LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A.V.RAVIKUMAR
Course Name & Code **:** POWER SYSTEMS-II – 20EE12
L-T-P Structure **: 2-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/A **A.Y.:** 2022-23

Pre-requisites: Power Systems-I, Electrical Circuit Analysis.

Course Educational Objectives: This course enables the student to learn performance of transmission lines, the voltage control and reactive power compensation methods of transmission lines. It also deals with importance of per unit representation of power system, symmetrical components, short circuit studies and protective devices

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

CO1	Analyze transmission line performance **(Apply-L3)**
CO2	Apply shunt compensation techniques to control reactive power of the transmission line **(Understand-L2)**
CO3	Determine the fault currents for symmetrical and unsymmetrical faults **(Apply-L3)**
CO4	Illustrate the protective relays and circuit breakers in power system protection. **(Understand-L2)**

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

TEXT BOOKS:

1. John J.Grainger & W.D.Stevenson, “Power System Analysis”, McGraw Hill International, 2017.
2. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis” ,Tata McGraw-Hill Pub. Co., New Delhi, FourthEdition,2011.

REFERENCE:

1.C.L. Wadhwa, “Electrical Power Systems”, New Age International, 2016.
2. Hadi Saadat, “Power System Analysis”, Tata Mc Graw Hill Pub.Co.2002.
3. V K Mehta & Rohit Mehta, “Principles of Power Systems” (Multicolor Edition), S.Chand Publishing, fourth edition,2006
4..W.D. Stevenson, “Elements of Power system Analysis”, McGraw Hill International Student Edition,2004

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: PERFORMANCE OF TRANSMISSION LINES

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.	Representation of lines	1	18-07-2022		TLM1	
2.	short transmission lines	1	21-07-2022		TLM1	
3.	Problems	1	22-07-2022		TLM1	
4.	Medium length lines: nominal T	1	23-07-2022		TLM1	
5.	Nominal π	1	25-07-2022		TLM1	
6.	Problems	1	28-07-2022		TLM1	
7.	long transmission lines	1	29-07-2022		TLM1	
8.	The equivalent circuit representation of a long Line	1	30-07-2022		TLM1	
9.	A, B, C, D constants	1	01-08-2022		TLM1	
10.	Ferranti Effect	1	04-08-2022		TLM1	
11.	Power flow through a transmission line	1	05-08-2022		TLM1	
12.	Receiving end power circle diagram	1	06-08-2022		TLM1	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: VOLTAGE CONTROL IN POWER SYSTEM

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction	1	08-08-2022		TLM1	
14.	Methods of voltage control shunt and series capacitors	1	11-08-2022		TLM1	
15.	Tap changing transformers	1	12-08-2022		TLM1	
16.	Synchronous phase-modifiers	1	13-08-2022		TLM1	
17.	Concepts of Load compensation	1	18-08-2022		TLM1	
18.	Lodability characteristics of overhead lines	1	19-08-2022		TLM1	
19.	Uncompensated transmission line	1	20-08-2022		TLM1	
20.	Symmetrical line	1	22-08-2022		TLM1	
21.	Radial line with asynchronous load	1	25-08-2022		TLM1	
22.	Compensation of lines	1	26-08-2022		TLM1	
23.	Problems	1	27-08-2022		TLM1	
24.	Problems	1	29-08-2022		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: SYMMETRICAL FAULT 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
25.	Per Unit Representation	1	01-09-2022		TLM1	
26.	Symmetrical Faults	1	02-09-2022		TLM1	
27.	Short circuit of synchronous machine unloaded	1	03-09-2022		TLM1	
28.	Short circuit of loaded synchronous machine	1	05-09-2022		TLM1	
29.	Calculation of symmetrical short circuit currents for simple systems	1	08-09-2022		TLM1	
30.	Short circuit current computation through Thevenin's theorem	1	09-09-2022		TLM1	

31.	Reactors and their location	1	10-09-2022		TLM1	
32.	short circuit capacity of a bus	1	06-10-2022		TLM1	
33.	computation of circuit breaker capacities	1	07-10-2022		TLM1	
34.	short circuit current and MVA Calculations	1	08-10-2022		TLM1	
35.	Problems	1	10-10-2022		TLM1	
36.	Problems	1	13-10-2022		TLM1	
37.	Problems	1	14-10-2022		TLM1	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: UNSYMMETRICAL 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
38.	Significance of positive sequence components	1	15-10-2022		TLM1	
39.	negative sequence components	1	17-10-2022		TLM1	
40.	zero sequence components	1	20-10-2022		TLM1	
41.	Average 3-phase power in terms of symmetrical components	2	21-10-2022 22-10-2022		TLM1	
42.	sequence impedances and sequence networks of power systems	1	27-10-2022		TLM1	
43.	Unsymmetrical Fault Analysis: LG faults with and without fault impedance	1	28-10-2022		TLM1	
44.	LL faults with and without fault impedance	1	29-10-2022		TLM1	
45.	LLG faults with and without fault impedance	1	31-10-2022		TLM1	
46.	Problems	1	03-11-2022		TLM1	
47.	Problems	1	04-11-2022		TLM1	
48.	Problems	1	05-11-2022		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: FUNDAMENTALS OF POWER SYSTEM PROTECTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	Need for protective systems	1	07-11-2022		TLM1	
50.	nature and causes of faults	1	10-11-2022		TLM1	
51.	zones of protection	1	11-11-2022		TLM1	
52.	primary and backup protection	1	12-11-2022		TLM1	
53.	essential qualities of protection	1	14-11-2022		TLM1	
54.	Classification of Protective Relays based on technology and function	1	17-11-2022		TLM1	
55.	over current relays, Distance relays	1	18-11-2022		TLM1	
56.	Impedance, reactance and MHO relays	1	19-11-2022		TLM1	
57.	Bucholz relay, differential relays	1	21-11-2022		TLM1	
58.	classification of circuit breakers	1	24-11-2022		TLM1	
59.	principle of operation of air blast, vacuum	1	25-11-2022		TLM1	
60.	SF6 Circuit breaker	1	26-11-2022		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO b	Design and analyze electrical machines, modern drive and lighting systems
PSO c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO d	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**	**Dr. M.S.GIRIDHAR**	**Dr.J.S.V.PRASAD**
Signature				

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A.V.RAVIKUMAR
Course Name & Code **:** POWER SYSTEMS-II – 20EE12
L-T-P Structure **: 2-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/B **A.Y.:** 2022-23

Pre-requisites: Power Systems-I, Electrical Circuit Analysis.

Course Educational Objectives: This course enables the student to learn performance of transmission lines, the voltage control and reactive power compensation methods of transmission lines. It also deals with importance of per unit representation of power system, symmetrical components, short circuit studies and protective devices

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

CO1	Analyze transmission line performance **(Apply-L3)**
CO2	Apply shunt compensation techniques to control reactive power of the transmission line **(Understand-L2)**
CO3	Determine the fault currents for symmetrical and unsymmetrical faults **(Apply-L3)**
CO4	Illustrate the protective relays and circuit breakers in power system protection. **(Understand-L2)**

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

TEXT BOOKS:

1. John J.Grainger & W.D.Stevenson, “Power System Analysis”, McGraw Hill International, 2017.
2. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis” ,Tata McGraw-Hill Pub. Co., New Delhi, FourthEdition,2011.

REFERENCE:

1.C.L. Wadhwa, “Electrical Power Systems”, New Age International, 2016.
2. Hadi Saadat, “Power System Analysis”, Tata Mc Graw Hill Pub.Co.2002.
3. V K Mehta & Rohit Mehta, “Principles of Power Systems” (Multicolor Edition), S.Chand Publishing, fourth edition,2006
4..W.D. Stevenson, “Elements of Power system Analysis”, McGraw Hill International Student Edition,2004

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: PERFORMANCE OF TRANSMISSION LINES

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.	Representation of lines	1	18-07-2022		TLM1	
2.	short transmission lines	1	19-07-2022		TLM1	
3.	Problems	1	20-07-2022		TLM1	
4.	Medium length lines: nominal T	1	23-07-2022		TLM1	
5.	Nominal π	1	25-07-2022		TLM1	
6.	Problems	1	26-07-2022		TLM1	
7.	long transmission lines	1	27-07-2022		TLM1	
8.	The equivalent circuit representation of a long Line	1	30-07-2022		TLM1	
9.	A, B, C, D constants	1	01-08-2022		TLM1	
10.	Ferranti Effect	1	02-08-2022		TLM1	
11.	Power flow through a transmission line	1	03-08-2022		TLM1	
12.	Receiving end power circle diagram	1	06-08-2022		TLM1	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: VOLTAGE CONTROL IN POWER SYSTEM

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction	1	08-08-2022		TLM1	
14.	Methods of voltage control shunt and series capacitors	1	10-08-2022		TLM1	
15.	Tap changing transformers	1	13-08-2022		TLM1	
16.	Synchronous phase-modifiers	1	16-08-2022		TLM1	
17.	Concepts of Load compensation	1	17-08-2022		TLM1	
18.	Lodability characteristics of overhead lines	1	20-08-2022		TLM1	
19.	Uncompensated transmission line	1	22-08-2022		TLM1	
20.	Symmetrical line	1	23-08-2022		TLM1	
21.	Radial line with asynchronous load	1	24-08-2022		TLM1	
22.	Compensation of lines	1	27-08-2022		TLM1	
23.	Problems	1	29-08-2022		TLM1	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: SYMMETRICAL FAULT 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
24.	Per Unit Representation	1	30-08-2022		TLM1	
25.	Symmetrical Faults	1	03-09-2022		TLM1	
26.	Short circuit of synchronous machine unloaded	1	05-09-2022		TLM1	
27.	Short circuit of loaded synchronous machine	1	06-09-2022		TLM1	
28.	Calculation of symmetrical short circuit currents for simple systems	1	07-09-2022		TLM1	
29.	Short circuit current computation through Thevenin's theorem	1	10-09-2022		TLM1	

30.	Reactors and their location	1	08-10-2022		TLM1	
31.	short circuit capacity of a bus	1	10-10-2022		TLM1	
32.	computation of circuit breaker capacities	1	11-10-2022		TLM1	
33.	short circuit current and MVA Calculations	1	12-10-2022		TLM1	
34.	Problems	1	15-10-2022		TLM1	
35.	Problems	1	17-10-2022		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: UNSYMMETRICAL 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
36.	Significance of positive sequence components	1	18-10-2022		TLM1	
37.	negative sequence components	1	19-10-2022		TLM1	
38.	zero sequence components	1	22-10-2022		TLM1	
39.	Average 3-phase power in terms of symmetrical components	2	25-10-2022		TLM1	
40.	sequence impedances and sequence networks of power systems	1	26-10-2022		TLM1	
41.	Unsymmetrical Fault Analysis: LG faults with and without fault impedance	1	29-10-2022		TLM1	
42.	LL faults with and without fault impedance	1	31-10-2022		TLM1	
43.	LLG faults with and without fault impedance	1	01-11-2022		TLM1	
44.	Problems	1	02-11-2022		TLM1	
45.	Problems	1	05-11-2022		TLM1	
46.	Problems	1	07-11-2022		TLM1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: FUNDAMENTALS OF POWER SYSTEM PROTECTION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Need for protective systems	1	08-11-2022		TLM1	
48.	nature and causes of faults	1	09-11-2022		TLM1	
49.	zones of protection	1	12-11-2022		TLM1	
50.	primary and backup protection	1	14-11-2022		TLM1	
51.	essential qualities of protection	1	15-11-2022		TLM1	
52.	Classification of Protective Relays based on technology and function	1	16-11-2022		TLM1	
53.	over current relays, Distance relays	1	19-11-2022		TLM1	
54.	Impedance, reactance and MHO relays	1	21-11-2022		TLM1	
55.	Bucholz relay, differential relays	1	22-11-2022		TLM1	
56.	classification of circuit breakers	1	23-11-2022		TLM1	
57.	principle of operation of air blast, vacuum	1	26-11-2022		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO b	Design and analyze electrical machines, modern drive and lighting systems
PSO c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO d	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**	**Dr. M.S.GIRIDHAR**	**Dr.J.S.V.PRASAD**
Signature				

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.NAGALINGA CHARY
Course Name & Code **:** ELECTRICAL MACHINES-II – 20EE13
L-T-P Structure **: 2-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/A **A.Y.:** 2022-23

Pre-requisites: Electrical Circuit Analysis and Electrical Machines-I

Course Educational Objectives: This course enables the student to understand the analysis and performance of single phase and poly phase Induction motors which are the major part of domestic appliances, control systems, drives and agricultural pump sets . It also deals with detailed analysis of synchronous generators and motors which are the prime sources of electrical power generation.

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

CO1	Analyze the performance of poly phase Induction motors **Apply-L3)**
CO2	Illustrate the operation of single phase induction motor **(Understand-L2)**
CO3	Examine the performance of the synchronous generator. **(Apply-L3)**
CO4	Analyze the performance of the synchronous motor. **(Apply-L3)**

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

TEXT BOOKS:

1. P.S. Bimbra, “Electrical Machinery”, Khanna Publishers, 7th Edition, 2014
2. I.J.Nagrath & D.P.Kothari, “Electric Machines”, Tata Mc Graw Hill, 5th Edition.2017

REFERENCE:

1. M.G. Say ,”Alternating Current Machines”, John Wiley & Sons, 1976.
2. A. E. Fitzgerald, C. Kingsley and S. Umans, “Electric Machinery”, Mc Graw-Hill Companies, 6th edition 2017.
3. Ashfaq Husain ,”Electric Machines”, Dhanapati Rai&Co, New Delhi, 3rd edition , 2017.
4. Soft Starter Handbook, ABB Group.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: THREE PHASE INDUCTION MOTORS

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	19-07-2022		TLM1	
2.	Stator construction, Rotor construction details	1	21-07-2022		TLM1	
3.	Types of three phase induction motor	1	22-07-2022		TLM1	
4.	Working principle of three phase IM	1	23-07-2022		TLM1	
5.	Production of rotating magnetic field, Synchronous speed, Slip equation	1	26-07-2022		TLM1	
6.	Rotor emf and rotor frequency	1	28-07-2022		TLM1	
7.	**Tutorial-I**	1	29-07-2022		TLM3	
8.	Rotor reactance, rotor current and power factor	1	30-07-2022		TLM1	
9.	Phasor diagram of three phase IM	1	02-08-2022		TLM1	
10.	Equivalent circuit of three phase IM	1	04-08-2022		TLM1	
11.	**Tutorial-II**	1	05-08-2022		TLM3	
12.	Crawling and cogging	1	06-08-2022		TLM1	
13.	Revision	1	11-08-2022		TLM1	
14.	**Quiz-I /ASSIGNMENT-I**	1	12-08-2022			
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: PERFORMANCE OF INDUCTION MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Power stages -Rotor power input, rotor copper loss	1	13-08-2022		TLM1	
16.	Mechanical power developed and their inter relation	1	16-08-2022		TLM1	
17.	Torque equation- expressions for starting torque and running torque-condition for maximum torque	1	18-08-2022		TLM1	
18.	Torque-slip characteristics	1	19-08-2022		TLM1	
19.	Losses and efficiency	1	20-08-2022		TLM1	
20.	Starting methods of Three Phase IM	1	23-08-2022		TLM1	
21.	No load and blocked rotor tests –equivalent circuit	1	25-08-2022		TLM1	
22.	**Tutorial-III**	1	26-08-2022		TLM3	
23.	Circle Diagram	1	27-08-2022		TLM1	
24.	Circle Diagram Numerical	1	30-08-2022		TLM1	
25.	Operation of induction motor as induction generator	1	01-09-2022		TLM1	

26.	**Tutorial-IV**	1	02-09-2022		TLM3	
27.	Revision	1	03-09-2022		TLM1	
28.	**Quiz-II/ ASSIGNMENT-II**	1	06-09-2022			
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: SINGLE PHASE INDUCTION MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Principle,operation - Double revolving field theory	1	08-09-2022		TLM1	
30.	Split phase induction motor	1	09-09-2022		TLM1	
31.	Capacitor start and run induction motors	1	10-09-2022		TLM1	
32.	Shaded pole induction motor	1	07-10-2022		TLM1	
33.	Equivalent circuit	1	08-10-2022		TLM1	
34.	Revision	1	11-10-2022		TLM1	
35.	**Quiz-III/ ASSIGNMENT-III**	1	13-10-2022			
36.	**Tutorial-V**	1	14-10-2022		TLM3	
No. of classes required to complete UNIT-III: 8				**No. of classes taken:**		

UNIT-IV: SYNCHRONOUS GENERATORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Construction of synchronous generators & Types of rotor	1	15-10-2022		TLM1	
38.	Working principle & EMF equation	1	18-10-2022		TLM1	
39.	Types of Rotors	1	20-10-2022		TLM1	
40.	Armature reaction	2	21-10-2022		TLM1	
41.	Phasor diagram of alternator	1	22-10-2022		TLM1	
42.	Regulation Methods– EMF Method,MMF Method	1	25-10-2022		TLM1	
43.	ZPF method	1	27-10-2022		TLM1	
44.	**Tutorial-VI**	1	28-10-2022		TLM3	
45.	Synchronizing to infinite bus bars	1	29-10-2022		TLM1	
46.	Two reaction theory	1	01-11-2022		TLM1	
47.	Parallel operation of synchronous generators	1	03-11-2022		TLM1	
48.	**Tutorial-VII**		04-11-2022		TLM3	
49.	Synchronous Machine constants		05-11-2022		TLM1	
50.	Revision		08-11-2022		TLM1	
51.	**Quiz-IV/ASSIGNMENT-III**		10-11-2022			
No. of classes required to complete UNIT-IV: 16				**No. of classes taken:**		

UNIT-V: SYNCHRONOUS MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Constructional features, principle of operation	1	12-11-2022		TLM1	
53.	Methods of starting	1	15-11-2022		TLM1	
54.	Power developed, Effect of increased load with constant excitation	1	17-11-2022		TLM1	
55.	**Tutorial-VIII**	1	18-11-2022		TLM3	
56.	Synchronous motor with different excitations	1	19-11-2022		TLM1	
57.	Effect of changing excitation constant load & Torque equation	1	22-11-2022		TLM1	
58.	V curve and inverted V curve – hunting	1	24-11-2022		TLM1	
59.	**Tutorial-IX**	1	25-11-2022		TLM3	
60.	**Quiz-V/ ASSIGNMENT-V**		26-11-2022			
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO b	Design and analyze electrical machines, modern drive and lighting systems
PSO c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO d	Design controllers for electrical and electronic systems to improve their performance.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.K.NAGALINGA CHARY**	**Mr.K.NAGALINGA CHARY**	**Mr.P.DEEPAK REDDY**	**Dr.J.SIVAVARA 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, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.NAGALINGA CHARY
Course Name & Code **:** ELECTRICAL MACHINES-II – 20EE13
L-T-P Structure **: 2-1-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/B **A.Y.:** 2022-23

Pre-requisites: Electrical Circuit Analysis and Electrical Machines-I

Course Educational Objectives: This course enables the student to understand the analysis and performance of single phase and poly phase Induction motors which are the major part of domestic appliances, control systems, drives and agricultural pump sets . It also deals with detailed analysis of synchronous generators and motors which are the prime sources of electrical power generation.

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

CO1	Analyze the performance of poly phase Induction motors **Apply-L3)**
CO2	Illustrate the operation of single phase induction motor **(Understand-L2)**
CO3	Examine the performance of the synchronous generator. **(Apply-L3)**
CO4	Analyze the performance of the synchronous motor. **(Apply-L3)**

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

TEXT BOOKS:

1. P.S. Bimbra, “Electrical Machinery”, Khanna Publishers, 7th Edition, 2014
2. I.J.Nagrath & D.P.Kothari, “Electric Machines”, Tata Mc Graw Hill, 5th Edition.2017

REFERENCE:

1. M.G. Say ,”Alternating Current Machines”, John Wiley & Sons, 1976.
2. A. E. Fitzgerald, C. Kingsley and S. Umans, “Electric Machinery”, Mc Graw-Hill Companies, 6th edition 2017.
3. Ashfaq Husain ,”Electric Machines”, Dhanapati Rai&Co, New Delhi, 3rd edition , 2017.
4. Soft Starter Handbook, ABB Group.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: THREE PHASE INDUCTION MOTORS

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	19-07-2022		TLM1	
2.	Stator construction, Rotor construction details	1	21-07-2022		TLM1	
3.	Types of three phase induction motor	1	22-07-2022		TLM1	
4.	Working principle of three phase IM	1	23-07-2022		TLM1	
5.	Production of rotating magnetic field, Synchronous speed, Slip equation	1	26-07-2022		TLM1	
6.	Rotor emf and rotor frequency	1	28-07-2022		TLM1	
7.	Rotor reactance, rotor current and power factor	1	29-07-2022		TLM1	
8.	Phasor diagram of three phase IM	1	30-07-2022		TLM1	
9.	**Tutorial-I**	1	02-08-2022		TLM3	
10.	Equivalent circuit of three phase IM	1	04-08-2022		TLM1	
11.	Crawling and cogging	1	05-08-2022		TLM1	
12.	Revision	1	06-08-2022		TLM1	
13.	**Tutorial-II**	1	11-08-2022		TLM3	
14.	**Quiz-I /ASSIGNMENT-I**	1	12-08-2022			
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: PERFORMANCE OF INDUCTION MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Power stages -Rotor power input, rotor copper loss	1	13-08-2022		TLM1	
16.	Mechanical power developed and their inter relation	1	16-08-2022		TLM1	
17.	Torque equation- expressions for starting torque and running torque-condition for maximum torque	1	18-08-2022		TLM1	
18.	Torque-slip characteristics	1	19-08-2022		TLM1	
19.	Losses and efficiency	1	20-08-2022		TLM1	
20.	**Tutorial-III**	1	23-08-2022		TLM3	
21.	Starting methods of Three Phase IM	1	25-08-2022		TLM1	
22.	No load and blocked rotor tests –equivalent circuit	1	26-08-2022		TLM1	
23.	Circle Diagram	1	27-08-2022		TLM1	
24.	**Tutorial-IV**	1	30-08-2022		TLM3	
25.	Circle Diagram Numerical	1	01-09-2022		TLM1	

26.	Operation of induction motor as induction generator	1	02-09-2022		TLM1	
27.	Revision	1	03-09-2022		TLM1	
28.	**Quiz-II/ ASSIGNMENT-II**	1	06-09-2022			
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: SINGLE PHASE INDUCTION MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Principle,operation - Double revolving field theory	1	08-09-2022		TLM1	
30.	Split phase induction motor	1	09-09-2022		TLM1	
31.	Capacitor start and run induction motors	1	10-09-2022		TLM1	
32.	Shaded pole induction motor	1	07-10-2022		TLM1	
33.	Equivalent circuit	1	08-10-2022		TLM1	
34.	**Tutorial-V**	1	11-10-2022		TLM3	
35.	Revision	1	13-10-2022		TLM1	
36.	**Quiz-III/ ASSIGNMENT-III**	1	14-10-2022			
No. of classes required to complete UNIT-III: 8				**No. of classes taken:**		

UNIT-IV: SYNCHRONOUS GENERATORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Construction of synchronous generators & Types of rotor	1	15-10-2022		TLM1	
38.	Working principle & EMF equation	1	18-10-2022		TLM1	
39.	Types of Rotors	1	20-10-2022		TLM1	
40.	Armature reaction	2	21-10-2022		TLM1	
41.	Phasor diagram of alternator	1	22-10-2022		TLM1	
42.	**Tutorial-VI**	1	25-10-2022		TLM3	
43.	Regulation Methods– EMF Method,MMF Method	1	27-10-2022		TLM1	
44.	ZPF method	1	28-10-2022		TLM1	
45.	Synchronizing to infinite bus bars	1	29-10-2022		TLM1	
46.	Two reaction theory	1	01-11-2022		TLM1	
47.	Parallel operation of synchronous generators	1	03-11-2022		TLM1	
48.	Synchronous Machine constants		04-11-2022		TLM1	
49.	Revision		05-11-2022		TLM1	
50.	**Tutorial-VII**		08-11-2022		TLM3	
51.	**Quiz-IV/ASSIGNMENT-III**		10-11-2022			
No. of classes required to complete UNIT-IV: 16				**No. of classes taken:**		

UNIT-V: SYNCHRONOUS MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Constructional features, principle of operation	1	12-11-2022		TLM1	
53.	Methods of starting	1	15-11-2022		TLM1	
54.	Power developed, Effect of increased load with constant excitation	1	17-11-2022		TLM1	
55.	Synchronous motor with different excitations	1	18-11-2022		TLM1	
56.	Effect of changing excitation constant load & Torque equation	1	19-11-2022		TLM1	
57.	**Tutorial-VIII**	1	22-11-2022		TLM3	
58.	V curve and inverted V curve – hunting	1	24-11-2022		TLM1	
59.	**Tutorial-IX**	1	25-11-2022		TLM3	
60.	**Quiz-V/ ASSIGNMENT-V**		26-11-2022			
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO b	Design and analyze electrical machines, modern drive and lighting systems
PSO c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO d	Design controllers for electrical and electronic systems to improve their performance.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.K.NAGALINGA CHARY**	**Mr.K.NAGALINGA CHARY**	**Mr.P.DEEPAK REDDY**	**Dr.J.SIVAVARA PRASAD**
Signature				

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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 & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. J.Sivavara Prasad
Course Name & Code : Power Electronics-20EE14
L-T-P Structure : 2-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., V-Sem., Section- A&B A.Y : 2022-23

PRE-REQUISITE: Electronics circuits and Devices (20EE01),Electrical Circuit Analysis(20EE05)

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to study the characteristics of power semiconductor devices and to familiarize the principle of operation & performance of various power electronic converters.

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

CO1: Understand the characteristics of various power semiconductor devices. **(Understand- L2)**
CO2: Analyze the operating principles for single-phase and three phase thyristor based rectifiers **(Apply-L3)**
CO3: Analyze operation of dc-dc converters in steady state in continuous and discontinuous modes **(Apply-L3)**
CO4: Interpret the operation of ac voltage controllers and cyclo converters **(Understand-L2)**
CO5: Understand the operation and performance of inverters **(Understand-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2											2			2
CO2	2	2											1	2	2	2
CO3	2	2										1	2		2	2
CO4	2	2										2	2		2	
CO5	2	2										2			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): A Section

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	19.07.2022		TLM1	
2.	Introduction to Power semiconductor switches, Thyristor family	1	20.07.2022		TLM1	
3.	SCR operation& Characteristics of SCR	1	21.07.2022		TLM2	
4.	Two transistor model	1	23.07.2022		TLM1	
5.	Static and dynamic characteristics	1	26.07.2022		TLM1	
6.	Turn on and Turn off methods	1	27.07.2022		TLM2	
7.	**TUTORIAL-1**	1	28.07.2022		TLM3	
8.	Series and Parallel operation of thyristors	1	30.07.2022		TLM1	
9.	Gate triggering circuits	1	02.08.2022		TLM1	
10.	Protection	1	03.08.2022		TLM1	
11.	Snubber circuits, Characteristics of GTO & IGBT	1	04.08.2022		TLM1	
12.	**TUTORIAL-2**	1	06.08.2022		TLM3	
No. of classes required to complete UNIT-I:12				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	10.08.2022		TLM1	
2.	Self, Impulse and complimentary commutations	1	11.08.2022		TLM1	
3.	Single phase Half wave bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes	1	13.08.2022		TLM2	
4.	Numericals on single phase half wave bridge controlled rectifiers	1	16.08.2022		TLM1	
5.	**TUTORIAL-3**	1	17.08.2022		TLM3	
6.	Full wave bridge controlled rectifiers with R and RL loads– continuous and discontinuous modes	1	18.08.2022		TLM2	
7.	Numericals on full wave bridge controlled rectifiers	1	20.08.2022		TLM1	
8.	effect of freewheeling diode	1	23.08.2022		TLM1	
9.	Dual converters-single phase	1	24.08.2022		TLM1	
10.	Dual converters- three phase	1	25.08.2022		TLM1	
11.	Effect of Source impedance	1	27.08.2022		TLM1	

12.	**TUTORIAL-4**	1	30.08.2022		TLM3	
13.	Problems	1	01.09.2022		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	03.09.2022		TLM1	
2.	Problems on single phase ac voltage controller with R and RL loads	1	06.09.2022		TLM2	
3.	Three phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	07.09.2022		TLM1	
4.	Problems on Three phase ac voltage controller with R and RL loads	1	08.09.2022		TLM2	
5.	**TUTORIAL-5**	1	11.10.2022		TLM3	
6.	Principle of operation of Cyclo-converter	1	12.10.2022		TLM1	
7.	Single phase to single phase cyclo converters-Midpoint type	1	13.10.2022		TLM1	
8.	Single phase to single phase cyclo converters-Bridge type	1	15.10.2022		TLM1	
9.	Problems on Single phase to single phase cyclo converters	1	18.10.2022			
10.	Problems	1	19.10.2022			
No. of classes required to complete UNIT-III: 10				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	20.10.2022		TLM1	
2.	Step-up and step-down chopper	1	22.10.2022		TLM2	
3.	Control Strategies of dc to dc converters	1	25.10.2022		TLM1	
4.	Derivation of average load voltage, load current for continuous current operation	1	26.10.2022		TLM1	
5.	Numericals on step up chopper	1	27.10.2022		TLM1	
6.	**TUTORIAL-6**	1	29.10.2022		TLM3	
7.	Derivation of average load voltage, load current for discontinuous current operation	1	01.11.2022		TLM1	
8.	Analysis of Class A chopper	1	02.11.2022		TLM2	
9.	**TUTORIAL-7**	1	03.11.2022		TLM3	
10.	**Problems**		05.11.2022			
No. of classes required to complete UNIT-IV:10				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	08.11.2022		TLM1	
2.	Single phase Current source inverters	1	09.11.2022		TLM1	
3.	Comparison between VSI and CSI	1	10.11.2022		TLM1	
4.	Analysis with R & RL loads	1	15.11.2022		TLM2	
5.	3-phase inverters–180 and 120 degree mode of operation	1	16.11.2022		TLM1	
6.	**TUTORIAL-8**	1	17.11.2022		TLM3	
7.	Single Pulse Width Modulation	1	19.11.2022		TLM1	
8.	Multiple Pulse Width Modulation	1	22.11.2022		TLM1	
9.	Sinusoidal PWM	1	23.11.2022		TLM2	
10.	Single phase Current source inverters with ideal switches	1	24.11.2022		TLM1	
11.	**Content beyond syllabus**	1	26.11.2022		TLM2	
No. of classes required to complete UNIT-V:11				No. of classes taken:		

COURSE DELIVERY PLAN (LESSON PLAN): B- Section

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	18.07.2022		TLM1	
2.	Introduction to Power semiconductor switches, Thyristor family	1	19.07.2022		TLM1	
3.	SCR operation& Characteristics of SCR	1	20.07.2022		TLM2	
4.	Two transistor model	1	22.07.2022		TLM1	
5.	Static and dynamic characteristics	1	25.07.2022		TLM1	
6.	Turn on and Turn off methods	1	26.07.2022		TLM2	
7.	**TUTORIAL-1**	1	27.07.2022		TLM3	
8.	Series and Parallel operation of thyristors	1	29.07.2022		TLM1	
9.	Gate triggering circuits	1	01.08.2022		TLM1	
10.	Protection	1	02.08.2022		TLM1	
11.	Snubber circuits, Characteristics of GTO & IGBT	1	03.08.2022		TLM1	
12.	**TUTORIAL-2**	1	05.08.2022		TLM3	
No. of classes required to complete UNIT-I:12				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	08.08.2022		TLM1	
2.	Self, Impulse and complimentary commutations	1	10.08.2022		TLM1	
3.	Single phase Half wave bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes	1	12.08.2022		TLM2	
4.	Numericals on single phase half wave bridge controlled rectifiers	1	16.08.2022		TLM1	
5.	**TUTORIAL-3**	1	17.08.2022		TLM3	
6.	Full wave bridge controlled rectifiers with R and RL loads–continuous and discontinuous modes	1	22.08.2022		TLM2	
7.	Numericals on full wave bridge controlled rectifiers	1	23.08.2022		TLM1	
8.	effect of freewheeling diode	1	24.08.2022		TLM1	
9.	Dual converters-single phase	1	26.08.2022		TLM1	
10.	Dual converters- three phase	1	29.08.2022		TLM1	
11.	Effect of Source impedance	1	30.08.2022		TLM1	
12.	**TUTORIAL-4**	1	02.09.2022		TLM3	
13.	Problems	1	05.09.2022		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	06.09.2022		TLM1	
2.	Problems on single phase ac voltage controller with R and RL loads	1	07.09.2022		TLM2	
3.	Three phase ac voltage controller with R and RL loads continuous and discontinuous modes	1	09.09.2022		TLM1	
4.	Problems on Three phase ac voltage controller with R and RL loads	1	10.10.2022		TLM2	
5.	**TUTORIAL-5**	1	11.10.2022		TLM3	
6.	Principle of operation of Cyclo-converter	1	12.10.2022		TLM1	
7.	Single phase to single phase cyclo converters-Midpoint type	1	14.10.2022		TLM1	
8.	Single phase to single phase cyclo converters-Bridge type	1	17.10.2022		TLM1	
9.	Problems on Single phase to single phase cyclo converters	1	18.10.2022			
10.	Problems	1	19.10.2022			
No. of classes required to complete UNIT-III: 10				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	21.10.2022		TLM1	
2.	Step-up and step-down chopper	1	25.10.2022		TLM2	
3.	Control Strategies of dc to dc converters	1	26.10.2022		TLM1	
4.	Derivation of average load voltage, load current for continuous current operation	1	28.10.2022		TLM1	
5.	Numericals on step up chopper	1	31.10.2022		TLM1	
6.	**TUTORIAL-6**	1	01.11.2022		TLM3	
7.	Derivation of average load voltage, load current for discontinuous current operation	1	02.11.2022		TLM1	
8.	Analysis of Class A chopper	1	04.11.2022		TLM2	
9.	**TUTORIAL-7**	1	07.11.2022		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	08.11.2022		TLM1	
2.	Single phase Current source inverters	1	09.11.2022		TLM1	
3.	Comparison between VSI and CSI	1	11.11.2022		TLM1	
4.	Analysis with R & RL loads	1	14.11.2022		TLM2	
5.	3-phase inverters–180 and 120 degree mode of operation	1	15.11.2022		TLM1	
6.	**TUTORIAL-8**	1	16.11.2022		TLM3	
7.	Single Pulse Width Modulation	1	18.11.2022		TLM1	
8.	Multiple Pulse Width Modulation	1	21.11.2022		TLM1	
9.	Sinusoidal PWM	1	22.11.2022		TLM2	
10.	Single phase Current source inverters with ideal switches	1	23.11.2022		TLM1	
11.	**Content beyond syllabus**	1	25.11.2022		TLM2	
No. of classes required to complete UNIT-V:11				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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

Dr.J.S.V.Prasad	Dr.J.S.V.Prasad	Dr.J.S.V.Prasad
Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.A.V.G.A.MARTHANDA
Course Name & Code **20EE17-ENERGY CONSERVATION AND MANAGEMENT**
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/A **A.Y.:** 2021-22

Pre-requisite course: Fundamentals of Electrical Engineering, Electrical Machines-I
COURSE OBJECTIVES: This course enables the student to introduce the need of energy auditing and devise energy efficient control strategies. It also deals with active power management, energy efficient lighting schemes and energy conservation methods.

COURSE OUTCOMES: At the end of the course, the student will be able to:
CO1: Illustrate the different parameters for energy auditing **(Understand-L2)**
CO2 : Interpret the controlling of energy management and energy efficiency **(Understand-L2)**
CO3: Analyze the Reactive power management strategies. **(Understand-L2)**
CO4: Analyze energy conservation measures for economic aspects. **(Apply-L3)**

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

TEXT BOOKS:
1. W.R. Murphy & G. Mckay Butter worth ,"Energy Management", Elsevier publications. 2012
2. John. C. Andres, "Energy Efficient Electric Motors "Marcel Dekker Inc. Ltd , 2nd Edition, 1995

REFERENCES:
1. Paulo' Callaghan, "Energy management" Mc – Graw Hill Book company.1st edition, 1998
2. W.C. Turner, "Energy management hand book" John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.
4. S C Tripathy, "Electric Energy Utilization and Conservation", Tata McGraw hill Publishing Company Ltd, New Delhi,1991
5. K.S.K.Weranga, SisilKumarawadu, D.P.Chandima,"Smart Metering Design and Applications", Springer Publications, 1st Edition, 2014.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: : BASIC PRINCIPLES OF ENERGY AUDIT

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.	Energy audit- definitions, concept types of audit, energy index, cost index, pie charts,	1	18-07-2022		TLM1	
2.	types of audit, energy index, cost index, pie charts	1	19-07-2022		TLM1	
3.	Sankey diagrams, load profiles, Energy conservation schemes-	1	22-07-2022		TLM1	
4.	Sankey diagrams, load profiles, Energy conservation schemes	1	23-07-2022		TLM1	
5.	. Energy audit of industries- energy saving potential, energy audit of process industry	1	25-07-2022		TLM1	
6.	Energy audit of industries- energy saving potential, energy audit of process industry	1	26-07-2022		TLM1	
7.	building energy audit. Smart Metering, Energy saving through smart metering	1	29-07-2022		TLM1	
8.	, Smart Metering, Energy saving through smart metering	1	30-07-2022		TLM1	
9.	Smart Metering, Energy saving through smart metering	1	01-08-2022		TLM1	
10.	Energy saving through smart metering	1	02-08-2022		TLM1	
11.	Energy conservation in vehicles, energy conservation in buildings	1	05-08-2022		TLM1	
12.	Energy conservation in vehicles, energy conservation in buildings	1	06-08-2022		TLM1	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: ENERGY 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
13.	: Principles of energy management, organizing energy management	1	08-08-2022		TLM1	
14.	Principles of energy management, organizing energy management	1	9-08-2022		TLM1	
15.	program, initiating, planning, controlling,	1	12-08-2022		TLM1	
16.	program, initiating, planning, controlling	1	13-08-2022		TLM1	
17.	promoting, monitoring,	1	18-08-2022		TLM1	
18.	promoting, monitoring, reporting-	1	19-08-2022		TLM1	
19.	promoting, monitoring, reporting	1	20-08-2022		TLM1	
20.	Energy manger, Qualities and functions, language	1	22-08-2022		TLM1	

21.	Energy manger, Qualities and functions, language	1	23-08-2022		TLM1	
22.	Energy manger,	1	25-08-2022		TLM1	
23.	Qualities and functions, language	1	26-08-2022		TLM1	
24.	REVISION	1	29-08-2022		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: ENERGY EFFICIENT MOTORS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Energy efficient motors ,	1	02-09-2022		TLM1	
26.	factors affecting efficiency, loss distribution,	1	03-09-2022		TLM1	
27.	factors affecting efficiency, loss distribution	1	05-09-2022		TLM1	
28.	constructional details, characteristics - variable speed ,	1	06-09-2022		TLM1	
29.	constructional details, characteristics - variable speed	1	08-09-2022		TLM1	
30.	variable duty cycle systems,	1	09-09-2022		TLM1	
31.	variable duty cycle systems, RMS ,	1	10-09-2022		TLM1	
32.	hp- voltage variation-voltage unbalance	1	06-10-2022		TLM1	
33.	- hp- voltage variation-voltage unbalance	1	07-10-2022		TLM1	
34.	over motoring- motor energy audit	1	08-10-2022		TLM1	
35.	over motoring- motor energy audit	1	10-10-2022		TLM1	
36.	motor energy audit	1	13-10-2022		TLM1	
37.	CASE STUDIES /REVISION	1	14-10-2022		TLM1	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY 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
38.	Power factor – methods of improvement, location of capacitors,	1	15-10-2022		TLM1	
39.	Power factor – methods of improvement, location of capacitors,	1	17-10-2022		TLM1	
40.	Pf with non linear loads,	1	20-10-2022		TLM1	
41.	Pf with non linear loads effect of harmonics on power factor	2	21-10-2022 22-10-2022		TLM1	
42.	design and practice, lighting control ,lighting energy audit	1	27-10-2022		TLM1	
43.	design and practice, lighting control ,lighting energy audit	1	28-10-2022		TLM1	
44.	power factor motor controllers - Good lighting system	1	29-10-2022		TLM1	
45.	Energy Instruments- wattmeter, data loggers,	1	31-10-2022		TLM1	
46.	thermocouples, pyrometers, lux meters,	1	03-11-2022		TLM1	
47.	tongue testers ,application of PLC’s	1	04-11-2022		TLM1	

48.	REVISION	1	05-11-2022		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: ECONOMIC ASPECTS AND 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
49.	Economics Analysis- Depreciation Methods, time value of money,	1	07-11-2022		TLM1	
50.	Economics Analysis- Depreciation Methods, time value of money,	1	10-11-2022		TLM1	
51.	rate of return, present worth method , replacement analysis	1	11-11-2022		TLM1	
52.	rate of return, present worth method , replacement analysis	1	12-11-2022		TLM1	
53.	life cycle costing analysis- -	1	14-11-2022		TLM1	
54.	life cycle costing analysis	1	17-11-2022		TLM1	
55.	Energy efficient motors- calculation of simple payback method,	1	18-11-2022		TLM1	
56.	Energy efficient motors- calculation of simple payback method,	1	19-11-2022		TLM1	
57.	net present worth method	1	21-11-2022		TLM1	
58.	Power factor correction, lighting -	1	24-11-2022		TLM1	
59.	Applications of life cycle costing analysis, return on investment	1	25-11-2022		TLM1	
60.		1	26-11-2022		TLM1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO b	Design and analyze electrical machines, modern drive and lighting systems
PSO c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO d	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**	**Dr. P.SOBHARANI**	**Dr.J.S.V.PRASAD**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor: Mr. B.Pangedaiah
Course Name & Code : Linear and Digital Integrated circuits – 20EE16
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/B **A.Y.:** 2022-23

Pre-requisites: Digital Electronics.

Course Educational Objectives: This course enables the student to understand the linear and digital integrated circuits and their applications.

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

CO1	Analyze linear ICs for engineering applications**(Apply-L3)**
CO2	Design various Filters using their frequency bands**(Apply-L3)**
CO3	Design all combinational and Sequential circuits using Digital ICs**(Apply-L3)**
CO4	Compare various memory devices**(Understand-L2)**

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

TEXT BOOKS:

T1 D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd.
T2 Floyd and Jain, "Digital fundamentals", Pearson Education.

REFERENCE:

R1 R.F. Coughlin and Fredrick F Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI.
R2 Denton J. Daibey, "Operational Amplifiers and Linear Integrated Circuits: Theory and Applications", TMH.
R3 Serigo Franco, "Design with Operational amplifiers and Analog Integrated circuits", McGraw Hill.
R4 J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI.
R5 Ramakanth A. Gayakwad, "Op-Amp & Linear ICs", PHI.

Part - B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I:Operational Amplifier

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to subject and awareness on COs	1	20-07-2022		**TLM2**	
2.	Introduction to Unit-I: Basic Information of Op-Amp	1	21-07-2022		**TLM2**	
3.	Ideal and practical Op-Amp	1	22-07-2022		**TLM2**	
4.	Internal circuit of Op-Amp	1	23-07-2022		**TLM2**	
5.	Op-Amp AC&DC characteristics	1	27-07-2022		**TLM2**	
6.	741 Op-Amp and its features	1	28-07-2022		**TLM2**	
7.	Tutorial-I	1	29-07-2022		**TLM3**	
8.	Modes of operation-inverting, non inverting, differential	1	30-07-2022		**TLM2**	
9.	Basic applications of Op-Amp	1	03-08-2022		**TLM2**	
10.	Instrumentation amplifier	1	04-08-2022		**TLM2**	
11.	Tutorial-II	1	05-08-2022		**TLM3**	
12.	Log and anti log amplifiers	1	06-08-2022		**TLM2**	
13.	Sample and hold circuits, multipliers	1	10-08-2022		**TLM2**	
14.	Dividers, differentiators Integrators	1	11-08-2022		**TLM2**	
15.	Tutorial-III	1	12-08-2022		**TLM3**	
16.	Comparators	1	13-08-2022		**TLM2**	
17.	Schmitt trigger, multivibrators	1	17-08-2022		**TLM2**	
18.	Assignment/Quiz-I	1	18-08-2022		**TLM6**	
No. of classes required to complete: 18				**No. of classes taken:**		

UNIT-II: Active Filers and Oscillators

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Introduction to Unit-II: 1st order low pass filter, high pass filter	1	19-08-2022		**TLM2**	
20.	Band pass filter Band reject filter, All pass filter	1	20-08-2022		**TLM2**	
21.	Oscillators types and principle of operation	1	24-08-2022		**TLM2**	
22.	Tutorial-IV	1	25-08-2022		**TLM3**	
23.	RC phase shift oscillator	1	26-08-2022		**TLM2**	
24.	Wein and Quadrature Oscillators	1	27-08-2022		**TLM2**	
25.	Wave form generators-triangular, sawtooth	1	01-09-2022		**TLM2**	
26.	Wave form generators-Square	1	02-09-2022		**TLM2**	
27.	Assignment/Quiz-II	1	03-09-2022		**TLM6**	

No. of classes required to complete: 9	**No. of classes taken:**

UNIT-III: Timers & A/D-D/A 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
28.	Introduction to Unit-III: 555 Timer, functional diagram	1	07-09-2022		**TLM2**	
29.	Monostable and Astable operations and Applications	1	08-09-2022		**TLM2**	
30.	Tutorial-V	1	09-09-2022		**TLM3**	
31.	VCO,PLL-introduction, block schematic	1	10-09-2022		**TLM2**	
32.	Introduction to converters, Basic DAC techniques	1	06-10-2022		**TLM2**	
33.	Weighted resistor and R-2R ladder DAC	1	07-10-2022		**TLM2**	
34.	Inverted R-2R DAC , IC 1408 DAC, Types of ADCs: Parallel comparator type ADC	1	08-10-2022		**TLM2**	
35.	Counter type, successive approximation ADC	1	12-10-2022		**TLM2**	

36.	Tutorial-VI	1	13-10-2022		**TLM3**	
37.	Dual slop ADC, specifications of DAC and ADC	1	14-10-2022		**TLM2**	
38.	Assignment/Quiz-III	1	15-10-2022		**TLM6**	
No. of classes required to complete: 10				**No. of classes taken:**		

UNIT-IV: Logic Families and Combinational Circuits

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Classification of integrated circuits, Comparision of various logic families	1	19-10-2022		**TLM2**	
40.	Tutorial-VII	1	20-10-2022		**TLM2**	
41.	Standard TTL NAND gate, analysis & Charecteristics	1	21-10-2022		**TLM2**	
42.	TTL open collector O/Ps, tristate TTL,	1	22-10-2022		**TLM2**	
43.	IC interfacing-TTL driving CMOS & CMOS driving TTL	1	26-10-2022		**TLM2**	
44.	Tutorial-VIII	1	27-10-2022		**TLM3**	
45.	MOS and CMOS open drain and tristate outputs, CMOS transmission gate	1	28-10-2022		**TLM2**	
46.	Design using TTL-74XX decoders, demux, Decoders & drivers for LED & LCD display, encoder	1	29-10-2022		**TLM2**	
47.	Priority encoder, multiplexers & their applications Parity generator /checker circuits	1	02-11-2022		**TLM2**	
48.	Parallel binary adder/subtractor circuit using 2's complement system and Digital comparator circuit	1	03-11-2022		**TLM2**	
49.	Assignment/Quiz-IV	1	04-11-2022		**TLM6**	
No. of classes required to complete: 11				**No. of classes taken:**		

UNIT-V:Sequential Circuits and Memories

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	74XX series of counters	1	05-11-2022		**TLM2**	
51.	ROM architecture Types and ROM Applications	2	09-11-2022, 10-11-2022		**TLM2**	
52.	RAM architecture, Static RAM	2	11-11-2022 16-11-2022		**TLM2**	
53.	Dynamic RAMs, Synchronous DRAMs	2	17-11-2022 18-11-2022		**TLM2**	
No. of classes required to complete: 07				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Assignment or Quiz
TLM3	Tutorial	**TLM7**	Group Discussion/Project
TLM4	Demonstration (Lab/Field Visit)		

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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PSO b	Design and analyze electrical machines, modern drive and lighting systems
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PSO d	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. B.Pangedaiah**	**Mr. B.Pangedaiah**	**Dr. G.Nageswararao**	**Dr.J.S.V.PRASAD**
Signature				

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http://lbrce.ac.in , Phone 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. K. Venkatesh
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem : B.Tech/EEE/V/A **A.Y.:** 2022-23

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

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

CO1	Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
CO2	Apply the basic principles of AI in problem solving. **(Apply-L3).**
CO3	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(Understand-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO2
CO1	2	3	2	-	3	-	-	-	-	-	-	2	3	-	-
CO2	2	3	3	3	3	-	-	-	-	-	-	2	3	-	-
CO3	2	3	3	-	3	-	-	-	-	-	-	2	3	-	-
CO4	2	3	3	2	3	-	-	-	-	-	-	2	3	-	-
CO5	2	3	3	2	3	-	-	-	-	-	-	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).

BOS APPROVED TEXT BOOKS:

T1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach",3rd edition, Prentice Hall, 2009. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmelen, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to programming.	1	19-07-2022		-	CO1	-	
2.	Introduction: What Is AI?,	1	21-07-2022		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	22-07-2022		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	23-07-2022		TLM1	CO1	T1,T2	
5.	The State of the Art,.	1	26-07-2022		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	28-07-2022		TLM1	CO1	T1,T2	
7.	Types of agents	1	29-07-2022		TLM2	CO1	T1,T2	
8.	Types of agents	1	30-07-2022		TLM2	CO1	T1,T2	
9.	Types of agents	1	02-08-2022		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	04-08-2022		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	05-08-2022		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	06-08-2022		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	11-08-2022		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	12-08-2022		TLM1	CO1	-	
No. of classes required to complete UNIT-I				14	**No. of classes taken:**			

UNIT-II : PROBLEM SOLVING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	1	13-08-2022		TLM1	CO2	T1,T2	
16.	searching for Solutions, Uninformed Search Strategies	1	16-08-2022		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	18-08-2022		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	20-08-2022		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	23-08-2022		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	25-08-2022		TLM2	CO2	T1,T2	
21.	A* Algorithm	1	26-08-2022		TLM2	CO2	T1,T2	
22.	AO* Algorithm	1	27-08-2022		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	30-08-2022		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	01-09-2022		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	02-09-2022		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	03-09-2022		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II		10\2			No. of classes taken:			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	06-09-2022		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	08-09-2022		TLM1	CO3	T1,T2	
29.	Breadth-first Search,	1	09-09-2022		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	10-09-2022		TLM2	CO3	T1,T2	
31.	Depth limited search	1	11-10-2022		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	13-10-2022		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	14-10-2022		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	15-10-2022		TLM2	CO3	T1,T2	

35.	Assignment/Quiz-3	1	18-09-2022		TLM1	CO3	-	
No. of classes required to complete UNIT-III		09			No. of classes taken:			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	20-10-2022		TLM1	CO4	T1,T2	
37.	Minimax algorithm	1	21-10-2022		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	1	22-10-2022		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	1	25-10-2022		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	27-10-2022		TLM1			
41.	Representation mappings	1	28-10-2022		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	29-10-2022		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	01-11-2022		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	03-11-2022		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	1	04-11-2022		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	05-11-2022		TLM1	CO4	-	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	08-11-2022		TLM1	CO5	T1,T2	T1,T2
48.	Logic, Propositional Logic:	1	10-11-2022		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	11-11-2022		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	12-11-2022		TLM2	CO4	T1,T2	
51.	Categories and Objects, Events	1	15-11-2022		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	17-11-2022		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	18-11-2022		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	19-11-2022		TLM1	CO4	T1,T2	

55.	Reasoning Systems for Categories	1	22-11-2022		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	24-11-2022		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	25-11-2022		TLM1	CO5	-	
No. of classes required to complete UNIT-V		11			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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	26-11-2022		**TLM1**			

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real timeproblems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
PSO 3	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. K.VENKATESH**	**Mr. K.VENKATESH**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. K. Venkatesh
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem : B.Tech/EEE/V-B **A.Y.:** 2022-23

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

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

CO1	Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
CO2	Apply the basic principles of AI in problem solving. **(Apply-L3).**
CO3	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(Understand-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO2
CO1	2	3	2	-	3	-	-	-	-	-	-	2	3	-	-
CO2	2	3	3	3	3	-	-	-	-	-	-	2	3	-	-
CO3	2	3	3	-	3	-	-	-	-	-	-	2	3	-	-
CO4	2	3	3	2	3	-	-	-	-	-	-	2	3	-	-
CO5	2	3	3	2	3	-	-	-	-	-	-	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).

BOS APPROVED TEXT BOOKS:

T1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach",3rd edition, Prentice Hall, 2009. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmelen, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I : INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to programming.	1	18-07-2022		-	CO1	-	
2.	Introduction: What Is AI?,	1	19-07-2022		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	20-07-2022		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	23-07-2022		TLM1	CO1	T1,T2	
5.	The State of the Art,.	1	25-07-2022		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	26-07-2022		TLM1	CO1	T1,T2	
7.	Types of agents	1	27-07-2022		TLM2	CO1	T1,T2	
8.	Types of agents	1	30-07-2022		TLM2	CO1	T1,T2	
9.	Types of agents	1	01-08-2022		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	02-08-2022		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	03-08-2022		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	06-08-2022		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	08-08-2022		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	10-08-2022		TLM1	CO1	-	
No. of classes required to complete UNIT-I				14	**No. of classes taken:**			

UNIT-II : PROBLEM SOLVING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	1	11-08-2022		TLM1	CO2	T1,T2	
16.	searching for Solutions, Uninformed Search Strategies	1	13-08-2022		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	16-08-2022		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	17-08-2022		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	18-08-2022		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	20-08-2022		TLM2	CO2	T1,T2	
21.	A* Algorithm	1	22-08-2022		TLM2	CO2	T1,T2	
22.	AO* Algorithm	1	23-08-2022		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	24-08-2022		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	27-08-2022		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	29-08-2022		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	30-08-2022		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	03-09-2022		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	05-09-2022		TLM1	CO3	T1,T2	
29.	Breadth-first Search,	1	06-09-2022		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	07-09-2022		TLM2	CO3	T1,T2	
31.	Depth limited search	1	10-10-2022		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	10-10-2022		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	11-10-2022		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	12-10-2022		TLM2	CO3	T1,T2	

35.	Assignment/Quiz-3	1	15-10-2022		TLM1	CO3	-	
No. of classes required to complete UNIT-III		09			No. of classes taken:			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	17-10-2022		TLM1	CO4	T1,T2	
37.	Minimax algorithm	1	18-10-2022		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	1	19-10-2022		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	1	22-10-2022		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	25-10-2022		TLM1			
41.	Representation mappings	1	26-10-2022		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	29-10-2022		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	31-10-2022		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	01-11-2022		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	1	02-11-2022		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	05-11-2022		TLM1	CO4	-	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	07-11-2022		TLM1	CO5	T1,T2	T1,T2
48.	Logic, Propositional Logic:	1	09-11-2022		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	12-11-2022		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	14-11-2022		TLM2	CO4	T1,T2	
51.	Categories and Objects, Events	1	15-11-2022		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	16-11-2022		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	19-11-2022		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	21-11-2022		TLM1	CO4	T1,T2	

55.	Reasoning Systems for Categories	1	22-11-2022		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	23-11-2022		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	26-11-2022		TLM1	CO5	-	
No. of classes required to complete UNIT-V		11			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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	26-11-2022		**TLM1**			

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
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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	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real timeproblems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
PSO 3	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. K.VENKATESH**	**Mr. K.VENKATESH**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**
Signature				

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COURSE HANDOUT

Part - A

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : Control Systems Lab–20EE58

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

COURSE CREDITS : 1

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

COURSE COORDINATOR : **Dr.K.R.L.Prasad**

Prerequisite: Control Systems

COURSE EDUCATIONAL OBJECTIVES (CEOs):

Course Educational Objective: This laboratory course enables the student to implement the mathematical techniques used in linear control systems to solve real world problems through experimentation and simulation tools.

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

CO1. Simulate the physical control system for stability studies **(Apply-L3)**
CO2. Demonstrate feedback controllers **(Understand-L2)**
CO3. Develop logic gates using PLC**(Apply-L3)**

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

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

LIST OF EXPERIMENTS

1. Modeling of Physical Systems (Mechanical and Electrical systems).
2. Block Diagram Reduction of Linear Systems
3. Time response analysis of Linear Systems for impulse and step inputs
4. Frequency response analysis of Linear Systems
5. Stability and relative stability analysis of Linear Systems Using (Root Locus, Bode and Nyquist plot).
6. Time Response analysis of Second Order System.
7. Study the effect of P, PD, PI, PID controllers on second order systems.
8. Magnitude and phase plot of Lag and lead compensators.
9. Determination of transfer function and effect of feedback on DC servo motor.
10. Study of logic gates using PLC

Additional Experiments

11. Design of Lag and Lead Compensators for a given system
12. Stepper motor control using Simulation tools.
13. Study the effect of P, PD, PI, PID controllers on DC servomotor system using PLC.
14. Study the effect of P, PD, PI, PID controllers on Temperature control system using PLC.

Part - B

COURSE DELIVERY PLAN (LESSON PLAN)

SECTION-A SCHEDULE

DAY :MONDAY

Batches : 20761A0201 to 227,**20761A0229 to 20761A0230,20761A0232 to 20761A0235**

Batch 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	XV
Tentative date	18/7/22	25/7/22	01/08/22	08/08/22	22/08/22	29/08/22	05/09/22	10/10/22	17/10/22	31/10/22	07/11/22	14/11/22	21/11/22
Actual Date													
B1	Demo	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	INTERNAL EXAM
B2		1	2	3	4	5	7	8	9	10	6		
B3		1	2	3	4	5	8	9	10	6	7		
B4		1	2	3	4	5	9	10	6	7	8		
B5		1	2	3	4	5	10	6	7	8	9		
B6		6	7	8	9	10	1	2	3	4	5		
B7		7	8	9	10	6	1	2	3	4	5		
B8		8	9	10	6	7	1	2	3	4	5		
B9		9	10	6	7	8	1	2	3	4	5		
B10		10	6	7	8	9	1	2	3	4	5		

DAY :WEDNESDAY

Batches :**20761A0236 to 20761A0251,20761A0253 to 20761A0259,20761A0261 to 20761A0263,21765A0201to 21765A0207**

	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	XIV
Tentative date	20/7 /22	27/7 /22	3/8/2 2	10/8 /22	17/0 8/22	24/0 8/22	7/9/ 22	12/10/ 22	19/1 0/22	26/10/2 2	2/11/2 2	9/11 /22	16/1 1/22	23/1 1/22
Actual dat														
B1	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**
B2	DEMO	1	2	3	4	5	7	8	9	10	6			
B3	DEMO	1	2	3	4	5	8	9	10	6	7			
B4	DEMO	1	2	3	4	5	9	10	6	7	8			
B5	DEMO	1	2	3	4	5	10	6	7	8	9			
B6	DEMO	6	7	8	9	10	1	2	3	4	5			
B7	DEMO	7	8	9	10	6	1	2	3	4	5			
B8	DEMO	8	9	10	6	7	1	2	3	4	5			
B9	DEMO	9	10	6	7	8	1	2	3	4	5			
B10	DEMO	10	6	7	8	9	1	2	3	4	5			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Assignment or Quiz
TLM3	Tutorial	**TLM7**	Group Discussion/Project
TLM4	Demonstration (Lab/Field Visit)		

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	26-09-2022	01-10-2022	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	28-11-2022	03-12-2022	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

Part - C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1. Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.

PEO2. Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.

PEO3. Work effectively as individuals and as team members in multidisciplinary projects.

PEO4. Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

PROGRAMME OUTCOMES (POs)

a: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b: 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.

c: 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.

d: 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.

e: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f: 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.

g: 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.

h: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j: 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.

k: Project management and finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l: 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.

PSOs (Program specific Outcomes):

PSO-a: Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power

PSO-b: Design and analyze electrical machines, modern drive and lighting systems

PSO-c: Specify, design, implement and test analog and embedded signal processing electronic systems

PSO-d: Design controllers for electrical and electronic systems to improve their performance.

Mrs.K.S.L.LAVANYA	Dr.K.R.L.Prasad		Dr.J.SIVAVARA PRASAD
Course Instructor	Course Coordinator	Module Coordinator	HOD

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

COURSE HANDOUT

Part - A

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : Control Systems Lab–20EE58

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

COURSE CREDITS : 1

COURSE INSTRUCTOR :**Mr Ch.Rajesh&Mrs.K.S.L.Lavanya**

COURSE COORDINATOR : Dr.K.R.L.Prasad

Prerequisite: Control Systems

COURSE EDUCATIONAL OBJECTIVES (CEOs):

Course Educational Objective: This laboratory course enables the student to implement the mathematical techniques used in linear control systems to solve real world problems through experimentation and simulation tools.

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

CO1. Simulate the physical control system for stability studies **(Apply-L3)**
CO2. Demonstrate feedback controllers **(Understand-L2)**
CO3. Develop logic gates using PLC**(Apply-L3)**

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

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

LIST OF EXPERIMENTS

1. Modeling of Physical Systems (Mechanical and Electrical systems).
2. Block Diagram Reduction of Linear Systems
3. Time response analysis of Linear Systems for impulse and step inputs
4. Frequency response analysis of Linear Systems
5. Stability and relative stability analysis of Linear Systems Using (Root Locus, Bode and Nyquist plot).
6. Time Response analysis of Second Order System.
7. Study the effect of P, PD, PI, PID controllers on second order systems.
8. Magnitude and phase plot of Lag and lead compensators.
9. Determination of transfer function and effect of feedback on DC servo motor.
10. Study of logic gates using PLC

Additional Experiments

11. Design of Lag and Lead Compensators for a given system
12. Stepper motor control using Simulation tools.
13. Study the effect of P, PD, PI, PID controllers on DC servomotor system using PLC.
14. Study the effect of P, PD, PI, PID controllers on Temperature control system using PLC.

Part - B

COURSE DELIVERY PLAN (LESSON PLAN)

SECTION-B SCHEDULE

DAY : Tuesday Batches : 20761A0264-2A0

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	XV	XVI
	Tentative date	22/7	29/ 07	05/ 08	12/ 08	26/ 08	02/ 09	07/ 09	09/ 09	07/ 10	14/ 10	21/ 10	28/10	04/11	11/11	18/11	25/11
	Actual date																
B-1	20761A0271 20761A0291	DEMO	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	INTERNAL EXAM
B-2	20761A0282 20761A0292	DEMO	DEMO	2	3	4	5	1	7	8	9	10	6				
B-3	20761A0273 20761A0283 20761A0293	DEMO	DEMO	3	4	5	1	2	8	9	10	6	7				
B-4	20761A0264 20761A0274 20761A0284 20761A0294	DEMO	DEMO	4	5	1	2	3	9	10	6	7	8				
B-5	20761A0265 20761A0275 20761A0285 20761A0295	DEMO	DEMO	5	1	2	3	4	10	6	7	8	9				
B-6	20761A0266 20761A0276 20761A0286 20761A0296	DEMO	DEMO	1	2	3	4	5	6	7	8	9	10				
B-7	20761A0267 20761A0277 20761A0287 20761A0297	DEMO	DEMO	2	3	4	5	1	7	8	9	10	6				
B-8	20761A0268 20761A0288 20761A0298	DEMO	DEMO	3	4	5	1	2	8	9	10	6	7				
B-9	20761A0269 20761A0289 20761A0299	DEMO	DEMO	4	5	1	2	3	9	10	6	7	8				
B-10	20761A0270 20761A0280 20761A0290 20761A02A0	DEMO	DEMO	5	1	2	3	4	10	6	7	8	9				

DAY : Friday

Batches : 20761A02A1 – 2C3, 21765A0208-217

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	19/07	26/07	02/08	16/08	23/08	30/08	06/09	11/10	18/10	25/10	01/11	08/11	15/11	22/11
	Actual date														
B-1	20761A02A1 20761A02B1 20761A02C1	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**
B-2	20761A02A2 20761A02B2 20761A02C2 21765A0212	DEMO	2	3	4	5	1	7	8	9	10	6			
B-3	20761A02A3 20761A02B3 20761A02C3 21765A0213	DEMO	3	4	5	1	2	8	9	10	6	7			
B-4	20761A02A4 20761A02B4 21765A0214	DEMO	4	5	1	2	3	9	10	6	7	8			
B-5	20761A02A5 20761A02B5 21765A0215	DEMO	5	1	2	3	4	10	6	7	8	9			
B-6	20761A02A6 20761A02B6 21765A0216	DEMO	1	2	3	4	5	6	7	8	9	10			
B-7	20761A02A7 20761A02B7 21765A0217	DEMO	2	3	4	5	1	7	8	9	10	6			
B-8	20761A02A8 20761A02B8 21765A0208	DEMO	3	4	5	1	2	8	9	10	6	7			
B-9	20761A02A9 20761A02B9	DEMO	4	5	1	2	3	9	10	6	7	8			
B-10	20761A02B0 20761A02C0 21765A0210	DEMO	5	1	2	3	4	10	6	7	8	9			

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Assignment or Quiz
TLM3	Tutorial	**TLM7**	Group Discussion/Project
TLM4	Demonstration (Lab/Field Visit)		

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	26-09-2022	01-10-2022	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	28-11-2022	03-12-2022	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

Part - C

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1. Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.

PEO2. Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.

PEO3. Work effectively as individuals and as team members in multidisciplinary projects.

PEO4. Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

PROGRAMME OUTCOMES (POs)

a: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b: 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.

c: 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.

d: 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.

e: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f: 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.

g: 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.

h: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j: 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.

k: Project management and finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l: 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.

PSOs (Program specific Outcomes):

PSO-a: Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power

PSO-b: Design and analyze electrical machines, modern drive and lighting systems

PSO-c: Specify, design, implement and test analog and embedded signal processing electronic systems

PSO-d: Design controllers for electrical and electronic systems to improve their performance.

Mr Ch.Rajesh, Mrs.K.S.L.Lavanya	Dr.K.R.L.Prasad		Dr.J.SIVAVARA PRASAD
Course Instructor	Course Coordinator	Module Coordinator	HOD

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.NAGALINGA CHARY / Mr.Imran abdul / Mrs.R.Padma
Course Name & Code : ELECTRICAL MACHINES-II LAB & 20EE59
L-T-P Structure : **0-0-3** **Credits: 1.5**
Program/Sem/Sec : B.Tech/III/A **A.Y.:** 2022-23
PRE-REQUISITES : Electrical Machines-II
COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to know the operation of various ac machines and give practical exposure on the performance of various AC machines like induction motors and synchronous machines.

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

CO1	Analyze the performance of single phase transformer and induction motor **(Apply-L3)**
CO2	Examine the performance of three phase induction motor **(Apply-L3)**
CO3	Evaluate the performance parameters of synchronous machines **(Apply-L3)**
CO4	Analyze the performance of AC machines using simulation tools **(Apply-L3)**

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

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

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

DAY : WEDNESDAY
Batches : 20761A0201-235

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	20/7	27/ 07	03/ 08	10/ 08	17/ 08	24/ 08	07/ 09	12/ 10	19/ 10	26/ 10	02/ 11	09/ 11	16/ 11	23/11
	Actual date														
B-1	20761A0201 20761A0211 20761A0221	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**
B-2	20761A0202 20761A0212 20761A0222 20761A0232	DEMO	2	3	4	5	1	7	8	9	10	6			
B-3	20761A0203 20761A0213 20761A0223 20761A0233	DEMO	3	4	5	1	2	8	9	10	6	7			
B-4	20761A0204 20761A0214 20761A0224 20761A0234	DEMO	4	5	1	2	3	9	10	6	7	8			
B-5	20761A0205 20761A0215 20761A0225 20761A0235	DEMO	5	1	2	3	4	10	6	7	8	9			
B-6	20761A0206 20761A0216 20761A0226	DEMO	1	2	3	4	5	6	7	8	9	10			
B-7	20761A0207 20761A0217 20761A0227	DEMO	2	3	4	5	1	7	8	9	10	6			
B-8	20761A0208 20761A0218	DEMO	3	4	5	1	2	8	9	10	6	7			
B-9	20761A0209 20761A0219 20761A0229	DEMO	4	5	1	2	3	9	10	6	7	8			
B-10	20761A0210 20761A0220 20761A0230	DEMO	5	1	2	3	4	10	6	7	8	9			

DAY : MONDAY

Batches : 20761A0236 – 263, 21765A0201-207

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
	Tentative date	18/ 07	25/ 07	01/ 08	08/ 08	22/ 08	29/ 08	05/ 09	10/ 10	17/ 10	31/ 10	07/ 11	14/ 11	21/ 11
	Actual date													
B-1	20761A0241 20761A0251 20761A0261 21765A0201	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	INTERNAL EXAM
B-2	20761A0242 20761A0262 21765A0202	DEMO	2	3	4	5	1	7	8	9	10	6		
B-3	20761A0243 20761A0253 20761A0263 21765A0203	DEMO	3	4	5	1	2	8	9	10	6	7		
B-4	20761A0244 20761A0254 21765A0204	DEMO	4	5	1	2	3	9	10	6	7	8		
B-5	20761A0245 20761A0255 21765A0205	DEMO	5	1	2	3	4	10	6	7	8	9		
B-6	20761A0236 20761A0246 20761A0256 21765A0206	DEMO	1	2	3	4	5	6	7	8	9	10		
B-7	20761A0237 20761A0247 20761A0257 21765A0207	DEMO	2	3	4	5	1	7	8	9	10	6		
B-8	20761A0238 20761A0248 20761A0258	DEMO	3	4	5	1	2	8	9	10	6	7		
B-9	20761A0239 20761A0249 20761A0259	DEMO	4	5	1	2	3	9	10	6	7	8		
B-10	20761A0240 20761A0250	DEMO	5	1	2	3	4	10	6	7	8	9		

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Day – Day Evaluation	A=05
Record	B=05
Internal Exam	C=05
Cumulative Internal Examination (CIE) : A+B+C	15
Semester End Examination (SEE)	35
Total Marks = CIE + SEE	50

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO4	Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.

Mr.K.NAGALINGA CHARY	Mr.J.V.PAVAN CHAND	Mr.P.DEEPAK REDDY	Dr.J.SIVAVARA PRASAD
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr J.V.PAVAN CHAND / Mr.Imran Abdul
Course Name & Code **:** ELECTRICAL MACHINES-II LAB & 20EE59
L-T-P Structure **: 0-0-3** **Credits: 1.5**
Program/Sem/Sec : B.Tech/III/A **A.Y.:** 2022-23
PRE-REQUISITES : Electrical Machines-II
COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to know the operation of various ac machines and give practical exposure on the performance of various AC machines like induction motors and synchronous machines.

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

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

DAY : Friday
Batches : 20761A0264-2A0

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	XV	XVI
	Tentative date	22/7	29/07	05/08	12/08	26/08	02/09	07/09	09/09	07/10	14/10	21/10	28/10	04/11	11/11	18/11	25/11
	Actual date																
B-1	20761A0271 20761A0291	DEMO	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	INTERNAL EXAM
B-2	20761A0282 20761A0292	DEMO	DEMO	2	3	4	5	1	7	8	9	10	6				
B-3	20761A0273 20761A0283 20761A0293	DEMO	DEMO	3	4	5	1	2	8	9	10	6	7				
B-4	20761A0264 20761A0274 20761A0284 20761A0294	DEMO	DEMO	4	5	1	2	3	9	10	6	7	8				
B-5	20761A0265 20761A0275 20761A0285 20761A0295	DEMO	DEMO	5	1	2	3	4	10	6	7	8	9				
B-6	20761A0266 20761A0276 20761A0286 20761A0296	DEMO	DEMO	1	2	3	4	5	6	7	8	9	10				
B-7	20761A0267 20761A0277 20761A0287 20761A0297	DEMO	DEMO	2	3	4	5	1	7	8	9	10	6				
B-8	20761A0268 20761A0288 20761A0298	DEMO	DEMO	3	4	5	1	2	8	9	10	6	7				
B-9	20761A0269 20761A0289 20761A0299	DEMO	DEMO	4	5	1	2	3	9	10	6	7	8				
B-10	20761A0270 20761A0280 20761A0290 20761A02A0	DEMO	DEMO	5	1	2	3	4	10	6	7	8	9				

DAY : Tuesday

Batches : 20761A02A1 – 2C3, 21765A0208-217

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	19/07	26/07	02/08	16/08	23/08	30/08	06/09	11/10	18/10	25/10	01/11	08/11	15/11	22/11
	Actual date														
B-1	20761A02A1 20761A02B1 20761A02C1	DEMO	1	2	3	4	5	6	7	8	9	10	REVISION OF EXPERIMENTS	REVISION OF EXPERIMENTS	**INTERNAL EXAM**
B-2	20761A02A2 20761A02B2 20761A02C2 21765A0212	DEMO	2	3	4	5	1	7	8	9	10	6			
B-3	20761A02A3 20761A02B3 20761A02C3 21765A0213	DEMO	3	4	5	1	2	8	9	10	6	7			
B-4	20761A02A4 20761A02B4 21765A0214	DEMO	4	5	1	2	3	9	10	6	7	8			
B-5	20761A02A5 20761A02B5 21765A0215	DEMO	5	1	2	3	4	10	6	7	8	9			
B-6	20761A02A6 20761A02B6 21765A0216	DEMO	1	2	3	4	5	6	7	8	9	10			
B-7	20761A02A7 20761A02B7 21765A0217	DEMO	2	3	4	5	1	7	8	9	10	6			
B-8	20761A02A8 20761A02B8 21765A0208	DEMO	3	4	5	1	2	8	9	10	6	7			
B-9	20761A02A9 20761A02B9	DEMO	4	5	1	2	3	9	10	6	7	8			
B-10	20761A02B0 20761A02C0 21765A0210	DEMO	5	1	2	3	4	10	6	7	8	9			

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Day – Day Evaluation	A=05
Record	B=05
Internal Exam	C=05
Cumulative Internal Examination (CIE) : A+B+C	15
Semester End Examination (SEE)	35
Total Marks = CIE + SEE	50

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO4	Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.

Mr.J.V.PAVAN CHAND	Mr.J.V.PAVAN CHAND	Mr.P.DEEPAK REDDY	Dr.J.SIVAVARA PRASAD
Course Instructor	Course Coordinator	Module Coordinator	HOD