COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P.Sobha Rani
Course Name & Code **:** 20EE18: Power Systems-III
L-T-P Structure **:** 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech VI sem A/S **A.Y.:** 2022-23

PREREQUISITE: Power system-I, Power System-II

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to learn power flow solution methods, unit commitment problem and importance of economic load dispatch, concepts of power system operation and control and importance of frequency control.

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

CO1	Understand application of load flow methods
CO2	Analyze the economic operation of power system
CO3	Analyze load frequency control of power system
CO4	Determine the stability of power system

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

TEXTBOOKS:

T1 **John J.Grainger & W.D Stevenson, "Power system Analysis", McGraw Hill International,2017**

T2 **D.P.Kothari and I.J.Nagarath, "Modern Power System Analysis", 4th Edition, Tata McGraw Hill Education Private limited,2011**

REFERENCE BOOKS:

R1 C.L.Wadhwa, "Electrical Power Systems", New Age International,2016

R2 Prabha Kundur, "Power system stability and control", McGraw Hill Professional, first edition,2006

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Network Matrices

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	26-12-22		TLM1	
2.	Graph theory: Definitions	1	27-12-22		TLM2	
3.	Relevant concepts in graph theory	1	28-12-22		TLM2	
4.	Ybus formation by direct inspection method	1	29-12-22		TLM2	
5.	Numerical problems	1	30-12-22		TLM2	
6.	Singular transformation method	2	02-01-23 03-01-23		TLM2	
7.	Tutorial	1	04-01-23		TLM3	
8.	Singular transformation method	1	05-01-23		TLM2	
9.	Zbus Building algorithm	2	06-01-23 09-01-23		TLM2	
10.	Numerical problems	1	10-01-23		TLM3	
11.	Tutorial	1	11-01-23		TLM3	
12.	Introduction to Load flow studies	1	12-01-23		TLM2	
13.	Bus classification	1	18-01-23		TLM2	
No. of classes required to complete UNIT-I:				**No. of classes taken:**		

UNIT-II: Load Flow Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Load flow equations	1	19-01-23		TLM2	
15.	Gauss-Seidel method	3	20-01-23 23-01-23 24-01-23		TLM2	
16.	Tutorial	1	25-03-23		TLM3	
17.	Newton Raphson method	3	27-01-23 30-01-23 31-01-23		TLM2	
18.	Tutorial	1	01-02-23		TLM3	
19.	Fast Decoupled method	2	02-02-23 03-02-23		TLM2	
20.	Merits and Demerits	1	06-02-23		TLM2	

21.	System data for load flow study	1			TLM2	
No. of classes required to complete UNIT-II:				**No. of classes taken:**		

UNIT-III: Economic Operation of 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
22.	Economic load dispatch without transmission losses	2	07-02-23 08-02-23		TLM2	
23.	Economic load dispatch with transmission losses	1	09-02-23		TLM2	
24.	Transmission loss as a function of plant generation	1	10-02-23		TLM2	
25.	Calculation of loss coefficients	2	13-02-23 14-02-23		TLM2	
26.	Tutorial	1	15-02-23		TLM3	
27.	Distribution of load between plants	1	16-02-23		TLM2	
28.	Unit commitment problem	1	17-02-23		TLM2	
29.	Priority order scheduling	1	27-02-23		TLM2	
30.	Hydro-Thermal coordination	2	28-02-23 01-03-23		TLM2	
No. of classes required to complete UNIT-III:				**No. of classes taken:**		

UNIT-IV: Load Frequency Control

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Synchronous machine dynamics	1	02-03-23		TLM2	
32.	Mathematical model of speed governing system	2	03-03-23 06-03-23		TLM2	
33.	Turbine models	2	07-03-23 09-03-23		TLM2	
34.	Division of power system into control areas	1	10-03-23		TLM2	
35.	P-f control of single area system	2	13-03-23 14-03-23		TLM2	
36.	Tutorial	1	15-03-23		TLM3	
37.	P-f control of two area system	2	16-03-23 17-03-23		TLM2	
38.	Assignment	1	20-03-23		TLM3	
No. of classes required to complete UNIT-IV:				**No. of classes taken:**		

UNIT-V: Power System Stability

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Stability problem	1	21-03-23		TLM2	
40.	Swing Equation	2	23-03-23 24-03-23		TLM2	

41.	Equal area criterion of stability	1	27-03-23		TLM2	
42.	Applications of equal area criterion	1	28-03-23		TLM2	
43.	Tutorial	1	29-03-23		TLM3	
44.	Step by step solution of swing equation	3	31-03-23 03-04-23 04-04-23		TLM2	
45.	Factors affecting transient stability	2	06-04-23 10-04-23		TLM2	
46.	Methods to improve steady state and transient stability	1	11-04-23		TLM2	
47.	Tutorial	1	12-04-23		TLM3	
48.	Methods to improve steady state and transient stability	2	13-04-23 17-04-23		TLM2	
49.	Comparison of angle and voltage stability	2	18-04-23 19-04-23		TLM2	
50.	Revision	2	20-04-23 21-04-23		TLM3	
No. of classes required to complete UNIT-V:				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.

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

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.J.V.Pavan Chand
Course Name & Code **:** 20EE18: Power Systems-III
L-T-P Structure **:** 2-1-0 **Credits:** 3
Program/Sem/Sec : B.Tech VI sem A/S **A.Y.:** 2022-23

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CO2	Analyze the economic operation of power system
CO3	Analyze load frequency control of power system
CO4	Determine the stability of power system

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

TEXTBOOKS:

T1 **John J.Grainger & W.D Stevenson, "Power system Analysis", McGraw Hill International,2017**

T2 **D.P.Kothari and I.J.Nagarath, "Modern Power System Analysis", 4th Edition, Tata McGraw Hill Education Private limited,2011**

REFERENCE BOOKS:

R1 C.L.Wadhwa, "Electrical Power Systems", New Age International,2016

R2 Prabha Kundur, "Power system stability and control", McGraw Hill Professional, first edition,2006

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Network Matrices

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	26-12-22		TLM1	
2.	Graph theory: Definitions	1	27-12-22		TLM2	
3.	Relevant concepts in graph theory	1	29-12-22		TLM2	
4.	Ybus formation by direct inspection method	1	30-12-22		TLM2	
5.	Numerical problems	1	31-12-22		TLM2	
6.	Tutorial	1	02-01-23		TLM2	
7.	Singular transformation method	2	03-01-23 05-01-23		TLM3	
8.	Singular transformation method	1	06-01-23		TLM2	
9.	Zbus Building algorithm	2	07-01-23 10-01-23		TLM2	
10.	Tutorial	1	09-01-23		TLM3	
11.	Numerical problems	1	11-01-23		TLM3	
12.	Introduction to Load flow studies	1	12-01-23		TLM2	
13.	Bus classification	1	19-01-23		TLM2	
No. of classes required to complete UNIT-I:				**No. of classes taken:**		

UNIT-II: Load Flow Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Load flow equations	1	20-01-23		TLM2	
15.	Tutorial	1	21-01-23		TLM3	
16.	Gauss-Seidel method	3	23-01-23 24-01-23 27-03-23		TLM2	
17.	Newton Raphson method	3	28-01-23 31-01-23 02-02-23		TLM2	
18.	Tutorial	1	30-01-23		TLM3	
19.	Fast Decoupled method	2	02-02-23 03-02-23		TLM2	

20.	Merits and Demerits	1	04-02-23		TLM2	
21.	System data for load flow study	1	06-2-23		TLM2	
No. of classes required to complete UNIT-II:				**No. of classes taken:**		

UNIT-III: Economic Operation of 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
22.	Economic load dispatch without transmission losses	2	07-02-23 08-02-23		TLM2	
23.	Economic load dispatch with transmission losses	1	09-02-23		TLM2	
24.	Transmission loss as a function of plant generation	1	10-02-23		TLM2	
25.	Calculation of loss coefficients	2	13-02-23 14-02-23		TLM2	
26.	Tutorial	1	16-02-23		TLM3	
27.	Distribution of load between plants	1	17-02-23		TLM2	
28.	Unit commitment problem	1	18-02-23		TLM2	
29.	Priority order scheduling	1	27-02-23		TLM2	
30.	Hydro-Thermal coordination	2	28-02-23 01-03-23		TLM2	
No. of classes required to complete UNIT-III:				**No. of classes taken:**		

UNIT-IV: Load Frequency Control

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Synchronous machine dynamics	1	02-03-23		TLM2	
32.	Mathematical model of speed governing system	2	03-03-23 06-03-23		TLM2	
33.	Turbine models	2	07-03-23 09-03-23		TLM2	
34.	Division of power system into control areas	1	10-03-23		TLM2	
35.	P-f control of single area system	2	13-03-23 14-03-23		TLM2	
36.	Tutorial	1	15-03-23		TLM3	
37.	P-f control of two area system	2	16-03-23 17-03-23		TLM2	
38.	Assignment	1	20-03-23		TLM3	
No. of classes required to complete UNIT-IV:				**No. of classes taken:**		

UNIT-V: Power System Stability

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Stability problem	1	21-03-23		TLM2	

40.	Swing Equation	2	23-03-23 24-03-23		TLM2	
41.	Equal area criterion of stability	1	27-03-23		TLM2	
42.	Applications of equal area criterion	1	28-03-23		TLM2	
43.	Tutorial	1	29-03-23		TLM3	
44.	Step by step solution of swing equation	3	31-03-23 03-04-23 04-04-23		TLM2	
45.	Factors affecting transient stability	2	06-04-23 10-04-23		TLM2	
46.	Methods to improve steady state and transient stability	1	11-04-23		TLM2	
47.	Tutorial	1	12-04-23		TLM3	
48.	Methods to improve steady state and transient stability	2	13-04-23 17-04-23		TLM2	
49.	Comparison of angle and voltage stability	2	18-04-23 19-04-23		TLM2	
50.	Revision	2	20-04-23 21-04-23		TLM3	
No. of classes required to complete UNIT-V:				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.

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

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi, NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : **Solid State Drives** - 20EE19

L-T-P STRUCTURE : **2**-1-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **P.Deepak Reddy**

COURSE COORDINATOR : **P.Deepak Reddy**

PRE-REQUISITES: Power Electronics, Electrical Machines-I & Electrical Machines-II.

COURSE EDUCATIONAL OBJECTIVE: This course is an extension of power electronics applications to electrical drives. It converts in detail the basic and advanced speed control techniques using power electronic converters that are used in industry. It is equally important to understand to four quadrant operation of electrical drives and slip power recovery schemes in induction motors.

COURSE OUTCOMES(COs)

At the end of the course, the student will be able to

CO1: Examine the performance of dc motor drive by rectifier and chopper control method. (Apply-L3)

CO2: Understand the controlling mechanisms for squirrel cage induction motor and synchronous motors. (Understand-L2)

CO3: Analyze the slip power recovery schemes for wound rotor induction motor. (Apply-L3)

CO4: Analyze the BLDC motor drives. (Apply-L3)

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

COs	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	PSOa	PSOb	PSOc	PSOd
CO1	3	3	-	-	3	-	-	-	-	-	-	1	-	3		-
CO2	3	3	-	3	3	-	-	-	-	-	-	-	-	3		2
CO3	3	3	-	3	3	-	-	-	-	-	-	-	-	3		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).

BOS APPROVED TEXT BOOKS:

T1 G.K.Dubey, "Power Semi Conductor Dives", Prentice Hall, 1988

T2 B.K.Bose, "Modern Power Electronics and AC drives", PHI learning pvt ltd, 2005

BOS APPROVED REFERENCE BOOKS:

R1 Vedam Subramanyam, "Thyristor control of Electric Drives" Tata McGraw Hill Publications.

R2 S K Pillai, "A first course on Electrical Drives", New age International(P) ltd. 3rd Edition.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : RECTIFIER & CHOPPER CONTROLLED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Subject & Course Outcomes	1	26-12-2022		**TLM1**	CO1	1	
2.	UNIT-I, Significance of variable speed drives	1	27-12-2022		**TLM1**	CO1	1	
3.	Single-phase fully controlled rectifier fed separately excited DC motor	1	28-12-2022		**TLM1**	CO1	1	
4.	Single-phase semi controlled rectifier fed separately excited DC motor	1	29-12-2022		**TLM1**	CO1	1	
5.	Three-phase, fully controlled rectifier fed separately excited DC motor	1	30-12-2022		**TLM1**	CO1	1	
6.	TUTORIAL-1	1	02-01-2023		**TLM3**	CO1	1	
7.	Three-phase, semi controlled rectifier fed separately excited DC motor	1	03-01-2023		**TLM1**	CO1	1	
8.	Single-phase fully controlled rectifier fed DC series motor	1	04-01-2023		**TLM1**	CO1	1	
9.	Single-phase semi controlled rectifier fed DC series motor	1	05-01-2023		**TLM1**	CO1	1	
10.	Three-phase, fully controlled rectifier fed DC series motor	1	06-01-2023		**TLM1**	CO1	1	
11.	TUTORIAL-2	1	09-01-2023		**TLM3**	CO1	1	
12.	Three-phase, semi controlled rectifier fed DC series motor	1	10-01-2023		**TLM1**	CO1	1	
13.	Problems	1	11-01-2023		**TLM1**	CO1	1	

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
14.	Principle of operation and control techniques	1	12-01-2023		**TLM1**	CO1	1	
15.	motoring operation of separately excited dc motor	1	18-01-2023		**TLM1**	CO1	1	
16.	motoring operation of dc series motor	1	19-01-2023		**TLM1**	CO1	1	
17.	regenerative braking of separately excited dc motor and dc series motor	1	20-01-2023		**TLM1**	CO1	1	
18.	TUTORIAL-3	1	23-01-2023		**TLM3**	CO1	1	
19.	dynamic braking of separately excited dc motor and dc series motor	1	24-01-2023		**TLM1**	CO1	1	

20.	plugging of separately excited dc motor and dc series motor	1	25-01-2023		**TLM1**	CO1	1	
21.	multi quadrant control of chopper fed dc motors	1	27-01-2023		**TLM1**	CO1	1	
22.	TUTORIAL-4	1	30-01-2023		**TLM3**	CO1	1	
23.	problems	1	31-01-2023		**TLM1**	CO1	1	
No. of classes required to complete UNIT-I		23			No. of classes taken:			

UNIT-II : CONTROL OF INDUCTION MOTOR DRIVES

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
24.	Stator voltage control of Induction Motor	1	01-02-2023		**TLM1**	CO2	2	
25.	Stator frequency control-Open loop V/f control of Induction Motor	1	02-02-2023		**TLM1**	CO2	2	
26.	Control of Induction motor by ac voltage controller	1	03-02-2023		**TLM1**	CO2	2	
27.	Control of induction motor by voltage source Inverter	1	06-02-2023		**TLM1**	CO2	2	
28.	Control of induction motor by current source Inverter	1	07-02-2023		**TLM1**	CO2	2	
29.	Control of induction motor by cyclo converter	1	08-02-2023		**TLM1**	CO2	2	
30.	Comparison of voltage source and current source inverter drives	1	09-02-2023		**TLM1**	CO2	2	
31.	problems	1	10-02-2023		**TLM1**	CO2	2	
32.	TUTORIAL-5	1	13-02-2023		**TLM3**	CO2	2	
33.	problems	1	14-02-2023		**TLM1**	CO2	2	
No. of classes required to complete UNIT-II		10			No. of classes taken:			

UNIT-III : SLIP POWER CONTROLLED WOUND ROTOR INDUCTION MOTOR DRIVES

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
34.	Static rotor resistance control	1	15-02-2023		**TLM1**	CO3	1	
35.	Slip-power recovery schemes	1	16-02-2023		**TLM1**	CO3	1	
36.	Static Scherbius, Phasor diagram	1	17-02-2023		**TLM1**	CO3	1	
I-MID EXAMINATIONS(20/02/2023 TO 25/02/2023)								
37.	Static Kramer drive, Phasor diagram	1	28-02-2023		**TLM1**	CO3	1	
38.	TUTORIAL-6	1	27-02-2023		**TLM3**	CO3	1	

39.	Closed loop speed control of Static Scherbius drive	1	01-03-2023		**TLM1**	CO3	1	
40.	Modes of operation of Static Scherbius	1	02-03-2023		**TLM1**	CO3	1	
41.	Problems, Applications	1	03-03-2023		**TLM1**	CO3	1	
42.	Problems	1	06-03-2023		**TLM1**	CO3	1	
43.	TUTORIAL-7	1	07-03-2023		**TLM3**	CO3	1	
44.	Repetition	1	09-03-2023		**TLM2**	CO3	1	
45.	Assignment/Quiz-4	1	10-03-2023		**TLM6**	CO3	1	
46.	TUTORIAL-8	1	13-03-2023		**TLM3**	CO3	1	
No. of classes required to complete UNIT-III		13			No. of classes taken:			

UNIT-IV : CONTROL OF SYNCHRONOUS MOTOR DRIVES

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.	Synchronous motors- variable frequency control	1	14-03-2023		**TLM1**	CO2	1	
48.	Operation of self controlled Synchronous motors-by VSI.	1	15-03-2023		**TLM1**	CO2	1	
49.	Operation of self controlled Synchronous motors-by CSI.	1	16-03-2023		**TLM1**	CO2	1	
50.	Operation of self controlled Synchronous motors-by Cyclo converters	1	17-03-2023		**TLM1**	CO2	1	
51.	TUTORIAL-9	1	20-03-2023		**TLM3**	CO2	1	
52.	Load commutated CSI fed Synchronous Motor	1	21-03-2023		**TLM1**	CO2	1	
53.	Closed Loop control operation of synchronous motor drives (Block Diagram Only)	1	23-03-2023		**TLM1**	CO2	1	
54.	problems	1	24-03-2023		**TLM1**	CO2	1	
55.	TUTORIAL-10	1	27-03-2023		**TLM3**	CO2	1	
56.	Assignment/Quiz-4	1	28-03-2023		**TLM6**	CO2	1	
57.	Repetition	1	29-03-2023		**TLM2**	CO2	1	
58.	No. of classes required to complete UNIT-IV	11			No. of classes taken:			

UNIT-V : CONTROL OF BLDC MOTOR DRIVES

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
59.	Principle of operation of BLDC machine	1	31-03-2023		**TLM1**	CO4	1	
60.	TUTORIAL-11	1	03-04-2023		**TLM3**	CO4	1	

61.	Sensing and logic switching scheme	1	04-04-2023		**TLM1**	CO4	1	
62.	BLDM a variable speed SM	1	06-04-2023		**TLM1**	CO4	1	
63.	TUTORIAL-12	1	10-04-2023		**TLM3**	CO4	1	
64.	Methods of redusing torque pulations	1	11-04-2023		**TLM1**	CO4	1	
65.	Three phase full wave BLDC motor	1	12-04-2023		**TLM1**	CO4	1	
66.	Sinusoidal shape of BLDC motor	1	13-04-2023		**TLM1**	CO4	1	
67.	TUTORIAL-13	1	17-04-2023		**TLM3**	CO4	1	
68.	Current controlled BLDC motor servo drive	1	18-04-2023		**TLM1**	CO4	1	
69.	problems	1	19-04-2023		**TLM1**	CO4	1	
70.	Assignment/Quiz-4	1	20-04-2023		**TLM6**	CO4	1	
71.	Repetition	1	21-04-2023		**TLM1**	CO4	1	
72.	TUTORIAL-14	1	24-04-2023		**TLM3**	CO4	1	
73.	Repetition	1	25-04-2023		**TLM2**	CO4	1	
74.	Repetition	1	26-04-2023		**TLM2**	CO4	1	
75.	Repetition	1	27-04-2023		**TLM2**	CO4	1	
76.	Repetition	1	28-04-2023		**TLM2**	CO4	1	
No. of classes required to complete UNIT-V		13			No. of classes taken:			
II-MID EXAMINATIONS(24/04/2023 TO 29/04/2023)								

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
77.								
78.								
79.								

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:

Evaluation Task	COs	Marks
Assignment-1	1	A1=5
Assignment-2	2	A2=5
I-Mid Examination	1,2	B1=20
Quiz Marks-1	1,2	C1=10
Assignment-3	3	A3=5
Assignment-4	4	A4=5
Assignment-5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Quiz Marks-2	3,4,5	C2=10
Evaluation of Assignment/Quiz Marks: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Evaluation of Quiz Marks: B=75% of Max(C1,C2)+25% of Min(C1,C2)	1,2,3,4,5	C=10
Attendance		D=5
Cumulative Internal Examination : A+B+C+D	**1,2,3,4,5**	**A+B+C+D=40**
Semester End Examinations	**1,2,3,4,5**	**E=60**
Total Marks: A+B+C+D+E	**1,2,3,4,5**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)
PROGRAMME OUTCOMES (POs)
PSOs

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

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi, NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : **Solid State Drives** - 20EE19

L-T-P STRUCTURE : **2**-1-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : **G.Tabita**

COURSE COORDINATOR : **P.Deepak Reddy**

PRE-REQUISITES: Power Electronics, Electrical Machines-I & Electrical Machines-II.

COURSE EDUCATIONAL OBJECTIVE: This course is an extension of power electronics applications to electrical drives. It converts in detail the basic and advanced speed control techniques using power electronic converters that are used in industry. It is equally important to understand to four quadrant operation of electrical drives and slip power recovery schemes in induction motors.

COURSE OUTCOMES(COs)

At the end of the course, the student will be able to

CO1: Examine the performance of dc motor drive by rectifier and chopper control method. (Apply-L3)

CO2: Understand the controlling mechanisms for squirrel cage induction motor and synchronous motors. (Understand-L2)

CO3: Analyze the slip power recovery schemes for wound rotor induction motor. (Apply-L3)

CO4: Analyze the BLDC motor drives. (Apply-L3)

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

COs	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	PSOa	PSOb	PSOc	PSOd
CO1	3	3	-	-	3	-	-	-	-	-	-	1	-	3		-
CO2	3	3	-	3	3	-	-	-	-	-	-	-	-	3		2
CO3	3	3	-	3	3	-	-	-	-	-	-	-	-	3		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).

BOS APPROVED TEXT BOOKS:

T1 G.K.Dubey, "Power Semi Conductor Dives", Prentice Hall, 1988

T2 B.K.Bose, "Modern Power Electronics and AC drives", PHI learning pvt ltd, 2005

BOS APPROVED REFERENCE BOOKS:

R1 Vedam Subramanyam, "Thyristor control of Electric Drives" Tata McGraw Hill Publications.

R2 S K Pillai, "A first course on Electrical Drives", New age International(P) ltd. 3rd Edition.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : RECTIFIER & CHOPPER CONTROLLED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Subject & Course Outcomes	1	26-12-2022		**TLM1**	CO1	1	
2.	UNIT-I, Significance of variable speed drives	1	27-12-2022		**TLM1**	CO1	1	
3.	Single-phase fully controlled rectifier fed separately excited DC motor	1	28-12-2022		**TLM1**	CO1	1	
4.	Single-phase semi controlled rectifier fed separately excited DC motor	1	29-12-2022		**TLM1**	CO1	1	
5.	Three-phase, fully controlled rectifier fed separately excited DC motor	1	30-12-2022		**TLM1**	CO1	1	
6.	TUTORIAL-1	1	02-01-2023		**TLM3**	CO1	1	
7.	Three-phase, semi controlled rectifier fed separately excited DC motor	1	03-01-2023		**TLM1**	CO1	1	
8.	Single-phase fully controlled rectifier fed DC series motor	1	04-01-2023		**TLM1**	CO1	1	
9.	Single-phase semi controlled rectifier fed DC series motor	1	05-01-2023		**TLM1**	CO1	1	
10.	Three-phase, fully controlled rectifier fed DC series motor	1	06-01-2023		**TLM1**	CO1	1	
11.	TUTORIAL-2	1	09-01-2023		**TLM3**	CO1	1	
12.	Three-phase, semi controlled rectifier fed DC series motor	1	10-01-2023		**TLM1**	CO1	1	
13.	Problems	1	11-01-2023		**TLM1**	CO1	1	

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
14.	Principle of operation and control techniques	1	12-01-2023		**TLM1**	CO1	1	
15.	motoring operation of separately excited dc motor	1	18-01-2023		**TLM1**	CO1	1	
16.	motoring operation of dc series motor	1	19-01-2023		**TLM1**	CO1	1	
17.	regenerative braking of separately excited dc motor and dc series motor	1	20-01-2023		**TLM1**	CO1	1	
18.	TUTORIAL-3	1	23-01-2023		**TLM3**	CO1	1	
19.	dynamic braking of separately excited dc motor and dc series motor	1	24-01-2023		**TLM1**	CO1	1	

20.	plugging of separately excited dc motor and dc series motor	1	25-01-2023		**TLM1**	CO1	1	
21.	multi quadrant control of chopper fed dc motors	1	27-01-2023		**TLM1**	CO1	1	
22.	TUTORIAL-4	1	30-01-2023		**TLM3**	CO1	1	
23.	problems	1	31-01-2023		**TLM1**	CO1	1	
No. of classes required to complete UNIT-I		23			No. of classes taken:			

UNIT-II : CONTROL OF INDUCTION MOTOR DRIVES

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
24.	Stator voltage control of Induction Motor	1	01-02-2023		**TLM1**	CO2	2	
25.	Stator frequency control-Open loop V/f control of Induction Motor	1	02-02-2023		**TLM1**	CO2	2	
26.	Control of Induction motor by ac voltage controller	1	03-02-2023		**TLM1**	CO2	2	
27.	Control of induction motor by voltage source Inverter	1	06-02-2023		**TLM1**	CO2	2	
28.	Control of induction motor by current source Inverter	1	07-02-2023		**TLM1**	CO2	2	
29.	Control of induction motor by cyclo converter	1	08-02-2023		**TLM1**	CO2	2	
30.	Comparison of voltage source and current source inverter drives	1	09-02-2023		**TLM1**	CO2	2	
31.	problems	1	10-02-2023		**TLM1**	CO2	2	
32.	TUTORIAL-5	1	13-02-2023		**TLM3**	CO2	2	
33.	problems	1	14-02-2023		**TLM1**	CO2	2	
No. of classes required to complete UNIT-II		10			No. of classes taken:			

UNIT-III : SLIP POWER CONTROLLED WOUND ROTOR INDUCTION MOTOR DRIVES

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
34.	Static rotor resistance control	1	15-02-2023		**TLM1**	CO3	1	
35.	Slip-power recovery schemes	1	16-02-2023		**TLM1**	CO3	1	
36.	Static Scherbius, Phasor diagram	1	17-02-2023		**TLM1**	CO3	1	
I-MID EXAMINATIONS(20/02/2023 TO 25/02/2023)								
37.	Static Kramer drive, Phasor diagram	1	27-02-2023		**TLM1**	CO3	1	
38.	TUTORIAL-6	1	28-02-2023		**TLM3**	CO3	1	

39.	Closed loop speed control of Static Scherbius drive	1	01-03-2023		**TLM1**	CO3	1	
40.	Modes of operation of Static Scherbius	1	02-03-2023		**TLM1**	CO3	1	
41.	Problems, Applications	1	03-03-2023		**TLM1**	CO3	1	
42.	Problems	1	06-03-2023		**TLM1**	CO3	1	
43.	TUTORIAL-7	1	07-03-2023		**TLM3**	CO3	1	
44.	Repetition	1	09-03-2023		**TLM2**	CO3	1	
45.	Assignment/Quiz-4	1	10-03-2023		**TLM6**	CO3	1	
46.	TUTORIAL-8	1	13-03-2023		**TLM3**	CO3	1	
No. of classes required to complete UNIT-III		13			No. of classes taken:			

UNIT-IV : CONTROL OF SYNCHRONOUS MOTOR DRIVES

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.	Synchronous motors- variable frequency control	1	14-03-2023		**TLM1**	CO2	1	
48.	Operation of self controlled Synchronous motors-by VSI.	1	15-03-2023		**TLM1**	CO2	1	
49.	Operation of self controlled Synchronous motors-by CSI.	1	16-03-2023		**TLM1**	CO2	1	
50.	Operation of self controlled Synchronous motors-by Cyclo converters	1	17-03-2023		**TLM1**	CO2	1	
51.	TUTORIAL-9	1	20-03-2023		**TLM3**	CO2	1	
52.	Load commutated CSI fed Synchronous Motor	1	21-03-2023		**TLM1**	CO2	1	
53.	Closed Loop control operation of synchronous motor drives (Block Diagram Only)	1	23-03-2023		**TLM1**	CO2	1	
54.	problems	1	24-03-2023		**TLM1**	CO2	1	
55.	TUTORIAL-10	1	27-03-2023		**TLM3**	CO2	1	
56.	Assignment/Quiz-4	1	28-03-2023		**TLM6**	CO2	1	
57.	Repetition	1	29-03-2023		**TLM2**	CO2	1	
58.	No. of classes required to complete UNIT-IV	11			No. of classes taken:			

UNIT-V : CONTROL OF BLDC MOTOR DRIVES

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
59.	Principle of operation of BLDC machine	1	31-03-2023		**TLM1**	CO4	1	
60.	TUTORIAL-11	1	03-04-2023		**TLM3**	CO4	1	

61.	Sensing and logic switching scheme	1	05-04-2023		**TLM1**	CO4	1	
62.	BLDM a variable speed SM	1	06-04-2023		**TLM1**	CO4	1	
63.	TUTORIAL-12	1	10-04-2023		**TLM3**	CO4	1	
64.	Methods of redusing torque pulations	1	11-04-2023		**TLM1**	CO4	1	
65.	Three phase full wave BLDC motor	1	12-04-2023		**TLM1**	CO4	1	
66.	Sinusoidal shape of BLDC motor	1	13-04-2023		**TLM1**	CO4	1	
67.	TUTORIAL-13	1	17-04-2023		**TLM3**	CO4	1	
68.	Current controlled BLDC motor servo drive	1	18-04-2023		**TLM1**	CO4	1	
69.	problems	1	19-04-2023		**TLM1**	CO4	1	
70.	Assignment/Quiz-4	1	20-04-2023		**TLM6**	CO4	1	
71.	TUTORIAL-14	1	21-04-2023		**TLM1**	CO4	1	
No. of classes required to complete UNIT-V		13			No. of classes taken:			
II-MID EXAMINATIONS(24/04/2023 TO 29/04/2023)								

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
72.								
73.								
74.								

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:

Evaluation Task	**COs**	**Marks**
Assignment-1	1	A1=5

Assignment-2	2	A2=5
I-Mid Examination	1,2	B1=20
Quiz Marks-1	1,2	C1=10
Assignment-3	3	A3=5
Assignment-4	4	A4=5
Assignment-5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Quiz Marks-2	3,4,5	C2=10
Evaluation of Assignment/Quiz Marks: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Evaluation of Quiz Marks: B=75% of Max(C1,C2)+25% of Min(C1,C2)	1,2,3,4,5	C=10
Attendance		D=5
Cumulative Internal Examination : A+B+C+D	**1,2,3,4,5**	**A+B+C+D=40**
Semester End Examinations	**1,2,3,4,5**	**E=60**
Total Marks: A+B+C+D+E	**1,2,3,4,5**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)
PROGRAMME OUTCOMES (POs)
PSOs

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
L.B. Reddy Nagar, Mylavaram-521 230. Andhra Pradesh, INDIA
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
NAAC Accredited with "A grade, 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

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : Basic Microprocessors & Microcontrollers – 20EE20

L-T-P STRUCTURE : 3-0-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : Dr J.Sivavara Prasad

COURSE COORDINATOR : Dr J.Sivavara Prasad

PRE-REQUISITE: Digital Electronics

COURSE OBJECTIVE : The objective of the Microprocessor and Microcontrollers is to familiarize with the architecture of 8086 processor, assembling language programming and interfacing with various modules. Microcontroller concepts help the student to do any type of industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.

COURSE OUTCOMES (CO)

CO1	Understand the architecture and operation of 8086 microprocessor & 8051 microcontroller
CO2	Apply the instructions of 8086/8051 for various applications
CO3	Analyze the operation of peripherals and devices for different applications
CO4	Develop a system by interfacing memory, peripherals and I/O devices to 8086/8051

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CO2	2	3	-	-	2	-	-	-	-	-	-	-	-	-	-	
CO3	3	-	3	-	-	-	-	-	-	-	-	-	-	3	-	
CO4	2	3	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 Douglas V. Hall, "Micro Processors & Interfacing", TMH, 2007.

T2 A. K. Ray and K.M. Bhurchandi, Advanced Microprocessor And Peripherals,2nd Edition TMH Publishers.

T3 Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. Mckinlay

"Microcontrollers and Embedded System", Pearson Education Publishers, 2nd Edition

BOS APPROVED REFERENCE BOOKS:

R1 Raj Kamal, Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson Education Publishers.

R2 J. K. Uffenbeck, "The 8088 and 8086 Micro Processors", PHI, 4th Edition, 2003.

R3 Ajay Deshmukh, "Micro Controllers-Theory and Applications", Tata McGraw Hill Publishers.

R4 Kenneth J. Ayala, "The 8051 Micro Controller", Cengage Learning Publishers, 3rd Edition, 2000.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : Microprocessor Architecture & Instruction Set

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Subject	1	26-12-22		TLM1	CO1	A.K.Ray	
2.	Course Outcomes							
3.	Introduction to UNIT-I							
4.	Micro computer based system	1	28-12-22		TLM1	CO1	A.K.Ray	
5.	8086 Block diagram	1	29-12-22		TLM1	CO1	A.K.Ray	
6.	Register organization	1	31-12-22		TLM1	CO1	A.K.Ray	
7.	Addressing Modes of 8086	1	02-01-23		TLM1	CO1	A.K.Ray	
8.	Instruction set of 8086	1	04-01-23		TLM1	CO2	A.K.Ray	
9.	ALP for arithmetic operations	1	05-01-23		TLM4 TLM5	CO2	A.K.Ray	
10.	ALP for logical operations	1	07-01-23		TLM4 TLM5	CO2	A.K.Ray	
11.	ALP for string operations	1	09-01-23		TLM4 TLM5	CO2	A.K.Ray	
12.	Assembly Directives and Macro's	1	11-01-23		TLM1	CO2	A.K.Ray	
13.	Simple Programs using Assembler	1	12-01-23		TLM4 TLM5	CO2	A.K.Ray	
No. of classes required to complete UNIT-I: 11					No. of classes taken:			

UNIT-II : 8086 Memory and I/O Interfacing

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Pin diagram of 8086	1	18-01-23		TLM1	CO1	A.K.Ray	

15.	Minimum mode operation of 8086	1	19-01-23		TLM1	CO1		
16.	Timing diagrams for Minimum mode	1	21-01-23		TLM1	CO1	A.K.Ray	
17.	Maximum mode operation of 8086	1	23-01-23		TLM1	CO1	A.K.Ray	
18.	Timing diagrams for Maximum mode	1	25-01-23		TLM1	CO1	A.K.Ray	
19.	Different memories	1	28-01-23		TLM1	CO3	A.K.Ray	
20.	8-bit Memory and I/O interfacing with 8086	1	30-01-23		TLM1	CO4	A.K.Ray	
21.	16-bit memory and I/O interfacing with 8086	1	01-02-23		TLM1	CO4	A.K.Ray	
22.	Interrupt structure, vector table, Interrupt service routines	1	02-02-23		TLM1	CO4	A.K.Ray	
No. of classes required to complete UNIT-II : 9					No. of classes taken:			

UNIT-III : Peripherals and Interfacing:

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
23.	Basic block diagram of 8255	1	04-02-23		TLM1	CO3	A.K.Ray	
24.	Signal description of 8255 and interfacing with 8086	2	06-02-23 08-02-23		TLM1 TLM8	CO4	A.K.Ray	
25.	A/D converter basic diagram Signal description and interfacing with 8086	1	09-02-23		TLM1	CO3	A.K.Ray	
26.	D/A converter basic diagram	1	13-02-23		TLM8	CO3	A.K.Ray	
27.	Signal description of D/A converter and interfacing with 8086	1	15-02-23		TLM1	CO4	A.K.Ray	
28.	Basic block diagram and signal description of 8257-DMA and interfacing with 8086	2	16-02-23 27-02-23		TLM1	CO3	A.K.Ray	
29.	Interfacing 8086 with key board	1	01-03-23		TLM1	CO4	A.K.Ray	

30.	Basic block diagram of 8259 and Cascaded connection of 8259 with 8086	2	03-03-23		TLM1	CO3	A.K.Ray	
No. of classes required to complete UNIT-III: **10**				No. of classes taken:				

UNIT-IV : Microcontrollers

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
31.	Architecture of 8051	1	06-03-23		TLM1	CO1	Muhammad Ali Mazidi	
32.	Register organization and I/O ports of 8051	1	10-03-23		TLM1	CO1	Muhammad Ali Mazidi	
33.	Memory Organization of 8051	1	12-03-23		TLM1	CO3	Muhammad Ali Mazidi	
34.	Addressing modes of 8051	1	13-03-23		TLM1	CO1	Muhammad Ali Mazidi	
35.	Instruction set of 8051	2	15-03-23 17-03-23		TLM1	CO2	Muhammad Ali Mazidi	
36.	Simple Programs using Stack Pointer	2	19-03-23 20-03-23		TLM1	CO2	Muhammad Ali Mazidi	
37.	Programs using 8051	2	24-03-23 26-03-23		TLM4 TLM1	CO2	Muhammad Ali Mazidi	
No. of classes required to complete UNIT-IV : 10				No. of classes taken:				

UNIT-V : 8051 Interfacing

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
38.	Modes of timer operation	2	27-03-23 29-03-23		TLM1	CO1	Muhammad Ali Mazidi	
39.	Serial port operation	1	01-04-23		TLM1	CO1	Muhammad Ali Mazidi	
40.	Interrupt structure of 8051	2	03-04-23 06-04-23		TLM1 TLM2	CO1	Muhammad Ali Mazidi	
41.	Interfacing seven segment	1	10-04-23		TLM2	CO4	Muhammad Ali Mazidi	

	display							
42.	Interfacing stepper motor	1	12-04-23		TLM2 TLM4	CO4	Muhammad Ali Mazidi	
43.	Interfacing serial/parallel printer	2	13-04-23 15-04-23		TLM2	CO4	Muhammad Ali Mazidi	
44.	Revision	2	17-04-23 19-04-23			-		
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
45.	Advanced microprocessors and microcontrollers	1	20-04-23		TLM2	CO1	1.A.K.Ray 2.Muhammad Ali Mazidi	

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I : Microprocessor Architecture & Instruction Set

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Subject	1	27-12-22		TLM1	CO1	A.K.Ray	
2.	Course Outcomes							
3.	Introduction to UNIT-I							
4.	Micro computer based system	1	28-12-22		TLM1	CO1	A.K.Ray	
5.	8086 Block diagram	1	29-12-22		TLM1	CO1	A.K.Ray	
6.	Register organization	1	30-12-22		TLM1	CO1	A.K.Ray	
7.	Addressing Modes of 8086	1	03-01-23		TLM1	CO1	A.K.Ray	
8.	Instruction set of 8086	1	04-01-23		TLM1	CO2	A.K.Ray	
9.	ALP for arithmetic operations	1	05-01-23		TLM4 TLM1	CO2	A.K.Ray	
10.	ALP for logical operations	1	06-01-23		TLM4 TLM1	CO2	A.K.Ray	
11.	ALP for string operations	1	10-01-23		TLM4 TLM1	CO2	A.K.Ray	
12.	Assembly Directives and	1	11-01-23		TLM1	CO2	A.K.Ray	

	Macro's							
13.	Simple Programs using Assembler	1	12-01-23		TLM4 TLM1	CO2	A.K.Ray	
No. of classes required to complete UNIT-I: 11					No. of classes taken:			

UNIT-II : 8086 Memory and I/O Interfacing

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Pin diagram of 8086	1	18-01-23		TLM1	CO1	A.K.Ray	
15.	Minimum mode operation of 8086	1	19-01-23		TLM1	CO1	A.K.Ray	
16.	Timing diagrams for Minimum mode	1	20-01-23		TLM1	CO1	A.K.Ray	
17.	Maximum mode operation of 8086	1	24-01-23		TLM1	CO1	A.K.Ray	
18.	Timing diagrams for Maximum mode	1	25-01-23		TLM1	CO1	A.K.Ray	
19.	Different memories	1	27-01-23		TLM1	CO3	A.K.Ray	
20.	8-bit Memory and I/O interfacing with 8086	1	31-01-23		TLM1	CO4	A.K.Ray	
21.	16-bit memory and I/O interfacing with 8086	1	01-02-23		TLM1	CO4	A.K.Ray	
22.	Interrupt structure, vector table, Interrupt service routines	1	02-02-23		TLM1	CO4	A.K.Ray	
No. of classes required to complete UNIT-II : 9					No. of classes taken:			

UNIT-III : Peripherals and Interfacing:

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
23.	Basic block diagram of 8255	1	03-02-23		TLM1	CO3	A.K.Ray	
24.	Signal description of 8255 and interfacing with 8086	2	07-02-23 08-02-23		TLM1 TLM2	CO4	A.K.Ray	
25.	A/D converter basic diagram Signal description and interfacing with 8086	1	09-02-23		TLM1	CO3	A.K.Ray	
26.	D/A converter basic diagram	1	10-02-23		TLM2	CO3	A.K.Ray	
27.	Signal description of D/A converter	2	14-02-23 15-02-23		TLM1	CO4	A.K.Ray	

	and interfacing with 8086							
28.	Basic block diagram and signal description of 8257-DMA and interfacing with 8086	2	16-02-23 17-02-23		TLM1	CO3	A.K.Ray	
29.	Interfacing 8086 with key board	1	28-02-23		TLM1	CO4	A.K.Ray	
30.	Basic block diagram of 8259 and Cascaded connection of 8259 with 8086	2	01-03-23 02-03-23		TLM1	CO3	A.K.Ray	
No. of classes required to complete UNIT-III: **11**				No. of classes taken:				

UNIT-IV : Microcontrollers

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
31.	Architecture of 8051	1	03-03-23		TLM1	CO1	Muhammad Ali Mazidi	
32.	Register organization and I/O ports of 8051	1	07-03-23		TLM1	CO1	Muhammad Ali Mazidi	
33.	Memory Organization of 8051	1	09-03-23		TLM1	CO3	Muhammad Ali Mazidi	
34.	Addressing modes of 8051	1	10-03-23		TLM1	CO1	Muhammad Ali Mazidi	
35.	Instruction set of 8051	2	14-03-23 15-03-23		TLM1	CO2	Muhammad Ali Mazidi	
36.	Simple Programs using Stack Pointer	2	16-03-23 17-03-23		TLM4	CO2	Muhammad Ali Mazidi	
37.	Programs using 8051	2	21-03-23 23-03-23		TLM4 TLM1	CO2	Muhammad Ali Mazidi	
No. of classes required to complete UNIT-IV : 10				No. of classes taken:				

UNIT-V : 8051 Interfacing

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
38.	Modes of timer operation	2	24-03-23 28-03-23		TLM1	CO1	Muhammad Ali Mazidi	

39.	Serial port operation	1	29-03-23		TLM1	CO1	Muhammad Ali Mazidi	
40.	Interrupt structure of 8051	2	31-03-23 04-04-23		TLM1 TLM2	CO1	Muhammad Ali Mazidi	
41.	Interfacing seven segment display	1	06-04-23		TLM2	CO4	Muhammad Ali Mazidi	
42.	Interfacing stepper motor	1	11-04-23		TLM2 TLM4	CO4	Muhammad Ali Mazidi	
43.	Interfacing serial/parallel printer	2	12-04-23 13-04-23		TLM2	CO4	Muhammad Ali Mazidi	
44.	Revision	2	18-04-23 19-04-23			-	-	
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
45.	Advanced microprocessors and microcontrollers	2	20-04-23 21-04-23		TLM2	CO1	1.A.K.Ray 2.Muhammad Ali Mazidi	

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

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PART-A

Name of Course Instructor: T.Nagadurga
Course Name & Code : Classical and Heuristic Optimization Techniques-20EE22
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech., VI-Sem., EEE – A section
A.Y.: 2022-23

PREREQUISITE: Differential Equations, Linear algebra and Transformation Techniques

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to understand the need of constrained decision –making problems.

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

CO1	Solve various constrained and unconstrained problems in single variable as well as multivariable (**Apply-L3**)
CO2	Apply the concept of optimally criteria for various types of optimization problems(**Apply-L3)**
CO3	Interpret non-traditional optimization techniques (**Understand-L2**)
CO4	Identify a suitable technique to solve a particular engineering problem(**Apply-L3**)

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

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

TEXTBOOKS:

T1.S.S Rao, " Engineering Optimization-Theory and Practice" , John Wiley & Sons,5th edition 2019.

T2. KWang Y.Lee , Mohamed A.E1-Sharkawi , " Modern Heuristic Optimization Teechniques-Theory and Application to power systems" John Wiley & Sons,2008.

REFERENCE BOOKS:

R1: K.V. Mittal and C Mohan, "Optimization Methods in Operations Research and Systems Analysis", New Age International Publishers, New Delhi,3rd edition 2005.

R2: Kalyanmoy Deb, "Optimization for Engineering Design - Algorithms and Examples", PHI Learning Private Ltd, New Delhi, 2 ndedition,2012.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: INTRODUCTION TO OPTIMIZATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	27-12-2022		TLM1	
2.	Overview of optimization problem	1	29-12-2022		TLM1	
3.	Concepts and terms related to optimization	1	30-12-22		TLM1	
4.	Necessary and sufficient conditions for a multivariable function	1	31-12-22		TLM1	
5.	Necessary and sufficient conditions for a multivariable function	1	3-1-23		TLM1	
6.	Effects of scaling or adding a constant to an objective function	1	5-1-23		TLM1	
7.	Understanding of constrained and unconstrained optimization problems	1	6-1-23		TLM1	
8.	Local & global optima	1	7-1-23		TLM1	
9.	Properties of convex function	1	10-1-23		TLM1	
10.	Definiteness of a matrix	1	12-1-23		TLM1	
11.	Test for concavity	1	19-1-23		TLM1	

	of a function					
12.	Numerical examples.	1	20-1-23		TLM3	
No. of classes required to complete UNIT-I		12				

UNIT-II : LINEAR PROGRAMMING (LP)

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.	Simplex method	1	21-1-23		TLM1	
14.	Simplex method	1	24-1-23		TLM1	
15.	matrix form of simplex method	1	26-1-23		TLM1	
16.	solution of linear programming problems in tabular form via simplex method	1	27-1-23		TLM1	
17.	solution of linear programming problems in tabular form via simplex method	1	27-1-23		TLM1	
18.	Two-Phase simplex method	1	28-1-23		TLM1	
19.	Two-Phase simplex method	1	2-2-23		TLM1	
20.	Duality in simplex method	1	3-2-23		TLM1	
21.	Sensitivity analysis	1	7-2-23		TLM2	
22.	Sensitivity analysis	1	9-2-23		TLM1	
23.	Numerical examples.	1	10-2-23		TLM3	
24.	Numerical examples.	1	11-2-23		TLM3	
No. of classes required to complete UNIT-II		12				

UNIT-III : NON-LINEAR PROGRAMMING-I

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Lagrange multipliers	1	14-2-23		TLM1	
26.	Gradient descent method	1	16-2-23		TLM1	
27.	Gradient descent method	1	17-2-23		TLM1	
28.	Steepest descent method	1	18-2-23		TLM1	
29.	MID-I Exams	1	21-2-23			
30.	MID-I Exams	1	23-2-23			
31.	MID-I Exams	1	24-2-23			
32.	MID-I Exams	1	25-2-23			

33.	Steepest descent method	1	28-2-23		TLM1	
34.	Newton's method	1	2-3-23		TLM1	
35.	Newton's method	1	3-3-23		TLM1	
36.	Davison-Fletcher-Powell method	1	4-3-23		TLM1	
37.	Davison-Fletcher-Powell method	1	7-3-23		TLM1	
38.	Exterior point method	1	9-3-23		TLM1	
39.	Exterior point method	1	10-3-23		TLM1	
40.	Numerical examples.	1	11-3-23		TLM1	
41.	Numerical examples.	1	14-3-23		TLM1	
No. of classes required to complete UNIT-III		13				

UNIT-IV : NON-LINEAR PROGRAMMING-II

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Karush-Kuhn-Tucker (KKT) conditions	1	16-3-23		TLM1	
43.	Karush-Kuhn-Tucker (KKT) conditions	1	17-3-23		TLM1	
44.	Convex optimization	1	18-3-23		TLM1	
45.	Quadratic optimization	1	21-3-23		TLM1	
46.	Numerical examples	1	23-3-23		TLM1	
47.	Dynamic programming	1	24-3-23		TLM1	
48.	Dynamic programming	1	25-3-23		TLM2	
49.	Principle of optimality	1	28-3-23		TLM1	
50.	Concept of optimal control	1	30-3-23		TLM1	
51.	Mathematical formulation of problem	1	31-3-23		TLM1	
52.	Numerical examples	1	4-4-23		TLM3	
53.	Numerical examples	1	6-4-23		TLM3	
No. of classes required to complete UNIT-IV		12				

UNIT-V: HEURISTIC METHODS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
54.	Introduction	1	7-4-23		TLM1	
55.	Modern heuristic search techniques	1	8-4-23		TLM1	
56.	Introduction to genetic algorithms	1	11-4-23		TLM1	

57.	Encoding	1	13-4-23		TLM1	
58.	Fitness function	1	14-4-23		TLM1	
59.	Basic operators	1	15-4-23		TLM2	
60.	Introduction to particle swarm optimization	1	18-4-23		TLM2	
61.	Variations of particle swarm optimization-discrete PSO	1	20-4-23		TLM2	
62.	Variations of particle swarm optimization-discrete PSO	1	21-4-23		TLM2	
No. of classes required to complete UNIT-V		9				

CONTENT BEYOND SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods
1	Introduction to cat swarm optimization	1	22-4-23		TLM2

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

PART-C

EVALUATION PROCESS (R17 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 modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the 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.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO4	Design controllers for electrical and electronic systems to improve their performance.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	T.Nagadurga	T.Nagadurga	Dr.M.S.Giridhar	Dr.J.S.Vara 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 AND ELECTRONICS ENGINEERING

PART-A

Name of Course Instructor: Imran Abdul
Course Name & Code : Classical and Heuristic Optimization Techniques-20EE22
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech., VI-Sem., EEE – B section
A.Y.: : 2022-23

PREREQUISITE: Differential Equations, Linear algebra and Transformation Techniques

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to understand the need of constrained decision –making problems.

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

CO1	Solve various constrained and unconstrained problems in single variable as well as multivariable (**Apply-L3**)
CO2	Apply the concept of optimally criteria for various types of optimization problems(**Apply-L3)**
CO3	Interpret non-traditional optimization techniques (**Understand-L2**)
CO4	Identify a suitable technique to solve a particular engineering problem(**Apply-L3**)

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

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

TEXTBOOKS:

T1.S.S Rao, " Engineering Optimization-Theory and Practice" , John Wiley & Sons,5th edition 2019.

T2. KWang Y.Lee , Mohamed A.E1-Sharkawi , " Modern Heuristic Optimization Teechniques-Theory and Application to power systems" John Wiley & Sons,2008.

REFERENCE BOOKS:

R1: K.V. Mittal and C Mohan, "Optimization Methods in Operations Research and Systems Analysis", New Age International Publishers, New Delhi,3rd edition 2005.

R2: Kalyanmoy Deb, "Optimization for Engineering Design - Algorithms and Examples", PHI Learning Private Ltd, New Delhi, 2 ndedition,2012.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - A

UNIT-I: INTRODUCTION TO OPTIMIZATION

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, Over View of optimization Problem	1	26-12-2022		TLM1	
2.	Concepts and terms related to optimization	1	28-12-2022		TLM1	
3.	Necessary and sufficient conditions for a multivariable function	1	30-12-2022		TLM1	
4.	Necessary and sufficient conditions for a multivariable function	1	31-12-2022		TLM1	
5.	Effects of scaling or adding a constant to an objective function,	1	02-01-2023		TLM1	
6.	Understanding of constrained and unconstrained optimization problems	1	04-01-2023		TLM1	
7.	Local & global optima	1	06-01-2023		TLM1	
8.	Properties of convex function, Definiteness of a matrix	1	07-01-2023		TLM1	
9.	Test for concavity of a Function	1	09-01-2023		TLM1	

10.	Numerical examples.	1	11-01-2023		TLM1	
No. of classes required to complete UNIT-I		10				

UNIT-II : LINEAR PROGRAMMING (LP)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11	Simplex method	1	20-01-2023		TLM1	
12	Simplex method	1	21-01-2023		TLM1	
13	matrix form of simplex method	1	23-01-2023		TLM1	
14	solution of linear programming problems in tabular form via simplex method	1	25-01-2023		TLM1	
15	solution of linear programming problems in tabular form via simplex method	1	27-01-2023		TLM1	
16	Two-Phase simplex method	1	28-01-2023		TLM1	
17	Two-Phase simplex method	1	30-01-2023		TLM1	
18	Duality in simplex method	1	01-02-2023		TLM1	
19	Sensitivity analysis	1	03-02-2023		TLM2	
20	Numerical examples.	1	04-02-2023		TLM3	
21	Numerical examples.	1	06-02-2023		TLM3	
No. of classes required to complete UNIT-II		11				

UNIT-III : NON-LINEAR PROGRAMMING-I

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22	Lagrange multipliers	1	08-02-2023		TLM1	
23	Gradient descent method	1	10-02-2023		TLM1	
25	Steepest descent method	1	13-02-2023		TLM1	
26.	Newton's method	1	15-02-2023		TLM1	
27.	Newton's method	1	17-02-2023		TLM1	
29.	Davison-Fletcher-Powell method	1	18-02-2023		TLM1	
30.	Exterior point method	1	27-02-2023		TLM1	
31	Exterior point method	1	01-03-2023		TLM1	
32	Numerical examples.	1	03-03-2023		TLM1	
33.	Numerical examples.	1	04-03-2023		TLM1	
No. of classes required to		11				

complete UNIT-III					

UNIT-IV : NON-LINEAR PROGRAMMING-II

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34	Karush-Kuhn-Tucker (KKT) conditions	1	10-03-2023		TLM1	
35	Karush-Kuhn-Tucker (KKT) conditions	1	13-03-2023		TLM1	
36	Convex optimization	1	15-03-2023		TLM1	
37	Quadratic optimization	1	17-03-2023		TLM1	
38	Numerical examples	1	18-03-2023		TLM1	
39	Dynamic programming	1	20-03-2023		TLM1	
40	Dynamic programming	1	24-03-2023		TLM2	
41	Principle of optimality	1	25-03-2023		TLM1	
42	Concept of optimal control	1	27-03-2023		TLM1	
43	Mathematical formulation of Optimal problem	1	29-03-2023		TLM1	
44	Numerical examples	1	31-03-2023		TLM3	
No. of classes required to complete UNIT-IV		11				

UNIT-V: HEURISTIC METHODS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45	Introduction	1	01-04-2023		TLM1	
46	Modern heuristic search techniques	1	03-04-2023		TLM1	
47	Introduction to genetic algorithms	1	05-04-2023		TLM1	
48	Encoding	1	10-04-2023		TLM1	
49	Fitness function	1	12-04-2023		TLM1	
50	Basic operators	1	15-04-2023		TLM2	
51	Introduction to particle swarm optimization	1	17-04-2023		TLM2	
52	Variations of particle swarm optimization-discrete PSO	1	19-04-2023		TLM2	
53	Variations of particle swarm optimization-discrete PSO	1	21-04-2023		TLM2	
No. of classes required to complete UNIT-V		9				

CONTENT BEYOND SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods
1	Introduction to cat swarm optimization	1	22-4-23		TLM2

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

PART-C

EVALUATION PROCESS (R17 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 modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable

	development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the 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.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO 2	Design and analyze electrical machines, modern drive and lighting systems
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO4	Design controllers for electrical and electronic systems to improve their performance.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Imran Abdul**	**T.Nagadurga**		Dr.J.S.Vara Prasad
Signature				

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COURSE HANDOUT
PART-A

Name of Course Instructor: KATTUPALLI SUDHAKAR
Course Name &Code: INTRODUCTION TO DATA SCIENCE (20AD82)
L-T-P Structure: 3-0-0 **Credits:** 3
Program/Sem/Sec: B.Tech / III /SEC-A **A.Y.:** 2022-23
PREREQUISITE: Problem Solving Skills

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Identify basic building blocks of python to solve mathematical problems. **(Understand- L2)**
CO2	Describe the key concepts in data science.**(Remember– L1)**
CO3	Enumerate the fundamentals of NumPy. (**Understand – L2)**
CO4	Demonstrate the fundamentals of Pandas. (**Understand – L2)**
CO5	Demonstrate data analysis, manipulation and visualization of data using Python libraries. (**Apply L-3)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO2	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO3	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO4	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO5	3	1	2	-	3	-	-	-	-	1		1	3	2	3

1 - Low **2 –**Medium **3 –**High

TEXTBOOKS:

1. Wes McKinney, "Python for Data Analysis", O'Reilly, ISBN: 978-1-449-31979- 3, 1st edition, October 2012.
2. Richard Schutt & O'Neil, "Doing Data Science", O'Reilly, ISBN 978-1-449- 35865-5, 1st edition, October 2013.
3. Python For Data Analysis (O Reilly, Wes McKinney)

REFERENCE BOOKS:

1. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education
2. Joel Grus, Science from Scratch: First Principles with Python", O'Reilly Media, 2015
3. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization", O'Reilly, 2016.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Introduction to Data Science (20AD82)

UNIT-I: Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements. Strings: Creating strings and basic operations on strings, string testing methods. Lists, Dictionaries, Tuples.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Unit 1: Introduction to Python	1	26.12.2022	26.12.2022	TLM1	
2.	Features of Python, Data Types	1	27.12.2022	27.12.2022	TLM1	
3.	Operators, Input and Output	1	28.12.2022	28.12.2022	TLM1	
4.	Control Statements	1	30.12.2022	30.12.2022	TLM1	
5.	Strings: Creating Strings and Basic Operations on Strings	1	02.01.2023	02.01.2023	TLM1	
6.	String Testing Methods	1	03.01.2023	03.01.2023	TLM1	
7.	Lists: Operations and Examples	1	04.01.2023	04.01.2023	TLM1	
8.	Tuple: Operations and Examples	1	05.01.2023	05.01.2023	TLM1	
9.	Sets: Operations and Examples	1	09.01.2023	09.01.2023	TLM1	
10.	Dictionaries: Operations and Examples	1	10.01.2023	10.01.2023	TLM1	
11.	Python Programming Lab Practice	1	11.01.2023	11.01.2023	TLM1	
12.	Summary and Notes	1	18.01.2023	18.01.2023	TLM1	
No. of classes required to complete UNIT-I: 12				**No. of classes taken: 12**		

UNIT-II: What is Data science? Data Science life cycle, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

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.	What is Data science? Introduction	1	23.01.2023	23.01.2023	TLM2	
14.	Data Science life cycle	1	24.01.2023	24.01.2023	TLM2	
15.	Data Science life cycle	1	25.01.2023	25.01.2023	TLM2	
16.	Datafication	1	27.01.2023	27.01.2023	TLM2	
17.	Exploratory Data Analysis	1	28.01.2023	28.01.2023	TLM2	
18.	Exploratory Data Analysis	1	30.01.2023	30.01.2023	TLM2	
19.	The Data science process	1	31.01.2023	31.01.2023	TLM2	
20.	A data scientist role in this process	1	01.02.2023	01.02.2023	TLM2	
21.	Summary & Notes	1	03.02.2023	03.02.2023	TLM2	
No. of classes required to complete UNIT-I: 09					**No. of classes taken: 09**	

UNIT-III: NumPy Basics: The NumPy ndarray: A Multidimensional Array Object, creating ndarrays, Data Types for ndarrays, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays Sorting, Unique.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	NumPy Basics: The NumPy ndarray:	1	06.02.2023	06.02.2023	TLM2	
23.	A Multidimensional Array Object,	1	07.02.2023	07.02.2023	TLM2	
24.	Creating ndarrays	1	08.02.2023	08.02.2023	TLM2	
25.	Data Types for ndarrays	1	10.02.2023	10.02.2023	TLM2	
26.	Basic Indexing and Slicing	1	27.02.2023	27.02.2023	TLM2	
27.	Boolean Indexing, Fancy Indexing	1	28.02.202	28.02.202	TLM2	
28.	Expressing Conditional Logic as Array Operations	1	01.03.2023	01.03.2023	TLM2	
29.	Methods for Boolean Arrays Sorting	1	03.03.2023	03.03.2023	TLM2	
30.	Unique.	1	06.03.2023	06.03.2023	TLM2	
31.	Summary and Notes	1	07.03.2023	07.03.2023	TLM2	
No. of classes required to complete UNIT-III: 10				**No. of classes: 10**		

UNIT-IV: Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Re indexing, dropping entries from an axis, Indexing & selection, and filtering.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching L earning Methods	HOD Sign Weekly
32.	Getting Started with pandas: Introduction to pandas	1	08.03.2023	08.03.2023	TLM2	
33.	Library Architecture, Features,	1	10.03.2023	10.03.2023	TLM2	
34.	Applications, Data Structures,	1	13.03.2023	13.03.2023	TLM2	
35.	Series, Data Frame,	1	14.03.2023	14.03.2023	TLM2	
36.	Index Objects, Essential Functionality Re indexing,	1	15.03.2023	15.03.2023	TLM2	
37.	Dropping entries from an axis	1	17.03.2023	17.03.2023	TLM2	
38.	Indexing & selection	1	18.03.2023	18.03.2023	TLM2	
39.	Indexing & selection, and filtering.	1	20.03.2023	20.03.2023	TLM2	
40.	Summary & Notes	1	21.03.2023	21.03.2023	TLM2	
No. of classes required to complete UNIT-IV: 09				**No. of classes: 09**		

UNIT-V: Data Pre-processing: Data Loading, Storage, and File Formats - Reading and Writing data in text format, binary data formats, interacting with html and web apis, interacting with databases; Data Wrangling: Clean, Transform, Merge, Reshape - Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation. String Manipulation; Data Aggregation.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Data Pre-processing: Data Loading,	1	22.03.2023	22.03.2023	TLM2	
42.	Storage, and File Formats	1	24.03.2023	24.03.2023	TLM2	
43.	Reading and Writing data in text format,	1	27.03.2023	27.03.2023	TLM2	
44.	binary data formats	1	28.03.2023	28.03.2023	TLM2	
45.	, interacting with html and web APIs,	1	29.03.2023	29.03.2023	TLM2	
46.	interacting with databases;	1	31.03.2023	31.03.2023	TLM2	
47.	Data Wrangling: Clean, Transform, Merge, Reshape	1	03.04.2023	03.04.2023	TLM2	
48.	Combining and Merging Data Sets,	1	05.04.2023	05.04.2023	TLM2	
49.	Reshaping and Pivoting	1	07.04.2023	07.04.2023	TLM2	
50.	Data Transformation.	1	10.04.2023	10.04.2023	TLM2	
51.	String Manipulation; Data Aggregation.	1	11.04.2023	11.04.2023	TLM2	
No. of classes required to complete UNIT-V: 09				**No. of classes: 11**		

Content Beyond the Syllabus:

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50						
51						

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 analyzecomplex 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	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
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.

Course Instructor	Course Coordinator	Module Coordinator	HoD
K Sudhakar			**Dr.J.Siva Prasad**

COURSE HANDOUT

PART-A

Name of Course Instructor:KATTUPALLI SUDHAKAR
Course Name &Code:INTRODUCTION TO DATA SCIENCE (20AD82)
L-T-P Structure:3-0-0 **Credits:** 3
Program/Sem/Sec: B.Tech / III /SEC-B **A.Y.:** 2022-23

PREREQUISITE: Problem Solving Skills

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Identify basic building blocks of python to solve mathematical problems. **(Understand- L2)**
CO2	Describe the key concepts in data science.**(Remember– L1)**
CO3	Enumerate the fundamentals of NumPy. (**Understand – L2)**
CO4	Demonstrate the fundamentals of Pandas. (**Understand – L2)**
CO5	Demonstrate data analysis, manipulation and visualization of data using Python libraries. (**Apply L-3)**

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO2	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO3	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO4	3	2	1	-	3	-	-	-	-	1		2	3	-	
CO5	3	1	2	-	3	-	-	-	-	1		1	3	2	3
1 - Low **2 –**Medium **3 –**High															

TEXTBOOKS:

1. Wes McKinney, "Python for Data Analysis", O'Reilly, ISBN: 978-1-449-31979- 3, 1st edition, October 2012.
2. Richard Schutt & O'Neil, "Doing Data Science", O'Reilly, ISBN 978-1-449- 35865-5, 1st edition, October 2013.
3. Python For Data Analysis (O Reilly, Wes McKinney)

REFERENCE BOOKS:

1. Python: The Complete Reference, Martin C. Brown, McGraw Hill Education
2. Joel Grus, Science from Scratch: First Principles with Python", O'Reilly Media, 2015
3. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization", O'Reilly, 2016.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Introduction to Data Science (20AD82)

UNIT-I: Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements. Strings: Creating strings and basic operations on strings, string testing methods. Lists, Dictionaries, Tuples.

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.	Unit 1: Introduction to Python	1	26.12.2022	26.12.2022	TLM1	
2.	Features of Python, Data Types	1	27.12.2022	27.12.2022	TLM1	
3.	Operators, Input and Output	1	28.12.2022	28.12.2022	TLM1	
4.	Control Statements	1	29.12.2022	29.12.2022	TLM1	
5.	Strings: Creating Strings and Basic Operations on Strings	1	02.01.2023	02.01.2023	TLM1	
6.	String Testing Methods	1	03.01.2023	03.01.2023	TLM1	
7.	Lists: Operations and Examples	1	04.01.2023	04.01.2023	TLM1	

8.	Tuple: Operations and Examples	1	05.01.2023	05.01.2023	TLM1
9.	Sets: Operations and Examples	1	09.01.2023	09.01.2023	TLM1
10.	Dictionaries: Operations and Examples	1	10.01.2023	10.01.2023	TLM1
11.	Python Programming Lab Practice	1	11.01.2023	11.01.2023	TLM1
12.	Summary and Notes	1	12.01.2023	12.01.2023	TLM1
No. of classes required to complete UNIT-I: 12				**No. of classes taken:12**	

UNIT-II: What is Data science? Data Science life cycle, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process.

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.	What is Data science? Introduction	1	18.01.2023	18.01.2023	TLM2	
14.	Data Science life cycle	1	19.01.2023	19.01.2023	TLM2	
15.	Data Science life cycle	1	23.01.2023	23.01.2023	TLM2	
16.	Datafication	1	24.01.2023	24.01.2023	TLM2	
17.	Exploratory Data Analysis	1	25.01.2023	25.01.2023	TLM2	
18.	Exploratory Data Analysis	1	30.01.2023	30.01.2023	TLM2	
19.	The Data science process	1	31.01.2023	31.01.2023	TLM2	
20.	A data scientist role in this process	1	01.02.2023	01.02.2023	TLM2	
21.	Summary & Notes	1	02.02.2023	02.02.2023	TLM2	

No. of classes required to complete UNIT-I: 09	No. of classes taken: 09

UNIT-III: NumPy Basics: The NumPy ndarray: A Multidimensional Array Object, creatingndarrays , Data Types for ndarrays, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays Sorting, Unique.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	NumPy Basics: The NumPy ndarray:	1	06.02.2023	06.02.2023	TLM2	
23.	A Multidimensional Array Object,	1	07.02.2023	07.02.2023	TLM2	
24.	Creating ndarrays	1	08.02.2023	08.02.2023	TLM2	
25.	Data Types for ndarrays	1	09.02.2023	09.02.2023	TLM2	
26.	Basic Indexing and Slicing	1	13.02.2023	13.02.2023	TLM2	
27.	Boolean Indexing, Fancy Indexing	1	14.02.2023	14.02.2023	TLM2	
28.	Expressing Conditional Logic as Array Operations	1	15.02.2023	15.02.2023	TLM2	
29.	Methods for Boolean Arrays Sorting	1	16.02.2023	16.02.2023	TLM2	
30.	Unique.	1	27.02.2023	27.02.2023	TLM2	
31.	Summary and Notes	1	28.02.2023	28.02.2023	TLM2	
No. of classes required to complete UNIT-III: 10				**No. of classes taken: 10**		

UNIT-IV: Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Re indexing, dropping entries from an axis, Indexing & selection, and filtering.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Getting Started with pandas: Introduction to pandas	1	01.03.2023	01.03.2023	TLM2	
33.	Library Architecture, Features,	1	02.03.2023	02.03.2023	TLM2	
34.	Applications, Data Structures,	1	06.03.2023	06.03.2023	TLM2	
35.	Series, Data Frame,	1	07.03.2023	07.03.2023	TLM2	
36.	Index Objects, Essential Functionality Re indexing,	1	08.03.2023	08.03.2023	TLM2	
37.	Dropping entries from an axis	1	09.03.2023	09.03.2023	TLM2	
38.	Indexing & selection	1	13.03.2023	13.03.2023	TLM2	
39.	Indexing & selection, and filtering.	1	14.03.2023	14.03.2023	TLM2	
40.	Summary & Notes	1	15.03.2023	15.03.2023	TLM2	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken: 09**		

UNIT-V: Data Preprocessing: Data Loading, Storage, and File Formats - Reading and Writing data in text format, binary data formats, interacting with html and web apis, interacting with databases; Data Wrangling: Clean, Transform, Merge, Reshape - Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation. String Manipulation; Data Aggregation.

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Data Pre-processing: Data Loading,	1	16.03.2023	16.03.2023	TLM2	
42.	Storage, and File Formats	1	20.03.2023	20.03.2023	TLM2	
43.	Reading and Writing data in text format,	1	21.03.2023	21.03.2023	TLM2	
44.	binary data formats	1	22.03.2023	22.03.2023	TLM2	
45.	, interacting with html and web APIs,	1	23.03.2023	23.03.2023	TLM2	
46.	interacting with databases;	1	27.03.2023	27.03.2023	TLM2	
47.	Data Wrangling: Clean, Transform, Merge, Reshape	1	28.03.2023	28.03.2023	TLM2	
48.	Combining and Merging Data Sets,	1	29.03.2023	29.03.2023	TLM2	
49.	Reshaping and Pivoting	1	30.03.2023	30.03.2023	TLM2	
50.	Data Transformation.	1	03.04.2023	03.04.2023	TLM2	
51.	String Manipulation; Data Aggregation.	1	04.04.2023	04.04.2023	TLM2	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Content Beyond the Syllabus:

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50						
51						

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.
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PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
PSO 2	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
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.

Course Instructor	Course Coordinator	Module Coordinator	HoD
K Sudhakar			**Dr.J.Siva Prasad**

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

COURSE HANDOUT

PROGRAM : B.Tech., VI-Sem., EEE(A)

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE :**Power Electronics and Drives Lab.**& 20EE60

L-T-P STRUCTURE : 0-0-3

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mr.P.Deepak Reddy/Mr.V.Prabhakar Reddy

COURSE COORDINATOR : Mr.P.Deepak Reddy

PRE-REQUISITE: **Power Electronics**

COURSE OUTCOMES(CO):

Power Electronics Lab

CO1 Examine the characteristics of Power electronic devices.(Understand-L2)
CO2 Analyze the performance of different power converters and drives using trainer kits.(Apply-L3)
CO3 Evaluate the performance of different power converters and drives using simulation tools.(Apply-L3)

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

	a	b	c	d	e	f	g	h	i	j	k	l	PSOa	PSOb	PSOc	PSOd	PSOe
CO1	3	2			3				3	3		3	1	2	1		
CO2	2			2	3				3	3			2	2	3		2
CO3	3	3		3	3	2			3	3		3	2	2	2		1

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

LIST OF EXPERIMENTS

CYCLE1

1. Charcteristics of SCR, IGBT, MOSFET
2. Single phase AC voltage controller with R & RL Loads.
3. Single phase IGBT inverter with R and Rl Loads
4. Single phase Cyclo converter with RL load.
5. Three phase fully controlled bridge converter fed dc motor drive.

CYCLE2

6. Four quadrant operation of chopper fed dc drive.
7. Three phase Ac Voltage controller fed Induction motor drive.
8. Three phase slip ring Induction motor by Static Rotor Resistance Control.
9. Single phase fully controlled rectifier with R & RL Loads using simulation tools.
10. Single phase inverter with PWM technique using simulation tools.

SECTION-B SCHEDULE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

DAY: Thursday(20-201 to 20-235)

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		29/12	5/1	12/1	19/1	2/2	9/2	16/2	2/3	9/3	16/3	23/3	6/4	13/4	20/4
Actual Date															
B-1	201,202,203	Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2	204,205,206	Demo	1	2	3	4	5	6	7	8	9	10			
B-3	207,208,209	Demo	1	2	3	4	5	6	7	8	9	10			
B-4	210,211,212	Demo	1	2	3	4	5	6	7	8	9	10			
B-5	213,214,215	Demo	1	2	3	4	5	6	7	8	9	10			
B-6	216,217,218	Demo	1	2	3	4	5	6	7	8	9	10			
B-7	219,220,221	Demo	1	2	3	4	5	6	7	8	9	10			
B-8	222,223,224,225	Demo	1	2	3	4	5	6	7	8	9	10			
B-9	226,227,229,230	Demo	1	2	3	4	5	6	7	8	9	10			
B-10	232,233,234,235	Demo	1	2	3	4	5	6	7	8	9	10			

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

DAY: Friday(20761A0236 to 21765A0207)

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		29/12	6/1	20/1	27/1	3/2	10/2	17/2	3/3	10/3	17/3	24/3	31/3	21/4
Actual Date														
B-1	236,237,238	Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Internal test
B-2	239,240,241	Demo	1	2	3	4	5	6	7	8	9	10		
B-3	242,243,244	Demo	1	2	3	4	5	6	7	8	9	10		
B-4	245,246,247	Demo	1	2	3	4	5	6	7	8	9	10		
B-5	248,249,250	Demo	1	2	3	4	5	6	7	8	9	10		
B-6	251,253,254	Demo	1	2	3	4	5	6	7	8	9	10		
B-7	255,256,257	Demo	1	2	3	4	5	6	7	8	9	10		
B-8	258,259,261,262	Demo	1	2	3	4	5	6	7	8	9	10		
B-9	263,201,202,203	Demo	1	2	3	4	5	6	7	8	9	10		
B-10	204,205,206,207	Demo	1	2	3	4	5	6	7	8	9	10		

HEAD OF THE DEPARTMENT

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
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NAAC Accredited with "A" grade, Accredited by NBA,
New Delhi & Certified by ISO 9001:2015, http://www.lbrce.ac.in
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : **Power Electronics and Drives Lab**& 20EE60

L-T-P STRUCTURE : 0-0-3

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mrs.T.Nagadurga/Dr.K.R.L.Prasad/Mr.P.Deepak Reddy

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

PRE-REQUISITE: **Power Electronics**

COURSE OUTCOMES (CO):

Power Electronics Lab

CO1 Examine the characteristics of Power electronic devices (**Understand-L2**).
CO2 Analyze the performance of different power converters and drives using trainer kits.(**Apply-L3**)
CO3 Evaluate the performance of different power converters and drives using simulation tools(**Apply-L3**)

LIST OF EXPERIMENTS

1. Charcteristics of SCR, IGBT, MOSFET
2. Single phase AC voltage controller with R & RL Loads.
3. Single phase IGBT inverter with R and RL Loads.
4. Single phase Cyclo converter with RL load.
5. Three phase fully controlled bridge converter fed dc motor drive.
6. Four quadrant operation of chopper fed dc drive.
7. Three phase AC Voltage controller fed induction motor drive.
8. Three phase slip ring Induction motor by Static Rotor Resistance Control.
9. Single Phase fully controlled rectifier with R &RL loads using simulation tools.
10. Single phase inverter with PWM technique using simulation tools.

ADDITIONAL EXPERIMENTS

11. PWM control of Boost converter with R and R-L loads.
12. IGBT based three phase PWM Inverter with R load.
13. Single phase fully controlled bridge converter with R & RL Loads.

SECTION-B SCHEDULE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Monday

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		2/1/23	9/1/23	23/1/23	30/1/23	6/2/23	13/2/23	27/2/23	6/3/23	13/3/23	20/3/23	27/3/23	3/4/23	10/4/23	17/4/23
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	1	2	3	4	5	6	7	8	9	10			
B-3		Demo	1	2	3	4	5	6	7	8	9	10			
B-4		Demo	1	2	3	4	5	6	7	8	9	10			
B-5		Demo	1	2	3	4	5	6	7	8	9	10			
B-6		Demo	1	2	3	4	5	6	7	8	9	10			
B-7		Demo	1	2	3	4	5	6	7	8	9	10			
B-8		Demo	1	2	3	4	5	6	7	8	9	10			
B-9		Demo	1	2	3	4	5	6	7	8	9	10			
B-10		Demo	1	2	3	4	5	6	7	8	9	10			

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Wednesday

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		4/1/23	11/1/23	18/1/23	25/1/23	1/2/23	8/2/23	15/2/23	22/2/23	1/3/23	8/3/23	15/3/23	22/3/23	29/3/23	5/4/23
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	1	2	3	4	5	6	7	8	9	10			
B-3		Demo	1	2	3	4	5	6	7	8	9	10			
B-4		Demo	1	2	3	4	5	6	7	8	9	10			
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B-6		Demo	1	2	3	4	5	6	7	8	9	10			
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B-8		Demo	1	2	3	4	5	6	7	8	9	10			
B-9		Demo	1	2	3	4	5	6	7	8	9	10			
B-10		Demo	1	2	3	4	5	6	7	8	9	10			

LAB INCHARGE **HEAD OF THE DEPARTMENT**

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

Part - A

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

ACADEMIC YEAR : **2022-23**

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

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

COURSE CREDITS : **1**

COURSE INSTRUCTOR : **Dr.A.V.G.A.Marthanda,Dr.JSVprasad. Mrs.R.padma, Mrs.G.Tabitha**

Course Coordinator : Dr.A.V.G.A.Marthanda
Prerequisite: Microprocessors and Microcontrollers (17EC22)

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

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

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

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

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

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

	P O	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO2	PO3	PSO	PSO	PSO	PS O
COs	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	
CO1	2	2	3	2	2	-	-	-	-	-	-	-	-	2	-	
CO2	3	2	2	2	2	-	-	-	-	-	-	-	-	3	-	
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	

SECTION- A

SCHEDULE
PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A **DAY: Monday**

B.NO.		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		2/1/23	9/1/23	23/1/23	30/1/23	6/2/23	13/2/23	27/2/23	6/3/23	13/3/23	20/3/23	27/3/23	3/4/23	10/4/23	17/4/23
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	1	2	3	4	5	6	7	8	9	10			
B-3		Demo	1	2	3	4	5	6	7	8	9	10			
B-4		Demo	1	2	3	4	5	6	7	8	9	10			
B-5		Demo	1	2	3	4	5	6	7	8	9	10			
B-6		Demo	1	2	3	4	5	6	7	8	9	10			
B-7		Demo	1	2	3	4	5	6	7	8	9	10			
B-8		Demo	1	2	3	4	5	6	7	8	9	10			
B-9		Demo	1	2	3	4	5	6	7	8	9	10			
B-10		Demo	1	2	3	4	5	6	7	8	9	10			

COURSE DELIVERY PLAN (LESSON PLAN): Section-B **DAY: Friday**

B.NO.		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		6/1/23	13/1/23	20/1/23	27/1/23	3/2/23	10/2/23	17/2/23	24/2/23	3/3/23	10/3/23	17/3/23	24/3/23	31/3/23	7/4/23
Actual Date															
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	Repetition	INTERNAL TEST
B-2		Demo	1	2	3	4	5	6	7	8	9	10			
B-3		Demo	1	2	3	4	5	6	7	8	9	10			
B-4		Demo	1	2	3	4	5	6	7	8	9	10			
B-5		Demo	1	2	3	4	5	6	7	8	9	10			
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B-8		Demo	1	2	3	4	5	6	7	8	9	10			
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B-10		Demo	1	2	3	4	5	6	7	8	9	10			

Part – C

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.

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

Course Instructors	Course Coordinator	Module Coordinator	HOD
Dr.A.V.G.A.Marthanda , Dr.J.S.V.PRASAD, SMT.R.PADMA ,SMT. G.TABITHA	Dr.J.S.V.PRASAD	Dr.J.S.V.PRASAD	Dr.J.S.V.PRASAD

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PROGRAM : B.Tech. VI-Sem, EEE (A)

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : Power Systems Lab& 20EE62

L-T-P STRUCTURE : 0-0-3

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Dr.P.Sobha Rani/Dr.M.S.Giridhar/ Mr. B. Pangedaiah

COURSE COORDINATOR : Dr. P.Sobha Rani

PRE-REQUISITE: **Power Systems-II**

COURSE OUTCOMES (CO):

CO1 Analyze transmission systems under steady state and transient conditions
CO2 Perform fault calculation and network protection
CO3 Understand the performance of renewable energy systems

LIST OF EXPERIMENTS

1. Determination of Receiving end quantities and the line performance of a medium/long transmission line using simulation tool.
2. Using Computer code determine:
   (i) Bus admittance matrix by inspection method for a 3-bus power system and obtain
   (ii) Power flow solution by Newton-Raphson method.
3. Determination of Sequence components (Positive, Negative and Zero) of an alternator using simulation tool.
4. Transient analysis of a Single Machine Infinite Bus (SMIB) system using simulation tool.
5. Simulation of LG, LL, LLG and LLL faults on a simple power system.
6. Determine steady state frequency error and frequency deviation response for an
   (i) Isolated power system and (ii) Interconnected power system.
7. Plot the Swing curve for a simple 3 or 4 bus power system using Simulation Tool.
8. Study the Over current protection scheme using numerical relay.
9. Determination of ABCD parameters and performance of a transmission line
10. Determination of Positive, Negative and Zero sequence reactance for a 3-phase alternator

Additional Experiments

1. Plot V-I characteristics of Solar panel at various levels of insolation.
2. Study the performance of a Wind turbine system at different wind speeds and plot the characteristics.
3. Determination of Earth resistance in humid and dry earth conditions.

SECTION-A SCHEDULE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

DAY: Thursday

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	XIV Week
Tentative Date		5/1/23	12/1/23	19/1/23	2/2/23	9/2/23	16/2/23	2/3/23	9/3/23	16/3/23	23/3/23	6/4/23	13/4/23	20/4/23
Actual Date														
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	INTERNAL TEST
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B-8		Demo	1	2	3	4	5	6	7	8	9	10		
B-9		Demo	1	2	3	4	5	6	7	8	9	10		
B-10		Demo	1	2	3	4	5	6	7	8	9	10		

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

DAY: Friday

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		30/12/23	6/1/23	20/1/23	27/1/23	3/2/23	10/2/23	17/2/23	3/3/23	10/3/23	17/3/23	24/3/23	31/3/23	21/4/22
Actual Date														
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COURSE HANDOUT

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

ACADEMIC YEAR : 2022-23

COURSE NAME & CODE : Power Systems Lab& 20EE62

L-T-P STRUCTURE : 0-0-3

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Dr.G.NAGESWARA RAO/ Mr.P.SRIHARI/ Mr. P.RATHNAKAR

COURSE COORDINATOR : Dr.G.NAGESWARA RAO

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3. Determination of Earth resistance in humid and dry earth conditions.

SECTION-A SCHEDULE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Monday

S.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	XIV Week
Tentative Date		2/1/23	9/1/23	23/1/23	30/2/23	6/2/23	13/2/23	27/2/23	6/3/23	13/3/23	20/3/23	27/3/23	03/4/23 & 10/4/23	17/4/23
Actual Date														
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B-9		Demo	1	2	3	4	5	6	7	8	9	10		
B-10		Demo	1	2	3	4	5	6	7	8	9	10		

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Wednesday

S.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		28/12/23	4/1/23	11/1/23	18/1/23	25/1/23	01/2/23	08/2/23	15/2/23	1/3/23	15/3/23	22/3/23	29/3/23 & 5/4/23	11/4/22
Actual Date														
B-1		Demo	1	2	3	4	5	6	7	8	9	10	Repetition	INTERNAL TEST
B-2		Demo	1	2	3	4	5	6	7	8	9	10		
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