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 : M.Tech., II-Sem., EEE(PED)

ACADEMIC YEAR : **2018-19**

COURSE NAME & CODE : **APPLICATION OF ARTIFICAL INTELLIGENCE TECHNIQUES – 17PE17**

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

COURSE CREDITS : 3

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

COURSE COORDINATOR :

PRE-REQUISITE:

COURSE OBJECTIVE : This course will enable the basic principles of soft computing techniques. It covers simple representation schemes, problem solving paradigms of ANN, fuzzy & genetic algorithms and their applications to power electronics.

COURSE OUTCOMES(COs)
Af the enf of the course, student will be able to:

CO1: Apply AI technique to engineering problems.

CO2: Understand different types of perceptron models.

CO3: Understand different types of fuzzy sets, member ship functions and their implementation methods.

CO4: Apply genetic algorithms to power electronics

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

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	2	2	2
CO2	2		2	2	2	2
CO3	2		2	2	2	2
CO4	2		2	2	2	2

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

BOS APPROVED TEXT BOOKS:

T1 Jacek M. Zuarda, "Introduction to Artificial Neural Systems", Jaico Publishing House, 1999.

T2 Timothy J Ross, "Fuzzy logic with engineering application", Wiley publications, Third edition, 2010.

BOS APPROVED REFERENCE BOOKS:

1. James A Freeman and Davis Skapura, "Neural Networks" ,Pearson Education, 2003.

2. Rajasekharan and Pai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and aplications” ,PHI Publication, 2003.
3. Samir Roy, Udit Chakraborty, “Introduction to Sift Computing: Neuro Fuzzy & Genetic Algorithms, Pearson Publications.
4. C.Kamalakannan, L.Padma Suresh, “Power Electronics and Renewable energy systems”, Spriger, 2015
5. Devendra K.Chaturvedi, “Soft Computing: Techniques & its applications in Electrical Engineering, Springer Science.
6. B.K.Bose, “Neuran network applications in power electronics and motor drives-An introduction and perspective”, IEEE transaction on Industrial Electronics, Volume 54, No 1, February, 2007.
7. Gilberto C.D.Sousa, Bimal K.Bose, “Fuzzy logic applications to power electronics and drives-An overview”, IEEE conference, 1995, pages 57-62.
8. Peter Vas, “Artificial-Intellegence based electrical machines and drives”, Oxford university press.
9. Naziha Ahmad Azil, Shahrinmd Ayob, Norkharzian Mohd Nayan, “Particle Swarm Optimization and its application in power converter systems”, IEEE conference.
10. Susana Estefany De, Hugo Calleja, Jesus Aquayo Alquicira, “Metaheuristic optimization methods applied to power converters:A review”, IEEE transaction on power electronics, volume 30, issue 12, December 2015.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: ARTIFICIAL NEURAL NETWORKS

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.	UNIT-I : **Evolution of neural networks**	1	22-01-19		**TLM1**	CO1	T1	
2.	Artificial Neural Network: Basic model, Classification	1	23-01-19		**TLM1**	CO1	T1	
3.	Feed forward and Recurrent topologies, Activation functions	1	24-01-19		**TLM1**	CO1	T1	
4.	Learning algorithms: Supervised, Un-supervised and Reinforcement	1	25-01-19		**TLM1**	CO1	T1	
5.	McCulloach – Pits model,	1	29-01-19		**TLM1**	CO1	T1	
6.	Perceptron	1	30-01-19		**TLM1**	CO2	T1	
7.	Adaline, Madaline	1	31-01-19		**TLM1**	CO2	T1	
8.	Topology of Multi-layer perceptron, Back propagation learning algorithm	1	01-02-19		**TLM1**	CO2	T1	
9.	Topology of Multi-layer perceptron, Back propagation learning algorithm	1	05-02-19		**TLM1**	CO2	T1	
10.	Kohenen’s self-organising network: Topology	1	06-02-19		**TLM1**	CO2	T1	
11.	Bidirectional associative memory Topology	1	07-02-19		**TLM1**	CO2	T1	
12.	Hopfield network: Topology	1	08-02-19		**TLM1**	CO2	T1	
13.	Neural network applications in power electronics & motor drives using feedforward and recurrent architectures	1	12-02-19		**TLM1**	CO2	T1	
14.	Seminar-1	1	13-02-19		**TLM6**			

15.	Assignment-1	1	14-02-19		**TLM6**			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNITII: FUZZY LOGIC

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
16.	Introduction to classical and fuzzy sets, crisp sets, universal sets,	1	15-02-19		**TLM1**	CO3	T2	
17.	properties of crisp sets, partition and covering, operations on crisp sets, crisp relations, operations on relations	1	19-02-19		**TLM1**	CO3	T2	
18.	fuzzy sets- membership function, properties of fuzzy sets, basic fuzzy set operations	1	20-02-19		**TLM1**	CO3	T2	
19.	fuzzy relations	1	21-02-19		**TLM1**	CO3	T2	
20.	operations on fuzzy relations	1	22-02-19		**TLM1**	CO3	T2	
21.	cardinality and relative of fuzzy relations	1	26-02-19		**TLM1**	CO3	T2	
22.	Fuzzification, development of rule based system	1	27-02-19		**TLM1**	CO3	T2	
23.	fuzzy propositions, fuzzy operators, fuzzy quantifiers, fuzzy inference, fuzzy decision making system	1	28-02-19		**TLM1**	CO3	T2	
24.	defuzzification to crisp sets, defuzzification methods	1	01-03-19		**TLM1**	CO3	T2	
25.	control of phase controlled dc motor drive by using fuzzy logic controllers.	1	05-03-19		**TLM1**	CO3	T2	
26.	Seminar-2	1	06-03-19		**TLM6**	CO3	T2	
27.	Assignment-2	1	07-03-19		**TLM2**	CO3	T2	
28.	Revision	1	08-03-19					
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III : GENETIC ALGORITHM

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
29.	Introduction-Basic concepts of Genetic AlgorithmS	1	19-03-19		**TLM1**	CO4	R2	
30.	Basic concepts of Genetic AlgorithmS	1	20-03-19		**TLM1**	CO4	R2	
31.	Selection-Cross over-Mutation-algorithm	1	21-03-19		**TLM1**	CO4	R2	
32.	Selection-Cross over-Mutation-algorithm	1	22-03-19		**TLM1**	CO4	R2	

33.	Selection-Cross over-Mutation-algorithm,	1	26-03-19		**TLM1**	CO4	R2	
34.	steps-fitness function limitations of GA	1	27-03-19		**TLM1**	CO4	R2	
35.	steps-fitness function limitations of GA	1	28-03-19		**TLM1**	CO4	R2	
36.	function limitations of GA	1	29-03-19		**TLM1**	CO4	R2	
37.	function limitations of GA	1	02-04-19		**TLM1**	CO4	R2	
38.	Optimization of controllers using genetic algorithm	1	03-04-19		**TLM1**	CO4	R2	
39.	Optimization of controllers using genetic algorithm	1	04-04-19		**TLM1**	CO4	R2	
40.	Problems	1	05-04-19		**TLM1**	CO4	R2	
41.	Repetition unit-iii	1	09-04-19		**TLM1**	CO4	R2	
42.	Seminar-3	1	10-04-19		**TLM1**			
43.	Assignment-3	1	11-04-19		**TLM6**			
No. of classes required to complete UNIT-III		15			No. of classes taken:			

UNIT IV: PARTICLE SWARM OPTIMIZATION

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
44.	PSO algorithm	1	12-04-19		**TLM1**		R5	
45.	parameter selection	1	16-04-19		**TLM1**		R5	
46.	Neighbourhoods and topologies	1	17-04-19		**TLM2**		R5	
47.	Inner workings- Convergence, Biases	1	18-04-19		**TLM2**		R5	
48.	Variants- Hybridization	1	19-04-19		**TLM2**		R5	
49.	Alleviate premature, Simplifications	1	23-04-19		**TLM2**		R5	
50.	Multi-objective optimization,	1	24-04-19		**TLM2**		R5	
51.	Binary, discrete, and combinatoria	1	25-04-19		**TLM2**		R5	
52.	PSO applications to power converter systems	1	26-04-19		**TLM2**		R5	
53.	Seminar-4	1	30-04-19		**TLM1**			
54.	Assignment-4	1	01-05-19		**TLM6**			
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT V: META-HEURISTICS TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
55.	Properties	1	02-05-19		**TLM2**	CO4	R5	
56.	Classification-Local search vs. Global search	1	03-05-19		**TLM2**	CO4	R5	
57.	Single-solution vs. Population-based	1	07-05-19		**TLM2**	CO4	R5	
58.	Hybridization and memetic algorithms	1	08-05-19		**TLM2**	CO4	R5	
59.	Parallel metaheuristics	1	09-05-19		**TLM2**	CO4	R5	
60.	Nature-inspired metaheuristics	1	10-05-19		**TLM2**	CO4	R5	
61.	Nature-inspired metaheuristics	1	14-05-19		**TLM2**	CO4	R5	
62.	meta-heuristic applications in the area of power converters	1	15-05-19		**TLM2**	CO4	R5	
63.	meta-heuristic applications in the area of power converters	1	16-05-19		**TLM2**	CO4	R5	
64.	Revision	1	17-05-19		**TLM6**	CO4		
No. of classes required to complete UNIT-V		10			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
65.	Neural Networks in Electrical Engineering	1	17-05-19					
66.	Fuzzy Logic in Electrical Engineering	1	17-05-19					
67.	Genatic algorthim in Electrical Engineering	1	17-05-19					

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:

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Phone: 08659-222933/Extn: 203 hodeee@lbrce.ac.in, eee.lbrce@gmail.com

COURSE HANDOUT

Part-A

PROGRAM : M.Tech., II-Sem., EEE (PE&D)

ACADEMIC YEAR : 2018-19

COURSE NAME & CODE : Control of Motor Drives-II – 17PE12

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : Mrs.T.Nagadurga

COURSE COORDINATOR : Mrs.T.Nagadurga

PRE-REQUISITE: Power Electronics, Solid State Drives

COURSE OBJECTIVE : This course enables the student to illustrate the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers. It also deals with the steady state operation and transient dynamics of a motor- load system.

COURSE OUTCOMES(CO)

CO1	Analyze DTC & sensor less vector controls of induction motor
CO2	Control AC drives with different controlling strategies
CO3	Identify different types of AC motor drives based on application

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

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2	2	2	2
CO2	2		2	2	2	2
CO3	2		2	2	2	2

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

BOS APPROVED TEXT BOOKS:

T1 B. K. Bose "Modern Power Electronics and AC Drives", Prentice Hall, 1st edition, 2001.

T2 MD Murphy & FG Turn Bull "Power Electronics control of AC motors", Franklin Book Co, 1st edition, 1998

BOS APPROVED REFERENCE BOOKS:

R1 R. Krishnan "Electric Motor Drives Modelling, Analysis and Control", Pearson, 1st edition, 2001.

R2 Venkataratnam "Special electrical Machines", University press, 1st edition, 2008.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : DTC & SENSORLESS VECTOR CONTROL OF INDUCTION MOTOR

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	21-01- 19		TLM1	CO1	**T1**	
2.	Course Outcomes							
3.	Introduction to UNIT-I							
4.	Direct torque control of induction motor drives	1	21-01- 19		TLM1	CO1	**T1**	
5.	Sensorless vector control	1	24-01-19		TLM1	CO1	**T1**	
6.	slip and speed Estimation at low performance	2	25-01-19 28-01-19		TLM1	CO1	**T1**	
7.	Rotor Angle and Flux linkage Estimation at high performance	1	28-01-19		TLM2	CO1	**T1**	
8.	Rotor Speed Estimation Scheme-estimators using rotor slot harmonics	2	31/1/19		TLM1	CO1	**T1**	
9.	Model Reference adaptive systems	1	1/2/19		TLM1	CO3	**T1**	
10.	Extended Kaman Filter	1	4/2/19		TLM2	CO3	**T1**	
11.	Injection of auxiliary signal on salient rotor	2	4/2/19 7/2/19		TLM1	CO3	**T1**	
12.	Seminar-1	1	8/2/19		TLM1 TLM7		**T1**	
13.	Test on Unit-I	1	11/2/19				**T1**	
No. of classes required to complete UNIT-I: 14					No. of classes taken:			

UNIT-II : 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
14.	Synchronous motor and its characteristics	1	11/2/19		TLM1	CO2	**T1**	
15.	Control strategies-Constant torque angle control power factor control	2	14/2/19 15/2/19		TLM1	CO3	**T1**	
16.	Constant flux control	1	18/2/19		TLM1	CO3	**T1**	

17.	Flux weakening operation	1	21/2/19		TLM1 TLM2	CO2	**T1**	
18.	Load commutated inverter fed synchronous motor drive	2	22/2/19 25/2/19		TLM1	CO3	**T1**	
19.	Motoring and regeneration	2	25/2/19		TLM1	CO2	**T1**	
20.	Phasor diagrams.	2	28/2/19		TLM1	CO2	**T1**	
21.	Seminar-2	1	1/3/19		TLM1 TLM7		**T1**	
22.	Test on unit-II	1	7/3/19					
No. of classes required to complete UNIT-II : 13					No. of classes taken:			

UNIT-III : CONTROL OF SWITCHED RELUCTANCE 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
23.	Introduction of SRM	1	8/3/19		TLM1	CO2	**T2,R2**	
24.	Principle of operation	1	18/3/19		TLM1	CO2	**T2,R2**	
25.	Design aspects of stator and rotor pole arcs	1	18/3/19		TLM1 TLM2	CO3	**T2,R2**	
26.	torque equation, torque-speed characteristics	1	21/3/19		TLM1 TLM2	CO2	**T2,R2**	
27.	Stator Excitation, techniques of sensor less operation	1	22/3/19		TLM1	CO2	**T2,R2**	
28.	convertor topologies	1	25/3/19		TLM1	CO3	**T2,R2**	
29.	SRM Waveforms, SRM drive design factor	1	25/3/19		TLM4	CO3	**T2,R2**	
30.	Torque controlled SRM, Torque Ripple	1	28/3/19		TLM1 TLM2	CO2	**T2,R2**	
31.	Instantaneous Torque control using current controllers-flux controllers.	1	29/3/19		TLM1	CO2	**T2,R2**	
32.	Instantaneous Torque control using flux controller	1	1/4/19		TLM1	CO2	**T2,R2**	

33.	Seminar-3	1	1/4/19		TLM1 TLM7			
34.	Test on unit-III	1	4/4/19					
No. of classes required to complete UNIT-III: **12**				No. of classes taken:				

UNIT-IV : 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
35.	Principle of operation of BLDC Machine	1	8/4/19		TLM1	CO2	**T2,R2**	
36.	Sensing and logic switching scheme	1	8/4/19		TLM1	CO2	**T2,R2**	
37.	BLDM as Variable Speed Synchronous motor	2	11/4/19		TLM1	CO3	**T2,R2**	
38.	Methods of reducing Torque pulsations	1	12/4/19		TLM1	CO2	**T2,R2**	
39.	Three-phase full wave Brushless dc motor	2	15/4/19		TLM1	CO3	**T2,R2**	
40.	Sinusoidal type of Brushless dc motor	1	18/4/19		TLM1	CO3	**T2,R2**	
41.	Current controlled Brushless dc motor Servo drive	1	22/4/19		TLM1	CO3	**T2,R2**	
42.	Seminar-4	1	22/4/19		TLM1 TLM7			
43.	Test on unit-IV	1	25/4/19					
No. of classes required to complete UNIT-IV : 11				No. of classes taken:				

UNIT-V : CONTROL OF LINEAR MOTORS

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
44.	Types of linear motors	1	16/4/19		TLM1	CO2	**T2,R2**	
45.	construction details	1	29/4/19		TLM1	CO2	**T2,R2**	
46.	Flat LIMs, Tubular LIMs	1	29/4/19		TLM1	CO2	**T2,R2**	
47.	LIM equivalent circuit, Design considerations	1	2/5/19		TLM1 TLM2	CO2	**T2,R2**	
48.	Applications of LIM	1	3/5/19		TLM1	CO3	**T2,R2**	
49.	Control of Linear induction motor	1	6/5/19		TLM1	CO2	**T2,R2**	
50.	Linear synchronous motor (LSM), Principle of operation	1	6/5/19		TLM1	CO2	**T2,R2**	

51.	Types of LSM	1	9/5/19		TLM1 TLM2	CO2	**T2,R2**	
52.	Iron core LSM and Air core LSM	1	10/5/19		TLM1 TLM2	CO2	**T2,R2**	
53.	Control of LSM	1	13/5/19		TLM1 TLM2	CO3	**T2,R2**	
54.	Semianr-5	1	13/5/19		TLM1 TLM7			
55.	Test on unit-V	1	16/5/19					
56.	Revision	1	17/5/19					
No. of classes required to complete UNIT-V: **13**				No. of classes taken:				

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	21-01-2019	09-03-2019	7W
I Mid Examinations	11-03-2019	16-03-2019	1W
II Phase of Instructions-I	18-03-2019	18-05-2019	9W
Summer Vacation	20-05-2019	01-06-2019	2W
II Mid Examinations	03-06-2019	08-06-2019	1W
Practical's	10-06-2019	15-06-2019	1W
Semester End Examinations	17-06-2019	29-06-2019	2W

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
I-Mid Examination	1,2,3	A1=40
II-Mid Examination	1,2,3	A2=40
Evaluation of Mid Marks: A=75% of Max(A1,A2)+25% of Min(A1,A2)	1,2,3	A=40
Semester End Examinations	1,2,3	B=60
Total Marks: A+B	1,2,3	**100**

PEOs(Program Educational Objectives):

PEO1. Design and develop products and services in the field of Power Electronics and Drives

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

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

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

PROGRAM OUTCOMES:
Engineering Post Graduates will be able to:

PO1: Independently carry out research /investigation and development work to solve practical problems

PO2: Write and present a substantial technical report/document

PO3: Demonstrate a degree of mastery over the area as per the specialization of the program

PO4: Design green energy systems to conserve and protect environment

PO5: Develop power electronic based controllers for electrical systems to improve their performance

PO6: Develop innovative and entrepreneurial solutions

Mrs.T.Nagadurga	Mrs.T.Nagadurga	J.Sivavara Prasad	Dr.M.Uma Vani
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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COURSE HANDOUT

PROGRAM **:** M.Tech., II-Sem., EEE(PED)

ACADEMIC YEAR **:** 2018-19

COURSE NAME & CODE **: Hybrid Electric Vehicles** – 17PE14

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

COURSE CREDITS **:** 3

COURSE INSTRUCTOR **: Ch.Rajesh**

COURSE COORDINATOR **: Ch.Rajesh**

PRE-REQUISITE: Control Systems, Power Electronics.

COURSE OBJECTIVE : This course enables the student to illustrate the characteristics, architecture, control and management strategies of hybrid electric vehicles.

COURSE OUTCOMES(COs)

After completion of the course, the student will be able to

CO1 : Explore fundamental concepts of hybrid electric vehicles
CO2 : Analyze the performance of electric and hybrid electric vehicles
CO3 : Illustrate different energy management strategies for hybrid electric vehicles.

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

CO's	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	2	2	1
CO2	3		2	2	2	1
CO3	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).

BOS APPROVED TEXT BOOKS:

T1 Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.

T2 Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.

BOS APPROVED REFERENCE BOOKS:

R1 James Larminie, John Lowry, "Electric Vehicle Technology Explained",Wiley, 2003.

R2 Chris MI, **M.** Abul and David Wenzhong Gao , "Hybrid Electrical Vehicle Principles and application with practical perceptives.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A & B

UNIT-I: INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction	1	21-01-2019		**TLM1**	CO1	T2	
2.	History of hybrid electric vehicles	1	22-01-2019		**TLM1**	CO1	T2	
3.	, social and environmental importance of hybrid electric vehicles	1	23-01-2019		**TLM1**	CO1	T2	
4.	impact of modern drive-trains on energy supplies.	1	24-01-2019		**TLM1**	CO1	T2	
5.	Conventional Vehicles- Basics of vehicle performance	2	28-01-2019 29-01-2019		**TLM1**	CO1	T2	
6.	vehicle power source characterization	2	30-01-2019 31-01-2019		**TLM1**	CO1	T2	
7.	transmission characteristics	2	04-02-2019 05-02-2019		**TLM1**	CO1	T2	
8.	mathematical models to describe vehicle performance	2	07-02-2019		**TLM1**	CO1	T2	
9.	Seminar-1	1	11-02-2019		**TLM1**			
10.	Assignment-1	1	12-02-2019		**TLM6**			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNITII: HYBRID ELECTRIC DRIVE-TRAINS

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
11.	Electric Drive-trains: Basic concepts of electric traction	1	13-02-2019		**TLM1**	CO2	T2	
12.	introduction to various electric drivestrain topologies	1	14-02-2019		**TLM1**	CO2	T2	
13.	power flow control in electric drive-train topologies	1	11-02-2019		**TLM1**	CO2	T2	
14.	fuel efficiency analysis	1	18-02-2019		**TLM1**	CO2	T2	
15.	Basic concepts of hybrid traction	1	19-02-2019		**TLM1**	CO2	T2	
16.	introduction to various hybrid drives-train topologies	1	20-02-2019		**TLM1**	CO2	T2	
17.	power flow control in hybrid drive-train topologies	1	21-02-2019		**TLM1**	CO2	T2	
18.	fuel efficiency analysis	1	25-02-2019		**TLM1**	CO2	T2	
19.	problems	1	26-02-2019		**TLM1**	CO2	T2	
20.	Seminar-2	1	27-02-2019		**TLM1**			
21.	Assignment-2	1	28-02-2019		**TLM6**			
22.	Repitition of Unit-2	1	05-03-2019		**TLM2**	CO2	T2	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III : ELECTRIC PROPULSION

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.	Introduction to electric components used in hybrid and electric vehicles	2	06-03-2019 07-03-2019		**TLM1**	CO2	T2	
24.	Configuration and control of DC Motor drives	2	08-03-2019 18-03-2019		**TLM1**	CO2	T2	
25.	Configuration and control of Induction Motor drives	2	19-03-2019 20-03-2019		**TLM1**	CO2	T2	
26.	Configuration and control of Permanent Magnet Motor drives	2	25-03-2019 26-03-2019		**TLM1**	CO2	T2	
27.	Configuration and control of Switched Reluctance Motor drives	2	27-03-2019 28-03-2019		**TLM1**	CO2	T2	
28.	drive system efficiency	2	01-04-2019 02-04-2019		**TLM1**	CO2	T2	
29.	Problems	1	03-04-2019		**TLM1**	CO2	T2	
30.	Seminar-3	1	04-04-2019		**TLM1**			
31.	Assignment-3	1	08-04-2019		**TLM6**			
No. of classes required to complete UNIT-III		15			No. of classes taken:			

UNIT IV: DRIVE SYSTEM

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
32.	Introduction to Internal Combustion Engine(ICE)	1	09-04-2019		**TLM1**	CO2	T1	
33.	Matching the electric machine and the internal combustion engine (ICE),	1	10-04-2019		**TLM1**	CO2	T1	
34.	Matching the electric machine and the internal combustion engine (ICE) continued	1	11-04-2019		**TLM2**	CO2	T1	
35.	Sizing the propulsion motor and power electronics	1	15-04-2019		**TLM2**	CO2	T1	
36.	Sizing the propulsion motor and power electronics continued	1	16-04-2019		**TLM2**	CO2	T1	
37.	selecting the energy storage technology	1	17-04-2019		**TLM2**	CO2	T1	
38.	selecting the energy storage technology continued	1	18-04-2019		**TLM2**	CO2	T1	
39.	Communications, supporting subsystems.	2	22-04-2019 23-04-2019		**TLM2**	CO2	T1	
40.	Revision	1	24-04-2019		**TLM2**	CO2	T1	
41.	Seminar-4	1	25-04-2019		**TLM1**			
42.	Assignment-4	1	29-04-2019		**TLM6**			
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT V: ENERGY MANAGEMENT STRATEGIES

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
43.	Introduction	1	30-04-2019		**TLM2**	CO3	T1	
44.	Introduction continued	1	01-05-2019		**TLM2**	CO3	T1	
45.	Classification of energy management strategies	1	02-05-2019		**TLM2**	CO3	T1	
46.	Comparison of different energy management strategies	1	06-05-2019		**TLM2**	CO3	T1	
47.	Comparison of different energy management strategies	1	07-05-2019		**TLM2**	CO3	T1	
48.	implementation issues of energy management strategies	1	08-05-2019		**TLM2**	CO3	T1	
49.	implementation issues of energy management strategies continued	1	09-05-2019		**TLM2**	CO3	T1	
50.	Case Studies: Design of Hybrid Electric Vehicle (HEV),	2	13-05-2019		**TLM2**	CO3	T1	
51.	Case Studies: Design of Hybrid Electric Vehicle (HEV),	2	14-05-2019 15-05-2019		**TLM2**	CO3	T1	
52.	Assignment-5	1	16-05-2019		**TLM6**	CO3		
No. of classes required to complete UNIT-V		10			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
53.	Case Studies: Design of Battery Electric Vehicle (BEV)	1	05-022019		**TLM1**	CO2	T1	
54.	Case Studies: Design of Battery Electric Vehicle (BEV)	1	24-04-2019		**TLM2**	CO4	T1	
55.	REvision	1	15-05-2019		**TLM2**	CO4	T1	

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)		

M.Tech. II Semester (2018 Admitted batch)			
I Phase of Instructions	21-01-2019	09-03-2019	7 W
I MID Examinations	11-03-2019	16-03-2019	1 W
II Phase of Instructions	18-03-2019	18-05-2019	9 W
Summer Vacation	20-05-2019	01-06-2019	2 W
II MID Examinations	03-06-2019	08-06-2019	1 W
Practicals	10-06-2019	15-06-2019	1 W
Semester End Examinations	17-06-2019	29-06-2019	2 W

Part - C

EVALUATION PROCESS:

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

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

			Dr.M.UmaVani
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION 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 : M.Tech., II-Sem., PED

ACADEMIC YEAR : 2018-19

COURSE NAME & CODE : INTEGRATION OF RENEWABLE SOURCES- 17PE91

L-T-P STRUCTURE : 3 - -

COURSE CREDITS : 3

COURSE INSTRUCTOR : Mrs.K.S.L.Lavanya.

COURSE COORDINATOR :

PRE-REQUISITE: Power Electronics. Distributed Generation

COURSE OBJECTIVE: This course enables the students to introduce the concepts of Standalone and grid connected renewable energy systems with power conversion systems

COURSE OUTCOMES (CO)

After completion of the course student will be able to:

CO1. Characterize various renewable energy technologies and their effective utilization
CO2. Design power electronic circuits for PV-Grid integration
CO3: Design power electronic circuits for Wind-Grid integration
CO4. Analyze various energy storage systems

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

COs	PO a	PO b	PO c	PO d	PO e	PO f	PSO a	PSO b	PSO c
CO1	3		2	2	2	1	2	3	3
CO2	3		2	2	2	1	2	3	3
CO3	3		2	2	2	1	2	3	3
CO4	3		2	2	2	1	3	3	3

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

BOS APPROVED TEXT BOOKS:

T1 Farret,M.Godoy.Simoe,"Integration of alternating sources of energy"wiley-IEEE press, Dec 2005

T2 Freries.LL,"Wind energy conversion systems"Prentice Hall, UK

BOS APPROVED REFERENCE BOOKS:

R1 Farret,M.Godoy.Simoe,"Integration of alternating sources of energy"wiley-IEEE press, Dec 2005

R2 Freries.LL,"Wind energy conversion systems"Prentice Hall, UK

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : SOLAR ENERGY

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.	UNIT - I: Review of Solar energy-	1	21-01-2019		TLM1	1	T1 &R1	
2.	Applications of PV Systems-	1	23-01-2019		TLM1	1	T1 &R1	
3.	Commercially available modules-	1	24-01-2019		TLM1	1	T1 &R1	
4.	FBC ETC collectors	1	25-01-2019		TLM1	1	T1 &R1	
5.	switching devices for solar energy conversion	1	28-01-2019		TLM1	1	T1 &R1	
6.	Maximum Power Point Tracking (MPPT) and Its Importance	1	30-01-2019		TLM1	1	T1 &R1	
7.	M PPT algorithms	1	31-01-2019		TLM1	1	T1 &R1	
8.	Performance analysis for varying solar irradiance and temperature-	1	1-2-2019		TLM4	1	T1 &R1	
9.	SEMINAR	1	4-2-2019		TLM3	1	T1 &R1	
10.	MPPT Techniques- -	1	6-2-2019		TLM1	1	T1 &R1	
11.	Comparison of various techniques and Charge controllers	1	7-2-2019		TLM1	1	T1 &R1	
12.	Unit revision/assignment	1	8-2-2019		TLM1	1,4	T1 &R1	
No. of classes required to complete UNIT-I		12			No. of classes taken:			

UNIT-II : pv based converter design & integration

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
13.	Unit –II Introduction	1	11-02-2019		TLM1	1,2	T1 &R1	
14.	DC-DC Converter-Classification	1	13-02-2019		TLM1	2	T1 &R1	
15.	DC-DC Converter	1	14-02-2019		TLM1	2	T1 &R1	
16.	seminar	1	15-02-2019		TLM1	2	T1 &R1	
17.	DC-AC converters- Classification of Inverters-	1	18-02-2019		TLM3	2	T1 &R1	
18.	DC-AC converters- Classification of Inverters	1	20-02-2019		TLM1	2	T1 &R1	
19.	Applications- Photo Voltaic inverter	1	21-02-2019		TLM1	2	T1 &R1	

20.	Grid-Tie Inverter	1	22-02-2019		TLM1	1,2	T1 &R1	
21.	Hybrid Inverter with batteries and grid connected system-inverter Topologies	1	25-02-2019		TLM3	2	T1 &R1	
22.	grid connected system- inverter Topologies	1	27-02-2019		TLM1	1,2	T1 &R1	
23.	Seminar/unit revision	1	28-02-2019		TLM2	1,2	T1 &R1	
No. of classes required to complete UNIT-II		11			No. of classes taken:			

UNIT-III :

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.	UNIT - III: WIND ENERGY Overview of Wind Energy	1	01-03-2019		TLM1	1	T1 &R1	
25.	Conversion Systems (WECS),	1	06-03-2019		TLM1	1	T1 &R1	
26.	Wind turbine Technologies.	1	07-03-2019		TLM1	1	T1 &R1	
27.	classifications of WECS	1	08-03-2019		TLM1	1	T1 &R1	
28.	performance of induction generators for WECS	1	18-03-2019		TLM3	1	T1 &R1	
29.	induction generators for WECS	1	21-03-2019		TLM1	1	T1 &R1	
30.	self excited induction generator for isolated power generators.	1	22-03-2019		TLM1	1	T1 &R1	
31.	generator for isolated power generators	1	25-03-2019		TLM1	1	T1 &R1	
32.	Seminar	1	27-03-2019		TLM3	1	T1 &R1	
33.	capacitance requirements. power conditioning schemes	1	28-03-2019		TLM4	1,4	T1 &R1	
34.	power conditioning schemes	1	29-03-2019		TLM2	1,4	T1 &R1	
35.	Maximum Power Point Tracking (MPPT) Control	1	01-04-2019		TLM1	1	T1 &R1	
36.	Maximum Power Point Tracking (MPPT) Control	1	03-04-2019		TLM1	1	T1 &R1	
37.	Synchronous generators	1	04-04-2019		TLM1	1	T1 &R1	
38.	Synchronous generators	1	08-04-2019		TLM1	1	T1 &R1	
No. of classes required to complete UNIT-III					No. of classes taken:			

UNIT-IV : WIND ENERGY BASED CONVERTER DESIGN & INTEGRATION

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
39.	AC Voltage Controllers (Soft Starters)-	1	10-04-2019		TLM1	3	T2 &R2	
40.	Interleaved Boost Converters-	1	11-04-2019		TLM1	3	T2 &R2	

41.	Two-Level Voltage Source Converters-	1	12-04-2019		TLM1	3	T2 &R2	
42.	Three-Level Neutral Point Clamped Converters-	1	15-04-2019		TLM1	3	T2 &R2	
43.	PWM Current Source Converters	1	17-04-2019		TLM1	3	T2 &R2	
44.	PWM Current Source Converters	1	18-04-2019		TLM3	3	T2 &R2	
45.	SEMINAR	1	22-04-2019		TLM4	3,4	T2 &R2	
46.	. Grid connectors concept	1	23-04-2019		TLM1	3	T2 &R2	
47.	grid related problems	1	24-04-2019		TLM1	3	T2 &R2	
48.	Control of Grid-Connected Inverter	1	25-04-2019		TLM1	3	T2 &R2	
49.	Unit revision/seminar	1	26-04-2019		TLM1	3	T2 &R2	
No. of classes required to complete UNIT-IV		15			No. of classes taken:			

UNIT-V: ENERGY STORAGE SYSTEMS

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
50.	Energy storage parameters. Lead acid batteries-Construction	1	29-04-2019		TLM1	3	T2 &R4	
51.	features-operating limits-Maintenance	1	01-05-2019		TLM1	3	T2 &R4	
52.	seminar	1	02-05-2019		TLM1	3	T2 &R4	
53.	Ultra capacitors- double layer capacitor-.	1	03-05-2019		TLM1	3,4	T2 &R4	
54.	double layer capacitor	1	06-05-2019		TLM3	3,4	T2 &R4	
55.	high energy capacitor-applications	1	08-05-2019		TLM1	3	T2 &R4	
56.	Flywheels. Super conducting magnetic storage system. storage heat	1	09-05-2019		TLM1	3	T2 &R4	
57.	magnetic storage system. storage heat	1	10-05-2019		TLM3	3	T2 &R4	
58.	Seminar/ unit revision	1	13-05-2019		TLM6	3,4	T2 &R4	
59	Unit revision/assignment	1	15-05-2019		TLM6	3,4	T1&R4	
No. of classes required to complete UNIT-V		10						

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
59.	Advance topics-Hybrid systems(solar-wind)	1	16-05-2019		TLM1	1,2,4	T1 & R1	
60.	Advance topics-Hybrid systems(solar-wind/fuel cells)	1	17-05-2019		TLM2	3,4	T2 & R2	

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

Description	From	To	Weeks
I Phase of Instructions-1	21-01-2019	09-03-2019	7W
I Mid Examinations	11-03-2019	16-03-2019	1W
II Phase of Instructions-I	18-03-2019	18-05-2019	9W
Summer Vacation	20-05-2019	01-06-2019	2W
II Mid Examinations	03-06-2019	08-06-2019	1W
Practicals	10-06-2019	15-06-2019	1W
Semester End Examinations	17-06-2019	29-06-2019	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
I-Mid Examination	1,2	A1=40
II-Mid Examination	3,4,	A2=40
Evaluation of Mid Marks: B=75% of Max(A1,A2)+25% of Min(A1,A2)	1,2,3,4	B=40
Cumulative Internal Examination : A+B	**1,2,3,4**	**B=40**
Semester End Examinations	**1,2,3,4**	**C=60**
Total Marks: B+C	**1,2,3,4**	**100**

Signature				
	Name of the faculty	Name of the course Co-ordinator	Name of the Module Co-ordinator	HOD
	Mrs.K.S.L.Lavanya	Mrs.K.S.L.Lavanya		Dr.M.Uma Vani

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part - A

PROGRAM : M.Tech., II-Sem.,

ACADEMIC YEAR : 2018-19

COURSE NAME & CODE : Modern Control Theory – 17PE10

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : **Mr. A.V.RAVIKUMAR**

COURSE COORDINATOR : **Mr. A.V.RAVIKUMAR**

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course enables the student to learn modern state-space methods to design and analyze continuous-time control systems.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Analyze the state-space model of continuous linear and non-linear systems
CO2: Apply Lyapunov stability theorem to non-linear LTI systems
CO3: Identify expected state-space trajectories
CO4: Formulate the optimal control problems

COURSE ARTICULATION MATRIX (Correlation between Cos & POs):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2			
CO2	3		2			
CO3	3		2			
CO4	3		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).

BOS APPROVED TEXT BOOKS:

T1. I.J. Nagrath and M. Gopal. "Control Systems Engineering". New Age International Publishers.Sixth edition .2017
T2. Ashish Tewari. "Modern control Design with Matlab and Simulink". John Wiley,NewDelhi.2005.

BOS APPROVED REFERENCE BOOKS:

R1. Jinzhi Wang, Zhisheng Duan, Ying Yang, Lin Huang. "Analysis and Control of Nonlinear Systems with Stationary sets-Time domain and Frequency domain methods". World Science publishing co.Pvt Ltd, 2009.
R2. George J. Thaler. `Automatic Control Systems', Jaico Publishers,1993.
R3. M.Gopal'Modern control system theory', New Age International Publishers, 2014.
R4. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, "Feedback Control of Dynamic Systems", seventh edition, Pearson Education,2015

Part - B
COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: MODAL CONTROL

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	UNIT-I : MODAL CONTROL	1	21-01-19		TLM1	CO2	T1	
2	Introduction to controllability and observability	1	22-01-19		TLM1	CO2	T1	
3	Examples of Controllability	1	24-01-19		TLM1	CO2	T1	
4	Examples of Observability	1	25-01-19		TLM1	CO2	T1	
5	Effect of state feedback on controllability	1	28-01-19		TLM1	CO2	T1	
6	Effect of state feedback on Observability	1	29-01-19		TLM1	CO2	T1	
7	Design of State Feedback Control through Pole placement	1	31-01-19		TLM1	CO2	T1	
8	Full order observer	1	01-02-19		TLM1	CO2	T1	
9	Reduced order observer	1	04-02-19		TLM1	CO2	T1	
10	Problems on Controllability and Observability	1	05-02-19		TLM1	CO2	T1	
11	problems	1	07-02-19		TLM1	CO2	T1	
12	problems	1	08-02-19		TLM1	CO2	T1	
13	Seminar-1	1	11-02-19		TLM6			
14	Assignment-1	1	12-02-19		TLM2			
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNITII: DESCRIBING FUNCTION ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15	Introduction to Non Linear Systems	1	14-02-19		TLM1	CO1	T1	
16	Behaviour of nonlinear systems	1	15-02-19		TLM1	CO1	T1	
17	properties of Nonlinear Systems	1	18-02-19		TLM1	CO1	T1	
18	Types of Nonlinearities	1	19-02-19		TLM1	CO1	T1	
19	Introduction to Linearization of nonlinear systems	1	21-02-19		TLM1	CO1	T1	
20	Describing function (DF)	1	22-02-19		TLM1	CO1	T1	
21	Derivation of general DF	1	25-02-19		TLM1	CO1	T1	
22	DF for different nonlinearities	1	26-02-19		TLM1	CO1	T1	
23	Describing function of saturation Nonlinearity	1	28-02-19		TLM1	CO1	T1	
24	Describing function of Deadzone Nonlinearity	1	01-03-19		TLM1	CO1	T1	
25	Describing function of Hysteresis-Backlash Nonlinearity	1	04-03-19		TLM1	CO1	T1	
26	Stability analysis of Non – Linear systems through describing functions	1	05-03-19		TLM1	CO1	T1	
27	Seminar-2	1	07-03-19		TLM6	CO1	T1	

28	Assignment-2	1	08-03-19		TLM2	CO1	T1	
29	MID-I		11-03-19					
30	MID-I		12-03-19					
31	MID-I		14-03-19					
32	MID-I		15-03-19					
No. of classes required to complete UNIT-II		14			No. of classes taken:			

UNIT-III : PHASE PLANE ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
33	Introduction to phase plane analysis	1	18-03-19		TLM1	CO3	T2	
34	Singular points, and their classification	1	19-03-19		TLM1	CO3	T2	
35	Singular points, and their classification	1	21-03-19		TLM1	CO3	T2	
36	Limit cycle and behaviour of limit cycle	1	22-03-19		TLM1	CO3	T2	
37	Analytical method for constructing	1	25-03-19		TLM1	CO3	T2	
38	Isoclines method for constructing Trajectories	1	26-03-19		TLM1	CO3	T2	
39	Isoclines method for constructing Trajectories	1	28-03-19		TLM1	CO3	T2	
40	Isoclines method for constructing Trajectories	1	29-03-19		TLM1	CO3	T2	
41	Delta method for constructing Trajectories	1	01-04-19		TLM1	CO3	T2	
42	Delta method for constructing Trajectories	1	02-04-19		TLM1	CO3	T2	
43	Delta method for constructing Trajectories	1	04-04-19		TLM1	CO3	T2	
44	Seminar-3	1	05-04-19		TLM1			
45	Assignment-3	1	08-04-19		TLM6			
No. of classes required to complete UNIT-III		13			No. of classes taken:			

UNIT IV: STABILITY ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
46	Introduction to stability	1	09-04-19		TLM1	CO4	T1	
47	Stability of equilibrium state Asymptotic stability	1	11-04-19		TLM1	CO4	T1	
48	Graphical representation	1	12-04-19		TLM2	CO4	T1	
49	Lyapunov stability theorem	1	15-04-19		TLM2	CO4	T1	
50	Stability analysis of linear and nonlinear systems	1	16-04-19		TLM2	CO4	T1	
51	Stability analysis of linear and nonlinear systems	1	18-04-19		TLM2	CO4	T1	
52	Construction of Lyapunov functions using Krasovskii method	1	19-04-19		TLM2	CO4	T1	
53	Construction of Lyapunov functions using variable gradient method	1	22-04-19		TLM2	CO4	T1	

54	Problems	1	23-04-19		TLM2	CO4	T1	
55	Seminar-4	1	25-04-19		TLM2			
56	Assignment-4	1	26-04-19		TLM6			
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT V: OPTIMAL CONTROL

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
57	OPTIMAL CONTROL	1	29-04-19		TLM2	CO4	T1	
58	Introduction of optimal control problems	1	30-04-19		TLM2	CO4	T1	
59	Minimum time, Minimum energy,	1	02-05-19		TLM2	CO4	T1	
60	State regulator problem	1	03-05-19		TLM2	CO4	T1	
61	Output regulator problem Tracking problem, calculus of variations	1	06-05-19		TLM2	CO4	T1	
62	fundamental concepts	1	07-05-19		TLM2	CO4	T1	
63	Linear quadratic regulator	1	09-05-19		TLM2	CO4	T1	
64	Linear Quadratic Gaussian(LQG)	1	10-05-19		TLM2	CO4	T1	
65	Formulation of optimal control problems	1	13-05-19		TLM2	CO4	T1	
66	Seminar-5/Assignment-5	1	14-05-19		TLM6	CO4		
67	MID-II		03-06-19					
68	MID-II		04-06-19					
69	MID-II		06-06-19					
70	MID-II		07-06-19					
No. of classes required to complete UNIT-V		10			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
1.	four degree of freedom	1	16-05-19					
2.	Kalman filter design	1	17-05-19					

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM2	PPT	**TLM6**	Assignment or Quiz
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Description	From	To	Weeks
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I Mid Examinations	11-03-19	16-03-19	1W
II Phase of Instructions	18-03-19	18-05-19	9W
SUMMER VACATION	20-05-19	01-06-19	2W
II Mid Examinations	03-06-19	08-06-19	1W
Preparation and Practicals	10-06-19	15-06-19	1W
Semester End Examinations	17-06-19	29-06-19	2W

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
I-Mid Examination	1,2	A1=40
II-Mid Examination	3,4	A2=20
Evaluation of Mid Marks: B=75% of Max(A1,A2)+25% of Min(A1,A2)	1,2,3,4	B=40
Cumulative Internal Examination : B	**1,2,3,4**	**40**
Semester End Examinations	**1,2,3,4**	**C=60**
Total Marks: B+C	**1,2,3,4**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

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

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

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

PROGRAMME OUTCOMES (POs)

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

PSOs (Program specific Outcomes):

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

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

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

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

Mr. A.V.Ravikumar	Mr. A.V.Ravikumar	Dr.K.R.L.Prasad	Dr.M.UmaVani
Course Instructor	Course Coordinator	Module Coordinator	HOD

MLAKKIREDDY 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 **:** M.Tech., II-Sem., EEE(PED)

ACADEMIC YEAR **:** 2018-19

COURSE NAME & CODE **: Switched Mode Power Conversion** – 17PE11

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

COURSE CREDITS **:** 3

COURSE INSTRUCTOR **: G.TABITA**

COURSE COORDINATOR **: G.TABITA**

PRE-REQUISITE: Analysis of Power Converters

COURSE OBJECTIVE : This course enables the student to understand principles and basic topologies of switched mode power converters.

COURSE OUTCOMES(COs)

After completion of the course, the student will be able to

CO1: Identify various types of switched mode converter topologies
CO2: Deign DC-DC converters of different topologies.
CO3: Analyze soft switching techniques.
CO4: Analyze different types of power factor correction circuits.

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

COs	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		2	2	2	1
CO2	3		2	2	2	1
CO3	3		2	2	2	1
CO4	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).

BOS APPROVED TEXT BOOKS:

T1 Ned Mohan, Undeland and Robbin, "Power Electronics: Converters, Application and design", John Wiley and sons, Newyork, 2007.

T2 Robert Erickon and Dragon Maksivimovic " Fundamentals of Power Electronics", Springer Publications, 2nd edition, 2001.

BOS APPROVED REFERENCE BOOKS:

R1 Philip T.Krein " Elements of Power Electronic", Oxford University Press, 2nd edition, 2014.

R2 L.Umanand "Power Electronics Essentials & Applications", Wiley India Private Limited, 2011.

R3 Issa Batarseh "Power Electronics Circuits", John Wiely, 2006.

R4 Md.H.Rahid "Power Electronics", Pearson Education, 4th edition, 2014.

COURSE DELIVERY PLAN (LESSON PLAN)
UNIT-I: NON ISOLATED SWICHMODE POWER CONVERSION

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	1	21-01-2019		**TLM1**	CO2	T1	
2.	Analysis of Buck converter, CCM,DCM	1	22-01-2019		**TLM1**	CO2	T1	
3.	Designing of Buck converter, CCM,DCM	1	23-01-2019		**TLM1**	CO2	T1	
4.	Analysis of Boost converter, CCM,DCM	1	24-01-2019		**TLM1**	CO2	T1	
5.	Designing of Boost converter, CCM,DCM	1	28-01-2019		**TLM1**	CO2	T1	
6.	Analysis of Buck-Boost converter, CCM,DCM	1	29-01-2019		**TLM1**	CO2	T1	
7.	Designing of Buck-Boost converter, CCM,DCM	1	30-01-2019		**TLM1**	CO2	T1	
8.	Analysis of Cuk converter, CCM,DCM	1	31-01-2019		**TLM1**	CO2	T1	
9.	Designing of Cuk converter, CCM,DCM	1	04-02-2019		**TLM1**	CO2	T1	
10.	applications, problems	1	05-02-2019		**TLM1**	CO2	T1	
11.	problems	1	06-02-2019		**TLM1**	CO2	T1	
12.	problems	1	07-02-2019		**TLM1**	CO2	T1	
13.	Seminar-1	1	11-02-2019		**TLM1**	CO2	T1	
14.	Assignment-1	1	12-02-2019		**TLM6**	CO2	T1	
No. of classes required to complete UNIT-I		14			No. of classes taken:			

UNITII: ISOLATED SWICHMODE POWER CONVERSION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Requirement for isolation in the switch-mode converters, transformer connection	1	13-02-2019		**TLM1**	CO1	T1	
16.	Forward converter, power circuit and steady state analysis-Applications.	1	14-02-2019		**TLM1**	CO1	T1	
17.	fly back converter, power circuit and steady state analysis-Applications.	1	11-02-2019		**TLM1**	CO1	T1	
18.	Push Pull Converters: Power circuit and steady state analysis	1	18-02-2019		**TLM1**	CO1	T1	
19.	utilization of magnetic circuits in single switch and push-pull topologies	1	19-02-2019		**TLM1**	CO1	T1	
20.	full bridge converter- Power circuit and steady state analysis	1	20-02-2019		**TLM1**	CO1	T1	
21.	Half bridge converter- Power circuit and steady state analysis	1	21-02-2019		**TLM1**	CO1	T1	
22.	Utilization of magnetic circuits	1	25-02-2019		**TLM1**	CO1	T1	
23.	comparison with previous topologies	1	26-02-2019		**TLM1**	CO1	T1	

24.	Seminar-2	1	27-02-2019		**TLM1**	CO1	T1	
25.	Assignment-2	1	28-02-2019		**TLM6**	CO1	T1	
26.	Repitition of Unit-2	1	05-03-2019		**TLM2**	CO1	T1	
No. of classes required to complete UNIT-II		12		No. of classes taken:				

UNIT-III : SOFT SWITCHING CONVERTERS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	Classification of Resonant converters-Basic resonant circuits	1	06-03-2019		**TLM1**	CO3	T2	
28.	Series resonant circuit	1	07-03-2019		**TLM1**	CO3	T2	
29.	Parallel resonant circuits	1	08-03-2019		**TLM1**	CO3	T2	
30.	Resonant switches, Concept of Zero voltage switching	1	18-03-2019		**TLM1**	CO3	T2	
31.	Principle of operation, analysis of M-type Buck Converter	1	19-03-2019		**TLM1**	CO3	T2	
32.	Principle of operation, analysis of L-type Buck Converter	1	20-03-2019		**TLM1**	CO3	T2	
33.	Principle of operation, analysis of M-type Boost Converter	1	25-03-2019		**TLM1**	CO3	T2	
34.	Principle of operation, analysis of L-type Boost Converter	1	26-03-2019		**TLM1**	CO3	T2	
35.	Concept of Zero current switching	1	27-03-2019		**TLM1**	CO3	T2	
36.	Principle of operation, analysis of M-type Buck Converter	1	28-03-2019		**TLM1**	CO3	T2	
37.	Principle of operation, analysis of L-type Buck Converter	1	01-04-2019		**TLM1**	CO3	T2	
38.	Principle of operation, analysis of M-type Boost Converter	1	02-04-2019		**TLM1**	CO3	T2	
39.	Principle of operation, analysis of L-type Boost Converter	1	03-04-2019		**TLM1**	CO3	T2	
40.	Seminar-3	1	04-04-2019		**TLM1**	CO3	T2	
41.	Assignment-3	1	08-04-2019		**TLM6**	CO3	T2	
No. of classes required to complete UNIT-III		15		No. of classes taken:				

UNIT IV: POWER FACTOR CORRECTION CIRCUITS

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
42.	Introduction, Definition of PF and THD, Power Factor Correction	1	09-04-2019		**TLM1**	CO4	T1	
43.	Energy Balance in PFC Circuits	1	10-04-2019		**TLM1**	CO4	T1	
44.	Passive Power Factor Corrector	1	11-04-2019		**TLM2**	CO4	T1	
45.	Basic Circuit Topologies of Active Power Factor Correctors	1	15-04-2019		**TLM2**	CO4	T1	

46.	System Configurations of PFC Power Supply	1	16-04-2019		**TLM2**	CO4	T1	
47.	CCM Shaping Technique	1	17-04-2019		**TLM2**	CO4	T1	
48.	Current Mode Control	1	18-04-2019		**TLM2**	CO4	T1	
49.	Voltage Mode Control	1	22-04-2019		**TLM2**	CO4	T1	
50.	Other PFC Techniques	2	23-04-2019 24-04-2019		**TLM2**	CO4	T1	
51.	Seminar-4	1	25-04-2019		**TLM1**	CO4	T1	
52.	Assignment-4	1	29-04-2019		**TLM6**	CO4	T1	
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT V: CONTROL METHODS FOR SWITCHING POWER CONVERTERS

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
53.	Control methods for buck dc-dc converters using State-space Modelling	1	30-04-2019		**TLM2**	CO4	T1	
54.	Control methods for boost dc-dc converters using State-space Modelling	1	01-05-2019		**TLM2**	CO4	T1	
55.	Control methods for forward dc-dc converters using State-space Modelling	1	02-05-2019		**TLM2**	CO4	T1	
56.	Converter Transfer Functions of buck dc-dc converter	1	06-05-2019		**TLM2**	CO4	T1	
57.	Converter Transfer Functions of boost dc-dc converter	1	07-05-2019		**TLM2**	CO4	T1	
58.	Converter Transfer Functions of forward dc-dc converter	1	08-05-2019		**TLM2**	CO4	T1	
59.	Pulse Width Modulator Transfer Functions	1	09-05-2019		**TLM2**	CO4	T1	
60.	Pulse Width Modulator Transfer Functions	1	13-05-2019		**TLM2**	CO4	T1	
61.	Linear Feedback Design Ensuring Stability	2	14-05-2019 15-05-2019		**TLM2**	CO4	T1	
62.	Assignment-5	1	16-05-2019		**TLM6**	CO4		
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
63.	Applications of various converter	1	05-022019		**TLM1**	CO2	T1	
64.	Other PFC Techniques	1	24-04-2019		**TLM2**	CO4	T1	
65.	Linear Feedback Design Ensuring Stability	1	15-05-2019		**TLM2**	CO4	T1	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
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I Mid Examinations	11-03-19	16-03-19	1W
II Phase of Instructions	18-03-19	18-05-19	9W
SUMMER VACATION	20-05-19	01-06-19	2W
II Mid Examinations	03-06-19	08-06-19	1W
Preparation and Practicals	10-06-19	15-06-19	1W
Semester End Examinations	17-06-19	29-06-19	2W

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
I-Mid Examination	1,2	A1=40
II-Mid Examination	3,4	A2=20
Evaluation of Mid Marks: B=75% of Max(A1,A2)+25% of Min(A1,A2)	1,2,3,4	B=40
Cumulative Internal Examination : B	**1,2,3,4**	**40**
Semester End Examinations	**1,2,3,4**	**C=60**
Total Marks: B+C	**1,2,3,4**	**100**

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e: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PSO-d: Design controllers for electrical and electronic systems to improve their performance.

Smt. G.Tabita	Smt. G.Tabita	Dr. J.Siva vara Prasad	Dr.M.UmaVani
Course Instructor	Course Coordinator	Module Coordinator	HOD