing distribution systems.	2	25-10-23 26-10-23		TLM2	
48.	Revision	2	27-10-23 28-10-23			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.

Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Dr.P.Sobha Rani	Dr.M.S.Giridhar	Dr.J.Sivavara Prasad
Signature			

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.Nageswara Rao
Course Name & Code **:** Hybrid Electric Vehicles & 20EE27
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/VII/A **A.Y.:**2023-24
PREREQUISITE: Power Electronics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Understand the concept of electric and hybrid electric vehicles.(Understand-L2)
CO2	Analyze different configuration of hybrid electric vehicles. (Understand-L2)
CO3	Understand the performance of Plug- in hybrid electric vehicles. (Understand-L2)
CO4	Apply the power converters used in hybrid electric vehicles (Apply-L3)
CO5	Analyze different types of batteries and energy storage systems. (Understand-L2)

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

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

TEXTBOOKS:

T1 Ali Emadi, Advanced Electric Drive Vehicles, CRC Press,Ist Edition 2017.

T2 Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press,3rd Edition 2021.

REFERENCE BOOKS:

R1 MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,3rd Edition 2019.

R2 James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley,2nd Edition 2017.

R3 H. Partab Modern Electric Traction – Dhanpat Rai& Co, 2017.

R4 Pistooa G., "Power Sources Models, Sustanability, Infrstructure and the market", Elsevier 2008

R5 Mi Chris, Masrur A., and Gao D.W., " Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives" 2nd Edition,2017.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Fundamentals of vehicle,	1			TLM1	
2.	Components of conventional vehicle	1			TLM1	
3.	Drive cycles and drive terrain;	1			TLM1	
4.	Concept of electric vehicle	1			TLM1	
5.	History of hybrid vehicles,	1			TLM2	
6.	Applications of Electric and Hybrid Electric Vehicles,	1			TLM1	
7.	Principle of magnetic levitation,	1			TLM1	
8.	Different Motors suitable for of Electric and Hybrid Electric Vehicles.	1			TLM1	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT-II: HYBRIDIZATION OF AUTOMOBILE

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Architectures of HEVs,	1			TLM1	
10.	Series and parallel HEVs,	1			TLM1	
11.	Complex HEVs.	1			TLM1	
12.	Plug-in hybrid vehicle,	1			TLM2	
13.	Constituents of PHEV,	1			TLM2	
14.	Comparison of HEV and PHEV;	1			TLM1	
15.	Fuel Cell vehicles and its constituents.	1			TLM1	
No. of classes required to complete UNIT-II: 07				**No. of classes taken:**		

UNIT-III: PLUG-IN HYBRID ELECTRIC VEHICLE

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	PHEVs and EREVs blended PHEVs,	1			TLM1	
17.	PHEV Architectures,	1			TLM2	
18.	Equivalent electric range of blended PHEVs;	1			TLM1	
19.	Fuel economy of PHEVs,	1			TLM1	
20.	Power management of PHEVs,	1			TLM1	
21.	Vehicle to grid technology, PHEV battery charging.	2			TLM1	
No. of classes required to complete UNIT-III: 07				**No. of classes taken:**		

UNIT-IV: POWER ELECTRONICS IN HEVS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Rectifiers used in HEVs,	1			TLM1	
23.	Buck converter	1			TLM1	
24.	Voltage source inverter, Current source inverter,	2			TLM1	
25.	Isolated bidirectional DC-DC converter,	1			TLM1	
26.	PWM rectifier	1			TLM1	
27.	Charging methods	2			TLM2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: BATTERY AND STORAGE 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
28.	Energy Storage Parameters;	1			TLM1	
29.	Lead–Acid Batteries;	1			TLM1	
30.	Lithium-ion batteries-Ultra capacitors;	1			TLM2	
31.	Flywheels - Superconducting Magnetic Storage System;	2			TLM1	
32.	Pumped Hydroelectric Energy Storage; Economic Resource	2			TLM1	
No. of classes required to complete UNIT-V: 07				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.Nageswara Rao
Course Name & Code **:** Hybrid Electric Vehicles & 20EE27
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/VII/B **A.Y.:**2023-24
PREREQUISITE: Power Electronics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Understand the concept of electric and hybrid electric vehicles.(Understand-L2)
CO2	Analyze different configuration of hybrid electric vehicles. (Understand-L2)
CO3	Understand the performance of Plug- in hybrid electric vehicles. (Understand-L2)
CO4	Apply the power converters used in hybrid electric vehicles (Apply-L3)
CO5	Analyze different types of batteries and energy storage systems. (Understand-L2)

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

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

TEXTBOOKS:

T1 Ali Emadi, Advanced Electric Drive Vehicles, CRC Press,Ist Edition 2017.

T2 Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press,3rd Edition 2021.

REFERENCE BOOKS:

R1 MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,3rd Edition 2019.

R2 James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley,2nd Edition 2017.

R3 H. Partab Modern Electric Traction – Dhanpat Rai& Co, 2017.

R4 Pistooa G., "Power Sources Models, Sustanability, Infrstructure and the market", Elsevier 2008

R5 Mi Chris, Masrur A., and Gao D.W., " Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives" 2nd Edition,2017.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Fundamentals of vehicle,	1			TLM1	
2.	Components of conventional vehicle	1			TLM1	
3.	Drive cycles and drive terrain;	1			TLM1	
4.	Concept of electric vehicle	1			TLM1	
5.	History of hybrid vehicles,	1			TLM2	
6.	Applications of Electric and Hybrid Electric Vehicles,	1			TLM1	
7.	Principle of magnetic levitation,	1			TLM1	
8.	Different Motors suitable for of Electric and Hybrid Electric Vehicles.	1			TLM1	
No. of classes required to complete UNIT-I: 08				**No. of classes taken:**		

UNIT-II: HYBRIDIZATION OF AUTOMOBILE

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Architectures of HEVs,	1			TLM1	
10.	Series and parallel HEVs,	1			TLM1	
11.	Complex HEVs.	1			TLM1	
12.	Plug-in hybrid vehicle,	1			TLM2	
13.	Constituents of PHEV,	1			TLM2	
14.	Comparison of HEV and PHEV;	1			TLM1	
15.	Fuel Cell vehicles and its constituents.	1			TLM1	
No. of classes required to complete UNIT-II: 07				**No. of classes taken:**		

UNIT-III: PLUG-IN HYBRID ELECTRIC VEHICLE

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	PHEVs and EREVs blended PHEVs,	1			TLM1	
17.	PHEV Architectures,	1			TLM2	
18.	Equivalent electric range of blended PHEVs;	1			TLM1	
19.	Fuel economy of PHEVs,	1			TLM1	
20.	Power management of PHEVs,	1			TLM1	
21.	Vehicle to grid technology, PHEV battery charging.	2			TLM1	
No. of classes required to complete UNIT-III: 07				**No. of classes taken:**		

UNIT-IV: POWER ELECTRONICS IN HEVS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Rectifiers used in HEVs,	1			TLM1	
23.	Buck converter	1			TLM1	
24.	Voltage source inverter, Current source inverter,	2			TLM1	
25.	Isolated bidirectional DC-DC converter,	1			TLM1	
26.	PWM rectifier	1			TLM1	
27.	Charging methods	2			TLM2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: BATTERY AND STORAGE 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
28.	Energy Storage Parameters;	1			TLM1	
29.	Lead–Acid Batteries;	1			TLM1	
30.	Lithium-ion batteries-Ultra capacitors;	1			TLM2	
31.	Flywheels - Superconducting Magnetic Storage System;	2			TLM1	
32.	Pumped Hydroelectric Energy Storage; Economic Resource	2			TLM1	
No. of classes required to complete UNIT-V: 07				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
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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.
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PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. P.Deepak Reddy
Course Name & Code : Analog and Digital Signal Processing &20EE30
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections- A A.Y :2023-24

PRE-REQUISITES: Differential Equations and liner algebra, Transformation techniques

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student toUnderstand Discrete Fourier Transform and its computation. It also deals with Discrete Fourier Series, Fast Fourier Series, Z-transforms and concepts of filter design

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

CO 1	Classify different types of signals and systems
CO 2	Analyze DFT and FFT
CO 3	Design digital filters using different techniques

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		2	1	1		1		1	1		2			3	1
CO2	2		3	1	1		1		1	1		2			3	1
CO3		2	3		1										3	1
CO4		2	3		1										3	1

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

TEXT BOOKS:

T1 John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Prentice Hall, illustrated 4th edition, 2007.
T2 A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", Pearson education, 3rd edition, 2013.

REFERENCE BOOKS:

R1 Andreas Antoniou "Digital Signal Processing", TATA McGraw Hill edition, 2006.
R2 MH Hayes, Schaum's, "Digital Signal Processing: Outlines", TATA Mc-Graw Hill professional, 1999.
R3 C. Britton, Rorabaugh, "DSP Primer", Tata McGraw Hill edition, 2005.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: CLASSIFICATION OF SIGNALS AND 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 Course and COs	1	03-07-2023		TLM1	
2.	Introduction to unit-I: Signals, systems and DSP	1	04-07-2023		TLM1	
3.	Continuous time signals (CT signals)	1	05-07-2023		TLM1	
4.	Discrete time signals (DT signals)	1	07-07-2023		TLM1	
5.	Classification of CT signals	1	10-07-2023		TLM1	
6.	Classification of DT signals	1	11-07-2023		TLM1	
7.	Classification of CT and DT systems: static and dynamic, linear and non linear	1	12-07-2023		TLM1	
8.	Time-variant & Time-invariant	1	14-07-2023		TLM1	
9.	Causal & Noncausal	1	15-07-2023		TLM1	
10.	Stable & Unstable systems	1	17-07-2023		TLM1	
11.	Linear constant coefficient difference equations	1	18-07-2023		TLM1	
12.	problems	1	19-07-2023		TLM1	
13.	Sampling Theorem	1	21-07-2023		TLM1	
14.	Convolution theorem	1	22-07-2023		TLM1	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: DISCRETE FOURIER SERIES & FAST FOURIER TRANSFORM

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.	Properties of discrete Fourier series	1	24-07-2023		TLM1	
2.	DFS representation of periodic sequences	1	25-07-2023		TLM1	
3.	Discrete Fourier transforms	1	26-07-2023		TLM1	
4.	Discrete Fourier transforms	1	28-07-2023		TLM1	
5.	Properties of DFT	1	01-08-2023		TLM1	
6.	Linear convolution of sequences using DFT	1	02-08-2023		TLM1	
7.	problems	1	01-08-2023		TLM1	
8.	Computation of DFT	1	04-08-2023		TLM1	
9.	Relation between Z-transform and DFS	1	05-08-2023		TLM1	
10.	Fast Fourier transforms (FFT)	1	07-08-2023		TLM1	
11.	Radix-2 decimation in time	1	08-08-2023		TLM1	
12.	Radix-2 decimation in frequency	1	09-08-2023		TLM1	
13.	problems	1	11-08-2023		TLM1	
14.	problems	1	14-08-2023		TLM1	
15.	FFT Algorithms,	1	16-08-2023		TLM1	
16.	Inverse FFT	1	18-08-2023		TLM1	
No. of classes required to complete UNIT-II: 16				No. of classes taken:		

UNIT-III: REALIZATION OF DIGITAL FILTERS

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.	Z – transforms and Applications	1	19-08-2023		TLM1	
2.	Solution of difference equations of digital filters	1	21-08-2023		TLM1	
3.	Block diagram representation of linear constant-coefficient difference equations	1	22-08-2023		TLM1	
4.	Basic structures of IIR systems	1	23-08-2023		TLM1	
5.	problems	1	25-08-2023		TLM1	
6.	problem	1	26-08-2023		TLM1	
7.	I mid exams(28-08-2023 to 02-09-2023)					
8.	Transposed forms	1	04-09-2023		TLM1	
9.	Basic structures of FIR systems	1	05-09-2023		TLM1	
10.	Basic structures of FIR systems	1	08-09-2023		TLM1	
11.	problems	1	11-09-2023		TLM1	
12.	problems	1	12-09-2023		TLM1	
13.	problems	1	13-09-2023		TLM1	
14.	problems	1	15-09-2023		TLM1	
No. of classes required to complete UNIT-III:14				No. of classes taken:		

UNIT-IV: IIR DIGITAL FILTERS

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.	Analog filter approximations	1	16-09-2023		TLM1	
2.	Butter worth filters	1	19-09-2023		TLM1	
3.	Chebyshev filters	1	20-09-2023		TLM1	
4.	Design of IIR Digital filters from analog filters	1	22-09-2023		TLM1	
5.	problems	1	23-09-2023		TLM1	
6.	Design of IIR Digital filters from analog filters	1	25-09-2023		TLM1	
7.	problems	1	26-09-2023		TLM1	
8.	Design Examples: Analog-Digital transformations	1	27-09-2023		TLM1	
9.	problems	1	29-09-2023		TLM1	
10.	Design Examples: Analog-Digital transformations	1	30-09-2023		TLM1	
11.	problems	1	03-10-2023		TLM1	
12.	problems	1	04-10-2023		TLM1	
13.	problems	1	06-10-2023		TLM1	
14.	problems	1	07-10-2023		TLM1	
No. of classes required to complete UNIT-IV:14				No. of classes taken:		

UNIT-V: FIR DIGITAL FILTERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of FIR Digital Filters	1	09-10-2023		TLM1	
2.	Frequency response	1	10-10-2023		TLM1	
3.	Design of FIR Digital Filters using Window Techniques	1	11-10-2023		TLM1	
4.	Design of FIR Digital Filters using Window Techniques	1	13-10-2023		TLM1	
5.	Design of FIR Digital Filters using Window Techniques	1	16-10-2023		TLM1	
6.	Design of FIR Digital Filters using Window Techniques	1	17-10-2023		TLM1	

7.	Frequency Sampling technique	1	18-10-2023		TLM1	
8.	Frequency Sampling technique	1	20-10-2023		TLM1	
9.	Frequency Sampling technique	1	21-10-2023		TLM1	
10.	Frequency Sampling technique	1	24-10-2023		TLM1	
11.	Comparison of IIR & FIR filters	1	25-10-2023		TLM1	
12.	problems	1	27-10-2023		TLM1	
13.	problems	1	28-10-2023		TLM1	
No. of classes required to complete UNIT-V:13				No. of classes taken:		

Contents beyond the Syllabus:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Applications of DSP processors	1			TLM2	
2	DSP programming in MATLAB	1			TLM4	

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

PART-C

EVALUATION PROCESS (R20 Regulations):

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	03-07-2023	26-08-2023	8W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	8W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practicals	06-11-2023	11-11-2023	1W
Semester End Examinations	13-11-2023	25-11-2023	2W

PART-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	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO 4	Design controllers for electrical and electronic systems to improve their performance.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. P.Deepak Reddy	Mr. P.Deepak Reddy	Mr. P. Deepak Reddy	Dr. J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. P.Deepak Reddy
Course Name & Code : Analog and Digital Signal Processing &20EE30
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections-B A.Y :2023-24

PRE-REQUISITES: Differential Equations and liner algebra, Transformation techniques

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student toUnderstand Discrete Fourier Transform and its computation. It also deals with Discrete Fourier Series, Fast Fourier Series, Z-transforms and concepts of filter design

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

CO 1	Classify different types of signals and systems
CO 2	Analyze DFT and FFT
CO 3	Design digital filters using different techniques

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3		2	1	1		1		1	1		2			3	1
CO2	2		3	1	1		1		1	1		2			3	1
CO3		2	3		1										3	1
CO4		2	3		1										3	1

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

TEXT BOOKS:

T1 John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Prentice Hall, illustrated 4th edition, 2007.
T2 A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", Pearson education, 3rd edition, 2013.

REFERENCE BOOKS:

R1 Andreas Antoniou "Digital Signal Processing", TATA McGraw Hill edition, 2006.
R2 MH Hayes, Schaum's, "Digital Signal Processing: Outlines", TATA Mc-Graw Hill professional, 1999.
R3 C. Britton, Rorabaugh, "DSP Primer", Tata McGraw Hill edition, 2005.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: CLASSIFICATION OF SIGNALS AND 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 Course and COs	1	03-07-2023		TLM1	
2.	Introduction to unit-I: Signals, systems and DSP	1	05-07-2023		TLM1	
3.	Continuous time signals (CT signals)	1	06-07-2023		TLM1	
4.	Discrete time signals (DT signals)	1	07-07-2023		TLM1	
5.	Classification of CT signals	1	10-07-2023		TLM1	
6.	Classification of DT signals	1	12-07-2023		TLM1	
7.	Classification of CT and DT systems: static and dynamic, linear and non linear	1	13-07-2023		TLM1	
8.	Time-variant & Time-invariant	1	14-07-2023		TLM1	
9.	Causal & Noncausal	1	15-07-2023		TLM1	
10.	Stable & Unstable systems	1	17-07-2023		TLM1	
11.	Linear constant coefficient difference equations	1	19-07-2023		TLM1	
12.	problems	1	20-07-2023		TLM1	
13.	Sampling Theorem	1	21-07-2023		TLM1	
14.	Convolution theorem	1	22-07-2023		TLM1	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: DISCRETE FOURIER SERIES & FAST FOURIER TRANSFORM

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.	Properties of discrete Fourier series	1	24-07-2023		TLM1	
2.	DFS representation of periodic sequences	1	26-07-2023		TLM1	
3.	Discrete Fourier transforms	1	27-07-2023		TLM1	
4.	Discrete Fourier transforms	1	28-07-2023		TLM1	
5.	Properties of DFT	1	02-08-2023		TLM1	
6.	Linear convolution of sequences using DFT	1	03-08-2023		TLM1	
7.	problems	1	04-08-2023		TLM1	
8.	Computation of DFT	1	05-08-2023		TLM1	
9.	Relation between Z-transform and DFS	1	07-08-2023		TLM1	
10.	Fast Fourier transforms (FFT)	1	09-08-2023		TLM1	
11.	Radix-2 decimation in time	1	10-08-2023		TLM1	
12.	Radix-2 decimation in frequency	1	11-08-2023		TLM1	
13.	problems	1	14-08-2023		TLM1	
14.	problems	1	16-08-2023		TLM1	
15.	FFT Algorithms,	1	17-08-2023		TLM1	
16.	Inverse FFT	1	18-08-2023		TLM1	
No. of classes required to complete UNIT-II: 16				No. of classes taken:		

UNIT-III: REALIZATION OF DIGITAL FILTERS

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.	Z – transforms and Applications	1	19-08-2023		TLM1	
2.	Solution of difference equations of digital filters	1	21-08-2023		TLM1	

3.	Block diagram representation of linear constant-coefficient difference equations	1	23-08-2023		TLM1	
4.	Basic structures of IIR systems	1	24-08-2023		TLM1	
5.	problems	1	25-08-2023		TLM1	
6.	problem	1	26-08-2023		TLM1	
7.	I mid exams(28-08-2023 to 02-09-2023)					
8.	Transposed forms	1	04-09-2023		TLM1	
9.	Basic structures of FIR systems	1	07-09-2023		TLM1	
10.	Basic structures of FIR systems	1	08-09-2023		TLM1	
11.	problems	1	11-09-2023		TLM1	
12.	problems	1	13-09-2023		TLM1	
13.	problems	1	14-09-2023		TLM1	
14.	problems	1	15-09-2023		TLM1	
No. of classes required to complete UNIT-III:14				No. of classes taken:		

UNIT-IV: IIR DIGITAL FILTERS

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.	Analog filter approximations	1	16-09-2023		TLM1	
2.	Butter worth filters	1	20-09-2023		TLM1	
3.	Chebyshev filters	1	21-09-2023		TLM1	
4.	Design of IIR Digital filters from analog filters	1	22-09-2023		TLM1	
5.	problems	1	23-09-2023		TLM1	
6.	Design of IIR Digital filters from analog filters	1	25-09-2023		TLM1	
7.	problems	1	27-09-2023		TLM1	
8.	Design Examples: Analog-Digital transformations	1	29-09-2023		TLM1	
9.	problems	1	30-09-2023		TLM1	
10.	Design Examples: Analog-Digital transformations	1	04-10-2023		TLM1	
11.	problems	1	05-10-2023		TLM1	
12.	problems	1	06-10-2023		TLM1	
13.	problems	1	07-10-2023		TLM1	
14.	problems	1	09-10-2023		TLM1	
No. of classes required to complete UNIT-IV:14				No. of classes taken:		

UNIT-V: FIR DIGITAL FILTERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of FIR Digital Filters	1	11-10-2023		TLM1	
2.	Frequency response	1	12-10-2023		TLM1	
3.	Design of FIR Digital Filters using Window Techniques	1	13-10-2023		TLM1	
4.	Design of FIR Digital Filters using Window Techniques	1	16-10-2023		TLM1	
5.	Design of FIR Digital Filters using Window Techniques	1	18-10-2023		TLM1	
6.	Design of FIR Digital Filters using Window Techniques	1	19-10-2023		TLM1	
7.	Frequency Sampling technique	1	20-10-2023		TLM1	
8.	Frequency Sampling technique	1	21-10-2023		TLM1	
9.	Frequency Sampling technique	1	25-10-2023		TLM1	
10.	Frequency Sampling technique	1	26-10-2023		TLM1	
11.	Comparison of IIR & FIR filters	1	27-10-2023		TLM1	
12.	problems	1	28-10-2023		TLM1	
No. of classes required to complete UNIT-V:12				No. of classes taken:		

Contents beyond the Syllabus:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Applications of DSP processors	1			TLM2	
2.	DSP programming in MATLAB	1			TLM4	

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

PART-C

EVALUATION PROCESS (R20 Regulations):

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	03-07-2023	26-08-2023	8W
I Mid Examinations	28-08-2023	02-09-2023	1W
II Phase of Instructions	04-09-2023	28-10-2023	8W
II Mid Examinations	30-10-2023	04-11-2023	1W
Preparation and Practicals	06-11-2023	11-11-2023	1W
Semester End Examinations	13-11-2023	25-11-2023	2W

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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PO 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	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO 4	Design controllers for electrical and electronic systems to improve their performance.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. P.Deepak Reddy	Mr. P.Deepak Reddy	Mr. P. Deepak Reddy	Dr. J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.V.Sankararao, Sr. Assistant Professor
Course Name & Code : ROBOTICS IN AUTOMATION -20ME82 **Regulation**: R20
L-T-P Structure : **3-0-0** **Credits:** 03
Program/Sem/Sec : B.Tech- VII Sem A/S **A.Y.:** 2023-24

PREREQUISITE : **Nil**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to impart knowledge about basic mathematics related to industrial robots for their control, design, and application in robotics & automation Industries.

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

CO1	Comprehend the anatomy of robots, end effectors. (**Understanding-L2)**
CO2	Categorize various actuators and sensors employed in industrial robots. **(Understanding-L2)**
CO3	Formulate transformations using DH parameters for kinematics and dynamics of robots. **(Applying-L3)**
CO4	Illustrate the control system and develop the robotic programming. **(Understanding-L2)**
CO5	Outline the robotic applications in present and future industrial scenario. **(Understanding-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					2						2		2		
CO2	3	3	2									2		2	2	
CO3	3	3	2									2		2		
CO4	3	2	1				2					2		2		2
CO5	2					3	3					1		2		
	1-Low					**2**–Medium						**3** -High				

TEXTBOOKS:

T1	Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
T2	Saeed B.Niku, Introduction to robotics- analysis ,systems &application, Second Edition, Willy India Private Limited, New Delhi,2011.

REFERENCE BOOKS:

R1	S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2009.
R2	Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 2009.
R3	Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning, 2009.
R4	Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 2007.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: ROBOT ANATOMY & END EFFECTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	03.07.2023		TLM1/TLM2	
2.	History of robots	1	04.07.2023		TLM1/TLM2	
3.	Laws of robotics, Classification of robots	1	05.07.2023		TLM1/TLM2	
4.	Present status, and future trends	1	07.07.2023		TLM1/TLM2	
5.	Basic components of robotic system	1	10.07.2023		TLM1/TLM2	
6.	links, joints, types	1	11.07.2023		TLM1/TLM2	
7.	configurations of robots	1	12.07.2023		TLM1/TLM2	
8.	Degree of freedom	1	14.07.2023		TLM1/TLM2	
9.	Mechanisms and transmission	1	15.07.2023		TLM1/TLM2	
10.	End effectors	1	17.07.2023		TLM1/TLM2	
11.	Grippers-different methods of gripping	1	18.07.2023		TLM1/TLM2	
12.	Mechanical grippers	1	19.07.2023		TLM1/TLM2	
13.	Magnetic grippers	1	21.07.2023		TLM1/TLM2	
14.	Vacuum grippers	1	22.07.2023		TLM1/TLM2	
15.	Specifications of Robot	1	24.07.2023		TLM1/TLM2	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: DRIVE SYSTEMS & SENSORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Introduction	1	25.07.2023		TLM1/TLM2	
17.	Hydraulic drives	1	26.07.2023		TLM1/TLM2	
18.	Pneumatic drives	1	28.07.2023		TLM1/TLM2	
19.	Electric systems	1	31.07.2023		TLM1/TLM2	
20.	Advantages, limitations	1	01.08.2023		TLM1/TLM2	
21.	Industrial applications	1	02.08.2023		TLM1/TLM2	
22.	Sensors in robots	1	04.08.2023		TLM1/TLM2	
23.	Touch sensors	1	05.08.2023		TLM1/TLM2	
24.	Tactile sensor	1	07.08.2023		TLM1/TLM2	

25.	Proximity and range sensors	1	08.08.2023		TLM1/TLM2	
26.	Robotic vision sensor	1	09.08.2023		TLM1/TLM2	
27.	Force sensor, Light sensors	1	11.08.2023		TLM1/TLM2	
28.	Pressure sensors, applications	1	12.08.2023			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: KINEMATICS & DYNAMICS OF ROBOTS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction	1	14.08.2023		TLM1/TLM2	
30.	2D, 3D Transformation	1	16.08.2023		TLM1/TLM2	
31.	Rotation, translation	1	18.08.2023		TLM1/TLM2	
32.	Examples	1	19.08.2023		TLM1/TLM2	
33.	Homogeneous coordinates multiple transformation	1	21.08.2023		TLM1/TLM2	
34.	Matrix representation	1	22.08.2023		TLM1/TLM2	
35.	Homogeneous transformations	1	23.08.2023		TLM1/TLM2	
36.	Inverse of transformations	1	25.08.2023		TLM1/TLM2	
37.	Forward kinematics of robots	1	26.08.2023		TLM1/TLM2	
38.	Inverse kinematics of robots	1	04.09.2023		TLM1/TLM2	
39.	Problems	1	05.09.2023		TLM1/TLM2	
40.	D-H representation of robots	1	08.09.2023		TLM1/TLM2	
41.	Dynamics of Robots: Introduction	1	09.09.2023		TLM1/TLM2	
42.	Robot Arm dynamics	1	11.09.2023		TLM1/TLM2	
43.	Significance	1	12.09.2023		TLM1/TLM2	
44.	Force and torque requirements for two degrees of freedom robotic arm	1	13.09.2023		TLM1/TLM2	
45.	Problems	1	15.09.2023		TLM1/TLM2	
No. of classes required to complete UNIT-III: 17				**No. of classes taken:**		

UNIT-IV: TRAJECTORY PLANNING AND ROBOT CONTROL

S. No.	Topics to Be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Introduction	1	16.09.2023		TLM1/TLM2	
47.	Basics of Trajectory Planning	1	19.09.2023		TLM1/TLM2	
48.	Point to point control	1	20.09.2023		TLM1/TLM2	
49.	Continuous path control	1	22.09.2023		TLM1/TLM2	
50.	Interpolations	1	23.09.2023		TLM1/TLM2	
51.	Control system for robot joint	1	25.09.2023		TLM1/TLM2	
52.	Control actions	1	26.09.2023		TLM1/TLM2	
53.	Feedback devices	1	27.09.2023		TLM1/TLM2	
54.	Adaptive control	1	29.09.2023		TLM1/TLM2	
55.	Introduction to Robot Programming	1	30.09.2023		TLM1/TLM2	

56.	Online programming	1	03.10.2023		TLM1/TLM2	
57.	Off-line programming	1	04.10.2023		TLM1/TLM2	
58.	Programming examples	1	06.10.2023		TLM1/TLM2	
59.	Programming examples	1	07.10.2023		TLM1/TLM2	
60.	Programming examples	1	09.10.2023		TLM1/TLM2	
No. of classes required to complete UNIT-IV: 15				**No. of classes taken:**		

UNIT-V: ROBOT APPLICATIONS, AUTOMATION AND INDUSTRY 4.0

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	Introduction	1	10.10.2023		TLM1/TLM2	
62.	Robot Applications	1	11.10.2023		TLM1/TLM2	
63.	Material handling	1	13.10.2023		TLM1/TLM2	
64.	Machine loading and unloading	1	14.10.2023		TLM1/TLM2	
65.	Assembly, Inspection, Welding	1	16.10.2023		TLM1/TLM2	
66.	Spray painting	1	17.10.2023		TLM1/TLM2	
67.	Applications in unmanned systems	1	18.10.2023		TLM1/TLM2	
68.	Defence applications	1	20.10.2023		TLM1/TLM2	
69.	Medical, industries	1	21.10.2023		TLM1/TLM2	
70.	Introduction to Industry 4.0	1	24.10.2023		TLM1/TLM2	
71.	Robotics and Automation for Industry 4.0	1	25.10.2023		TLM1/TLM2	
72.	Robot safety	1	27.10.2023		TLM1/TLM2	
73.	Social robotics	1	28.10.2023		TLM1/TLM2	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO 2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO 3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO 4	Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**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.
PO4	**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.
PO5	**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.
PO6	**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.
PO7	**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.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**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 ring 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	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO 2	Design and analyze electrical machines, modern drive and lighting systems.
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems.
PSO 4	Design controllers for electrical and electronic systems to improve their performance.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr.V.Sankararao	Dr.Ch.Siva Sankara Babu	Dr.M.B.S.Sreekara Reddy	Dr.S.Pichi Reddy
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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

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

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Venkateswara Reddy, Assistant Professor

Course Name & Code	**:** ROBOTICS IN AUTOMATION - 20ME82	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VII Sem (B)	**A.Y.:** 2023-2024

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to impart knowledge about basic mathematics related to industrial robots for their control, design, and application in robotics & automation Industries.

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

CO1	Comprehend the anatomy of robots, end effectors. (**Understanding-L2)**
CO2	Categorize various actuators and sensors employed in industrial robots. **(Understanding-L2)**
CO3	Formulate transformations using DH parameters for kinematics and dynamics of robots. **(Applying-L3)**
CO4	Illustrate the control system and develop the robotic programming. **(Understanding-L2)**
CO5	Outline the robotic applications in present and future industrial scenario. **(Understanding-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					2						2		2		
CO2	3	3	2									2		2	2	
CO3	3	3	2									2		2		
CO4	3	2	1				2					2		2		2
CO5	2					3	3					1		2		
	1 - Low					**2 –**Medium						**3 -** High				

TEXTBOOKS:

T1	Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
T2	Saeed B.Niku, Introduction to robotics- analysis ,systems &application, Second Edition, Willy India Private Limited, New Delhi,2011.

REFERENCE BOOKS:

R1	S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2009.
R2	Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 2009.
R3	Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning, 2009.
R4	Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 2007.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - B

UNIT-I: ROBOT ANATOMY & END EFFECTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	03-07-2023		TLM1/TLM2	
2.	History of robots	1	04-07-2023		TLM1/TLM2	
3.	Laws of robotics, Classification of robots	1	05-07-2023		TLM1/TLM2	
4.	Present status, and future trends	1	06-07-2023		TLM1/TLM2	
5.	Basic components of robotic system	1	10-07-2023		TLM1/TLM2	
6.	links, joints, types, configurations of robots	1	11-07-2023		TLM1/TLM2	
7.	Degree of freedom, Mechanisms and transmission	1	12-07-2023		TLM1/TLM2	
8.	End effectors	1	13-07-2023		TLM1/TLM2	
9.	Grippers-different methods of gripping	1	15-07-2023		TLM1/TLM2	
10.	Mechanical grippers	1	17-07-2023		TLM1/TLM2	
11.	Magnetic grippers	1	18-07-2023		TLM1/TLM2	
12.	Vacuum grippers	1	19-07-2023		TLM1/TLM2	
13.	Specifications of Robot	1	20-07-2023		TLM1/TLM2	
14.	Quiz-I	1	22-07-2023		TLM1/TLM2	
No. of classes required to complete UNIT-I:				**No. of classes taken:**		

UNIT-II: DRIVE SYSTEMS & SENSORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Introduction	1	24-07-2023		TLM1/TLM2	
16.	Hydraulic drives	1	25-07-2023		TLM1/TLM2	
17.	Pneumatic drives	1	26-07-2023		TLM1/TLM2	
18.	Electric systems, Advantages, limitations	1	27-07-2023		TLM1/TLM2	
19.	Industrial applications	1	29-07-2023		TLM1/TLM2	
20.	Sensors in robots	1	31-07-2023		TLM1/TLM2	
21.	Touch sensors, tactile sensor	1	01-08-2023		TLM1/TLM2	
22.	Proximity and range sensors	1	02-08-2023		TLM1/TLM2	
23.	Robotic vision sensor	1	03-08-2023		TLM1/TLM2	

24.	Force sensor, Light sensors	1	05-08-2023		TLM1/TLM2	
25.	Pressure sensors, applications	1	07-08-2023		TLM1/TLM2	
26.	Quiz-II	1	08-08-2023		TLM1/TLM2	
No. of classes required to complete UNIT-II:				**No. of classes taken:**		

UNIT-III: KINEMATICS & DYNAMICS OF ROBOTS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Introduction	1	09-08-2023		TLM1/TLM2	
28.	2D, 3D Transformation	1	10-08-2023		TLM1/TLM2	
29.	Rotation, translation, Examples	1	14-08-2023		TLM1/TLM2	
30.	Homogeneous coordinates multiple transformation	1	16-08-2023		TLM1/TLM2	
31.	Matrix representation	1	17-08-2023		TLM1/TLM2	
32.	Homogeneous transformations	1	19-08-2023		TLM1/TLM2	
33.	Inverse of transformations	1	21-08-2023		TLM1/TLM2	
34.	Forward kinematics of robots	1	22-08-2023		TLM1/TLM2	
35.	Inverse kinematics of robots, Problems	1	23-08-2023		TLM1/TLM2	
36.	D-H representation of robots	1	24-08-2023		TLM1/TLM2	
37.	Dynamics of Robots: Introduction	1	26-08-2023		TLM1/TLM2	
38.	Robot Arm dynamics, Significance	1	04-09-2023		TLM1/TLM2	
39.	Force and torque requirements for two degrees of freedom robotic arm	1	05-09-2023		TLM1/TLM2	
40.	Problems	1	06-09-2023		TLM1/TLM2	
41.	Quiz-III	1	11-09-2023		TLM1/TLM2	
No. of classes required to complete UNIT-III:				**No. of classes taken:**		

UNIT-IV: TRAJECTORY PLANNING AND ROBOT CONTROL

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Introduction	1	12-09-2023		TLM1/TLM2	
43.	Basics of Trajectory Planning	1	13-09-2023		TLM1/TLM2	
44.	Point to point control	1	14-09-2023		TLM1/TLM2	
45.	Continuous path control	1	16-09-2023		TLM1/TLM2	
46.	Interpolations	1	19-09-2023		TLM1/TLM2	
47.	Control system for robot joint	1	20-09-2023		TLM1/TLM2	
48.	Control actions	1	21-09-2023		TLM1/TLM2	
49.	Feedback devices	1	23-09-2023		TLM1/TLM2	
50.	Adaptive control	1	25-09-2023		TLM1/TLM2	
51.	Introduction to Robot Programming	1	26-09-2023		TLM1/TLM2	
52.	online programming	1	27-09-2023		TLM1/TLM2	
53.	off-line programming	1	28-09-2023		TLM1/TLM2	
54.	programming examples	1	30-09-2023		TLM1/TLM2	
55.	programming examples	1	03-10-2023		TLM1/TLM2	

56.	programming examples	1	04-10-2023		TLM1/TLM2	
No. of classes required to complete UNIT-IV:				**No. of classes taken:**		

UNIT-V: ROBOT APPLICATIONS, AUTOMATION AND INDUSTRY 4.0

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
57.	Introduction	1	05-10-2023		TLM1/TLM2	
58.	Robot Applications	1	07-10-2023		TLM1/TLM2	
59.	Material handling	1	09-10-2023		TLM1/TLM2	
60.	Machine loading and unloading	1	10-10-2023		TLM1/TLM2	
61.	Assembly, Inspection, Welding	1	11-10-2023		TLM1/TLM2	
62.	Spray painting	1	12-10-2023		TLM1/TLM2	
63.	Applications in unmanned systems	1	16-10-2023		TLM1/TLM2	
64.	Defence applications	1	17-10-2023		TLM1/TLM2	
65.	Medical, industries	1	18-10-2023		TLM1/TLM2	
66.	Introduction to Industry 4.0	1	19-10-2023		TLM1/TLM2	
67.	Robotics and Automation for Industry 4.0	1	25-10-2023		TLM1/TLM2	
68.	Robot safety	1	26-10-2023		TLM1/TLM2	
69.	Social robotics	1	28-10-2023		TLM1/TLM2	
No. of classes required to complete UNIT-V:				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO 2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO 3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO 4	Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO 2	Design and analyze electrical machines, modern drive and lighting systems.
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems.
PSO 4	Design controllers for electrical and electronic systems to improve their performance.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr.K.Venkateswara Reddy	Dr.Ch.Siva Sankara Babu	Dr.M.B.S.Sreekara Reddy	Dr.S.Pichi Reddy
Signature				

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Sasi Bhushan K

Course Name & Code : Elements of Communication Systems - 20EC82

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

Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section-A A.Y : 2023-24

PRE-REQUISITE: Concept of signals and modulation theory.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on fundamental properties of systems, radio transmitters, receivers, and noise present in the communication channel and transmission lines and antennas used in communication systems.

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

- **CO 1 :** **Summarize** the properties of systems and concepts of noise in communication systems. (Understand-L2).
- **CO 2 :** **Outline** the concepts of communication system, transmission lines, antennas, and response of linear systems (Understand-L2).
- **CO 3 :** **Apply** the knowledge of systems, transmission and reception concepts for communication systems in the presence of noise. (Apply-L3).
- **CO 4 :** **Interpret** the response of linear systems and performance of RF transmitters, receivers, transmission lines and antennas (Understand L2).

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

COs	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	1	-	2	-	-	-	-	-	-	-	2	3	-	-

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

Prescribed Syllabus

UNIT-I: Introduction to Systems [8Hrs]

Definition, Classification, Properties of Systems - Linear and Non-Linear, Time Invariant and Variant, Causal and Non-Causal, Stable and Unstable; Signal and System Bandwidth.

UNIT-II: Response of Linear Systems [8Hrs]

Transfer Function, Impulse Response, Distortion less Transmission through a system, transmission of a signal through LTI system, elements of a communication system and its description.

UNIT-III: Noise in Communication Systems [9Hrs]

Concepts, external noise, internal noise, White noise, Band limited white noise, Colored noise, noise calculations, noise figure, noise temperature, noise equivalent bandwidth, Narrow band noise and its mathematical representation, power spectral density of in phase and Quadrature components of noise.

UNIT-IV: [8Hrs]

Radio Transmitters: AM transmitter, FM transmitter- Direct method of FM transmission, indirect method of FM transmission.

Radio Receivers: Types of radio receivers-Tuned Radio frequency receiver and its limitations, Super heterodyne receiver.

UNIT-V: [9Hrs]

Transmission lines: Fundamentals, characteristic impedance, losses in transmission lines, standing waves, Quarter & half wavelength lines and reactance properties.

Antennas: Basics, Directional High Frequency Antennas: Dipole Arrays, Folded dipole and applications, UHF and Microwave Antennas: Antennas with parabolic reflectors, Horn antennas, Lens antennas. (Qualitative Analysis Only)

TEXT BOOKS:

Simon Haykin, Communication Systems, Second Edition, John Wiley & Sons Publications, Singapore, 1983.

Kennedy, Davis, Electronic Communication Systems, 4thedition, Tata McGraw-Hill Publications, 2009.

REFERENCE BOOKS:

Herbert Taub , Donald L. Schilling, “Principles of Communication Systems”, Second Edition, Tata McGraw-Hill, New Delhi, 1991.

B.P.Lathi, “Modern Digital and Analog Communication Systems”, Third Edition, Oxford University.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to 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.	Course Objectives	1	03-07-2023		TLM1	
2.	Brief introduction about the course and its importance.	1	04-07-2023		TLM1	
3.	Introduction to Systems - Definition	1	05-07-2023		TLM1	
4.	Classification of systems	1	07-07-2023		TLM1	
5.	Properties of systems – Linear and Non - linear	1	10-07-2023		TLM1	
6.	Time invariant and time variant	1	11-07-2023		TLM1	
7.	Causal and Non-causal	1	12-07-2023		TLM1	
8.	Stable and Unstable	1	14-07-2023		TLM1	
9.	Signal and system bandwidth, Revision	1	17-07-2023		TLM1	
10.	Problems based on properties	1	18-07-2023		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Response of linear systems:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	19-07-2023		TLM1	
2.	Transfer function	1	21-07-2023		TLM1	
3.	Impulse response	1	24-07-2023		TLM1	
4.	Distortion less transmission through a system	1	25-07-2023		TLM1	
5.	Transmission of a signal through LTI system	1	26-07-2023		TLM1	
6.	Elements of communication system and its description	1	28-07-2023		TLM1	
7.	Revision	1	31-07-2023		TLM1	
No. of classes required to complete UNIT-II: 07				No. of classes taken:		

UNIT-III: Noise in Communication 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.	Concepts	1	01-08-2023		TLM1	
2.	External Noise	1	02-08-2023		TLM1	
3.	Internal noise	1	04-08-2023		TLM1	
4.	White Noise, Band limited white noise	1	07-08-2023		TLM1	
5.	Colored noise	1	08-08-2023		TLM1	
6.	Noise Calculations, noise figure	1	04-09-2023		TLM1	
7.	Noise temperature, Noise equivalent bandwidth	1	05-09-2023		TLM1	
8.	Narrow band noise and its mathematical representation	1	08-09-2023		TLM1	
9.	Power spectral density of in phase and quadrature components of noise	1	11-09-2023		TLM1	
10.	Revision	1	12-09-2023		TLM1	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: Radio Transmitters and Receivers

S.No.	Topics to be covered	No. of Classes Required		Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Radio Transmitters : AM Transmitter	1	13-09-2023		TLM1	
2.	FM Transmitter – Direct method of FM Transmission	1	15-09-2023		TLM2	
3.	Indirect method of FM transmission	1	18-09-2023		TLM1	
4.	Radio Receivers : Types of Radio receivers	1	20-09-2023		TLM1	
5.	TRF Receiver and its limitations	1	22-09-2023		TLM1	
6.	Super heterodyne receiver	1	25-09-2023		TLM2	
7.	Revision	1			TLM1	
No. of classes required to complete UNIT-IV: 07				No. of classes taken:		

UNIT-V: Transmission lines and Antennas:

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.	Transmission lines : Fundamentals	1	26-09-2023		TLM1	
2.	Characteristic Impedance	1	27-09-2023		TLM1	
3.	Losses in transmission lines, Standing waves	1	29-09-2023		TLM2	
4.	Quarter and half wavelength lines	1	03-10-2023		TLM1	
5.	Reactance properties	1	04-10-2023		TLM1	
6.	Antennas : Basics	1	06-10-2023		TLM1	
7.	Directional high frequency Antennas : Dipole Arrays	1	09-10-2023		TLM1	
8.	Folded Dipole and applications	1	10-10-2023		TLM2	
9.	UHF and Microwave Antennas : Antennas with Parabolic reflectors	1	11-10-2023		TLM2	
10.	Horn Antennas, Lens Antennas	1	13-10-2023		TLM1	
11.	Revision	1	16-10-2023		TLM1	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

BEYOND THE SYLLABUS & REVISION [2 HRS]						
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.	Software Defined Radio	1	17-10-2023			
2.	Advanced Trends in comm. using Patch Antenna	1	18-10-2023			

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

PART-C

Academic Calendar : B.Tech., VII-Sem., 2023-24			
Description	**From**	**To**	**Weeks**
Commencement of Class work: 03-07-2023			
I Phase of Instructions	03-07-2023	26-08-2023	8 W
I MID Examinations	28-08-2023	02-09-2023	1 W
II Phase of Instructions	04-09-2023	28-10-2023	8 W
II MID Examinations	30-10-2023	04-11-2023	1 W
Preparation and Practicals	06-11-2023	11-11-2023	1 W
Semester End Examinations	13-11-2023	25-11-2023	2 W

Evaluation Process		
Evaluation Task	**COs**	**Marks**
Day to Day work	1,2,3,4	A1=10
Internal Lab Examination	1,2,3,4	B=5
Total Internal Marks: [A+B]		**C=15**
Semester End Examinations	1,2,3,4	**D=35**
Total Marks: [C+D]	1,2,3,4	**50**

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mr. K.SASI BHUSHAN]	[Ms. ASHA. G]	[Dr.M.V.SUDHAKAR]	[Dr.Y. AMAR BABU]

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS

COURSE HANDOUT
PART-A

Name of Course Instructor : Ms. Asha. G

Course Name & Code : Elements of Communication Systems – 20EC82

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

Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section-B A.Y : 2023-24

PRE-REQUISITE: Concept of signals and modulation theory.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on fundamental properties of systems, radio transmitters, receivers, and noise present in the communication channel and transmission lines and antennas used in communication systems.

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

- **CO 1 :** **Summarize** the properties of systems and concepts of noise in communication systems. (Understand-L2).
- **CO 2 :** **Outline** the concepts of communication system, transmission lines, antennas, and response of linear systems (Understand-L2).
- **CO 3 :** **Apply** the knowledge of systems, transmission and reception concepts for communication systems in the presence of noise. (Apply-L3).
- **CO 4 :** **Interpret** the response of linear systems and performance of RF transmitters, receivers, transmission lines and antennas (Understand L2).

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

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

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

Prescribed Syllabus

UNIT-I: Introduction to Systems [8Hrs]

Definition, Classification, Properties of Systems - Linear and Non-Linear, Time Invariant and Variant, Causal and Non-Causal, Stable and Unstable; Signal and System Bandwidth.

UNIT-II: Response of Linear Systems [8Hrs]

Transfer Function, Impulse Response, Distortion less Transmission through a system, transmission of a signal through LTI system, elements of a communication system and its description.

UNIT-III: Noise in Communication Systems [9Hrs]

Concepts, external noise, internal noise, White noise, Band limited white noise, Colored noise, noise calculations, noise figure, noise temperature, noise equivalent bandwidth, Narrow band noise and its mathematical representation, power spectral density of in phase and Quadrature components of noise.

UNIT-IV: [8Hrs]

Radio Transmitters: AM transmitter, FM transmitter- Direct method of FM transmission, indirect method of FM transmission.

Radio Receivers: Types of radio receivers-Tuned Radio frequency receiver and its limitations, Super heterodyne receiver.

UNIT-V: [9Hrs]

Transmission lines: Fundamentals, characteristic impedance, losses in transmission lines, standing waves, Quarter & half wavelength lines and reactance properties.

Antennas: Basics, Directional High Frequency Antennas: Dipole Arrays, Folded dipole and applications, UHF and Microwave Antennas: Antennas with parabolic reflectors, Horn antennas, Lens antennas. (Qualitative Analysis Only)

TEXT BOOKS:

Simon Haykin, Communication Systems, Second Edition, John Wiley & Sons Publications, Singapore, 1983.

Kennedy, Davis, Electronic Communication Systems, 4thedition, Tata McGraw-Hill Publications, 2009.

REFERENCE BOOKS:

Herbert Taub , Donald L. Schilling, “Principles of Communication Systems”, Second Edition, Tata McGraw-Hill, New Delhi, 1991.

B.P.Lathi, “Modern Digital and Analog Communication Systems”, Third Edition, Oxford University.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to 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.	Course Objectives	1	03-07-2023		TLM1	
2.	Brief introduction about the course and its importance.	1	04-07-2023		TLM1	
3.	Introduction to Systems - Definition	1	05-07-2023		TLM1	
4.	Classification of systems	1	06-07-2023		TLM1	
5.	Properties of systems – Linear and Non - linear	1	10-07-2023		TLM1	
6.	Time invariant and time variant	1	11-07-2023		TLM1	
7.	Causal and Non-causal	1	12-07-2023		TLM1	
8.	Stable and Unstable	1	13-07-2023		TLM1	
9.	Signal and system bandwidth, Revision	1	17-07-2023		TLM1	
10.	Problems based on properties	1	18-07-2023		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Response of linear systems:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	19-07-2023		TLM1	
2.	Transfer function	1	20-07-2023		TLM1	
3.	Impulse response	1	24-07-2023		TLM1	
4.	Distortion less transmission through a system	1	25-07-2023		TLM1	
5.	Transmission of a signal through LTI system	1	26-07-2023		TLM1	
6.	Elements of communication system and its description	1	27-07-2023		TLM1	
7.	Revision	1	31-07-2023		TLM1	
No. of classes required to complete UNIT-II: 07				No. of classes taken:		

UNIT-III: Noise in Communication 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.	Concepts	1	01-08-2023		TLM1	
2.	External Noise	1	02-08-2023		TLM1	
3.	Internal noise	1	03-08-2023		TLM1	
4.	White Noise, Band limited white noise	1	07-08-2023		TLM1	
5.	Colored noise	1	08-08-2023		TLM1	
6.	Noise Calculations, noise figure	1	04-09-2023		TLM1	
7.	Noise temperature, Noise equivalent bandwidth	1	05-09-2023		TLM1	
8.	Narrow band noise and its mathematical representation	1	07-09-2023		TLM1	
9.	Power spectral density of in phase and quadrature components of noise	1	11-09-2023		TLM1	
10.	Revision	1	12-09-2023		TLM1	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: Radio Transmitters and Receivers

S.No.	Topics to be covered	No. of Classes Required		Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Radio Transmitters : AM Transmitter	1	13-09-2023		TLM1	
2.	FM Transmitter – Direct method of FM Transmission	1	14-09-2023		TLM2	
3.	Indirect method of FM transmission	1	18-09-2023		TLM1	
4.	Radio Receivers : Types of Radio receivers	1	20-09-2023		TLM1	
5.	TRF Receiver and its limitations	1	21-09-2023		TLM1	
6.	Super heterodyne receiver	1	25-09-2023		TLM2	
7.	Revision	1			TLM1	
No. of classes required to complete UNIT-IV: 07				No. of classes taken:		

UNIT-V: Transmission lines and Antennas:

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.	Transmission lines : Fundamentals	1	26-09-2023		TLM1	
2.	Characteristic Impedance	1	27-09-2023		TLM1	
3.	Losses in transmission lines, Standing waves	1	03-10-2023		TLM2	
4.	Quarter and half wavelength lines	1	04-10-2023		TLM1	
5.	Reactance properties	1	05-10-2023		TLM1	
6.	Antennas : Basics	1	09-10-2023		TLM1	
7.	Directional high frequency Antennas : Dipole Arrays	1	10-10-2023		TLM1	
8.	Folded Dipole and applications	1	11-10-2023		TLM2	
9.	UHF and Microwave Antennas : Antennas with Parabolic reflectors	1	12-10-2023		TLM2	
10.	Horn Antennas, Lens Antennas	1	16-10-2023		TLM1	
11.	Revision	1	17-10-2023		TLM1	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

BEYOND THE SYLLABUS & REVISION [2 HRS]						
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.	Software Defined Radio	1	18-10-2023			
2.	Advanced Trends in comm. using Patch Antenna	1	19-10-2023			

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

PART-C

Academic Calendar : B.Tech., VII-Sem., 2023-24			
Description	**From**	**To**	**Weeks**
Commencement of Class work: 03-07-2023			
I Phase of Instructions	03-07-2023	26-08-2023	8 W
I MID Examinations	28-08-2023	02-09-2023	1 W
II Phase of Instructions	04-09-2023	28-10-2023	8 W
II MID Examinations	30-10-2023	04-11-2023	1 W
Preparation and Practicals	06-11-2023	11-11-2023	1 W
Semester End Examinations	13-11-2023	25-11-2023	2 W

Evaluation Process		
Evaluation Task	**COs**	**Marks**
Day to Day work	1,2,3,4	A1=10
Internal Lab Examination	1,2,3,4	B=5
Total Internal Marks: [A+B]		**C=15**
Semester End Examinations	1,2,3,4	**D=35**
Total Marks: [C+D]	1,2,3,4	**50**

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
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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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Ms.ASHA. G]	[Ms.ASHA. G]	[Dr.M.V.SUDHAKAR]	[Dr.Y. AMAR BABU]

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DEPARTMENT OF ELECTRICAL &ELECTRONICS ENGINEERING

COURSEHANDOUT

PART-A

NameofCourseInstructor:A.Dhanunjay Kumar

Course Name &Code	**:** MANAGEMENT SCIENCE FORENGINEERS &20HS02	**Regulation**:R20
L-T-PStructure	**:3-0-0**	**Credits:**03
Program/Sem/Sec	:B.TechVIISem (A)	**A.Y.:**2023-2024

PREREQUISITE: Professionalethicsandhumanvalues

COURSEEDUCATIONALOBJECTIVES(CEOs):

1. Tomakestudentsunderstandmanagement,itsprinciples,contributiontomanagement,organization,anditsbasicissuesandtypes.
2. Tomakestudentsunderstandtheconceptofplantlocationanditsfactorsandplantlayoutandtypes,methodofproductionandworkstudyimportance.
3. Tounderstandthepurposeandfunctionofstatisticalqualitycontrol.Andunderstandthematerialmanagement techniques.

COURSE OUTCOMES(COs): Attheend ofthecourse,student willbeableto

CO1	Understandmanagementprinciplestopracticalsituationsbasedontheorganization structures.(L2)
CO2	DesignEffectiveplant Layoutsbyusingworkstudymethods.(L2)
CO3	Applyqualitycontroltechniquesforimprovementofqualityandmaterialsmanagement.(L3)
CO4	DevelopbestpracticesofHRMincorporateBusinesstoraiseemployeeproductivity.(L2)
CO5	IdentifycriticalpathandprojectcompletiontimebyusingCPMandPERTtechniques.(L3)

COURSEARTICULATIONMATRIX(CorrelationbetweenCOs,POs&PSOs):

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

TEXTBOOKS:

T1 Dr.A.R.Aryasri,ManagementScience,TMH,10thedition,2012

REFERENCEBOOKS:

R1 Koontz&weihrich–Essentialsofmanagement,TMH,10thedition,2015
R2 Stoner,Freeman,Gilbert,Management,6theditionPearsoneducation,NewDelhi,2004
R3 O.P.Khana,Industrialengineering andManagementL.S.Srinath,PERT& CPM

PART-B

COURSEDELIVERYPLAN(LESSONPLAN):Section-A

UNIT-I:INTRODUCTION

S. No.	Topicstobecovered	No. ofClasses Required	Tentative Dateof Completion	Actual Dateof Completion	Teaching Learning Methods	HOD SignWeekly
1.	Course Outcomes, Introduction to Subject	1	03-07-2023		**TLM1/TLM2**	
2.	Management-Natureand Importance	1	04-07-2023		**TLM1/TLM2**	
3.	Managementfunctions	1	05-07-2023		**TLM1/TLM2**	
4.	ContributionsofTaylor	1	06-07-2023		**TLM1/TLM2**	
5.	Fayal's Principles of management	1	08-07-2023		**TLM1/TLM2**	
6.	ContributionofEltonMayo	1	10-07-2023		**TLM1/TLM2**	
7.	Maslow's& Herzberg'sTwo FactorTheory	1	11-07-2023		**TLM1/TLM2**	
8.	DouglasMcGregor	1	12-07-2023		**TLM1/TLM2**	
9.	BasicConceptsofOrganization-Authority	1	13-07-2023		**TLM1/TLM2**	
10.	ResponsibilityDelegationof Authority	1	15-07-2023		**TLM1/TLM2**	
11.	Departmentationand Decentralization	1	17-07-2023		**TLM1/TLM2**	
12.	SpanofControl	1	18-07-2023		**TLM1/TLM2**	
13.	Line,LineandStafforganizations	1	19-07-2023		**TLM1/TLM2**	
14.	Functional,Committee	1	20-07-2023		**TLM1/TLM2**	
15.	MatrixOrganizations	1	22-07-2023		**TLM1/TLM2**	
16.	Quiz-I	1	24-07-2023		**TLM1/TLM2**	
No.ofclassesrequiredtocompleteUNIT-I:16				**No.ofclassestaken:**		

UNIT-II:OPERATIONSMANAGEMENT

S. No.	Topicstobecovered	No. ofClasses Required	TentativeDate ofCompletion	Actual Dateof Completion	TeachingLearningMethods	HOD SignWeekly
17.	Plantlocation	1	25-07-2023		**TLM1/TLM2**	
18.	Factorsinfluencinglocation	1	26-07-2023		**TLM1/TLM2**	
19.	Principles	1	27-07-2023		**TLM1/TLM2**	
20.	Typesofplantlayouts					
21.	Methodsofproduction(job,batchproduction)	1	31-07-2023		**TLM1/TLM2**	
22.	Massproduction	1	01-08-2023		**TLM1/TLM2**	
23.	Work study - Basic procedureinvolvedinmethod studyand Workmeasurement	1	02-08-2023		**TLM1/TLM2**	

24.	Workstudy-Basicprocedure involved in method study andWorkmeasurement	1	03-08-2023		**TLM1/TLM2**	
25.	Quiz-II	1	05-08-2023		**TLM1/TLM2**	
No.ofclassesrequiredtocompleteUNIT-II:07				**No.ofclassestaken:**		

UNIT-III:STATISTICALQUALITYCONTROL,MATERIALSMANAGEMENT

S. No.	Topicstobecovered	No.of Classes Required	Tentative Date ofCompletion	Actual Dateof Completion	Teaching Learning Methods	HOD SignWeekly
26.	StatisticalqualitycontrolIntroduction	1	07-08-2023		**TLM1/TLM2**	
27.	Concept of Quality & QualityControl	1	08-08-2023		**TLM1/TLM2**	
28.	Functions,Meaning ofSQC	1	09-08-2023		**TLM1/TLM2**	
29.	Variablesandattributes	1	10-08-2023		**TLM1/TLM2**	
30.	Xchart	1	12-08-2023		**TLM1/TLM2**	
31.	RChart	1	14-08-2023		**TLM1/TLM2**	
32.	CChart	1	16-08-2023		**TLM1/TLM2**	
33.	PChart	1	17-08-2023		**TLM1/TLM2**	
34.	SimpleProblems	1	19-08-2023		**TLM1/TLM2**	
35.	Acceptancesampling	1	21-08-2023		**TLM1/TLM2**	
36.	Samplingplans	1	22-08-2023		**TLM1/TLM2**	
37.	Deming'scontributionto quality	1	23-08-2023		**TLM1/TLM2**	
38.	Materialsmanagement	1	24-08-2023		**TLM1/TLM2**	
39.	Meaningandobjectives	1	26-08-2023		**TLM1/TLM2**	
40.	Inventorycontrol	1	04-09-2023		**TLM1/TLM2**	
41.	Needforinventorycontrol	1	05-09-2023		**TLM1/TLM2**	
42.	Purchaseprocedure	1	07-09-2023		**TLM1/TLM2**	
43.	Storerecords					
44.	EOQ,ABCanalysis	1	09-09-2023		**TLM1/TLM2**	
45.	Stocklevels	1	11-09-2023		**TLM1/TLM2**	
46.	Quiz-3	1	12-09-2023		**TLM1/TLM2**	
No.ofclassesrequiredtocompleteUNIT-III:15				**No.ofclassestaken:**		

UNIT-IV:HUMANRESOURCEMANAGEMENT(HRM)

S. No.	Topicstobecovered	No.of Classes Required	Tentative Date ofCompletion	Actual Dateof Completion	Teaching Learning Methods	HOD SignWeekly
47.	Conceptsof HRM	1	13-09-2023		**TLM1/TLM2**	
48.	BasicfunctionsofHRmanager	1	14-09-2023		**TLM1/TLM2**	
49.	Manpowerplanning	1	16-09-2023		**TLM1/TLM2**	
50.	Recruitment	1	19-09-2023		**TLM1/TLM2**	
51.	Selection	1	20-09-2023		**TLM1/TLM2**	

52.	Traininganddevelopment	1	21-09-2023		**TLM1/TLM2**	
53.	Placement	1	23-09-2023		**TLM1/TLM2**	
54.	Wageandsalary administration	1	25-09-2023		**TLM1/TLM2**	
55.	Wageandsalary administration	1	26-09-2023		**TLM1/TLM2**	
56.	Promotion	1	27-09-2023		**TLM1/TLM2**	
57.	TransfersSeparation	1	30-09-2023		**TLM1/TLM2**	
58.	Performanceappraisal					
59.	Jobevaluationand meritrating	1	03-10-2023		**TLM1/TLM2**	
60.	Quiz-4	1	04-10-2023		**TLM1/TLM2**	
No.ofclassesrequiredtocompleteUNIT-IV:14				**No.ofclassestaken:**		

UNIT-V:PROJECTMANAGEMENT

S. No.	Topicstobecovered	No. ofClasses Required	Tentative DateofCompletion	Actual Dateof Completion	Teaching Learning Methods	HOD SignWeekly
61.	Introduction	1	05-10-2023		**TLM1/TLM2**	
62.	Earlytechniquesinproject management	1	07-10-2023		**TLM1/TLM2**	
63.	Networkanalysis	1	09-10-2023		**TLM1/TLM2**	
64.	ProgrammeEvaluationandReviewTechnique(PERT)	1	10-10-2023		**TLM1/TLM2**	
65.	Problems	1	11-10-2023		**TLM1/TLM2**	
66.	Criticalpathmethod(CPM)	1	12-10-2023		**TLM1/TLM2**	
67.	Identifyingcriticalpath	1	14-10-2023		**TLM1/TLM2**	
68.	Problems	1	16-10-2023		**TLM1/TLM2**	
69.	Problems	1	17-10-2023		**TLM1/TLM2**	
70.	Probability of completingprojectwithin giventime	1	18-10-2023		**TLM1/TLM2**	
71.	Projectcostanalysis	1	19-10-2023		**TLM1/TLM2**	
72.	Problems	1	25-10-2023		**TLM1/TLM2**	
73.	projectcrashing	1	26-10-2023		**TLM1/TLM2**	
74.	Simpleproblems	1	28-10-2023		**TLM1/TLM2**	
No.ofclassesrequiredtocompleteUNIT-V:14				**No.ofclassestaken:**		

TeachingLearningMethods			
TLM1	Chalkand Talk	**TLM4**	Demonstration(Lab/FieldVisit)
TLM2	PPT	**TLM5**	ICT (NPTEL/SwayamPrabha/MOOCS)
TLM3	Tutorial	**TLM6**	GroupDiscussion/Project

PART-C

EVALUATIONPROCESS(R20Regulation):

Evaluation Task	Marks
Assignment-I(Units-I,II&UNIT-III(HalfoftheSyllabus))	A1=5
I-DescriptiveExamination (Units-I,II&UNIT-III(HalfoftheSyllabus))	M1=15
I-QuizExamination (Units-I,II&UNIT-III(HalfoftheSyllabus))	Q1=10
Assignment-II(Unit-III(RemainingHalfoftheSyllabus),IV&V)	A2=5
II-DescriptiveExamination(UNIT-III(RemainingHalfoftheSyllabus),IV&V)	M2=15
II-QuizExamination(UNIT-III(RemainingHalfoftheSyllabus),IV&V)	Q2=10
MidMarks=80%ofMax((M1+Q1+A1),(M2+Q2+A2)) +20%ofMin((M1+Q1+A1),(M2+Q2+A2))	M=30
CumulativeInternalExamination(CIE):M	30
SemesterEndExamination(SEE)	70
TotalMarks=CIE+SEE	100

PART-D

PROGRAMMEEDUCATIONALOBJECTIVES(PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentalswithanattitudetopursuecontinuingeducation.
PEO 2	ToFunctionprofessionallyintherapidlychangingworldwithadvancesintechnology
PEO 3	ToContributetotheneedsofthesocietyinsolvingtechnicalproblemsusingElectronics&CommunicationEngineeringprinciples,toolsandpractices.
PEO 4	ToExerciseleadershipqualities,atlevelsappropriatetotheirexperience,whichaddressesissuesinaresponsive,ethical,andinnovativemanner.

PROGRAMMEOUTCOMES (POs):

PO1	**Engineeringknowledge**:Applytheknowledgeofmathematics,science, engineeringfundamentals,andanengineeringspecializationtothesolutionofcomplexengineeringproblems.
PO2	**Problemanalysis**:Identify,formulate,reviewresearchliterature,andanalysecomplexengineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesofmathematics,naturalsciences,andengineering sciences.
PO3	**Design/developmentofsolutions**:Designsolutionsforcomplexengineeringproblems anddesignsystemcomponentsorprocessesthatmeetthespecified needswithappropriateconsiderationforthepublichealthandsafety,andtheculturaL,societal,andenvironmentalconsiderations.
PO4	**Conduct investigations of complex problems**: Use research-basedknowledgeandresearchmethodsincludingdesignofexperiments,analysis andinterpretationofdata,and synthesisoftheinformationtoprovidevalidconclusions.
PO5	**Moderntoolusage**:Create, select,and apply appropriate techniques,resources,andmodernengineeringandITtoolsincludingpredictionand modellingtocomplexengineeringactivitieswithanunderstandingofthe limitations.
PO6	**Theengineerandsociety**:Applyreasoninginformedbythecontextual knowledge toassesssocietal,health,safety,legalandculturalissuesand theconsequentresponsibilitiesrelevanttotheprofessionalengineeringpractice.

PO7	**Environmentandsustainability**:Understand theimpactoftheprofessional engineering solutions in societal and environmental contexts, anddemonstratetheknowledgeof,andneedforsustainable development.
PO8	**Ethics**:Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilitiesandnormsoftheengineeringpractice.
PO9	**Individualandteamwork**:Functioneffectivelyasanindividual,andasamemberorleaderindiverseteams,andinmultidisciplinary settings.
PO10	**Communication**:Communicateeffectivelyoncomplexengineeringactivitieswiththeengineeringcommunityandwithsocietyatlarge,suchas,being able tocomprehendandwriteeffective reports anddesign documentation,makeeffectivepresentations,andgiveandreceiveclearinstructions.
PO11	**Projectmanagementandfinance**:Demonstrateknowledgeandunderstanding oftheengineeringandmanagementprinciplesand applythesetoone'sownwork,asamemberandleaderinateam,tomanage projectsandinmultidisciplinaryenvironments.
PO12	**Life-longlearning**:Recognizetheneedfor,andhavethepreparationand abilitytoengageinindependentandlife-longlearninginthebroadestcontextoftechnologicalchange.

PROGRAMMESPECIFICOUTCOMES(PSOs):

PSO 1	Design anddevelopmoderncommunicationtechnologiesfor buildingtheinterdisciplinaryskillstomeetcurrent and futureneedsofindustry.
PSO 2	DesignandAnalyzeAnalog andDigitalElectronicCircuitsorsystemsand Implement real time applications in the field of VLSI and Embedded Systemsusingrelevanttools.
PSO 3	ApplytheSignalprocessingtechniquestosynthesizeandrealizetheissuesrelated torealtimeapplications.

Title	**CourseInstructor**	**CourseCoordinator**	**ModuleCoordinator**	**Head of theDepartment**
Name oftheFaculty	A.Dhanunjay Kumar	Mr.A.Nageswara Rao	Dr.M.B.S.Sreekara Reddy	Dr.S.PichiReddy
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. S. Uma Maheswara Reddy, Assistant Professor

Course Name & Code	**:** MANAGEMENT SCIENCE FOR ENGINEERS & 20HS02	**Regulation**: R20
L-T-P Structure	**: 3-0-0**	**Credits:** 03
Program/Sem/Sec	: B.Tech VII Sem (B)	**A.Y.:** 2023-2024

PREREQUISITE: Professional ethics and human values

COURSE EDUCATIONAL OBJECTIVES (CEOs):

1. To make students understand management, its principles, contribution to management, organization, and its basic issues and types.
2. To make students understand the concept of plant location and its factors and plant layout and types, method of production and work study importance.
3. To understand the purpose and function of statistical quality control. And understand thematerial management techniques.

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

CO1	Understand management principles to practical situations based on the organization structures. (L2)
CO2	Design Effective plant Layouts by using work study methods. (L2)
CO3	Apply quality control techniques for improvement of quality and materials management. (L3)
CO4	Develop best practices of HRM in corporate Business to raise employee productivity. (L2)
CO5	Identify critical path and project completion time by using CPM and PERT techniques. (L3)

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

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

TEXTBOOKS:

T1 Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

REFERENCE BOOKS:

R1 Koontz & weihrich – Essentials of management, TMH, 10th edition, 2015

R2 Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004

R3 O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: INTRODUCTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Outcomes, Introduction to Subject	1	03-07-2023		**TLM1/TLM2**	
2.	Management-Nature and Importance	1	04-07-2023		**TLM1/TLM2**	
3.	Management functions	1	05-07-2023		**TLM1/TLM2**	
4.	Contributions of Taylor	1	06-07-2023		**TLM1/TLM2**	
5.	Fayal's Principles of management	1	07-07-2023		**TLM1/TLM2**	
6.	Contribution of Elton Mayo	1	10-07-2023		**TLM1/TLM2**	
7.	Maslow's & Herzberg's Two Factor Theory	1	11-07-2023		**TLM1/TLM2**	
8.	Douglas McGregor	1	12-07-2023		**TLM1/TLM2**	
9.	Basic Concepts of Organization-Authority	1	13-07-2023		**TLM1/TLM2**	
10.	Responsibility Delegation of Authority	1	14-07-2023		**TLM1/TLM2**	
11.	Departmentation and Decentralization	1	17-07-2023		**TLM1/TLM2**	
12.	Span of Control	1	18-07-2023		**TLM1/TLM2**	
13.	Line, Line and Staff organizations	1	19-07-2023		**TLM1/TLM2**	
14.	Functional, Committee	1	20-07-2023		**TLM1/TLM2**	
15.	Matrix Organizations	1	21-07-2023		**TLM1/TLM2**	
16.	Quiz-I	1	24-07-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: OPERATIONS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Plant location	1	25-07-2023		**TLM1/TLM2**	
18.	Factors influencing location	1	26-07-2023		**TLM1/TLM2**	
19.	Principles	1	27-07-2023		**TLM1/TLM2**	
20.	Types of plant layouts	1	28-07-2023		**TLM1/TLM2**	

21.	Methods of production (job, batchproduction)	1	31-07-2023		**TLM1/TLM2**	
22.	Mass production	1	01-08-2023		**TLM1/TLM2**	
23.	Work study - Basic procedureinvolved in method study and Work measurement	1	02-08-2023		**TLM1/TLM2**	
24.	Work study - Basic procedure involved in method study andWork measurement	1	03-08-2023		**TLM1/TLM2**	
25.	Quiz-II	1	04-08-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-II: 07				**No. of classes taken:**		

UNIT-III: STATISTICAL QUALITY CONTROL, MATERIALS MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Statistical quality control Introduction	1	07-08-2023		**TLM1/TLM2**	
27.	Concept of Quality & Quality Control	1	08-08-2023		**TLM1/TLM2**	
28.	Functions, Meaning of SQC	1	09-08-2023		**TLM1/TLM2**	
29.	Variables and attributes	1	10-08-2023		**TLM1/TLM2**	
30.	X chart	1	11-08-2023		**TLM1/TLM2**	
31.	R Chart	1	14-08-2023		**TLM1/TLM2**	
32.	C Chart	1	16-08-2023		**TLM1/TLM2**	
33.	P Chart	1	17-08-2023		**TLM1/TLM2**	
34.	Simple Problems	1	18-08-2023		**TLM1/TLM2**	
35.	Acceptance sampling	1	21-08-2023		**TLM1/TLM2**	
36.	Sampling plans	1	22-08-2023		**TLM1/TLM2**	
37.	Deming's contribution to quality	1	23-08-2023		**TLM1/TLM2**	
38.	Materials management	1	24-08-2023		**TLM1/TLM2**	
39.	Meaning and objectives	1	25-08-2023		**TLM1/TLM2**	
40.	Inventory control	1	04-09-2023		**TLM1/TLM2**	
41.	Need for inventory control	1	05-09-2023		**TLM1/TLM2**	
42.	Purchase procedure	1	06-09-2023		**TLM1/TLM2**	
43.	Store records	1	07-09-2023		**TLM1/TLM2**	
44.	EOQ, ABC analysis	1	08-09-2023		**TLM1/TLM2**	
45.	Stock levels	1	11-09-2023		**TLM1/TLM2**	
46.	Quiz-3	1	12-09-2023		**TLM1/TLM2**	
No. of classes required to complete UNIT-III: 15				**No. of classes taken:**		

UNIT-IV: HUMAN RESOURCE MANAGEMENT (HRM)

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 HRM	1	13-09-2023		TLM1/TLM2	
48.	Basic functions of HR manager	1	14-09-2023		TLM1/TLM2	
49.	Manpower planning	1	15-09-2023		TLM1/TLM2	
50.	Recruitment	1	18-09-2023		TLM1/TLM2	
51.	Selection	1	20-09-2023		TLM1/TLM2	
52.	Training and development	1	21-09-2023		TLM1/TLM2	
53.	Placement	1	22-09-2023		TLM1/TLM2	
54.	Wage and salary administration	1	25-09-2023		TLM1/TLM2	
55.	Wage and salary administration	1	26-09-2023		TLM1/TLM2	
56.	Promotion	1	27-09-2023		TLM1/TLM2	
57.	Transfers Separation	1	28-09-2023		TLM1/TLM2	
58.	Performance appraisal	1	29-09-2023		TLM1/TLM2	
59.	Job evaluation and merit rating	1	03-10-2023		TLM1/TLM2	
60.	Quiz-4	1	04-10-2023		TLM1/TLM2	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: PROJECT MANAGEMENT

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	Introduction	1	05-10-2023		TLM1/TLM2	
62.	Early techniques in project management	1	06-10-2023		TLM1/TLM2	
63.	Network analysis	1	09-10-2023		TLM1/TLM2	
64.	Programme Evaluation and Review Technique (PERT)	1	10-10-2023		TLM1/TLM2	
65.	Problems	1	11-10-2023		TLM1/TLM2	
66.	Critical path method (CPM)	1	12-10-2023		TLM1/TLM2	
67.	Identifying critical path	1	13-10-2023		TLM1/TLM2	
68.	Problems	1	16-10-2023		TLM1/TLM2	
69.	Problems	1	17-10-2023		TLM1/TLM2	
70.	Probability of completing project within given time	1	18-10-2023		TLM1/TLM2	
71.	Project cost analysis	1	19-10-2023		TLM1/TLM2	
72.	Problems	1	25-10-2023		TLM1/TLM2	
73.	project crashing	1	26-10-2023		TLM1/TLM2	
74.	Simple problems	1	27-10-2023		TLM1/TLM2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME 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 analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr.S.Uma Maheswara Reddy	Mr. A.Nageswara Rao	Dr.M.B.S.Sreekara Reddy	Dr.S.Pichi Reddy
Signature				