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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. P.Deepak Reddy, Mrs.R.Padma (T)
Course Name & Code : Analog and Digital Signal Processing & 17EE17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Sections- A A.Y :2021-22

PRE-REQUISITES: Differential Equations and liner algebra (17FE04), Transformation techniques and vector calculus (17FE06), Numerical methods and Fourier analysis (17FE07)

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Understand Discrete Fourier Transform and its computation.
- Deal with Discrete Fourier Series, Fast Fourier Series, Z-transforms
- Know the concepts of filter design

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

CO 1	Illustrate properties of continuous and discrete-time signals
CO 2	Analyze DFT and FFT
CO 3	Analyze discrete time signals
CO 4	Design digital filters & wavelet 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.
R4 Robert J. Schilling, Sandra L.Harris "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.
R5 Lonnie, C.Ludeman, " Fundamentals of DSP", Wiley India Pvt. Limited, 2009
R6 Rao R M and A S Bopardikar, "Wavelet Transofrmations Introduction to theory and Applications",Pearson Education, Asia, 2000.

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	22-02-2022		TLM1	
2.	Introduction to unit-I: Signals, systems and DSP	1	23-02-2022		TLM1	
3.	Continuous time signals (CT signals) and Discrete time signals (DT signals)	1	25-02-2022		TLM1	
4.	Classification of CT and DT signals	1	26-02-2022		TLM1	
5.	**TUTORIAL 1**	1	01-03-2022		TLM3	
6.	CT and DT systems	1	02-03-2022		TLM1	
7.	Classification of CT and DT systems: static and dynamic, linear and non linear	1	04-03-2022		TLM1	
8.	Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable systems	1	05-03-2022		TLM1	
9.	**TUTORIAL 2**	1	08-3-2022		TLM3	
10.	Linear constant coefficient difference equations	1	09-3-2022		TLM1	
11.	Sampling Theorem, Convolution theorem	1	11-3-2022		TLM1	
12.	Review of Z-transforms **TUTORIAL 3**	1	15-3-2022		TLM1& TLM3	
No. of classes required to complete UNIT-I:12				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	16-3-2022		TLM2	
2.	**TUTORIAL 4**	1	22-3-2022		TLM3	
3.	DFS representation of periodic sequences	1	23-3-2022		TLM1	
4.	Discrete Fourier transforms: Properties of DFT, Linear convolution of sequences using DFT	1	25-3-2022		TLM1	
5.	Computation of DFT	1	26-3-2022		TLM1	
6.	**TUTORIAL 5**	1	29-3-2022		TLM3	
7.	Relation between Z-transform and DFS ,Fast Fourier transforms (FFT)	1	30-3-2022		TLM1	
8.	Radix-2 decimation in time and decimation in frequency	1	01-4-2022		TLM1	
9.	**TUTORIAL 6**	1	05-4-2022		TLM3	
10.	FFT Algorithms, Inverse FFT ,FFT for composite N	1	06-4-2022		TLM1	
11.	Mid-I Exams		12-4-2022			
12.	Mid-I Exams		13-4-2022			
13.	Mid-I Exams		15-4-2022			
14.	Mid-I Exams		16-4-2022			
No. of classes required to complete UNIT-II: 10				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	20-5-2021		TLM1	
2.		1	22-5-2021		TLM3	
3.	Solution of difference equations of digital filters	1	25-5-2021		TLM1	
4.	Block diagram representation of linear constant-coefficient difference equations	1	26-5-2021		TLM1	
5.	Basic structures of IIR systems	1	27-5-2021		TLM1	
6.	**TUTORIAL 7**	1	29-5-2021		TLM3	
7.	Transposed forms	1	1-6-2021		TLM1	
8.	Basic structures of FIR systems	1	2-6-2021		TLM1	
9.	Continuous Wavelet Transforms – Definition, Properties of Continuous Wavelet Transforms	1	3-6-2021		TLM2	
10.	Concept of scale and wavelet transform relation with Frequency **TUTORIAL 8**	1	5-6-2021		TLM1& TLM3	
No. of classes required to complete UNIT-III:				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	8-6-2021		TLM1	
2.	Butter worth filters	1	9-6-2021		TLM2	
3.	Chebyshev filters	1	10-6-2021		TLM1	
4.	Design of IIR Digital filters from analog filters	1	15-6-2021		TLM1	
5.	Design of IIR Digital filters from analog filters	1	16-6-2021		TLM1	
6.	Design Examples: Analog-Digital transformations	1	17-6-2021		TLM1	
7.	**TUTORIAL 9**	1	19-6-2021		TLM3	
8.	Design Examples: Analog-Digital transformations	1	22-6-2021		TLM1& TLM3	
No. of classes required to complete UNIT-IV:				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	23-6-2021		TLM1	
2.	Frequency response	1	24-6-2021		TLM1	
3.	**TUTORIAL 10**	1	26-6-2021		TLM3	
4.	Design of FIR Digital Filters using Window Techniques	1	29-6-2021		TLM1	
5.	Frequency Sampling technique	1	30-6-2021		TLM1	
6.	Comparison of IIR & FIR filters, Wavelet Filters	1	1-7-2021		TLM1	
7.	**TUTORIAL 11**	1	3-7-2021		TLM3	
8.	Inverse discrete wavelets transform computation by filter banks	1	6-7-2021		TLM1	
9.	Basic properties of filter coefficients, Choice of wavelet function coefficients	1	7-7-2021		TLM1	
10.	Mid-II Exams		8-7-2021			
11.	Mid-II Exams		10-7-2021			
No. of classes required to complete UNIT-V:				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	7-7-2021		TLM2	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	21-02-2022	09-04-2022	7W
I Mid Examinations	11-04-2022	16-04-2022	1W
II Phase of Instructions	18-04-2022	04-06-2022	7W
II Mid Examinations	06-06-2022	11-06-2022	1W
Preparation and Practicals	13-06-2022	18-06-2022	1W
Semester End Examinations	20-06-2022	02-07-2022	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 : Mrs.R.Padma, Mr.B.Pangedaiah (T)
Course Name & Code : Analog and Digital Signal Processing & 17EE17
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Sections- B A.Y :2021-22

PRE-REQUISITES: Differential Equations and liner algebra (17FE04), Transformation techniques and vector calculus (17FE06), Numerical methods and Fourier analysis (17FE07)

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Understand Discrete Fourier Transform and its computation.
- Deal with Discrete Fourier Series, Fast Fourier Series, Z-transforms
- Know the concepts of filter design

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

CO 1	Illustrate properties of continuous and discrete-time signals
CO 2	Analyze DFT and FFT
CO 3	Analyze discrete time signals
CO 4	Design digital filters & wavelet 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).

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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.
R4 Robert J. Schilling, Sandra L.Harris "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.
R5 Lonnie, C.Ludeman, " Fundamentals of DSP", Wiley India Pvt. Limited, 2009
R6 Rao R M and A S Bopardikar, "Wavelet Transofrmations Introduction to theory and Applications",Pearson Education, Asia, 2000.

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	22-02-2022		TLM1	
2.	Introduction to unit-I: Signals, systems and DSP	1	23-02-2022		TLM1	
3.	Continuous time signals (CT signals) and Discrete time signals (DT signals)	1	25-02-2022		TLM1	
4.	Classification of CT and DT signals	1	26-02-2022		TLM1	
5.	**TUTORIAL 1**	1	01-03-2022		TLM3	
6.	CT and DT systems	1	02-03-2022		TLM1	
7.	Classification of CT and DT systems: static and dynamic, linear and non linear	1	04-03-2022		TLM1	
8.	Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable systems	1	05-03-2022		TLM1	
9.	**TUTORIAL 2**	1	08-03-2022		TLM3	
10.	Linear constant coefficient difference equations	1	09-03-2022		TLM1	
11.	Sampling Theorem, Convolution theorem	1	11-03-2022		TLM1	
12.	Review of Z-transforms **TUTORIAL 3**	1	15-03-2022		TLM1& TLM3	
No. of classes required to complete UNIT-I:12				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	16-03-2022		TLM2	
2.	**TUTORIAL 4**	1	22-03-2022		TLM3	
3.	DFS representation of periodic sequences	1	23-03-2022		TLM1	
4.	Discrete Fourier transforms: Properties of DFT, Linear convolution of sequences using DFT	1	25-03-2022		TLM1	
5.	Computation of DFT	1	26-03-2022		TLM1	
6.	**TUTORIAL 5**	1	29-03-2022		TLM3	
7.	Relation between Z-transform and DFS ,Fast Fourier transforms (FFT)	1	30-03-2022		TLM1	
8.	Radix-2 decimation in time and decimation in frequency	1	01-04-2022		TLM1	
9.	**TUTORIAL 6**	1	05-04-2022		TLM3	
10.	FFT Algorithms, Inverse FFT ,FFT for composite N	1	06-04-2022		TLM1	
11.	Mid-I Exams		12-04-2022			
12.	Mid-I Exams		13-04-2022			
13.	Mid-I Exams		16-04-2022			
No. of classes required to complete UNIT-II: 10				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.	**TUTORIAL 7** Z – transforms and Applications	1	19-04-2022		TLM1 &TLM3	
2.	Solution of difference equations of digital filters	1	20-04-2022		TLM1	
3.	Block diagram representation of linear constant-coefficient difference equations	1	22-04-2022		TLM1	
4.	Block diagram representation of linear constant-coefficient difference equations	1	23-04-2022		TLM1	
5.	**TUTORIAL 8**	1	26-04-2022		TLM3	
6.	Basic structures of IIR systems	1	27-04-2022		TLM1	
7.	Transposed forms	1	29-04-2022		TLM1	
8.	Basic structures of FIR systems	1	30-04-2022		TLM1	
9.	Continuous Wavelet Transforms – Definition, Properties of Continuous Wavelet Transforms	1	04-05-2022		TLM2	
10.	Concept of scale and wavelet transform relation with Frequency	1	04-05-2022		TLM1& TLM3	
No. of classes required to complete UNIT-III:10				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	07-05-2022		TLM1	
2.	**TUTORIAL 9**	1	10-05-2022		TLM3	
3.	Butter worth filters	1	11-05-2022		TLM1	
4.	Chebyshev filters	1	13-05-2022		TLM1	
5.	**TUTORIAL 10**	1	17-05-2022		TLM3	
6.	Design of IIR Digital filters from analog filters	1	18-05-2022		TLM1	
7.	Design Examples: Analog-Digital transformations	1	20-05-2022		TLM1	
8.	Design Examples: Analog-Digital transformations	1	21-05-2022		TLM1	
No. of classes required to complete UNIT-IV:08				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	21-05-2022		TLM1	
2.	**TUTORIAL 11**	1	24-05-2022		TLM3	
3.	Frequency response	1	25-05-2022		TLM1	
4.	Design of FIR Digital Filters using Window Techniques	1	27-05-2022		TLM1	
5.	Frequency Sampling technique	1	28-05-2022		TLM1	
6.	**TUTORIAL 12**	1	31-05-2022		TLM3	
7.	Comparison of IIR & FIR filters, Wavelet Filters	1	01-06-2022		TLM1	
8.	Inverse discrete wavelets transform computation by filter banks	1	03-06-2022		TLM1	
9.	Basic properties of filter coefficients, Choice of wavelet function coefficients	1	04-06-2022		TLM1	
10.	Mid-II Exams		07-06-2022			
11.	Mid-II Exams		08-06-2022			
12.	Mid-II Exams		10-06-2022			

13.	Mid-II Exams		11-06-2022			
No. of classes required to complete UNIT-V:09				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	06-04-2022		TLM2	

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

PART-C (EVALUATION PROCESS (R17 Regulations):)

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	21-02-2022	09-04-2022	7W
I Mid Examinations	11-04-2022	16-04-2022	1W
II Phase of Instructions	18-04-2022	04-06-2022	7W
II Mid Examinations	06-06-2022	11-06-2022	1W
Preparation and Practicals	13-06-2022	18-06-2022	1W
Semester End Examinations	20-06-2022	02-07-2022	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
Mrs.R.Padma	Mr. P.Deepak Reddy	Mr. P. Deepak Reddy	Dr. J.Siva Vara Prasad

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.M.S.Giridhar
Course Name & Code : Power System Analysis (17EE18) Credits : 3
L-T-P Structure : 3-0-0 A.Y : 2021-22
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Sections- A

PRE-REQUISITE: None

Course Educational Objective: This course enables the student to
- Model and analyze large power systems
- Familiarize with the calculation of power flow in a power system network using various techniques

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

CO 1	Formulate the network matrices required for power flow and short circuit studies
CO 2	Apply appropriate power flow method to power system problems
CO 3	Analyze the various faults occurring in power systems
CO 4	Illustrate the power system stability problem

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

Mappings of course outcomes (COs) with programme outcomes (POs) & PSOs – 17EE52 – POWER SYSTEM ANALYSIS

		POs												PSOs			
		a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2	PSO3	PSO4
COs	CO1	3	2	2	2	3		1						2	2		1
	CO2	3	3	2	2	3							2	3	2		1
	CO3	3	2	3	2	3	2	1						2	2		1
	CO4	2	2											1			1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

TEXT BOOKS

1. W.D.Stevenson Jr., "Power System Analysis", TMH Publication, 4th Edition, 1982.
2. D.P Kothari, I.J.Nagarath, "Modern Power System Analysis", TMH Publication, 4th Edition, 2011.

REFERENCES

1. G.W.Stagg and A.H.El-Abiad, "Computer methods in power system analysis", 1983.
2. Prabha Kundur, "Power system Stability and Control, TMH, 10th Reprint, 2010.
3. M.A.Pai, "Computer Techniques in Power system Analysis" TMH Publication, 3rd Edition, 2014.
4. Hadi Saadat, "Power System Analysis" TMH Publication, 3rd Edition, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT – I: POWER SYSTEM NETWORK MATRICES

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.	Graph Theory Definitions	1	21.02.2022		TLM1	
2.	Graph Theory relevant concepts in graph theory	1	22.02.2022		TLM1	
3.	Network matrices	1	23.02.2022		TLM1	
4.	Ybus formation by Direct Inspection	1	24.02.2022		TLM1	
5.	Ybus formation by Direct Inspection Simple Numerical Problems	1	02.03.2022		TLM1	
6.	Ybus formation Singular Transformation method	1	03.03.2022		TLM1	
7.	Ybus formation Singular Transformation methods - Problem	1	07.03.2022		TLM1	
8.	Zbus Building Algorithm	1	08.03.2022		TLM1	
9.	Addition of Branch and Links, modification of Zbus Matrix	1	09.03.2022		TLM1	
10.	Numerical Problems.	1	10.03.2022		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT – II: POWER FLOW METHODS

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.	Review of per unit system	1	14.03.2022		TLM1	
2.	power flow problem formulation	1	15.03.2022		TLM1	
3.	solution of non-linear algebraic equations by Gauss-Seidal Methods	1	16.03.2022		TLM1	
4.	solution of non-linear algebraic equations by Newton Raphson Methods	1	21.03.2022		TLM1	
5.	Numerical Problems	1	22.03.2022		TLM1	
6.	Power flow solution by Newton's method in polar coordinates	1	23.03.2022		TLM1	
7.	Power Flow GS methods - flow charts	1	24.03.2022		TLM1	
8.	Power Flow NR methods - flow charts	1	28.03.2022		TLM1	
9.	Power flow Solution of small systems.	1	29.03.2022		TLM1	
10.	Power flow Solution of small systems.	1	30.03.2022		TLM1	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT – III: POWER FLOW METHODS CONTINUED

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.	Sensitivity of system operating parameters	1	04.04.2022		TLM1	
2.	Derivation of fast decoupled load flow	1	06.04.2022		TLM1	

3.	Simple numerical Problem	1	07.04.2022		TLM1	
4.	comparison of power flow methods with newton-raphson method	1	18.04.2022		TLM1	
5.	DC load flow formulation	1	19.04.2022		TLM1	
6.	DC load flow applications	1	20.04.2022		TLM1	
7.	Simple numerical problem	1	21.04.2022		TLM1	
8.	Introduction to optimal ordering of system of equations	1	25.04.2022		TLM1	
9.	Computation of power flow matrices - triangular factors.	1	26.04.2022		TLM1	
10.	Computation of power flow matrices - sparcity.	1	27.04.2022		TLM1	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT–IV: NETWORK FAULTS AND FAULT CALCULATIONS

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.	Symmetrical Fault Analysis (LLL): Short-circuit of synchronous machine unloaded	1	28.04.2022		TLM1	
2.	short circuit of loaded synchronous machine	1	02.05.2022		TLM1	
3.	Calculation of symmetrical short circuit currents for simple systems		04.05.2022		TLM1	
4.	Short circuit computation through Thevenin's Theorem,	1	05.05.2022		TLM1	
5.	Numerical problem on a simple systems		09.05.2022		TLM1	
6.	Symmetrical components transformation	1	10.05.2022		TLM1	
7.	Phase shift in Y/Δ Transformers, Sequence impedance of transmission lines, sequence impedance and networks of power system	1	11.05.2022		TLM1	
8.	sequence impedance and networks of synchronous machine, sequence impedance and networks of transformers	1	12.05.2022		TLM1	
9.	construction of sequence networks of a power system	1	16.05.2022		TLM1	
10.	computation of circuit breaker capacities, short circuit currents and MVA calculations	1	17.05.2022		TLM1	
11.	Procedure for Unsymmetrical fault analysis – LG, LL, LLG faults with and without fault impedance	1	18.05.2022		TLM1	
12.	Unsymmetrical fault analysis – LG, LL, LLG faults without fault impedance, Numerical Problems	1	19.05.2022		TLM1	
13.	Unsymmetrical fault analysis – LG, LL, LLG faults with fault impedance, Numerical Problems		23.05.2022		TLM1	

No. of classes required to complete UNIT-IV: 13	No. of classes taken:

UNIT – V: POWER SYSTEM STABILITY

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.	Elementary concepts of steady state, Dynamic and Transient Stabilities	1	24.05.2022		TLM1	
2.	Description of steady state Stability power limit, Transfer reactance, Synchronizing power coefficient	1	25.05.2022		TLM1	
3.	Power angle curve and Determination of steady state Stability	1	26.05.2022		TLM1	
4.	Formulation of swing equation and its solution	1	30.05.2022		TLM1	
5.	Determination of Transient stability by equal area criterion	1	31.05.2022		TLM1	
6.	Application of equal area criterion	1	01.06.2022		TLM1	
7.	Stability calculations for Loss of one parallel line	1	02.06.2022		TLM1	
8.	critical clearing angle calculation	1	02.06.2022		TLM1	
9.	Methods to improve steady state and Transient stability	1	04.06.2022		TLM1	
No. of classes required to complete UNIT-V: 09				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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10

Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
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	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
(Name)	(Name)	(Name)	(Name)

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.P.Sobha Rani
Course Name & Code : Power System Analysis 17EE18
L-T-P Structure : 2-2-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE **:** Electrical Power Transmission

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Model and analyze large power systems
- Familiarize with calculation of power flow in a power system network using various techniques

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

CO 1	Formulate the network matrices required for power flow and short circuit studies.
CO 2	Apply appropriate power flow method to power system problems
CO 3	Analyze the various faults occurring on power systems
CO 4	Illustrate the power system stability problem

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	2	3								2	2	1
CO2	3	3	2	2	3							2	3	2	1
CO3	3	2	3	2	3	2	1						2	2	1
CO4	2	2											1		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 W D Stevenson Jr., "Power System Analysis", T M H, 4th edition,1982.
T2 D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis", T M H New Delhi,4th Edition 2011

REFERENCE BOOKS:

R1 G.W. Stagg & A.H. El-Abiad, "Computer Methods in Power System Analysis", 1983.
R2 Prabha Kundur, "Power System Stability and Control", T M H, 10th reprint 2010.
R3 M.A. Pai, "Computer Techniques in Power System Analysis", TMH, 3 rd edition, 2014
R4 Hadi Saadat, "Power System Analysis"– TMH , 3rd Edition, 2011.
R5 Abhijit Chakraborty, Sunita, Halder, "Power System Analysis: Operation and Control", PHI Learning Pvt Ltd., New Delhi, III Edition., 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):B/S

UNIT-I: POWER SYSTEM NETWORK MATRICES

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	22-02-2022		TLM1	
2.	Introduction to Unit-I	1	23-02-2022		TLM1	
3.	relevant concepts in graph theory	1	24-02-2022		TLM1	
4.	Network Matrices	1	26-02-2022		TLM1	
5.	Y_{bus} formation by Direct Inspection	1	2-03-2022		TLM1	
6.	Y_{bus} formation by Singular Transformation Method	1	3-03-2022		TLM2	
7.	**Tutorial-1**	1	5-03-2022		TLM3	
8.	Z_{bus} building algorithm	2	8-03-2022 9-03-2022		TLM1	
9.	**Tutorial-2**	1	10-03-2022		TLM3	
No. of classes required to complete UNIT-I:10				No. of classes taken:		

UNIT-II: POWER FLOW METHODS

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.	Review of per-unit system	1	15-03-2022		TLM1	
2.	power flow problem formulation	1	16-03-2022		TLM1	
3.	solution of non-linear algebraic equations by Gauss-Seidel	1	17-03-2022		TLM1	
4.	Tutorial-1	1	19-03-2022		TLM3	
5.	Newton-Raphson method	2	22-03-2022 23-03-2022		TLM1	
6.	Newton-Raphson method	1	24-03-2022		TLM1	
7.	Tutorial-2	1	26-03-2022		TLM3	
8.	Power flow solution by Newton's method in polar coordinates	1	29-03-2022		TLM2	
9.	Flow charts	1	30-03-2022		TLM2	
10.	Solution of small systems.	1	31-03-2022		TLM3	
11.	I-Mid		12-04-2022			
12.	I-Mid		13-04-2022			
13.	I-Mid		16-04-2022			
No. of classes required to complete UNIT-II:11				No. of classes taken:		

UNIT-III: POWER FLOW METHODS CONTINUED

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.	Sensitivities of system operating parameters	1	6-04-2022		TLM1	
2.	derivation of Fast Decoupled Load flow	1	7-04-2022		TLM1	
3.	comparison with Newton-	1	19-04-2022		TLM1	

	Raphson method					
4.	DC Load flow and applications	1	20-04-2022		TLM1	
5.	Introduction to optimal ordering of system of equations	1	21-04-2022		TLM1	
6.	Tutorial-1	1	23-04-2022		TLM3	
7.	triangular factors	1	26-04-2022		TLM1	
8.	sparcity	1	27-04-2022		TLM2	
No. of classes required to complete UNIT-III:8				No. of classes taken:		

UNIT-IV : NETWORK FAULTS AND FAULT CALCULATIONS

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.	Short circuit of synchronous machine unloaded and loaded	1	28-04-2022		TLM1	
2.	Calculation of symmetrical short circuit currents for simple systems	1	30-04-2022		TLM3	
3.	short circuit current computation through Thevenin's theorem	1	4-05-2022		TLM1	
4.	Symmetrical components transformation	1	5-05-2022		TLM1	
5.	Tutorial-2	1	7-05-2022		TLM3	
6.	phase shift in Y/Δ transformers	1	10-05-2022		TLM1	
7.	sequence impedance and networks of power system	1	11-05-2022		TLM1	
8.	computation of circuit breaker capacities	1	12-05-2022		TLM1	
9.	Short Circuit Current and MVA Calculations	1	14-05-2022		TLM3	
10.	LG, LL, LLG faults with and without fault impedance	2	17-05-2022 18-05-2022		TLM1	
No. of classes required to complete UNIT-IV:11				No. of classes taken:		

UNIT-V : POWER SYSTEM STABILITY

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.	Elementary concepts of Steady State, Dynamic and Transient Stabilities	1	19-05-2022		TLM1	
2.	Description of Steady State Stability Power Limit,	1	21-05-2022		TLM1	
3.	Transfer Reactance, Synchronizing Power Coefficient	1	24-05-2022		TLM1	
4.	Power Angle Curve and Determination of Steady State Stability	1	25-05-2022		TLM1	
5.	Formulation of Swing Equation and its solution	1	26-05-2022		TLM1	
6.	Tutorial-1	1	28-05-2022		TLM3	
7.	determination of Transient Stability by Equal Area Criterion	1	31-05-2022		TLM1	
8.	Application of Equal	1	1-06-2022		TLM1	

	Area Criterion					
9.	Critical Clearing Angle Calculation	1	2-06-2022		TLM1	
10.	Methods to improve Steady State and Transient Stability	1	4-06-2022		TLM1	
11.	II Mid		7-06-2022			
12.	II Mid		8-06-2022			
13.	II Mid		9-06-2022			
14.	II Mid		11-06-2022			
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 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
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	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
PSO4	Design controllers for electrical and electronic systems to improve their performance

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Name)	(Name)	(Name)	(Name)

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. K. Harinadha Reddy
Course Name & Code : Power Electronics
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Section- A A.Y : 2021-22

PRE-REQUISITE: Electronics circuits and Devices (17EE01),Network Theory-II(17EE07)

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Make use of different power converters & their enhancement in performance of power transmission, distribution and utilization systems.
- Analyze the performance of various power electronic converters by applying different control mechanisms

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

CO 1	**Illustrate** the operation of various power semiconductor devices.
CO 2	**Evaluate** the performance of power converters.
CO 3	**Design** the protection and control circuits for various converters.
CO 4	**Analyze** different firing and commutation circuits.

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

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:

1. Md.H.Rashid "Power Electronics", Pearson Education fourth Edition, first Indian Reprint- 2014.
2. Dr.P.S. Bhimbra, "Power Electronics", Khanna Publishers, 5th Edition, 2012.

REFERENCES:

1. Ned Mohan, T.M. Undeland and William P.Robbins, "Power Electronic Converters- Applications", John Wiley & Sons, 3rd Edition, , 2009
2. M D Singh, K B Khanchandani "Power Electronics", Tata MC Graw Hill Publishers,2nd edition 2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:POWER SEMI-CONDUCTOR DEVICES

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	21.02.2022		TLM1	
2.	Introduction to Power semiconductor switches, Thyristor family	1	22.02.2022		TLM1	
3.	SCR operation& Characteristics of SCR	1	24.02.2022		TLM2	
4.	Two transistor model	1	26.02.2022		TLM1	
5.	Static and dynamic characteristics	1	28.02.2022		TLM1	
6.	Turn on and Turn off methods	2	03.03.2022		TLM2	
7.	**TUTORIAL-1**	1	05.03.2022		TLM3	
8.	Series and Parallel operation of thyristors	2	07.03.2022		TLM1	
9.	Gate triggering circuits	1	08.03.2022		TLM1	
10.	Rating and protection	1	10.03.2022		TLM1	
11.	Snubber circuits, Characteristics of GTO & IGBT	1	12.03.2022		TLM1	
12.	**TUTORIAL-2**	1	14.03.2022		TLM3	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: COMMUTATIONS & PHASE-CONTROLLED RECTIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Natural commutation, Forced commutation circuits	1	15.03.2022		TLM1	
2.	Impulse, Resonant pulse, Numerical	1	17.03.2022		TLM1	
3.	complimentary and external pulse commutation	1	19.03.2022		TLM1	
4.	Single phase Half wave bridge controlled rectifiers with R and RL loads– continuous and discontinuous modes	1	21.03.2022		TLM2	
5.	Numericals on single phase half wave bridge controlled rectifiers	1	22.03.2022		TLM1	
6.	**TUTORIAL-3**	1	24.03.2022		TLM3	
7.	Full wave bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes	1	26.03.2022		TLM2	
8.	Numericals on full wave bridge controlled rectifiers	1	28.03.2022		TLM1	
9.	effect of freewheeling diode	1	29.03.2022		TLM1	
10.	Dual converters-single phase	1	31.03.2022		TLM1	
11.	Dual converters- three phase Effect of Source impedance	1	04.04.2022		TLM1	
12.	**TUTORIAL-4**	1	05.04.2022		TLM3	
13.	Problems	2	07.04.2022 09-04-2022		TLM1	
No. of classes required to complete UNIT-II:14				No. of classes taken:		

UNIT-III: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

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.	Single phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	18.04.2022		TLM1	
2.	Problems on single phase ac voltage controller with R and RL loads	1	19.04.2022		TLM2	
3.	Three phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	21.04.2022		TLM1	
4.	Problems on Three phase ac voltage controller with R and RL loads	1	23.04.2022		TLM2	
5.	**TUTORIAL-5**	1	25.04.2022		TLM3	
6.	Principle of operation of Cyclo-converter	1	26.04.2022		TLM1	
7.	Single phase to single phase cyclo converters	1	28.04.2022		TLM1	
8.	Problems on Single phase to single phase cyclo converters	1	30.04.2022		TLM1	
9.	Content beyond syllabus	1	02.05.2022			
No. of classes required to complete UNIT-III:9				No. of classes taken:		

UNIT-IV : DC TO DC CONVERTERS

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.	Principle of operation dc to dc converters	1	05.05.2022		TLM1	
2.	Step-up and step-down chopper	1	07.05.2022		TLM2	
3.	Control Strategies of dc to dc converters	1	09.05.2022		TLM1	
4.	Derivation of average load voltage, load current for continuous current operation	1	10.05.2022		TLM1	
5.	Numericals on step up chopper	1	12.05.2022		TLM1	
6.	**TUTORIAL-6**	1	14.05.2022		TLM3	
7.	Derivation of average load voltage, load current for discontinuous current operation	1	16.05.2022		TLM1	
8.	Analysis of Class A chopper	1	17.05.2022		TLM2	
9.	**TUTORIAL-7**	1	19.05.2022		TLM3	
No. of classes required to complete UNIT-IV:9				No. of classes taken:		

UNIT-V : INVERTERS

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.	Single phase Voltage Source Inverter	1	21.05.2022		TLM1	
2.	Single phase Current source inverters	1	23.05.2022		TLM1	
3.	Comparison between VSI and CSI	1	24.05.2022		TLM1	
4.	Analysis with R & RL loads	1	26.05.2022		TLM2	
5.	3-phase inverters–180 and 120 degree mode of operation	1	28.05.2022		TLM1	
6.	**TUTORIAL-8**	1	30.05.2022		TLM3	
7.	Single Pulse Width Modulation	1	31.05.2022		TLM1	
8.	Multiple Pulse Width Modulation	1	02.06.2022		TLM1	
9.	Sinusoidal & Modified Sinusoidal PWM	1	04.06.2022		TLM2	
No. of classes required to complete UNIT-V:09				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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Dr. K. Harinadha Reddy	Dr.J.S.V.Prasad	Mr P.Deepak Reddy	Dr.J.S.V.Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. J.Sivavara Prasad
Course Name & Code : Power Electronics
L-T-P Structure : 3-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE: Electronics circuits and Devices (17EE01),Network Theory-II(17EE07)

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Make use of different power converters & their enhancement in performance of power transmission, distribution and utilization systems.
- Analyze the performance of various power electronic converters by applying different control mechanisms

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

CO 1	**Illustrate** the operation of various power semiconductor devices.
CO 2	**Evaluate** the performance of power converters.
CO 3	**Design** the protection and control circuits for various converters.
CO 4	**Analyze** different firing and commutation circuits.

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

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:

3. Md.H.Rashid "Power Electronics", Pearson Education fourth Edition, first Indian Reprint- 2014.
4. Dr.P.S. Bhimbra, "Power Electronics", Khanna Publishers, 5th Edition, 2012.

REFERENCES:

1. Ned Mohan, T.M. Undeland and William P.Robbins, "Power Electronic Converters- Applications", John Wiley & Sons, 3rd Edition, , 2009
2. M D Singh, K B Khanchandani "Power Electronics", Tata MC Graw Hill Publishers,2nd edition 2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: POWER SEMI-CONDUCTOR DEVICES

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	21.02.2022		TLM1	
2.	Introduction to Power semiconductor switches, Thyristor family	1	22.02.2022		TLM1	
3.	SCR operation& Characteristics of SCR	1	24.02.2022		TLM2	
4.	Two transistor model	1	25.02.2022		TLM1	
5.	Static and dynamic characteristics	1	28.02.2022		TLM1	
6.	Turn on and Turn off methods	2	03.03.2022		TLM2	
7.	**TUTORIAL-1**	1	04.03.2022		TLM3	
8.	Series and Parallel operation of thyristors	2	07.03.2022		TLM1	
9.	Gate triggering circuits	1	08.03.2022		TLM1	
10.	Rating and protection	1	10.03.2022		TLM1	
11.	Snubber circuits, Characteristics of GTO & IGBT	1	11.03.2022		TLM1	
12.	**TUTORIAL-2**	1	14.03.2022		TLM3	
No. of classes required to complete UNIT-I:14				No. of classes taken:		

UNIT-II: COMMUTATIONS & PHASE-CONTROLLED RECTIFIERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Natural commutation, Forced commutation circuits	1	15.03.2022		TLM1	
2.	Impulse, Resonant pulse, complimentary and external pulse commutation	1	17.03.2022		TLM1	
3.	Single phase Half wave bridge controlled rectifiers with R and RL loads– continuous and discontinuous modes	1	21.03.2022		TLM2	
4.	Numericals on single phase half wave bridge controlled rectifiers	1	22.03.2022		TLM1	
5.	**TUTORIAL-3**	1	24.03.2022		TLM3	
6.	Full wave bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes	1	25.03.2022		TLM2	
7.	Numericals on full wave bridge controlled rectifiers	1	28.03.2022		TLM1	
8.	effect of freewheeling diode	1	29.03.2022		TLM1	
9.	Dual converters-single phase	1	31.03.2022		TLM1	
10.	Dual converters- three phase	1	01.04.2022		TLM1	
11.	Effect of Source impedance	1	04.04.2022		TLM1	
12.	**TUTORIAL-4**	1	07.04.2022		TLM3	
13.	Problems	1	08.04.2022		TLM1	
No. of classes required to complete UNIT-II:13				No. of classes taken:		

UNIT-III: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

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.	Single phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	18.04.2022		TLM1	
2.	Problems on single phase ac voltage controller with R and RL loads	1	19.04.2022		TLM2	
3.	Three phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	21.04.2022		TLM1	
4.	Problems on Three phase ac voltage controller with R and RL loads	1	22.04.2022		TLM2	
5.	**TUTORIAL-5**	1	25.04.2022		TLM3	
6.	Principle of operation of Cyclo-converter	1	26.04.2022		TLM1	
7.	Single phase to single phase cyclo converters	1	28.04.2022		TLM1	
8.	Problems on Single phase to single phase cyclo converters	1	29.04.2022		TLM1	
9.	Content beyond syllabus	1	02.05.2022			
No. of classes required to complete UNIT-III:9				No. of classes taken:		

UNIT-IV : DC TO DC CONVERTERS

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.	Principle of operation dc to dc converters	1	05.05.2022		TLM1	
2.	Step-up and step-down chopper	1	06.05.2022		TLM2	
3.	Control Strategies of dc to dc converters	1	09.05.2022		TLM1	
4.	Derivation of average load voltage, load current for continuous current operation	1	10.05.2022		TLM1	
5.	Numericals on step up chopper	1	12.05.2022		TLM1	
6.	**TUTORIAL-6**	1	13.05.2022		TLM3	
7.	Derivation of average load voltage, load current for discontinuous current operation	1	16.05.2022		TLM1	
8.	Analysis of Class A chopper	1	17.05.2022		TLM2	
9.	**TUTORIAL-7**	1	19.05.2022		TLM3	
No. of classes required to complete UNIT-IV:9				No. of classes taken:		

UNIT-V : INVERTERS

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.	Single phase Voltage Source Inverter	1	20.05.2022		TLM1	
2.	Single phase Current source inverters	1	23.05.2022		TLM1	
3.	Comparison between VSI and CSI	1	24.05.2022		TLM1	
4.	Analysis with R & RL loads	1	26.05.2022		TLM2	
5.	3-phase inverters–180 and 120 degree mode of operation	1	27.05.2022		TLM1	
6.	**TUTORIAL-8**	1	30.05.2022		TLM3	
7.	Single Pulse Width Modulation	1	31.05.2022		TLM1	

8.	Multiple Pulse Width Modulation	1	02.06.2022		TLM1	
9.	Sinusoidal & Modified Sinusoidal PWM	1	03.06.2022		TLM2	
No. of classes required to complete UNIT-V:09				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 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Dr.J.S.V.Prasad	Dr.J.S.V.Prasad	Mr P.Deepak Reddy	Dr.J.S.V.Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. A.V.RAVIKUMAR
Course Name & Code : Measurements and Instrumentation&17EE20
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Section-A A.Y : 2021-22

PRE-REQUISITE: Network Theory-I,II, Applied Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Understand the construction and working principle of different types of meters
- Provide knowledge to design and create novel products and solutions for real life problems

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

CO 1	Compare the performance of MC, MI and Dynamometer types of measuring instruments and Energy meters
CO 2	Determine the circuit parameters using AC and DC bridges
CO 3	Compute the errors in CTs and PTs
CO 4	Identify suitable transducers for the measurement of temperature, displacement and Strain
CO 5	Illustrate operating principles of electronic measuring instruments

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

COs	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2										1	1	1		2
CO2	2	2	2										1	1		
CO3	2	2	2										2	1		1
CO4	2	2														1
CO5	2	2	2													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 A K Sawhaney,DhanpatRai& Sons., "A course in Electrical and Electronic measurements & Instrumentation", Education & Technical publishers New Delhi, 4th edition,2015.

T2 U A Bakshi& A V Bakshi, "Electrical measurement" ,Technicalpublications,Pune, second edition,2010

REFERENCE BOOKS:

R1 Nakra& Chaudhari, "Instrumentation, Measurement and Analysis", TMH, 4th edition 2006.

R2 D V S Murthy, "TransducersandInstrumentation", PHI Ltd, New Delhi, 2nd edition 2011

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: Measuring Instruments

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.	Functional elements of an instrument-static and dynamic characteristics	1	21-02-2022		TLM2	
2.	Errors in measurement-statistical evaluation of measurement data	1	24-02-2022		TLM2	
3.	Standards and calibration, classification of measuring instruments	1	25-02-2022		TLM2	
4.	Essentials of indicating instruments, deflecting, controlling and damping systems	1	28-02-2022		TLM1	
5.	Construction, working, torque equation of MI instrument	1	03-03-2022		TLM1	
6.	Construction, working, torque equation of PMMC instrument	1	04-03-2022		TLM1	
7.	Extension of range of ammeters and voltmeters using shunt, multiplier	1	07-03-2022		TLM1	
8.	Universal shunt, universal multiplier	1	10-03-2022		TLM1	
9.	Problems	1	11-03-2022		TLM1	
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: MEASUREMENT OF R, L, C

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.	Measurement of Resistance: voltmeter – Ammeter method	1	14-03-2022		TLM1	
2.	Kelvin's Double bridge	1	17-03-2022		TLM1	
3.	Megger	1	18-03-2022		TLM1	
4.	A.C. Bridges : Sources and Detectors for A.C. Bridges	1	21-03-2022		TLM1	
5.	General equation for bridge at balance	1	24-03-2022		TLM1	
6.	Measurement of Inductance: Maxwell's Inductance-capacitance bridge	1	25-03-2022		TLM1	
7.	Anderson's bridge	1	28-03-2022		TLM1	
8.	Measurement of Capacitance: Schering bridge	1	31-03-2022		TLM1	
No. of classes required to complete UNIT-II:8				No. of classes taken:		

UNIT-III: SPECIAL PURPOSE MEASURING INSTRUMENTS

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.	Instrument Transformers: construction	1	01-04-2022		TLM1	
2.	Connection of CT &PT in the circuit	1	04-04-2022		TLM1	
3.	Advantages of CT/PT over shunt and multiplier for range extension	1	07-04-2022		TLM1	
4.	Transformation ratio, turns ratio, Nominal ratio, burden ,Ratio and phase angle error	1	08-04-2022		TLM1	
5.	Power factor meter	1	18-04-2022		TLM1	
6.	Frequency meter Resonance type and Weston type	1	21-04-2022		TLM1	
7.	Principle of AC Potentiometer	1	22-04-2022		TLM2	
8.	DC Potentiometer(Crompton)	1	25-04-2022		TLM2	
9.	Standardization & applications, Grounding techniques	1	28-04-2022		TLM2	
No. of classes required to complete UNIT-III:9				No. of classes taken:		

UNIT-IV :MEASUREMENT OF POWER AND 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
1.	Wattmeter: construction, working, Torque equation	1	29-04-2022		TLM1	
2.	Errors and their compensation in dynamometer type	1	02-05-2022		TLM1	
3.	Low power factor wattmeter	1	05-05-2022		TLM1	
4.	Polyphase wattmeter	1	06-05-2022		TLM1	
5.	Measurement of reactive power	1	09-05-2022		TLM1	
6.	Determination of power factor by two wattmeter method	1	12-05-2022		TLM1	
7.	Energy meter: construction,working, torque equation	1	13-05-2022		TLM1	
8.	Errors and adjustments of single phase conventional energy meter	1	16-05-2022		TLM2	
9.	Three phase energy meters	1	29-04-2022		TLM2	
No. of classes required to complete UNIT-IV:8				No. of classes taken:		

UNIT-V :INSTRUMENTATION

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.	Transducers, classification and selection of transducers	1	19-05-2022		TLM1	
2.	Strain gauges	1	20-05-2022		TLM1	
3.	Inductive transducers, LVDT	1	23-05-2022		TLM1	
4.	Capacitive transducers, Piezo electric and Hall effect transducers	1	26-05-2022		TLM1	
5.	Photo voltaic and photo conductive cells Measurement practices in substation	1	27-05-2022		TLM1	
6.	Optical and digital transducers-elements of data acquisition system	1	30-05-2022		TLM1	
7.	A/D, D/A converters	1	02-06-2022		TLM2	
8.	Smart sensors	1	03-06-2022		TLM2	
No. of classes required to complete UNIT-V:8				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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
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	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
PSO4	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 A.V.RAVIKUMAR**	**Mr A.V.RAVIKUMAR**		**DrJ.S.V.PRASAD**
Signature				

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

DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs. T. Naga Durga
Course Name & Code : Measurements and Instrumentation17EE20
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE **:** Network Theory-I,II, Applied Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Understand the construction and working principle of different types of meters
- Provide knowledge to design and create novel products and solutions for real life problems

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

CO 1	Compare the performance of MC, MI and Dynamometer types of measuring instruments and Energy meters
CO 2	Determine the circuit parameters using AC and DC bridges
CO 3	Compute the errors in CTs and PTs
CO 4	Identify suitable transducers for the measurement of temperature, displacement and Strain
CO 5	Illustrate operating principles of electronic measuring instruments

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

COs	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2										1	1	1		2
CO2	2	2	2										1	1		
CO3	2	2	2										2	1		1
CO4	2	2														1
CO5	2	2	2													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 A K Sawhaney,DhanpatRai& Sons., "A course in Electrical and Electronic measurements & Instrumentation", Education & Technical publishers New Delhi, 4th edition,2015.

T2 U A Bakshi & A V Bakshi, "Electrical measurement" , Technical publications,Pune, second edition,2010

REFERENCE BOOKS:

R1 Nakra & Chaudhari, "Instrumentation, Measurement and Analysis", TMH, 4thedition 2006.

R2 D V S Murthy, "Transducers and Instrumentation", PHI Ltd, New Delhi, 2nd edition 2011

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):B/S

UNIT-I: Measuring Instruments

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, Course outcomes	1	21/2/2022			
2.	Functional elements of an instrument-static and dynamic characteristics	1	22/2/2022			
3.	Errors in measurement-statistical evaluation of measurement data	1	25/2/2022			
4.	Standards and calibration, classification of measuring instruments	1	28/2/2022			
5.	Essentials of indicating instruments, deflecting, controlling and damping systems	1	4/3/2022			
6.	Construction, working ,torque equation of MI instrument	1	7/3/2022			
7.	Construction, working ,torque equation of PMMC instrument	1	8/3/2022			
8.	Extension of range of ammeters and voltmeters using shunt, multiplier	1	11/3/2022			
9.	Universal shunt, universal multiplier	1	14/3/2022			
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: MEASUREMENT OF R, L, C

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.	Measurement of Resistance: voltmeter –Ammeter method	1	15/3/2022		TLM2	
2.	Kelvin's Double bridge	1	21/3/2022		TLM2	
3.	Megger	1	22/3/2022		TLM2	
4.	A.C. Bridges : Sources and Detectors for A.C. Bridges	1	25/3/2022		TLM2	
5.	General equation for bridge at balance	1	28/3/2022		TLM2	
6.	Measurement of Inductance: Maxwell's Inductance-capacitance bridge	1	29/3/2022		TLM2	
7.	Anderson's bridge	1	1/4/2022		TLM2	
8.	Measurement of Capacitance: Schering bridge	1	4/4/2022		TLM2	
9.	I-Mid					
No. of classes required to complete UNIT-II:8				No. of classes taken:		

UNIT-III: SPECIAL PURPOSE MEASURING INSTRUMENTS

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.	Instrument Transformers: construction	1	18/4/2022		TLM2	
2.	Connection of CT &PT in the circuit	1	19/4/2022		TLM2	
3.	Advantages of CT/PT over shunt and multiplier for range extension	1	22/4/2022		TLM2	

4.	Transformation ratio, turns ratio, Nominal ratio, burden ,Ratio and phase angle error	1	25/4/2022		TLM2	
5.	Power factor meter	1	26/4/2022		TLM2	
6.	Frequency meter Resonance type and Weston type	1	29/4/2022		TLM2	
7.	Potentiometers: Principle of AC Potentiometer (polar and coordinate type)	1	2/5/2022		TLM2	
8.	DC Potentiometer(Crompton)	1	6/5/2022		TLM2	
9.	Standardization & applications, Grounding techniques	1	9/5/2022		TLM2	
No. of classes required to complete UNIT-III:9				No. of classes taken:		

UNIT-IV : MEASUREMENT OF POWER AND 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
1.	Wattmeter: construction, working, Torque equation	1	10/5/2022		TLM2	
2.	Errors and their compensation in dynamometer type	1	13/5/2022		TLM2	
3.	Low power factor wattmeter, Polyphase wattmeter	1	16/5/2022		TLM2	
4.	Measurement of reactive power, Determination of power factor by two wattmeter method	1	17/5/2022		TLM2	
5.	Energy meter: construction, working, torque equation	1	20/5/2022		TLM2	
6.	Errors and adjustments of single phase conventional energy meter	1	23/5/2022		TLM2	
7.	Three phase energy meters				TLM2	
No. of classes required to complete UNIT-IV:6				No. of classes taken:		

UNIT-V : INSTRUMENTATION

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.	Transducers, classification and selection of transducers	1	24/5/2022		TLM2	
2.	Strain gauges	1	27/5/2022		TLM2	
3.	Inductive transducers, LVDT	1	30/5/2022		TLM2	
4.	Capacitive transducers, Piezo electric and Hall effect transducers	1	31/5/2022		TLM2	
5.	Photo voltaic and photo conductive cells Measurement practices in substation	1	3/6/2022		TLM2	
6.	Optical and digital transducers-elements of data acquisition system	1			TLM2	
7.	A/D, D/A converters ,Smart sensors (elementary treatment)	1	4/6/2022			
8.	II Mid					
No. of classes required to complete UNIT-V:7				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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
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	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
PSO4	Design controllers for electrical and electronic systems to improve their performance

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Name)	(Name)	(Name)	(Name)

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DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.M.Sambasiva Reddy
Course Name & Code : Embedded System Design, 17EC29
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem, A Sec A.Y : 2021-22

PRE-REQUISITE: Microprocessors and Microcontrollers, Computer Organization.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on typical embedded system design methodologies, characteristics and design metrics, computational models for describing embedded system behavior, standard single purpose processors, various communication protocols and design technology for implementing embedded system.

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

CO 1	Outline the functionality of standard single purpose processors commonly used in embedded systems
CO 2	Apply top-down and bottom-up methodologies for embedded system design
CO 3	Analyze state machine and concurrent process models.
CO 4	Design Control unit and data path using computational models, and develop embedded systems using IC design technologies.

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

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

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

TEXT BOOKS:

T1 Frank Vahid/Tony Givargis, "Embedded Sytem Design A Unified Hardware/Software Introduction" Jhon Wiley & Sons,Inc.

REFERENCE BOOKS:

R1 James K Peckol," Embedded Systems- A Cntemporary Design Tool" Jhon Wiley, 2008.

R2 Joseph Yiu,"The Definitive Guide to the ARM Cortex-M3", Newnes, Elsevier, 2008.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Embedded System Introduction

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Embedded systems	1	22-02-2022			
2.	Introduction to Unit-1	1	24-02-2022			
3.	Embedded System overview, Design Challenge	1	26-02-2022			
4.	Processor Technology	1	03-03-2022			
5.	IC Technology, Design Technology, Trade-offs	1	05-03-2022			
6.	Single Purpose Processors	1	08-03-2022			
7.	RT Level Combinational Logic	1	10-03-2022			
8.	RT Level Sequential Logic	1	12-03-2022			
9.	Custom Single Purpose processor design	1	15-03-2022			
10.	Optimizing custom single Purpose processors	1	17-03-2022			
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: State Machine and Concurrent Process Models

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 Unit-II	1	19-03-2022			
2.	Models vs Languages, Finite State machines with data path models(FSMD)	1	22-03-2022			
3.	FSMD using state machines, Program State machine model	1	24-03-2022			
4.	Concurrent Process Model, Concurrent Processes	1	26-03-2022			
5.	Communication among processes, Synchronization among processes	1	29-03-2022			
6.	Implementation	1	31-03-2022			
7.	Data flow models	1	07-04-2022			
8.	Real-time Systems	1	09-04-2022			
No. of classes required to complete UNIT-II:08				No. of classes taken:		

UNIT-III: Standard Single-purpose Processors

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 Unit-III	1	19-04-2022			
2.	Timers, **Counters,** Watchdog Timers	1	21-04-2022			
3.	UART, LCD Controllers	1	23-04-2022			
4.	Stepper Motor Controllers	1	26-04-2022			
5.	Analog to digital Converters, Real-Time Clocks	1	28-04-2022			
6.	Common memory types	1	30-04-2022			
7.	Memory hierarchy and cache, Advanced RAM	1	05-05-2022			
No. of classes required to complete UNIT-III: 07				No. of classes taken:		

UNIT-IV: Interfacing

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.	Introductin to Unit-IV	1	07-05-2022			
2.	Communication Basics, Microprocessor Interfacing	1	10-05-2022			
3.	I/O Addressing,Interrupts, Direct Memory Access	1	12-05-2022			
4.	Arbitration, Multilevelbus architectures	1	14-05-2022			
5.	Advanced Communication principles: Serial Protocols	1	17-05-2022			
6.	Parallel Protocols, Wireless Protocols	1	19-04-2022			
No. of classes required to complete UNIT-IV: 06				No. of classes taken:		

UNIT-V : IC and Design Technology

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 Unit-V	1	21-05-2022			
2.	IC Technology, Full-Custom(VLSI) IC technology	1	24-05-2022			
3.	Semi-custom IC Technology, Programmable logic devices(PLD) IC technology	1	26-05-2022			
4.	Design technology: Automation	1	28-05-2022			
5.	Synthesis , Verification	1	31-05-2022			
6.	Reuse:Intellectual Property cores	1	02-06-2022			
7.	Hardware/Software Co-simulation, Design Process Models	1	04-06-2022			
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 (R14 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

Academic Calendar: B.Tech., VI-Sem., 2021-22			
Description	**From**	**To**	**Weeks**
Commencement of Class work: 21.02.2022			
I Phase of Instructions	21.02.2022	09.04.2022	7 W
I MID Examinations	11.04.2022	16.04.2022	1 W
II Phase of Instructions	18.04.2022	04.06.2022	7 W
II MID Examinations	06.06.2022	11.06.2022	1 W
Preparation and Practicals	13.06.2022	18.06.2022	1 W
Semester End Examinations	20.06.2022	02.07.2022	2 W

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(M.Sambasiva Reddy)	(M.Sambasiva Reddy)	(Dr.P.Lachi Reddy)	(Dr.Y.Amar Babu)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : N.Dharmachari
Course Name & Code : Embedded System Design-17EC29
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VI-Sem, B Sec A.Y : 2021-22

PRE-REQUISITE: Microprocessors and Microcontrollers, Computer Organization

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on typical embedded system design methodologies, characteristics and design metrics, computational models for describing embedded system behavior, standard single purpose processors, various communication protocols and design technology for implementing embedded system.

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

CO 1	Outline the functionality of standard single purpose processors commonly used in embedded systems
CO 2	Apply top-down and bottom-up methodologies for embedded system design
CO 3	Analyze state machine and concurrent process models.
CO 4	Design Control unit and data path using computational models, and develop embedded systems using IC design technologies.

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

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

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

TEXT BOOKS:

T1 Frank Vahid/Tony Givargis, "Embedded Sytem Design A Unified Hardware/Software Introduction" Jhon Wiley & Sons,Inc.

REFERENCE BOOKS:

R1 James K Peckol," Embedded Systems- A Cntemporary Design Tool" Jhon Wiley, 2008.

R2 Joseph Yiu,"The Definitive Guide to the ARM Cortex-M3", Newnes, Elsevier, 2008.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Embedded System 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 Objectives	1	23-.2-2022		TLM2	
2.	Embedded System overview, Design Challenge	1	24-02-2022		TLM2	
3.	Processor Technology	1	26-02-2022		TLM2	
4.	IC Technology	1	02-03-2022		TLM2	
5.	Design Technology, Trade-offs, Single Purpose Processors	1	03-03-2022		TLM2	
6.	RT Level Combinational Logic, Sequential Logic	1	05-03-2022		TLM2	
7.	Custom Single Purpose processor design	1	09-03-2022		TLM2	
8.	Optimizing custom single Purpose processors	1	10-03-2022		TLM2	
9.	Assignment-1	1	12-03-2022		TLM2	
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: State Machine and Concurrent Process Models

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.	Models vs Languages	1	16-03-2022		TLM2	
2.	Finite State machines with data path models(FSMD), FSMD using state machines	1	17-03-2022		TLM2	
3.	Program State machine model, Concurrent Process Model	1	19-03-2022		TLM2	
4.	Concurrent Processes	1	23-03-2022		TLM2	
5.	Communication among processes	1	24-03-2022		TLM2	
6.	Synchronization among processes, Implementation	1	26-03-2022		TLM2	
7.	Data flow models	1	30-03-2022		TLM2	
8.	Real-time Systems	1	31-03-2022		TLM2	
9.	**Assignment-2**	1	06-04-2022		TLM2	
No. of classes required to complete UNIT-II:9				No. of classes taken:		

UNIT-III: Standard Single-purpose Processors

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.	Timers	1	07-04-2022		TLM2	
2.	**Counters,** Watchdog Timers	1	09-04-2022		TLM2	
3.	UART, LCD Controllers	1	20-04-2022		TLM2	
4.	Stepper Motor Controllers	1	21-04-2022		TLM2	
5.	Analog to digital Converters	1	23-04-2022		TLM2	
6.	Real Time Clocks	1	27-04-2022		TLM2	
7.	Common memory types	1	28-04-2022		TLM2	
8.	Memory hierarchy, Cache, Advanced RAM	1	30-04-2022		TLM2	
9.	Assignment-3	1	04-05-2022		TLM2	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV: Interfacing

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.	Communication Basics	1	05-05-2022		TLM2	
2.	Microprocessor Interfacing, I/O Addressing, Interrupts	1	07-05-2022		TLM2	
3.	Direct Memory Access	1	11-05-2022		TLM2	
4.	Arbitration, Multilevel bus architectures	1	12-05-2022		TLM2	
5.	Advanced Communication principles: Serial Protocols	1	14-05-2022		TLM2	
6.	Parallel Protocols, Wireless Protocols	1	18-05-2022		TLM2	
7.	Assignment-4	1	19-05-2022		TLM2	
No. of classes required to complete UNIT-IV: 07				No. of classes taken:		

UNIT-V : IC and Design Technology

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.	IC Technology	1	21-05-2022		TLM2	
2.	Full- Custom(VLSI) IC technology	1	25-05-2022		TLM2	
3.	Programmable logic devices(PLD) IC technology	1	26-05-2022		TLM2	
4.	Design technology: Automation, Systhesis , Verification	1	28-05-222		TLM2	
5.	Hardware/Software Co-simulation	1	01-06-2022		TLM2	
6.	Reuse:Intellectual Property cores, Design Process Models	1	02-06-2022		TLM2	
7.	Assignment-5	1	04-06-2022		TLM2	
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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

Academic Calendar: B.Tech., VI-Sem., 2021-22			
Description	**From**	**To**	**Weeks**
Commencement of Class Work: 29.03.2021			
I Phase of Instructions-1	21-02-2022	09-04-2022	6 W
I Mid Examinations	**11-04-2022**	**16-04-2022**	**1 W**
II Phase of Instructions	18-04-2022	04-06-2022	7 W
II Mid Examinations	**06-06-2022**	**11-06-2022**	**1 W**
Preparation and Practical's	13-06-2022	18-06-2022	1 W
Semester End Examinations	**20-06-2022**	**02-07-2022**	**2 W**

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
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PSO 3	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor	Course Coordinator	Module Coordinator	HOD
(N.Dharmachari)	(M.Sambasiva Reddy)	(Dr.P.Lachi Reddy)	(Dr.Y.Amar Babu)

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.K.Ravi Kiran Yasaswi
Course Name & Code : Industrial Engineering and management-17MB80
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE-., VI-Sem., A Section A.Y : 2021-22

PRE-REQUISITE:NIL

Course Objectives:

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 material management techniques
4. To make students understand the concept of HRM and its functions
5. To make students understand PERT & CPM methods in effective project management and need of project crashing and its consequence on cost of project

Course Outcomes:

Upon The Successful Completion of This Course Students Will Able To:

1. Apply management principles to the particle situations to be in a position to know which type of business organisation structure suits
2. Determine decision making relating to the problems in operations and production activities.
3. Apply SQC techniques and to take effective decision making relating to reduce the investment in materials through better control of inventory
4. Ability to manage people in working environment with the practices of HRM across corporate businesses
5. Identify the PERT & CPM techniques in effective project management.

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

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1						2	2	2	1		1			
CO2					2							1			
CO3		2					2				2	1			
CO4								2	2	2		1			
CO5					2		2				2	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:Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

References:

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
R4:L.S.Srinath, PERT & CPM

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: introduction to 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
1.	Introduction to Subject & Course Outcomes	1	23-02-22		TLM1	
2.	Management Introduction and Definition, Nature Importance of management & Functions	1	24-02-22		TLM1	
3.	Taylor's scientific management theory, Fayal's principles of management	1	26-02-22		TLM1	
4.	Contribution of Elton mayo & MASLOW theory Herzberg theory of motivation & Douglas MC Gregor theory of motivation	1	02-03-22		TLM1	
5.	Organization Basic concept: Authority & responsibility & Delegation of Authority ,Span of control & Departmentation and Decentralization	1	03-03-22		TLM1	
6.	Organization structure :line organization structure, Line and staff organization	1	05-03-22		TLM2	
7.	Committee & Matrix organization & Functional organization	1	09-03-22		TLM1	
No. of classes required to complete UNIT-I:07				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
1.	Plant location and Factors influencing location	1	10-03-22		TLM1	
2.	Factors influencing location	1	12-03-22		TLM1	
3.	Objectives and Principles of plant layout	1	16-03-22		TLM1	
4.	types of plant layouts	1	16-03-22		TLM2	
5.	types of plant layouts	1	17-03-22		TLM2	
6.	Methods of production : job batch and mass production	1	19-03-22		TLM1	
7.	Work study: Basic procedure involved in method study work measurement	1	23-03-22		TLM2	
8.	Basic procedure involved in method study work measurement	1	24-03-22		TLM2	
No. of classes required to complete UNIT-II:08				No. of classes taken:		
MID-1 EXAM 11-04-2022 TO 16-04-2022						

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
1.	Statistical quality control Meaning , Variables and attributes & X chart problems and R	1	26-03-22		TLM1	
2.	C Chart problems AND P Chart, problems Acceptance sampling & Sampling plans & Deming's contribution to quality	1	30-03-22		TLM1	
3.	Materials management :Objectives of Materials management, Need for inventory control	1	31-03-22		TLM1	

4.	Purchase procedure, Store records	1	06-04-22		TLM1	
5.	Methods of inventory control :ABC analysis & EOQ analysis	1	07-04-22		TLM1	
6.	EOQ Problems	1	09-04-22		TLM1	
7.	Stock levels & Problems on stock levels	1	20-04-22		TLM1	
No. of classes required to complete UNIT-III:07				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
1.	Concepts of HRM: Basic functions of HR manager	1	21-04-22		TLM2	
2.	Man power planning	1	23-04-22		TLM2	
3.	Recruitment & Selection, Training and development	1	27-04-22		TLM2	
4.	Placement, Wage and salary administration	1	28-04-22		TLM2	
5.	Promotion, Transfer & Separation	1	30-04-22		TLM2	
6.	Performance Appraisal	1	04-05-22		TLM2	
7.	Job evaluation & Merit raring	1	05-05-22		TLM2	
No. of classes required to complete UNIT-IV:07				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
1.	**Project management: Introduction** Early techniques in project management	1	07-05-22		TLM2	
2.	Network analysis & Rules for drawing of networks and Critical path method	1	11-05-22		TLM2	
3.	Problems on CPM & Identifying critical path	1	12-05-22		TLM1	
4.	Problems on CPM & Identifying critical path	1	12-05-22		TLM1	
5.	Programme evaluation and review technique (PERT)	1	14-05-22		TLM1	
6.	Problems on PERT	1	18-05-22		TLM1	
7.	Problems on PERT	1	19-05-22		TLM1	
8.	Problems on PERT ,	1	21-05-22		TLM1	
9.	Project cost analysis	1	25-05-22		TLM1	
10.	Project cost analysis	1	26-05-22		TLM1	
11.	Project cost analysis	1	28-05-22		TLM1	
12.	Project cost analysis	1	01-06-22		TLM1	
13.	Project cost analysis	1	02-06-22		TLM1	
14.	Project cost analysis	1	04-06-22		TLM1	
No. of classes required to complete UNIT-V:14				No. of classes taken:		
MID-2 EXAM 06-06-2022 TO 11-06 -2022						

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 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Mr.K.Ravi Kiran)	(U.RAMBABU)	(U.RAMBABU)	(Dr.A.Adisesha Reddy)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.R.JEYALAKSHMI
Course Name & Code : Industrial Engineering and management-17MB80
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE-B., VI-Sem., A.Y : 2021-22

PRE-REQUISITE: NIL

Course Objectives:

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 material management techniques
4. To make students understand the concept of HRM and its functions
5. To make students understand PERT & CPM methods in effective project management and need of project crashing and its consequence on cost of project

Course Outcomes:

Upon The Successful Completion of This Course Students Will Able To:

1. Apply management principles to the particle situations to be in a position to know which type of business organisation structure suits
2. Determine decision making relating to the problems in operations and production activities.
3. Apply SQC techniques and to take effective decision making relating to reduce the investment in materials through better control of inventory
4. Ability to manage people in working environment with the practices of HRM across corporate businesses
5. Identify the PERT & CPM techniques in effective project management.

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

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1						2	2	2	1		1			
CO2					2							1			
CO3		2					2				2	1			
CO4								2	2	2		1			
CO5					2		2				2	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:Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

References:

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

R4:L.S.Srinath, PERT & CPM

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: introduction to 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
1.	Introduction to Subject & Course Outcomes	1	21-02-22		TLM1	
2.	Management Introduction and Definition, Nature Importance of management & Functions	1	23-02-22		TLM1	
3.	Taylor's scientific management theory, Fayal's principles of management	1	25-02-22		TLM1	
4.	Contribution of Elton mayo & MASLOW theory Herzberg theory of motivation & Douglas MC Gregor theory of motivation	1	28-02-22		TLM1	
5.	Organization Basic concept: Authority & responsibility & Delegation of Authority ,Span of control & Departmentation and Decentralization	1	02-03-22		TLM1	
6.	Organization structure :line organization structure, Line and staff organization	1	04-03-22		TLM2	
7.	Committee & Matrix organization & Functional organization	1	07-03-22		TLM1	
No. of classes required to complete UNIT-I:07				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
1.	Plant location and Factors influencing location	1	09-03-22		TLM1	
2.	Factors influencing location	1	11-03-22		TLM1	
3.	Objectives and Principles of plant layout	1	14-03-22		TLM1	
4.	types of plant layouts	1	16-03-22		TLM2	
5.	Methods of production : job batch and mass production	1	21-03-22		TLM1	
6.	Work study: Basic procedure involved in method study work measurement	1	23-03-22		TLM2	
7.	Basic procedure involved in method study work measurement	1	25-03-22		TLM2	
No. of classes required to complete UNIT-II:07				No. of classes taken:		
MID-1 EXAM 11-04-2022 TO 16-04-2022						

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
1.	Statistical quality control Meaning , Variables and attributes & X chart problems and R	1	28-03-22		TLM1	
2.	C Chart problems AND P Chart, problems Acceptance sampling & Sampling plans & Deming's contribution to quality	1	30-03-22		TLM1	
3.	Materials management :Objectives of Materials management, Need for inventory control	1	01-04-22		TLM1	
4.	Purchase procedure, Store records	1	04-04-22		TLM1	
5.	Methods of inventory control :ABC analysis & EOQ analysis	1	06-04-22		TLM1	
6.	EOQ Problems	1	08-04-22		TLM1	
7.	Stock levels & Problems on stock levels	1	18-04-22		TLM1	
No. of classes required to complete UNIT-III:07				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
1.	Concepts of HRM: Basic functions of HR manager	1	20-04-22		TLM2	
2.	Man power planning	1	22-04-22		TLM2	
3.	Recruitment & Selection, Training and development	1	25-04-22		TLM2	
4.	Placement, Wage and salary administration	1	27-04-22		TLM2	
5.	Promotion, Transfer & Separation	1	29-04-22		TLM2	
6.	Performance Appraisal	1	02-05-22		TLM2	
7.	Job evaluation & Merit raring	1	04-05-22		TLM2	
No. of classes required to complete UNIT-IV:07				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
1.	**Project management: Introduction** Early techniques in project management	1	06-05-22		TLM2	
2.	Network analysis & Rules for drawing of networks and Critical path method	1	09-05-22		TLM2	
3.	Problems on CPM & Identifying critical path	1	11-05-22		TLM1	
4.	Problems on CPM & Identifying critical path	1	13-05-22		TLM1	
5.	Programme evaluation and review technique (PERT)	1	16-05-22		TLM1	
6.	Problems on PERT	1	18-05-22		TLM1	
7.	Problems on PERT	1	20-05-22		TLM1	
8.	Problems on PERT ,	1	23-05-22		TLM1	
9.	Project cost analysis	1	25-05-22		TLM1	
10.	Project cost analysis	1	27-05-22		TLM1	
11.	Project cost analysis	1	30-05-22		TLM1	
12.	Project cost analysis	1	01-06-22		TLM1	
13.	Project cost analysis	1	03-06-22		TLM1	
No. of classes required to complete UNIT-V:13				No. of classes taken:		
MID-2 EXAM 06-06-2022 TO 11-06 -2022						

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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Mrs.R.Jeyalakshmi)	(U.RAMBABU)	(U.RAMBABU)	(Dr.A.Adisesha Reddy)

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Rathnakar Kumar
Course Name & Code : Electrical Reliability Engineering (17EE91)-AOC-II Credits : 3
L-T-P Structure : 3-0-0 A.Y : 2021-22
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Sections- A

PRE-REQUISITE: Complex variables and statistical methods

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Interpret the language of power system reliability analysis
- Illustrate analytical models for power system reliability analysis
- Implement algorithms for power system reliability analysis

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

CO 1	Illustrate the main principles in power system reliability analysis
CO 2	Analyze different methods and tools for power system reliability

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

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

TEXT BOOKS:

T1 Reliability evaluation of engineering system – R.Billinton and R.N.Allan Plenum Press,NewYork, reprinted in india by B.S.Publications, 2nd Edition, 2008.
T2 New Computational methods in power system reliability Elmakias, David, Springer 2008.

REFERENCE BOOKS:

R1 Engineering Reliability, S.S.Rao Pearson Education, 2004
R2 Reliability Engineering by R.Balaguruswamy.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Basics of Probability Theory and Distribution

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 Unit-I	1	21-02-2022		TLM1	
2.	Basic probability theory	1	22-02-2022		TLM1	
3.	Probability Distributions	1	24-02-2022		TLM1	
4.	Rules for combining probabilities of events	1	28-02-2022		TLM1	
5.	Bernoulli's trails	1	01-03-2022		TLM1	
6.	probabilities density and distribution functions	1	03-03-2022		TLM1	
7.	binomial distribution	1	07-03-2022		TLM1	
8.	expected value and standard deviation of binomial distribution	1	08-03-2022		TLM1	
9.	Network modelling and reliability analysis	1	10-03-2022		TLM1	
10.	analysis of series, parallel and series-parallel networks	2	14-03-2022 15-03-2022		TLM1	
11.	complex networks and decomposition method	1	17-03-2022		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Reliability functions

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.	Reliability functions f(t), F(t), R(t), h(t) and their relationships	2	21-03-2022 22-03-2022		TLM1	
2.	expected value and standard deviation of the exponential distribution	2	24-03-2022 28-03-2022		TLM1	
3.	Bath tub curve	2	29-03-2022 31-03-2022		TLM1	
4.	reliability analysis of series-parallel networks using exponential distribution	2	04-04-2022 05-04-2022		TLM1	
5.	Reliability measures MTTF, MTTR, MTBF.	2	07-04-2022		TLM1	
6.	MID-I		11-04-2022			
7.	MID-I		12-04-2022			
8.	MID-I		14-04-2022			
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: Markov modelling

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.	Markov chains	2	18-04-2022 19-04-2022		TLM1	
2.	Concept of stochastic transitional probability matrix, evaluation of limiting state probabilities	2	21-04-2022 25-04-2022		TLM1	
3.	Markov processes one component repairable	2	26-04-2022 28-04-2022		TLM1	
4.	time dependent probability evaluation using Laplace transform approach	1	02-05-2022		TLM1	
5.	evaluation of limiting state	1	05-05-2022		TLM1	

	probabilities using STPM					
6.	Two component repairable models	1			TLM1	
No. of classes required to complete UNIT-III:09				No. of classes taken:		

UNIT-IV : Frequency and Duration Techniques

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Frequency and duration concept	1	09-05-2022		TLM1	
2.	Evaluation of frequency of encountering state, mean cycle time, for one repairable models	1	10-05-2022		TLM1	
3.	Evaluation of frequency of encountering state, mean cycle time two repairable models	1	12-05-2022		TLM1	
4.	evaluation of cumulative probability	1	16-05-2022		TLM1	
5.	Cumulative frequency of encountering of merged states	1	17-05-2022		TLM1	
No. of classes required to complete UNIT-IV: 05				No. of classes taken:		

UNIT-V : Generation system reliability analysis

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Reliability model of a generation system	1	19-05-2022		TLM1	
2.	recursive relation for unit addition and removal	1	23-05-2022		TLM1	
3.	load modeling	1	24-05-2022		TLM1	
4.	Merging of load generation model	1	26-05-2022		TLM1	
5.	evaluation of transition rates for merged state model	1	30-05-2022		TLM1	
6.	cumulative probability, cumulative frequency of failure evaluation	1	31-05-2022		TLM1	
7.	LOLP, LOLE evaluations	1	02-06-2022		TLM1	
8.	MID-II		06-06-2022			
9.	MID-II		07-06-2022			
10.	MID-II		09-06-2022			
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 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	21-02-2022	09-04-2022	7W
I Mid Examinations	11-04-2022	16-04-2022	1W
II Phase of Instructions	18-04-2022	04-06-2022	7W
II Mid Examinations	06-06-2022	11-06-2022	1W
Preparation and Practicals	13-06-2022	18-06-2022	1W
Semester End Examinations	20-06-2022	02-07-2022	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.Rathnakar Kumar	Mr.P.Rathnakar Kumar	M.S.GIRIDHAR	Dr. J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.M.Raja Nayak
Course Name & Code : Electrical Reliability Engineering Credits : 3
L-T-P Structure : 3-0-0 A.Y : 2021-22
Program/Sem/Sec : B.Tech., EEE., VI-Sem., Sections- B

PRE-REQUISITE: Complex variables and statistical methods

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Interpret the language of power system reliability analysis
- Illustrate analytical models for power system reliability analysis
- Implement algorithms for power system reliability analysis

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

CO 1	Illustrate the main principles in power system reliability analysis
CO 2	Analyze different methods and tools for power system reliability

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

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

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

TEXT BOOKS:

T1 Reliability evaluation of engineering system – R.Billinton and R.N.Allan Plenum Press,NewYork, reprinted in india by B.S.Publications, 2nd Edition, 2008.
T2 New Computational methods in power system reliability Elmakias, David, Springer 2008.

REFERENCE BOOKS:

R1 Engineering Reliability, S.S.Rao Pearson Education, 2004
R2 Reliability Engineering by R.Balaguruswamy.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Basics of Probability Theory and Distribution

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 Unit-I	1	22-02-2022		TLM1	
2.	Basic probability theory	1	23-02-2022		TLM1	
3.	Probability Distributions	1	25-02-2022		TLM1	
4.	Rules for combining probabilities of events	1	02-03-2022		TLM1	
5.	Bernoulli's trails	1	04-03-2022		TLM1	
6.	probabilities density and distribution functions	1	08-03-2022		TLM1	
7.	binomial distribution	1	09-03-2022		TLM1	
8.	expected value and standard deviation of binomial distribution	1	11-03-2022		TLM1	
9.	Network modelling and reliability analysis	1	15-03-2022		TLM1	
10.	analysis of series, parallel and series-parallel networks	2	16-03-2022 22-03-2022		TLM1	
11.	complex networks and decomposition method	1	23-03-2022		TLM1	
No. of classes required to complete UNIT-I:11				No. of classes taken:		

UNIT-II: Reliability functions

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.	Reliability functions f(t), F(t), R(t), h(t) and their relationships	2	25-03-2022 29-03-2022		TLM1	
2.	expected value and standard deviation of the exponential distribution	2	30-03-2022 01-04-2022		TLM1	
3.	Bath tub curve	1	01-04-2022		TLM1	
4.	reliability analysis of series-parallel networks using exponential distribution	2	06-04-2022 08-04-2022		TLM1	
5.	Reliability measures MTTF, MTTR, MTBF.	1	19-04-2022		TLM1	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: Markov modelling

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.	Markov chains	1	20-04-2022		TLM1	
2.	Concept of stochastic transitional probability matrix, evaluation of limiting state probabilities	1	22-04-2022		TLM1	
3.	Markov processes one component repairable	1	26-04-2022		TLM1	
4.	time dependent probability evaluation using Laplace transform approach	1	27-04-2022		TLM1	
5.	evaluation of limiting state probabilities using STPM	1	29-04-2022		TLM1	

6.	Two component repairable models	1	04-05-2022		TLM1	
No. of classes required to complete UNIT-III:12				No. of classes taken:		

UNIT-IV :Frequency and Duration Techniques

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Frequency and duration concept	2	06-05-2022		TLM1	
2.	Evaluation of frequency of encountering state, mean cycle time, for one repairable models	2	10-05-2022 11-05-2022		TLM1	
3.	Evaluation of frequency of encountering state, mean cycle time two repairable models	1	13-05-2022		TLM1	
4.	evaluation of cumulative probability	1	17-05-2022		TLM1	
5.	Cumulative frequency of encountering of merged states	2	18-05-2022 20-05-2022		TLM1	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V :Generation system reliability analysis

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Reliability model of a generation system	1	24-05-2022		TLM1	
2.	recursive relation for unit addition and removal	1	25-05-2022		TLM1	
3.	load modeling	1	27-05-2022		TLM1	
4.	Merging of load generation model	1	27-05-2022		TLM1	
5.	evaluation of transition rates for merged state model	1	31-05-2022		TLM1	
6.	cumulative probability, cumulative frequency of failure evaluation	1	01-05-2022		TLM1	
7.	LOLP, LOLE evaluations	1	03-05-2022		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 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
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	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.M.RAJA NAYAK**	**Mr.P.RATNAKAR KUMAR**	**Dr.M.S.GIRIDHAR**	**Dr. J.S.V. PRASAD**
Signature				

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

Part - A

PROGRAM : B.Tech., VI-Sem., EEE

ACADEMIC YEAR : 2020-21

COURSE NAME & CODE : **Electrical Machines-II Lab - 17EE68**

L-T-P STRUCTURE : 0-0-2

COURSE CREDITS : 1

COURSE INSTRUCTOR : **Mr.J.V.Pavan Chand, Dr.A.V.G.M.MArthanda, Mr Imran abdul, Mr.P.Srihari**

COURSE COORDINATOR : **Mr.J.V.Pavan Chand**

Prerequisite: EM-I, EM-II

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to know the operation of various ac machines Give practical exposure on the performance of various AC machines like induction motors and synchronous machines.

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

CO1	Examine the performance characteristics of a single phase and three phase induction motor
CO2	Determine the regulation of alternator by conducting suitable test
CO3	Analyze the performance characteristics of synchronous motor
CO4	Estimate the losses of a single phase transformer

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	3		3	2				3	3		2		3		
CO2	3	3	3	3	2				3	3		2	3	3		
CO3	3	3		3	2				3	3		2		3		2
CO4	3	3	3	3	2				3	3		2	3	3		

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

Part - B
COURSE DELIVERY PLAN (LESSON PLAN)
SECTION-A SCHEDULE

Day: Monday(5, 6 Hours)
Batches: 18761A0258, 18761A0236, 19761A0201 - 19761A0234, 19765A0201-19765A0213

B.NO.	H.T. Nos	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative Date		21-02-2022	28-02-2022	07-03-2022	14-03-2022	21-03-2021	28-03-2022	04-04-2022	18-04-2022	25-04-2021	02-05-2022	09-05-2022	16-05-2021	23-05-2021	30-05-2021
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	2	3	4	5	6	7	8	9	10	1			
B-3		Demo	3	4	5	6	7	8	9	10	1	2			
B-4		Demo	4	5	6	7	8	9	10	1	2	3			
B-5		Demo	5	6	7	8	9	10	1	2	3	4			
B-6		Demo	6	7	8	9	10	1	2	3	4	5			
B-7		Demo	7	8	9	10	1	2	3	4	5	6			
B-8		Demo	8	9	10	1	2	3	4	5	6	7			
B-9		Demo	9	10	1	2	3	4	5	6	7	8			
B-10		Demo	10	1	2	3	4	5	6	7	8	9			

Day: Wednesday (2,3 Hours)
Batches: 19761A0235 - 19761A0254, 20765A0201 - 20765A0211

B.NO.	H.T. Nos	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative Date		23-02-2022	02-03-2022	09-03-2022	16-03-2022	23-03-2021	30-03-2022	06-04-2022	20-04-2022	27-04-2021	04-05-2022	11-05-2022	18-05-2021	25-05-2021	01-06-2021
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	2	3	4	5	6	7	8	9	10	1			
B-3		Demo	3	4	5	6	7	8	9	10	1	2			
B-4		Demo	4	5	6	7	8	9	10	1	2	3			
B-5		Demo	5	6	7	8	9	10	1	2	3	4			
B-6		Demo	6	7	8	9	10	1	2	3	4	5			
B-7		Demo	7	8	9	10	1	2	3	4	5	6			
B-8		Demo	8	9	10	1	2	3	4	5	6	7			
B-9		Demo	9	10	1	2	3	4	5	6	7	8			
B-10		Demo	10	1	2	3	4	5	6	7	8	9			

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	29-03-2021	15-05-2021	7W
I Mid Examinations	17-05-2021	19-05-2021	½ W
II Phase of Instructions + CRT Classes	20-05-2021	07-07-2021	7 W
II Mid Examinations	08-07-2021	10-07-2021	½ W
Preparation and Practicals	12-07-2021	17-07-2021	1W
Semester End Examinations	19-07-2021	31-07-2021	2W

Course Instructor	Course Coordinator	Module Coodrinator	HOD
Mr.J.V.Pavan Chand, Dr.A.V.G.M.MArthanda, Mr Imran abdul, Mr.P.Srihari	**Mr.J.V.Pavan Chand,**	Mr.P.Deepak Reddy	Dr.J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

Part - A

PROGRAM : B.Tech., VI-Sem., EEE

ACADEMIC YEAR : 2020-21

COURSE NAME & CODE : **Electrical Machines-II Lab- 17EE68**

L-T-P STRUCTURE : 0-0-2

COURSE CREDITS : 1

COURSE INSTRUCTOR: Mr.P.Srihari,

Mr.K.NagaLingachary,Mr.P.Rathnakar&Dr.A.V.G.A.Marthanda

COURSE COORDINATOR : Mr.J.V.Pavan Chand

Prerequisite: EM-I, EM-II

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student toknow the operation of various ac machines Give practical exposure on the performance of various AC machines like inductionmotors and synchronous machines.

Course Outcomes: At the end of the course, the studentwill be able to:

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CO3	Analyze the performance characteristics of synchronous motor
CO4	Estimate the losses of a single phase transformer

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	3		3	2				3	3		2		3		
CO2	3	3	3	3	2				3	3		2	3	3		
CO3	3	3		3	2				3	3		2		3		2
CO4	3	3	3	3	2				3	3		2	3	3		

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

Part - B
COURSE DELIVERY PLAN (LESSON PLAN)
SECTION-B SCHEDULE

Day: Monday(2, 3 Hours)
Batches: 18761A0283,19761A0255 - 19761A0286

B.NO.	H.T. Nos	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative Date		21-02-2022	28-02-2022	07-03-2022	14-03-2022	21-03-2021	28-03-2022	04-04-2022	18-04-2022	25-04-2021	02-05-2022	09-05-2022	16-05-2021	23-05-2021	30-05-2021
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	2	3	4	5	6	7	8	9	10	1			
B-3		Demo	3	4	5	6	7	8	9	10	1	2			
B-4		Demo	4	5	6	7	8	9	10	1	2	3			
B-5		Demo	5	6	7	8	9	10	1	2	3	4			
B-6		Demo	6	7	8	9	10	1	2	3	4	5			
B-7		Demo	7	8	9	10	1	2	3	4	5	6			
B-8		Demo	8	9	10	1	2	3	4	5	6	7			
B-9		Demo	9	10	1	2	3	4	5	6	7	8			
B-10		Demo	10	1	2	3	4	5	6	7	8	9			

Day:Thursday (5,6 Hours)
Batches: 19761A0287 - 19761A02A9, 20765A0212 - 20765A0222

B.NO.	H.T. Nos	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative Date		24-02-22	03-03	10-03	17-03	24-03	31-03	07-04	21-04	28-04	05-05	12-05	19-05	26-05	02-06
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	2	3	4	5	6	7	8	9	10	1			
B-3		Demo	3	4	5	6	7	8	9	10	1	2			
B-4		Demo	4	5	6	7	8	9	10	1	2	3			
B-5		Demo	5	6	7	8	9	10	1	2	3	4			
B-6		Demo	6	7	8	9	10	1	2	3	4	5			
B-7		Demo	7	8	9	10	1	2	3	4	5	6			
B-8		Demo	8	9	10	1	2	3	4	5	6	7			
B-9		Demo	9	10	1	2	3	4	5	6	7	8			
B-10		Demo	10	1	2	3	4	5	6	7	8	9			

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	29-03-2021	15-05-2021	7W
I Mid Examinations	17-05-2021	19-05-2021	½ W
II Phase of Instructions + CRT Classes	20-05-2021	07-07-2021	7 W
II Mid Examinations	08-07-2021	10-07-2021	½ W
Preparation and Practicals	12-07-2021	17-07-2021	1W
Semester End Examinations	19-07-2021	31-07-2021	2W

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.P.Srihari, Mr.K.NagaLingachary,Mr.P.Rathnakar&Dr.A.V.G.A.Marthanda	Mr.J.V.Pavan Chand	Mr.P.Deepak Reddy	Dr.J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

Part - A

PROGRAM : B.Tech., VI-Sem., EEE

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : Microprocessors and Microcontrollers Lab - 17EC70

L-T-P STRUCTURE : 0-0-2

COURSE CREDITS : 1

COURSE INSTRUCTOR : **Mrs. M.Raja Nayak, Dr.J. Sivavara Prasad&Mrs. K.S.L.Lavanya**

COURSE COORDINATOR : Dr. J. Sivavara Prasad

Prerequisite: Microprocessors and Microcontrollers (17EC22)

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- In this course, student will understand working of instructions by practicing programs of 8086/8051 and develop applications by interfacing devices.

Course Outcomes: At the end of the course, the studentwill be able to:

CO1: Demonstrate program proficiency using the various instructions of the 8086 microprocessor / 8051 microcontroller.

CO2: Apply different programming techniques like loops, subroutines for various applications.

CO3: Design systems for different applications by interfacing external devices.

CO4: Develop report writing skills

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	3	2	2	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	2	2	2	-	-	-	-	-	-	-	-	3	-	
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	
CO4								3	2	3		2				

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

Part - B
COURSE DELIVERY PLAN (LESSON PLAN)
SECTION-A SCHEDULE

Day:Monday (5,6 Hours)
Batches: 18761A0283,19761A0255-19761A0286

	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative date	21-02-2022	28-02-2022	07-03-2022	14-03-2022	21-03-2021	28-03-2022	04-04-2022	18-04-2022	25-04-2022	02-05-2022	09-05-2022	16-05-2022	23-05-2022	30-05-2022
Actual date														
	Demo	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**

Day: Wednesday (2,3 Hours)
Batches:19761A0287-20765A0222

H.T. No.s	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative date	23-02-22	02-03	09-03	16-03	23-03	30-03	06-04	20-04	27-04	04-05	11-05	18-05	25-05	01-06
Actual date														
	Demo	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	29-03-2021	15-05-2021	7W
I Mid Examinations	17-05-2021	19-05-2021	½ W
II Phase of Instructions + CRT Classes	20-05-2021	07-07-2021	7 W
II Mid Examinations	08-07-2021	10-07-2021	½ W
Preparation and Practicals	12-07-2021	17-07-2021	1W
Semester End Examinations	19-07-2021	31-07-2021	2W

Part– C

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and 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
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PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
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Mr. M.Raja Nayak, Dr.J. Sivavara Prasad & Mrs. K.S.L.Lavanya	Dr.J. Sivavara Prasad	Dr.J.SivaVara Prasad	Dr.J.Siva Vara Prasad
Course Instructors	Course Coordinator	Module Coordinator	HOD

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

Part - A

PROGRAM : B.Tech., VI-Sem., EEE

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : Microprocessors and Microcontrollers Lab - 17EC70

L-T-P STRUCTURE : 0-0-2

COURSE CREDITS : 1

COURSE INSTRUCTOR : **Dr.J. Sivavara Prasad&Mrs. K.S.L.Lavanya**

COURSE COORDINATOR : Dr. J. Sivavara Prasad

Prerequisite: Microprocessors and Microcontrollers (17EC22)

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- In this course, student will understand working of instructions by practicing programs of 8086/8051 and develop applications by interfacing devices.

Course Outcomes: At the end of the course, the studentwill be able to:

CO1: Demonstrate program proficiency using the various instructions of the 8086 microprocessor / 8051 microcontroller.

CO2: Apply different programming techniques like loops, subroutines for various applications.

CO3: Design systems for different applications by interfacing external devices.

CO4: Develop report writing skills

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	2	3	2	2	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	2	2	2	-	-	-	-	-	-	-	-	3	-	
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	
CO4								3	2	3		2				

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

Part - B
COURSE DELIVERY PLAN (LESSON PLAN)
SECTION-B SCHEDULE

Day:Monday(2,3 Hours)

	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative date	21-02-2022	28-02-2022	07-03-2022	14-03-2022	21-03-2021	28-03-2022	04-04-2022	18-04-2022	25-04-2021	02-05-2022	09-05-2022	16-05-2021	23-05-2021	30-05-2021
Actual date														
	Demo	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**

Batches:18761A0283,19761A0255-19761A0287

Day: Thursday(5,6Hours)

Batches:19761A0288-19761A02A9,20765A0212-20765A0222

H.T. No.s	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XII Week	XIII Week	XIV Week
Tentative date	24-02-22	03-03	10-03	17-03	24-03	31-03	07-04	21-04	28-04	05-05	12-05	19-05	26-05	02-06
Actual date														
	Demo	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	21-02-2022	09-04-2022	7W
I Mid Examinations	11-04-2022	16-04-2022	½ W
II Phase of Instructions + CRT Classes	18-04-2022	04-06-2022	7 W
II Mid Examinations	06-06-2022	11-06-2022	½ W
Preparation and Practicals	13-06-2022	18-06-2022	1W
Semester End Examinations	20-06-2022	02-07-2022	2W

Part– C

PROGRAMME OUTCOMES (POs):

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