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

DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.P.Sobha Rani
Course Name & Code : Power system Protection17EE21
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- A A.Y : 2021-22

PRE-REQUISITE **:** Electrical Power Transmission

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

- Understand working and operation of different types of circuit breakers, electromagnetic and electro -static relays
- Identify protection schemes for different electrical equipment in the power system
- Introduce the concepts of microprocessor based protective relaying system
- **COURSE OUTCOMES (COs):** At the end of the course, students are able to

CO 1	Illustrate the different types and functions of protective relays of power systems
CO 2	Analyze the operation and working of electro mechanical, static and numerical relays
CO 3	Design relevant protection schemes for the main elements of power system
CO 4	Illustrate the fundamental concepts and types of circuit breakers

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

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

1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

TEXT BOOKS:

T1 Badri Ram, D.N.Vishwakarma, "Power system protection and switchgear", TMH Publications,2nd edition,2011.

T2 T S Madhava Rao, "Power system protection-static relays with microprocessor applications" , TMH Publications,2nd edition,2008

REFERENCES:

R1 C R Mason, "Art and science of protective relaying", Wiley publications,1957.

R2 C.L.Wadhwa, "Electrical Power Systems", New Age International(P) Limited,3rd edition 2004

R3 Sunil S Rao, Switchgear Protection and Power system Theory, Practice and solved problems, 11th edition, Khanna publishers,1999

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: General Introduction to Power system Protection

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, course outcomes	1	27-09-2021		TLM2	
2.	Need for protective systems	1	28-09-2021		TLM2	
3.	Nature and causes of faults, types of faults and effects	1	30-09-2021		TLM2	
4.	Evolution of protective relays	1	01-10-2021		TLM2	
5.	Zones of protection, primary and backup protection	1	04-10-2021		TLM2	
6.	Essential qualities of protection	1	05-10-2021		TLM2	
7.	Classification of protective relays based on technology, function	1	07-10-2021		TLM2	
8.	Classification of protective schemes	1	08-10-2021		TLM2	
9.	Tutorial-1	1	11-10-2021		TLM3	
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: Operating Principles and Relay Construction

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.	Electromagnetic Relays-attracted armature	1	12-10-2021		TLM2	
2.	PMMC, MC,MI, balanced beam relay,	1	18-10-2021		TLM2	
3.	Induction disc, induction cup	1	19-10-2021		TLM2	
4.	Auxiliary relay, thermal relays	1	21-10-2021		TLM2	
5.	Static relays-merits and demerits	1	22-10-2021		TLM2	
6.	Comparators-amplitude and phase	1	25-10-2021		TLM2	
7.	Duality between amplitude and phase comparators	1	26-10-2021		TLM2	
8.	Types of amplitude and phase comparators	1	28-10-2021		TLM2	
9.	Microprocessor based protective relays	1	29-10-2021		TLM2	
10.	I-Mid		08-11-2021 to 13-11-2021			

No. of classes required to complete UNIT-II:9	No. of classes taken:

UNIT-III: Protective Schemes

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.	Over current Protection: Time-current characteristics	1	01-11-2021		TLM2	
2.	Reverse power or directional relay	1	02-11-2021		TLM2	
3.	Protection of feeders, ring mains	1	05-11-2021		TLM1	
4.	Earth fault and phase fault protection	1	15-11-2021		TLM2	
5.	Distance protection: impedance, reactance and MHO relay	1	16-11-2021		TLM2	
6.	Input quantities for various types of distance relays	1	18-11-2021		TLM2	
7.	Effect of arc resistance, power surges or power swings and line length performance of distance relays	1	19-11-2021		TLM2	
8.	Selection of distance relays, distance relay characteristics, choice of characteristics for different zones of protection	1	22-11-2021		TLM2	
9.	Generator protection-protection against stator and rotor faults and abnormal operating conditions	1	23-11-2021		TLM2	
10.	Generator-transformer unit protection	1	25-11-2021		TLM2	
11.	Transformer protection-types of faults, over current protection	1	26-11-2021		TLM2	
12.	Differential protection, differential relay with harmonic restraint	1	29-11-2021		TLM1	
13.	Protection against high resistance ground faults, interturn faults, Buchholz relay	1	30-11-2021		TLM2	
No. of classes required to complete UNIT-III:13				No. of classes taken:		

UNIT-IV : Microprocessor based protective relays and overvoltage protection

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Over current, distance and directional relays	1	02-12-2021		TLM2	
2.	Generalized mathematical expression for distance relays, measurement of R&X	1	03-12-2021		TLM2	
3.	Causes of over voltages	1	06-12-2021		TLM2	
4.	Methods of overvoltage protection-ground wire, Peterson coils, surge absorbers and diverters	2	07-12-2021 09-12-2021		TLM2	
5.	Location of protective apparatus	1	10-12-2021		TLM2	
6.	Insulation coordination	2	13-12-2021 14-12-2021		TLM2	
7.	Neutral earthing				TLM2	
No. of classes required to complete UNIT-IV:8				No. of classes taken:		

UNIT-V : Circuit Breakers

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.	Arc voltage, arc interruption theories	1	16-12-2021		TLM2	
2.	Restriking and recovery voltages, resistance switching	1	17-12-2021		TLM2	
3.	Current chopping, interruption of capacitive currents	1	20-12-2021		TLM2	
4.	Classification of circuit breakers-oil	1	21-12-2021		TLM2	
5.	Air blast, air break	1	23-12-2021		TLM2	
6.	SF_6 ,operating mechanism	1	24-12-2021		TLM2	
7.	Selection of circuit breakers, high voltage DC circuit breakers	1	27-12-2021		TLM2	
8.	Rating of circuit breakers , testing of circuit breakers	2	28-12-2021 30-12-2021		TLM2	
9.	revision	1	31-12-2021		TLM1	
10.	II Mid		03-01-2022 to 08-01-2022			
No. of classes required to complete UNIT-V:10				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.P.Sobha Rani
Course Name & Code : Power system Protection17EE21
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE **:** Electrical Power Transmission

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

- Understand working and operation of different types of circuit breakers, electromagnetic and electro -static relays
- Identify protection schemes for different electrical equipment in the power system
- Introduce the concepts of microprocessor based protective relaying system
- **COURSE OUTCOMES (COs):** At the end of the course, students are able to

CO 1	Illustrate the different types and functions of protective relays of power systems
CO 2	Analyze the operation and working of electro mechanical, static and numerical relays
CO 3	Design relevant protection schemes for the main elements of power system
CO 4	Illustrate the fundamental concepts and types of circuit breakers

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

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

1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

TEXT BOOKS:

T1 Badri Ram, D.N.Vishwakarma, "Power system protection and switchgear", TMH Publications,2nd edition,2011.

T2 T S Madhava Rao, "Power system protection-static relays with microprocessor applications" , TMH Publications,2nd edition,2008

REFERENCES:

R1 C R Mason, "Art and science of protective relaying", Wiley publications,1957.

R2 C.L.Wadhwa, "Electrical Power Systems", New Age International(P) Limited,3rd edition 2004

R3 Sunil S Rao, Switchgear Protection and Power system Theory, Practice and solved problems, 11th edition, Khanna publishers,1999

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):B/S

UNIT-I: General Introduction to Power system Protection

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, course outcomes	1	27-09-2021		TLM2	
2.	Need for protective systems	1	28-09-2021		TLM2	
3.	Nature and causes of faults, types of faults and effects	1	29-09-2021		TLM2	
4.	Evolution of protective relays	1	30-09-2021		TLM2	
5.	Zones of protection, primary and backup protection	1	04-10-2021		TLM2	
6.	Essential qualities of protection	1	05-10-2021		TLM2	
7.	Classification of protective relays based on technology, function	1	06-10-2021		TLM2	
8.	Classification of protective schemes	1	07-10-2021		TLM2	
9.	Tutorial-1	1	11-10-2021		TLM3	
No. of classes required to complete UNIT-I: 9				No. of classes taken:		

UNIT-II: Operating Principles and Relay Construction

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.	Electromagnetic Relays-attracted armature	1	12-10-2021		TLM2	
2.	PMMC, MC,MI, balanced beam relay,	1	18-10-2021		TLM2	
3.	Induction disc, induction cup	1	19-10-2021		TLM2	
4.	Auxiliary relay, thermal relays	1	21-10-2021		TLM2	
5.	Static relays-merits and demerits	1	25-10-2021		TLM2	
6.	Comparators-amplitude and phase	1	26-10-2021		TLM2	
7.	Duality between amplitude and phase comparators	1	27-10-2021		TLM2	
8.	Types of amplitude and phase comparators	1	28-10-2021		TLM2	
9.	Microprocessor based protective relays	1	01-11-2021		TLM2	
10.	I-Mid		08-11-2021 to 13-11-2021			

No. of classes required to complete UNIT-II:9	No. of classes taken:

UNIT-III: Protective Schemes

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.	Over current Protection: Time-current characteristics	1	02-11-2021		TLM2	
2.	Reverse power or directional relay	1	03-11-2021		TLM2	
3.	Protection of feeders, ring mains	1	15-11-2021		TLM1	
4.	Earth fault and phase fault protection	1	16-11-2021		TLM2	
5.	Distance protection: impedance, reactance and MHO relay	1	17-11-2021		TLM2	
6.	Input quantities for various types of distance relays	1	18-11-2021		TLM2	
7.	Effect of arc resistance, power surges or power swings and line length performance of distance relays	1	22-11-2021		TLM2	
8.	Selection of distance relays, distance relay characteristics, choice of characteristics for different zones of protection	1	23-11-2021		TLM2	
9.	Generator protection-protection against stator and rotor faults and abnormal operating conditions	1	24-11-2021		TLM2	
10.	Generator-transformer unit protection	1	25-11-2021		TLM2	
11.	Transformer protection-types of faults, over current protection	1	29-11-2021		TLM2	
12.	Differential protection, differential relay with harmonic restraint	1	30-11-2021		TLM1	
13.	Protection against high resistance ground faults, interturn faults, Buchholz relay	1	01-12-2021		TLM2	
No. of classes required to complete UNIT-III:13				No. of classes taken:		

UNIT-IV : Microprocessor based protective relays and overvoltage protection

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Over current, distance and directional relays	1	02-12-2021		TLM2	
2.	Generalized mathematical expression for distance relays, measurement of R&X	1	06-12-2021		TLM2	
3.	Causes of over voltages	1	07-12-2021		TLM2	
4.	Methods of overvoltage protection-ground wire, Peterson coils, surge absorbers and diverters	2	08-12-2021 09-12-2021		TLM2	
5.	Location of protective apparatus	1	13-12-2021		TLM2	
6.	Insulation coordination	2	14-12-2021 15-12-2021		TLM2	
7.	Neutral earthing				TLM2	
No. of classes required to complete UNIT-IV:8				No. of classes taken:		

UNIT-V : Circuit Breakers

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.	Arc voltage, arc interruption theories	1	20-12-2021		TLM2	
2.	Restriking and recovery voltages, resistance switching	1	21-12-2021		TLM2	
3.	Current chopping, interruption of capacitive currents	1	22-12-2021		TLM2	
4.	Classification of circuit breakers-oil	1	23-12-2021		TLM2	
5.	Air blast, air break	1	27-12-2021		TLM2	
6.	SF_6 ,operating mechanism	1	28-12-2021		TLM2	
7.	Selection of circuit breakers, high voltage DC circuit breakers	1	29-12-2021		TLM2	
8.	Rating of circuit breakers , testing of circuit breakers	1	30-12-2021		TLM2	
9.	II Mid		03-01-2022 to 08-01-2022			
No. of classes required to complete UNIT-V:10				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Srihari
Course Name & Code : Power System Operation and Control & 17EE22
L-T-P Structure : 2-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- A A.Y : 2021-22

PRE-REQUISITE : Power System Analysis

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

- Familiarize economic operation of power system
- Introduce emphasizes on single area and two area load frequency control
- Understand reactive power control methods

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

CO 1	Illustrate the fundamental concepts of economic operation of power
CO 2	Realize the operations of AGC and reactive power control
CO 3	Outline the concepts of deregulation

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

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

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

TEXT BOOKS:

T1 W D Stevenson Jr., "Power System Analysis", T M H, 4th edition,1982.
T2 PSR Murthy, "Operation and control in power system" , BS publications, second edition,2009

REFERENCE BOOKS:

R1 O.I.Elgerd, "Electric Energy systems theory: An introduction", TMH, 2nd edition 2017.
R2 A.J.Wood and B.F.Wallenberg, "Power Generation, operation and Control", John Wiley&sons publications, 2nd edition 2010.
R3 Hadi Saadat, "Power System Analysis"– TMH , 3rd Edition, 2011.
R4 Dr. Shailendra Jain, "Modelling and simulation using MATLAB-Simulink", Wiley Publication, II Edition., 2011.
R5 Dr.Vikramaditya Dave, "Electric power transmission and Distribution system with PSCAD (Basics)", Himanshu Publication, 2017.
R6 Atosua Yazdani, "Modern distribution systems with PSCAD analysis", CRC press, I Edition., 2018.

R7 Tharangika Bambaravanage, "Modelling, simulation and control of a medium scale power system", Springer, I Edition., 2017.

R8 Operating procedures for national grid, NLDC Power system operation corporation Ltd, July 2013

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: ECONOMIC OPERATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, Course outcomes	1	27-09-2021		TLM1	
2.	Optimal operation of generators in thermal stations	1	28-09-2021		TLM1	
3.	Heat rate curve, cost curve, incremental fuel and production costs	1	30-09-2021		TLM1	
4.	Input-output characteristics	1	02-10-2021		TLM1	
5.	Optimum generation allocation without line losses	1	04-10-2021		TLM1	
6.	Optimum generation allocation including effect of transmission line losses	1	05-10-2021		TLM2	
7.	Loss coefficients	1	07-10-2021		TLM1	
8.	Loss coefficients	1	09-10-2021		TLM1	
9.	General transmission line loss formula	1	11-10-2021		TLM1	
No. of classes required to complete UNIT-I: **09**				No. of classes taken:		

UNIT-II: UNIT COMMITMENT

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 commitment problem	1	18-10-2021		TLM1	
2.	Unit commitment problem	1	19-10-2021		TLM1	
3.	Priority order scheduling	1	21-10-2021		TLM1	
4.	Priority order scheduling	1	23-10-2021		TLM1	
5.	Dynamic programming approach to Unit commitment problem	2	25-10-2021, 26-10-2021		TLM1	
6.	Dynamic programming approach to Unit commitment problem	1	28-10-2021		TLM1	
7.	Hydro-Thermal coordination	1	30-10-2021		TLM1	
8.	Hydro-Thermal coordination	1	01-11-2021		TLM2	

9.	I-Mid		**08-11-2021**			
10.	I-Mid		**09-11-2021**			
11.	I-Mid		**11-11-2021**			
No. of classes required to complete UNIT-II:09				No. of classes taken:		

UNIT-III: AUTOMATIC GENERATION CONTROL(AGC)

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.	Generator-steady state and transient models	1	02-11-2021		TLM1	
2.	Description of simplified network model of a synchronous machine	1	06-11-2021		TLM1	
3.	Load, prime mover and governor models, Steady state performance of speed governing system	1	15-11-2021		TLM1	
4.	Restricted mode of governing mode of operation	1	16-11-2021		TLM1	
5.	Primary load frequency loop	1	18-11-2021		TLM1	
6.	Steady state response with and without integral control loop	1	20-11-2021		TLM1	
7.	dynamic response with and without integral control loop	1	22-11-2021		TLM1	
8.	Modeling and Performance of secondary load frequency loop	1	23-11-2021		TLM1	
9.	Extension to two area system	1	25-11-2021		TLM1	
10.	tie line power flow model, Interfacing AGC with economic dispatch	1	27-11-2021		TLM2	
No. of classes required to complete UNIT-III:**10**				No. of classes taken:		

UNIT-IV : REACTIVE POWER CONROL AND VOLTAGE STABILITY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Reactive power flow and voltage collapse	1	29-11-2021		TLM1	
2.	V-Q sensitivity analysis	1	30-11-2021		TLM1	
3.	Reactive power compensation in transmission system	1	02-12-2021		TLM1	
4.	Advantages and disadvantages of different types of compensating equipment for transmission system	1	04-12-2021		TLM1	
5.	Load compensation	1	06-12-2021		TLM1	
6.	Specifications of load compensator	1	07-12-2021		TLM1	
7.	Uncompensated and compensated transmission lines		09-12-2021		TLM1	

8.	Shunt and series compensation	1	11-12-2021		TLM1	
9.	FACTS devices (elementary treatment)	1	13-12-2021		TLM2	
No. of classes required to complete UNIT-IV:**09**				No. of classes taken:		

UNIT-V : DEREGULATION

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 of market structure	1	14-12-2021		TLM1	
2.	Spot market	1	16-12-2021		TLM1	
3.	Forward markets and settlements	1	18-12-2021		TLM1	
4.	pricing	2	20-12-2021		TLM1	
5.	Location marginal prices(LMP)	1	21-12-2021		TLM1	
6.	Location marginal prices(LMP)	1	23-12-2021		TLM1	
7.	Transmission pricing	1	27-12-2021		TLM1	
8.	Introduction to financial rights	1	28-12-2021		TLM2	
9.	revision	2	30-12-2021, 01-01-2022		TLM1	
10.	II Mid		**03-01-2022**			
11.	II Mid		**04-01-2022**			
12.	II Mid		**06-01-2022**			
13.	II Mid		**08-01-2022**			
No. of classes required to complete UNIT-V:**09**				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5
Assignment-II (Unit-II)	A2=5
I-Mid Examination (Units-I & II)	M1=20

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Mr.P.Srihari)	(Mr.P.Srihari)	(Dr.M.S.Giridhar)	(Dr.J.Siva Vara Prasad)

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.P.Srihari
Course Name & Code : Power System Operation and Control & 17EE22
L-T-P Structure : 2-1-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE : Power System Analysis

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

- Familiarize economic operation of power system
- Introduce emphasizes on single area and two area load frequency control
- Understand reactive power control methods

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

CO 1	Illustrate the fundamental concepts of economic operation of power
CO 2	Realize the operations of AGC and reactive power control
CO 3	Outline the concepts of deregulation

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

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

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

TEXT BOOKS:

T1 W D Stevenson Jr., "Power System Analysis", T M H, 4th edition,1982.

T2 PSR Murthy, "Operation and control in power system" , BS publications, second edition,2009

REFERENCE BOOKS:

R1 O.I.Elgerd, "Electric Energy systems theory: An introduction", TMH, 2nd edition 2017.

R2 A.J.Wood and B.F.Wallenberg, "Power Generation, operation and Control", John Wiley&sons publications, 2nd edition 2010.

R3 Hadi Saadat, "Power System Analysis"– TMH , 3rd Edition, 2011.

R4 Dr. Shailendra Jain, "Modelling and simulation using MATLAB-Simulink", Wiley Publication, II Edition., 2011.

R5 Dr.Vikramaditya Dave, "Electric power transmission and Distribution system with PSCAD (Basics)", Himanshu Publication, 2017.

R6 Atosua Yazdani, "Modern distribution systems with PSCAD analysis", CRC press, I Edition., 2018.

R7 Tharangika Bambaravanage, "Modelling, simulation and control of a medium scale power system", Springer, I Edition., 2017.

R8 Operating procedures for national grid, NLDC Power system operation corporation Ltd, July 2013

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: ECONOMIC OPERATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, Course outcomes	1	27-09-2021		TLM1	
2.	Optimal operation of generators in thermal stations	1	28-09-2021		TLM1	
3.	Heat rate curve, cost curve, incremental fuel and production costs	1	29-09-2021		TLM1	
4.	Input-output characteristics	1	02-10-2021		TLM1	
5.	Optimum generation allocation without line losses	1	04-10-2021		TLM1	
6.	Optimum generation allocation including effect of transmission line losses	1	05-10-2021		TLM2	
7.	Loss coefficients	1	06-10-2021		TLM1	

8.	Loss coefficients	1	09-10-2021		TLM1	
9.	General transmission line loss formula	1	11-10-2021		TLM1	
No. of classes required to complete UNIT-I: **09**				No. of classes taken:		

UNIT-II: UNIT COMMITMENT

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 commitment problem	1	18-10-2021		TLM1	
2.	Unit commitment problem	1	19-10-2021		TLM1	
3.	Priority order scheduling	1	23-10-2021		TLM1	
4.	Priority order scheduling	1	25-10-2021		TLM1	
5.	Dynamic programming approach to Unit commitment problem	2	26-10-2021 27-10-2021		TLM1	
6.	Dynamic programming approach to Unit commitment problem	1	30-10-2021		TLM1	
7.	Hydro-Thermal coordination	1	01-11-2021		TLM1	
8.	Hydro-Thermal coordination	1	02-11-2021		TLM2	
9.	I-Mid		**08-11-2021**			
10.	I-Mid		**09-11-2021**			
11.	I-Mid		**11-11-2021**			
No. of classes required to complete UNIT-II:09				No. of classes taken:		

UNIT-III: AUTOMATIC GENERATION CONTROL(AGC)

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.	Generator-steady state and transient models	1	03-11-2021		TLM1	
2.	Description of simplified network model of a synchronous machine	1	06-11-2021		TLM1	
3.	Load, prime mover and governor models, Steady state performance of speed governing system	1	15-11-2021		TLM1	
4.	Restricted mode of governing mode of operation	1	16-11-2021		TLM1	
5.	Primary load frequency loop	1	17-11-2021		TLM1	
6.	Steady state response with and without integral control loop	1	20-11-2021		TLM1	
7.	dynamic response with and without integral control loop	1	22-11-2021		TLM1	
8.	Modeling and Performance of secondary load frequency loop	1	23-11-2021		TLM1	

9.	Extension to two area system	1	24-11-2021		TLM1	
10.	tie line power flow model, Interfacing AGC with economic dispatch	1	27-11-2021		TLM2	
No. of classes required to complete UNIT-III:**10**				No. of classes taken:		

UNIT-IV : REACTIVE POWER CONROL AND VOLTAGE STABILITY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Reactive power flow and voltage collapse	1	29-11-2021		TLM1	
2.	V-Q sensitivity analysis	1	30-11-2021		TLM1	
3.	Reactive power compensation in transmission system	1	01-12-2021		TLM1	
4.	Advantages and disadvantages of different types of compensating equipment for transmission system	1	04-12-2021		TLM1	
5.	Load compensation	1	06-12-2021		TLM1	
6.	Specifications of load compensator	1	07-12-2021		TLM1	
7.	Uncompensated and compensated transmission lines		08-12-2021		TLM1	
8.	Shunt and series compensation	1	11-12-2021		TLM1	
9.	FACTS devices (elementary treatment)	1	13-12-2021		TLM2	
No. of classes required to complete UNIT-IV:**09**				No. of classes taken:		

UNIT-V : DEREGULATION

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 of market structure	1	14-12-2021		TLM1	
2.	Spot market	1	15-12-2021		TLM1	
3.	Forward markets and settlements	1	18-12-2021		TLM1	
4.	pricing	2	20-12-2021		TLM1	
5.	Location marginal prices(LMP)	1	21-12-2021		TLM1	
6.	Location marginal prices(LMP)	1	22-12-2021		TLM1	
7.	Transmission pricing	1	27-12-2021		TLM1	
8.	Introduction to financial rights	1	28-12-2021		TLM2	
9.	Revision	2	29-12-2021 01-01-2022		TLM1	
10.	II Mid		**03-01-2022**			

11.	II Mid		**04-01-2022**			
12.	II Mid		**05-01-2022**			
13.	II Mid		**08-01-2022**			
No. of classes required to complete UNIT-V:**09**				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics,

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Mr.P.Srihari)	(Mr.P.Srihari)	(Dr.M.S.Giridhar)	(Dr.J.Siva Vara Prasad)

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DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch.Rajesh
Course Name & Code : Solid State Drives & 17EE23
L-T-P Structure : 2-2-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- A A.Y : 2021-22

PRE-REQUISITE **:** Power Electronics, Electrical Machines-I & Electrical Machines-II

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

- Know the operation of various converter controlled dc and ac motor drives
- Provide the controlling of dc motor drives with single phase/three phase converters and choppers
- Understand AC motor drive control with variable frequency and variable voltage.

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

CO1	Interpret various operating regions of electrical drives
CO2	Analyze suitable controllers for DC Drives
CO3	Analyze suitable controllers for AC Drives

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

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

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

TEXT BOOKS:

1. G K Dubey "Power Semiconductor Drives", Prentice Hall , 1988.
2. B.K.Bose "Modern Power Electronics and AC Drives", Prentice Hall India Learning Private Limited , 2005.

REFERENCE BOOKS:

1. Vedam Subramanyam "Thyristor Control of Electric drives", Tata McGraw Hill Publications 2017.
2. S K Pillai "A First course on Electrical Drives", New Age International(P) Ltd. 3rd Edition, 2012.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: RECTIFIER 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	HOD Sign Weekly
1.	Introduction to Subject and Course Outcomes	1	28-09-2021		TLM1	
2.	Review of DC Machines and Review of Converters	1	30-09-2021		TLM1	
3.	Introduction to UNIT-I, Significance of variable speed drives	1	01-09-2021		TLM1	
4.	Single-phase controlled rectifier fed separately excited DC motor	1	02-10-2021		TLM1	
5.	Single-phase controlled rectifier fed DC series motor	1	05-10-2021		TLM1	
6.	Three-phase controlled rectifier fed separately excited DC motor	1	07-10-2021		TLM2	
7.	Three-phase controlled rectifier fed series excited DC motor	1	08-10-2021		TLM1	
8.	Numerical Problems	1	09-10-2021		TLM1	
9.	Numerical Problems	1	12-10-2021		TLM1	
No. of classes required to complete UNIT-I: **09**				No. of classes taken:		

UNIT-II: 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	HOD Sign Weekly
1.	Introduction to UNIT-II, Principle of operation and control techniques of chopper	1	19-10-2021		TLM1	
2.	Chopper based motoring operation of separately excited dc motor	1	21-10-2021		TLM1	
3.	Chopper based motoring operation of dc series motor	1	22-10-2021		TLM1	
4.	regenerative braking of separately excited dc motor and dc series motor	1	23-10-2021		TLM1	
5.	dynamic braking of separately excited dc motor and dc series motor	2	26-10-2021 28-10-2021		TLM1	

6.	plugging of separately excited dc motor and dc series motor	1	29-10-2021		TLM1	
7.	Numerical Problems	1	30-10-2021		TLM1	
8.	Multi quadrant control of chopper fed dc motors	1	02-11-2021		TLM2	
9.	I-Mid		**09-11-2021**			
10.	I-Mid		**11-11-2021**			
11.	I-Mid		**12-11-2021**			
No. of classes required to complete UNIT-II:09				No. of classes taken:		

UNIT-III: 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	HOD Sign Weekly
1.	Introduction to UNIT-III, Review of Induction Motors	1	05-11-2021		TLM1	
2.	Stator voltage control of Induction Motor	1	06-11-2021		TLM1	
3.	stator frequency control-Open loop V/f control of Induction Motor	1	16-11-2021		TLM1	
4.	Control of Induction motor by ac voltage controller	1	18-11-2021		TLM1	
5.	control of induction motor by voltage source Inverter	1	19-11-2021		TLM1	
6.	control of induction motor by current source Inverter	1	20-11-2021		TLM1	
7.	control of induction motor by cyclo converter	1	23-11-2021		TLM1	
8.	comparison of voltage source and current source inverter drives	1	25-11-2021		TLM1	
9.	Numeric problems	1	26-11-2021		TLM1	
10.	Numeric problems	1	27-11-2021		TLM2	
No. of classes required to complete UNIT-III:**10**				No. of classes taken:		

UNIT-IV : 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	HOD Sign Weekly
1.	Introduction to UNIT-IV, Review of Induction Motor	1	30-11-2021		TLM1	
2.	Static rotor resistance control	1	02-12-2021		TLM1	
3.	Slip-power recovery schemes	1	03-12-2021		TLM1	
4.	Static Scherbius drive	1	04-12-2021		TLM1	
5.	Static Kramer drive	1	07-12-2021		TLM1	

6.	closed loop speed control of static Scherbius drive	1	09-12-2021		TLM1	
7.	Modes of operation of Static Scherbius drive and applications	1	10-12-2021		TLM1	
8.	Numeric problems	1	11-12-2021		TLM1	
9.	Numeric problems	1	14-12-2021		TLM2	
No. of classes required to complete UNIT-IV:**09**				No. of classes taken:		

UNIT-V : 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	HOD Sign Weekly
1.	Introduction to UNIT-V, Review of Synchronous Motors	1	16-12-2021		TLM1	
2.	Synchronous motors- variable frequency control	1	17-12-2021		TLM1	
3.	operation of self controlled Synchronous motors-by VSI.	1	18-12-2021		TLM1	
4.	operation of self controlled Synchronous motors-by CSI.	2	21-12-2021		TLM1	
5.	operation of self controlled Synchronous motors-by Cyclo converters	1	23-12-2021		TLM1	
6.	Load commutated CSI fed Synchronous Motor	1	24-12-2021		TLM1	
7.	Closed Loop control operation of synchronous motor drives (Block Diagram Only)	1	28-12-2021		TLM1	
8.	Numeric problems	1	30-12-2021		TLM2	
9.	Revision	1	30-12-2021		TLM1	
10.	II Mid		**04-01-2022**			
11.	II Mid		**06-01-2022**			
12.	II Mid		**07-01-2022**			
13.	II Mid		**08-01-2022**			
No. of classes required to complete UNIT-V:**09**				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
Assignment-I (Unit-I)	A1=5

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in

	diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
(Mr.Ch.Rajesh)	(Mr.Ch.Rajesh)	(Dr.M.S.Giridhar)	(Dr.J.Siva Vara Prasad)

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

DEPARTMENT OF Electrical and Electronics Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch.Rajesh
Course Name & Code : Solid State Drives & 17EE23
L-T-P Structure : 2-2-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Section- B A.Y : 2021-22

PRE-REQUISITE : Power Electronics, Electrical Machines-I & Electrical Machines-II

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

- Know the operation of various converter controlled dc and ac motor drives
- Provide the controlling of dc motor drives with single phase/three phase converters and choppers
- Understand AC motor drive control with variable frequency and variable voltage.

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

CO1	Interpret various operating regions of electrical drives

CO2	Analyze suitable controllers for DC Drives
CO3	Analyze suitable controllers for AC Drives

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

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

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

TEXT BOOKS:

1. G K Dubey "Power Semiconductor Drives", Prentice Hall , 1988.

2. B.K.Bose "Modern Power Electronics and AC Drives", Prentice Hall India Learning Private Limited , 2005.

REFERENCE BOOKS:

1. Vedam Subramanyam "Thyristor Control of Electric drives", Tata McGraw Hill Publications 2017.
2. S K Pillai "A First course on Electrical Drives", New Age International(P) Ltd. 3rd Edition, 2012.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):A/S

UNIT-I: RECTIFIER 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	HOD Sign Weekly
1.	Introduction to Subject and Course Outcomes	1	27-09-2021		TLM1	
2.	Review of DC Machines and Review of Converters	1	28-09-2021		TLM1	
3.	Introduction to UNIT-I, Significance of variable speed drives	1	29-09-2021		TLM1	
4.	Single-phase controlled rectifier fed separately excited DC motor	1	30-09-2021		TLM1	
5.	Single-phase controlled rectifier fed DC series motor	1	04-10-2021		TLM1	

6.	Three-phase controlled rectifier fed separately excited DC motor	1	05-10-2021		TLM2	
7.	Three-phase controlled rectifier fed series excited DC motor	1	06-10-2021		TLM1	
8.	Numerical Problems	1	07-10-2021		TLM1	
9.	Numerical Problems	1	11-10-2021		TLM1	
No. of classes required to complete UNIT-I: **09**				No. of classes taken:		

UNIT-II: 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	HOD Sign Weekly
1.	Introduction to UNIT-II, Principle of operation and control techniques of chopper	1	18-10-2021		TLM1	
2.	Chopper based motoring operation of separately excited dc motor	1	19-10-2021		TLM1	
3.	Chopper based motoring operation of dc series motor	1	21-10-2021		TLM1	
4.	regenerative braking of separately excited dc motor and dc series motor	1	25-10-2021		TLM1	
5.	dynamic braking of separately excited dc motor and dc series motor	2	26-10-2021 27-10-2021		TLM1	
6.	plugging of separately excited dc motor and dc series motor	1	28-10-2021		TLM1	
7.	Numerical Problems	1	01-11-2021		TLM1	
8.	Multi quadrant control of chopper fed dc motors	1	02-11-2021		TLM2	
9.	I-Mid		**08-11-2021**			
10.	I-Mid		**09-11-2021**			
11.	I-Mid		**10-11-2021**			
No. of classes required to complete UNIT-II:09				No. of classes taken:		

UNIT-III: 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	HOD Sign Weekly
1.	Introduction to UNIT-III, Review of Induction Motors	1	03-11-2021		TLM1	
2.	Stator voltage control of Induction Motor	1	06-11-2021		TLM1	
3.	stator frequency control-Open loop V/f control of Induction Motor	1	15-11-2021		TLM1	
4.	Control of Induction motor by ac voltage controller	1	16-11-2021		TLM1	

5.	control of induction motor by voltage source Inverter	1	17-11-2021		TLM1	
6.	control of induction motor by current source Inverter	1	28-11-2021		TLM1	
7.	control of induction motor by cyclo converter	1	22-11-2021		TLM1	
8.	comparison of voltage source and current source inverter drives	1	23-11-2021		TLM1	
9.	Numeric problems	1	24-11-2021		TLM1	
10.	Numeric problems	1	25-11-2021		TLM2	
No. of classes required to complete UNIT-III:**10**				No. of classes taken:		

UNIT-IV : 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	HOD Sign Weekly
1.	Introduction to UNIT-IV, Review of Induction Motor	1	29-11-2021		TLM1	
2.	Static rotor resistance control	1	30-11-2021		TLM1	
3.	Slip-power recovery schemes	1	01-12-2021		TLM1	
4.	Static Scherbius drive	1	02-12-2021		TLM1	
5.	Static Kramer drive	1	06-12-2021		TLM1	
6.	closed loop speed control of static Scherbius drive	1	07-12-2021		TLM1	
7.	Modes of operation of Static Scherbius drive and applications	1	08-12-2021		TLM1	
8.	Numeric problems	1	09-12-2021		TLM1	
9.	Numeric problems	1	13-12-2021		TLM2	
No. of classes required to complete UNIT-IV:**09**				No. of classes taken:		

UNIT-V : 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	HOD Sign Weekly
1.	Introduction to UNIT-V, Review of Synchronous Motors	1	14-12-2021		TLM1	
2.	Synchronous motors- variable frequency control	1	15-12-2021		TLM1	
3.	operation of self controlled Synchronous motors-by VSI.	1	16-12-2021		TLM1	
4.	operation of self controlled Synchronous motors-by CSI.	2	20-12-2021		TLM1	
5.	operation of self controlled Synchronous motors-by Cyclo converters	1	21-12-2021		TLM1	
6.	Load commutated CSI fed Synchronous Motor	1	22-12-2021		TLM1	

7.	Closed Loop control operation of synchronous motor drives (Block Diagram Only)	1	23-12-2021		TLM1	
8.	Numeric problems	2	27-12-2021 28-12-2021		TLM2	
9.	Revision	2	29-12-2022 30-12-2021		TLM1	
10.	II Mid		**03-01-2022**			
11.	II Mid		**04-01-2022**			
12.	II Mid		**05-01-2022**			
13.	II Mid		**08-01-2022**			
No. of classes required to complete UNIT-V:**10**				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor Course Coordinator Module Coordinator HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
L.B. Reddy Nagar , Mylavaram-521 230. Andhra Pradesh, INDIA
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COURSE HANDOUT

Part-A

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

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : Intelligent Control Systems (PE-III) – 17EE24

L-T-P STRUCTURE : 3-1-0

COURSE CREDITS : 3

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

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

PRE-REQUISITE: Control Systems

COURSE OBJECTIVES (CEOs):

This Course will introduce the basic principles of soft computing techniques. It covers simple representation schemes, problem solving paradigms, Fuzzy logic and genetic algorithm.

COURSE OUTCOMES (COs)

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

CO1: Apply artificial intelligence techniques to engineering problems
CO2: Illustrate different types of perceptron models
CO3: Apply fuzzy sets, member ship functions and their implementation methods to engineering problems
CO4: Develop suitable search method to solve non linear control problem

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

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

BOS APPROVED TEXT BOOKS:

T1 Jecak M.Zurada, Introduction to Artifical Neural System", Jaico Publishing House, 1999

T2 Timothy J Ross, "Fuzzy Logic With Engineering Application", Wiley publication, Third Edition, 2010.

BOS APPROVED REFERENCE BOOKS:

R1 James A Freeman and Davis Skapura, "Neural Network", Pearson Education, 2003

R2 Rajasekharan and Pai, "Neural Network , Fuzzy logic, Genetic Algorithms: Synthesis and Applications", PHI Publication,2003

R3 Samir Roy, Udit Chakraborty, "Introduction of Soft Computing: Neuro Fuzzy & Genetic Algorthims, Pearson Publications.

R4 S.N.Sivanandam, S.Sumathi, S.N.Deepa, " Introduction to Neural Networks Using MATLAB 6.0, TMH,2008 Edition

Part - B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Introduction to 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.	Introduction to Subject and CO's	1	27-09-2021		TLM1	1	T1 &R1	
2.	UNIT – I: Introduction to Artificial Neural Networks, Evolution of neural networks	1	28-09-2021		TLM1	1	T1 &R1	
3.	ANN: Basic model, Classification	1	30-09-2021		TLM1	1	T1 &R1	
4.	Feed forward and Recurrent Topologies	1	02-10-2021		TLM1	1	T1 &R1	
5.	Learning Algorithms	1	04-10-2021		TLM1	1	T1 &R1	
6.	Supervised, Unsupervised & Reinforcement algorithms	1	05-10-2021		TLM1	1	T1 &R1	
7.	Numerical Problems	1	07-10-2021		TLM1	1,4	T1 &R1	
8.	**Numerical Problems**	1	09-10-2021		TLM3	1	T1 &R1	
9.	**Numerical Problems**	1	11-10-2021		TLM1	1	T1 &R1	
10.	Activation Functions	1	18-10-2021		TLM1	1	T1 &R1	
11.	MP Models	1	19-10-2021		TLM1	1,4	T1 &R1	
12.	Problems	1	21-10-2021		TLM3	1	T1 &R1	
13.	Perceptron model	1	23-10-2021		TLM1	1,2	T1 &R1	
14.	Adaline, Madaline models	1	25-10-2021		TLM1	1,2	T1 &R1	
15.	**Numerical Problems**	1	25-10-2021		TLM6	1,2,4	T1 &R1	
No. of classes required to complete		15			No. of classes taken:			

UNIT-I				

UNIT-II: Artificial Neural Networks-I

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 -II Introduction	1	26-10-2021		TLM1	1,2	T1 &R1	
2.	Topology of Multi layer Perceptron	1	28-10-2021		TLM1	2	T1 &R1	
3.	Back Propagation learning Algorithm	1	28-10-2021		TLM1	2	T1 &R1	
4.	Radial Basis function networks: Topology	1	30-10-2021		TLM1	2	T1 &R1	
5.	Radial Basis Function: learning algorithm	1	01-11-2021		TLM1	2	T1 &R1	
6.	Kohenen's self organizing network: Topology	1	02-11-2021		TLM3	2	T1 &R1	
7.	Bidirectional Associative Memory Topology, learning algorithm, Applications	1	06-11-2021		TLM1	2	T1 &R1	
8.	Bidirectional Associative Memory Topology, learning algorithm, Applications	1	06-11-2021		TLM1	1,2	T1 &R1	
9.	Numerical Problems	1	06-11-2021		TLM1	1,2	T1 &R1	
No. of classes required to complete UNIT-II		13			No. of classes taken:			

UNIT-III: Artificial Neural Networks-II

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 3 INTRODUCTION	1	15-11-2021		TLM1	1	T1 &R1	
2.	Recurrent Neural networks, Basic concepts	1	16-11-2021		TLM1	1	T1 &R1	
3.	RNN Applications	1	18-11-2021		TLM1	1	T1 &R1	
4.	Hopfield network topology	1	20-11-2021		TLM1	1	T1 &R1	
5.	Hopfield network learning algorithm	1	22-11-2021		TLM1	1	T1 &R1	
6.	Hopfield network learning algorithm	1	23-11-2021		TLM1	1	T1 &R1	
7.	Applications of Hopfield network	1	25-11-2021		TLM3	1	T1 &R1	

8.	Applications of Hopfield network	1	27-11-2021		TLM1	1	T1 &R1	
No. of classes required to complete UNIT-III		11		29/12/2020	No. of classes taken:			

UNIT-IV: Fuzzy Logic-I

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 4 INTRODUCTION	1	29-11-2021		TLM1	3	T2 &R2	
2.	Classical sets - relations and cardinalities, Crisp set operations, properties	1	30-11-2021		TLM1	3	T2 &R2	
3.	Fuzzy sets - relations and cardinalities, Fuzzy membership functions- different types	1	02-12-2021		TLM1	3	T2 &R2	
4.	Fuzzification, Membership value assignment	1	04-12-2021		TLM1	3	T2 &R2	
5.	Development of rule base and Implication methods	1	06-12-2021		TLM1	3	T2 &R2	
6.	Defuzzification methods, Defuzzification to crisp sets	1	07-12-2021		TLM1	3	T2 &R2	
7.	Fuzzy integrals, Fuzziness and fuzzy resolutions, Fuzzy Arithmetic	1	07-12-2021		TLM3	3	T2 &R2	
8.	Composition and inference	1	09-12-2021		TLM1	3	T2 &R2	
9.	Consideration of fuzzy decision-making	1	11-12-2021		TLM1	3	T2 &R2	
No. of classes required to complete UNIT-IV		16		13-12-2021	No. of classes taken:			

UNIT-V: Fuzzy Logic-II

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-5 INTRODUCTION	1	13-12-2021		TLM1	3	T2 &R4	
2.	Fuzzy logic control Classification	1	14-12-2021		TLM1	3	T2 &R4	
3.	Fuzzy decision making	1	16-12-2021		TLM3	3,4	T2 &R4	
4.	Design methodology of FLC	1	18-12-2021		TLM1	3	T2 &R4	

5.	Stability analysis of FLC	1	20-12-2021		TLM3	3,4	T2 &R4	
6.	Applications of FLC	1	21-12-2021		TLM1	3	T2 &R4	
7.	Quiz/Assignment-V	1	23-12-2021		TLM3	3	T2 &R4	
8.	Revision	1	27-12-2021		TLM1	3	T2 &R4	
9.	Revision	1	28-12-2021		TLM6	3,4	T2 &R4	
10.	II Mid		**03-01-2022**					
11.	II Mid		**04-01-2022**					
12.	II Mid		**06-01-2022**					
13.	II Mid		**08-01-2022**					
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
1.	Neural Networks in Electrical Engineering	1	30-12-2021		TLM2	1,2,4	T1 & R1	
2.	Fuzzy Logic in Electrical Engineering	1	30-12-2021		TLM2	3,4	T2 & R2	

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/Quiz – 1	1,2,4	A1=5
Assignment/Quiz – 2	1,2	A2=5
I-Mid Examination	1,2,4	B1=20
Assignment/Quiz – 3	1,4	A3=5
Assignment/Quiz – 4	3,4	A4=5
Assignment/Quiz – 5	3,4	A5=5
II-Mid Examination	1,3,4	B2=20

Evaluation of Assignment/Quiz 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):

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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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

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

Signature				
	Name of the faculty	Name of the Course Co-ordinator	Name of the Module Co-ordinator	HOD
	Mr. J.V.Pavan Chand	Mr. J.V.Pavan Chand	Dr.K.R.L.Prasad	Dr.J.Siva Vara Prasad

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
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COURSE HANDOUT

Part-A

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

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : Intelligent Control Systems (PE-III) – 17EE24

L-T-P STRUCTURE : 3-1-0

COURSE CREDITS : 3

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

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

PRE-REQUISITE: Control Systems

COURSE OBJECTIVES (CEOs):
This Course will introduce the basic principles of soft computing techniques. It covers simple representation schemes, problem solving paradigms, Fuzzy logic and genetic algorithm.

COURSE OUTCOMES (COs)
After completion of the course, the student will be able to

CO1: Apply artificial intelligence techniques to engineering problems
CO2: Illustrate different types of perceptron models
CO3: Apply fuzzy sets, member ship functions and their implementation methods to engineering problems
CO4: Develop suitable search method to solve non linear control problem

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

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

BOS APPROVED TEXT BOOKS:

T1 Jecak M.Zurada, Introduction to Artifical Neural System", Jaico Publishing House,

1999

T2 Timothy J Ross, "Fuzzy Logic With Engineering Application", Wiley publication, Third Edition, 2010.

BOS APPROVED REFERENCE BOOKS:

R1 James A Freeman and Davis Skapura, "Neural Network", Pearson Education, 2003

R2 Rajasekharan and Pai, "Neural Network , Fuzzy logic, Genetic Algorithms: Synthesis and Applications", PHI Publication,2003

R3 Samir Roy, Udit Chakraborty, "Introduction of Soft Computing: Neuro Fuzzy & Genetic Algorthims, Pearson Publications.

R4 S.N.Sivanandam, S.Sumathi, S.N.Deepa, " Introduction to Neural Networks Using MATLAB 6.0, TMH,2008 Edition

Part - B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Introduction to 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.	Introduction to Subject and CO's	1	27-09-2021		TLM1	1	T1 &R1	
2.	UNIT – I: Introduction to Artificial Neural Networks, Evolution of neural networks	1	28-09-2021		TLM1	1	T1 &R1	
3.	ANN: Basic model, Classification	1	30-09-2021		TLM1	1	T1 &R1	
4.	Feed forward and Recurrent Topologies	1	01-10-2021		TLM1	1	T1 &R1	
5.	Learning Algorithms	1	04-10-2021		TLM1	1	T1 &R1	
6.	Supervised, Unsupervised & Reinforcement algorithms	1	05-10-2021		TLM1	1	T1 &R1	
7.	Numerical Problems	1	06-10-2021		TLM1	1,4	T1 &R1	
8.	**Numerical Problems**	1	07-10-2021		TLM3	1	T1 &R1	
9.	**Numerical Problems**	1	11-10-2021		TLM1	1	T1 &R1	
10.	Activation Functions	1	12-10-2021		TLM1	1	T1 &R1	
11.	MP Models	1	18-10-2021		TLM1	1,4	T1 &R1	
12.	Problems	1	20-10-2021		TLM3	1	T1 &R1	
13.	Perceptron model	1	21-10-2021		TLM1	1,2	T1 &R1	
14.	Adaline, Madaline models	1	25-10-2021		TLM1	1,2	T1 &R1	
15.	**Numerical Problems**	1	26-10-2021		TLM6	1,2,4	T1 &R1	
No. of classes required to complete UNIT-I		15			No. of classes taken:			

UNIT-II: Artificial Neural Networks-I

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 -II Introduction	1	27-10-2021		TLM1	1,2	T1 &R1	
2.	Topology of Multi layer Perceptron	1	28-10-2021		TLM1	2	T1 &R1	
3.	Back Propagation learning Algorithm	1	28-10-2021		TLM1	2	T1 &R1	
4.	Radial Basis function networks: Topology	1	01-11-2021		TLM1	2	T1 &R1	
5.	Radial Basis Function: learning algorithm	1	02-11-2021		TLM1	2	T1 &R1	
6.	Kohenen's self organizing network: Topology	1	03-11-2021		TLM3	2	T1 &R1	
7.	Bidirectional Associative Memory Topology, learning algorithm, Applications	1	04-11-2021		TLM1	2	T1 &R1	
8.	Bidirectional Associative Memory Topology, learning algorithm, Applications	1	04-11-2021		TLM1	1,2	T1 &R1	
9.	Numerical Problems	1	04-11-2021		TLM1	1,2	T1 &R1	
10.	I Mid		08-11-2021					
11.	I Mid		09-11-2021					
12.	I Mid		10-11-2021					
13.	I Mid		11-11-2021					
No. of classes required to complete UNIT-II		13			No. of classes taken:			

UNIT-III: Artificial Neural Networks-II

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 3 INTRODUCTION	1	15-11-2021		TLM1	1	T1 &R1	
2.	Recurrent Neural networks, Basic concepts	1	16-11-2021		TLM1	1	T1 &R1	
3.	RNN Applications	1	17-11-2021		TLM1	1	T1 &R1	
4.	Hopfield network topology	1	18-11-2021		TLM1	1	T1 &R1	
5.	Hopfield network learning algorithm	1	22-11-2021		TLM1	1	T1 &R1	

6.	Hopfield network learning algorithm	1	23-11-2021		TLM1	1	T1 &R1	
7.	Applications of Hopfield network	1	24-11-2021		TLM3	1	T1 &R1	
8.	Applications of Hopfield network	1	25-11-2021		TLM1	1	T1 &R1	
No. of classes required to complete UNIT-III		11			No. of classes taken:			

UNIT-IV: Fuzzy Logic-I

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 4 INTRODUCTION	1	29-11-2021		TLM1	3	T2 &R2	
2.	Classical sets - relations and cardinalities, Crisp set operations, properties	1	30-11-2021		TLM1	3	T2 &R2	
3.	Fuzzy sets - relations and cardinalities, Fuzzy membership functions- different types	1	01-12-2021		TLM1	3	T2 &R2	
4.	Fuzzification, Membership value assignment	1	02-12-2021		TLM1	3	T2 &R2	
5.	Development of rule base and Implication methods	1	06-12-2021		TLM1	3	T2 &R2	
6.	Defuzzification methods, Defuzzification to crisp sets	1	07-12-2021		TLM1	3	T2 &R2	
7.	Fuzzy integrals, Fuzziness and fuzzy resolutions, Fuzzy Arithmetic	1	08-12-2021		TLM3	3	T2 &R2	
8.	Composition and inference	1	09-12-2021		TLM1	3	T2 &R2	
9.	Consideration of fuzzy decision-making	1	13-12-2021		TLM1	3	T2 &R2	
No. of classes required to complete UNIT-IV		16			No. of classes taken:			

UNIT-V: Fuzzy Logic-II

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-5 INTRODUCTION	1	13-12-2021		TLM1	3	T2 &R4	
2.	Fuzzy logic control Classification	1	14-12-2021		TLM1	3	T2 &R4	
3.	Fuzzy decision making	1	15-12-2021		TLM3	3,4	T2 &R4	

4.	Design methodology of FLC	1	16-12-2021		TLM1	3	T2 &R4	
5.	Stability analysis of FLC	1	20-12-2021		TLM3	3,4	T2 &R4	
6.	Applications of FLC	1	21-12-2021		TLM1	3	T2 &R4	
7.	Applications of FLC		22-12-2021		TLM1	3	T2 &R4	
8.	Quiz/Assignment-V	1	23-12-2021		TLM3	3	T2 &R4	
9.	Revision	1	27-12-2021		TLM1	3	T2 &R4	
10.	Revision	1	28-12-2021		TLM6	3,4	T2 &R4	
11.	Revision		29-12-2021					
12.	Revision		30-12-2021					
13.	II Mid		**03-01-2022**					
14.	II Mid		**04-01-2022**					
15.	II Mid		**06-01-2022**					
16.	II Mid		**08-01-2022**					
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
1.	Neural Networks in Electrical Engineering	1	30-12-2021		TLM2	1,2,4	T1 & R1	
2.	Fuzzy Logic in Electrical Engineering	1	30-12-2021		TLM2	3,4	T2 & R2	

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)		

P0art - C

EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Assignment/Quiz – 1	1,2,4	A1=5
Assignment/Quiz – 2	1,2	A2=5

I-Mid Examination	1,2,4	B1=20
Assignment/Quiz – 3	1,4	A3=5
Assignment/Quiz – 4	3,4	A4=5
Assignment/Quiz – 5	3,4	A5=5
II-Mid Examination	1,3,4	B2=20
Evaluation of Assignment/Quiz 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):

PEO1. Design and develop innovative products and 2services in the field of Electrical and Electronics Engineering and allied engineering disciplines.

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a: 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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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.

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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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

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

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

Signature				
	Name of the faculty	Name of the Course Co-ordinator	Name of the Module Co-ordinator	HOD
	Mr. J.V.Pavan Chand	Mr. J.V.Pavan Chand	Dr.K.R.L.Prasad	Dr.J.Siva Vara Prasad

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Mrs.G.TABITA

Course Name & Code : **ENERGY CONSERVATION AND AUDIT** & 17EE28

L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections- A A.Y : 2021-22
Pre-requisites : Electrical Power Transmission, Electrical Engineering Materials

Course Educational Objective: This course enables the student to

- Introduce the need of energy auditing and devise energy efficient control strategies.
- Learn reactive power management, energy efficient lighting schemes and energy conservation methods.

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

CO 1	Illustrate the different parameters for energy auditing.
CO 2	Interpret the controlling of energy management and energy efficiency.
CO 3	Analyze the Reactive power management strategies.
CO 4	Analyze energy conservation measures for economic aspects.

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

Cos	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PSO a	PSO b	PSO c	PSO d
CO1	3	3		2	2	1					1	1	3			
CO2	3	2		2	2						1	1	2			
CO3	3	2		2	3						1	1	3			
CO4	3	2		2	2						1	1	2	2		1

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Part - B
COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: BASIC PRINCIPLES OF ENERGY AUDIT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, course outcomes, Energy audit- definitions, concept, types of audit	1	27-09-21		TLM2	
2.	Energy index, cost index	1	29-09-21		TLM1	
3.	Pie charts, Sankey diagrams	1	30-10-21		TLM1	
4.	Numerical Problems	1	04-10-21		TLM1	
5.	Load profiles, Energy conservation schemes	1	06-10-21		TLM2	
6.	Energy audit of industries	1	07-10-21		TLM2	
7.	Energy saving potential	1	09-10-21		TLM1	
8.	Energy audit of process industry	1	11-10-21		TLM2	
9.	Thermal power station	1	18-10-21		TLM2	
10.	Building energy audit.	1	20-10-21		TLM2	
11.	Energy saving through smart metering	1	21-10-21		TLM2	
No. of classes required to complete UNIT-I: 11					No. of classes taken:	

UNIT-II: ENERGY MANAGEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Principles of energy management	1	23-10-21		TLM2	
2.	Organizing energy management program	1	25-10-21		TLM2	
3.	Initiating, Planning, Controlling	1	27-10-21		TLM2	
4.	Promoting, Monitoring, Reporting	1	28-10-21		TLM2	
5.	Energy manger	1	30-10-21			
6.	Qualities and functions, Language	1	01-11-21		TLM2	
7.	Qualities and functions, Language	1	03-11-21		TLM2	
8.	Revision of 1 & 2 units	1	06-11-21		TLM2	
9.	MID-I	1	08-11-21			
10.	MID-I	1	10-11-21			

11.	MID-I	1	11-11-21			
12.	MID-I	1	13-11-21			
13.	MID-I	1	15-11-21			
No. of classes required to complete UNIT-II: 08					No. of classes taken:	

UNIT-III: ENERGY EFFICIENT MOTORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction - Energy efficient motors	1	17-11-21		TLM2	
2.	Factors affecting efficiency	1	18-11-21		TLM2	
3.	Factors affecting efficiency	1	20-11-21		TLM2	
4.	Loss distribution	1	22-11-21		TLM1	
5.	Constructional details	1	24-11-21		TLM1	
6.	Characteristics, variable speed	1	25-11-21		TLM1	
7.	Variable duty cycle systems, RMS hp	1	27-11-21		TLM2	
8.	Voltage variation	1	29-11-21		TLM2	
9.	Over motoring, motor energy audit	1	01-12-21		TLM2	
No. of classes required to complete UNIT-III: 09					No. of classes taken:	

UNIT-IV: POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Power factor, methods of improvement	1	02-12-21		TLM1	
2.	Pf with nonlinear loads	1	04-12-21		TLM1	
3.	Effect of harmonics on power factor	1	06-12-21		TLM2	
4.	power factor motor controllers	1	08-12-21		TLM2	
5.	Good lighting system design and practice	1	19-12-21		TLM2	
6.	Lighting control, lighting energy audit	1	11-12-21		TLM2	
7.	Energy Instruments, Wattmeter, data	1	13-12-21		TLM2	

	loggers					
8.	Thermocouples, pyrometers	1	15-12-21			
9.	Lux meters, tongue testers, Application of PLC's	1	16-12-21		TLM2	
No. of classes required to complete UNIT-IV: 09					No. of classes taken:	

UNIT-V: ECONOMIC ASPECTS AND ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Economics Analysis, Depreciation Methods, time value of money, rate of return,	1	18-12-21		TLM1	
2.	Present worth method, replacement analysis	1	20-12-21		TLM1	
3.	Life cycle costing analysis	1	22-12-21		TLM1	
4.	Energy efficient motors, Calculation of simple payback method	1	23-12-21		TLM1	
5.	Net present worth method	1	27-12-21		TLM1	
6.	Power factor correction, lighting	1	29-12-21		TLM2	
7.	Applications of life cycle costing analysis, return on investment	2	30-12-21 01-01-22		TLM2	
8.	MID-II		03-01-22			
9.	MID-II		05-01-22			
10.	MID-II		06-01-22			
11.	MID-II		08-01-22			
No. of classes required to complete UNIT-V:08					No. of classes taken:	

Teaching Learning Methods

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

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.

PART-D

PROGRAMME OUTCOMES (POs):

PO a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO e	**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 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
PO 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.
PO h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO k	**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 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

G.TABITA	G.TABITA	Dr. P.Sobha Rani	J. Sivavara Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Mrs.G.TABITA
Course Name & Code : **ENERGY CONSERVATION AND AUDIT** & 17EE28
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections- B A.Y : 2021-22
Pre-requisites : Electrical Power Transmission, Electrical Engineering Materials

Course Educational Objective: This course enables the student to

- Introduce the need of energy auditing and devise energy efficient control strategies.
- Learn reactive power management, energy efficient lighting schemes and energy conservation methods.

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

CO 1	Illustrate the different parameters for energy auditing.
CO 2	Interpret the controlling of energy management and energy efficiency.
CO 3	Analyze the Reactive power management strategies.
CO 4	Analyze energy conservation measures for economic aspects.

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

Cos	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PSO a	PSO b	PSO c	PSO d
CO1	3	3		2	2	1					1	1	3			
CO2	3	2		2	2						1	1	2			
CO3	3	2		2	3						1	1	3			
CO4	3	2		2	2						1	1	2	2		1

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.
4. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing Company Ltd, New Delhi.

5. K.S.K.Weranga, SisilKumarawadu, D.P.Chandima-"Smart Metering Design and Applications", Springer Publications, 1st Edition, 2014.

Part - B
COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: BASIC PRINCIPLES OF ENERGY AUDIT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, course outcomes, Energy audit- definitions, concept, types of audit	1	28-09-21		TLM2	
2.	Energy index, cost index	1	30-09-21		TLM1	
3.	Pie charts, Sankey diagrams	1	01-10-21		TLM1	
4.	Numerical Problems	1	02-10-21		TLM1	
5.	Load profiles, Energy conservation schemes	1	05-10-21		TLM2	
6.	Energy audit of industries	1	07-10-21		TLM2	
7.	Energy saving potential	1	08-10-21		TLM1	
8.	Energy audit of process industry	1	09-10-21		TLM2	
9.	Thermal power station	1	19-10-21		TLM2	
10.	Building energy audit.	1	21-10-21		TLM2	
11.	Energy saving through smart metering	1	22-10-21		TLM2	
No. of classes required to complete UNIT-I: 11					No. of classes taken:	

UNIT-II: ENERGY MANAGEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Principles of energy management	1	23-10-21		TLM2	
2.	Organizing energy management program	1	26-10-21		TLM2	
3.	Initiating, Planning, Controlling	1	28-10-21		TLM2	
4.	Promoting,Monitoring, Reporting	1	29-10-21		TLM2	
5.	Energy manger	1	30-10-21			
6.	Qualities and	1	02-11-21		TLM2	

	functions, Language					
7.	Qualities and functions, Language	1	04-11-21		TLM2	
8.	Revision of unit 1	1	05-11-21		TLM2	
9.	Revision of unit 2	1	06-11-21		TLM2	
10.	MID-I	1	09-11-21			
11.	MID-I	1	11-11-21			
12.	MID-I	1	12-11-21			
13.	MID-I	1	13-11-21			
14.	MID-I	1	15-11-21			
15.	MID-I	1	16-11-21			
No. of classes required to complete UNIT-II: 09					No. of classes taken:	

UNIT-III: ENERGY EFFICIENT MOTORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction - Energy efficient motors	1	16-11-21		TLM2	
2.	Factors affecting efficiency	1	18-11-21		TLM2	
3.	Factors affecting efficiency	1	19-11-21		TLM2	
4.	Loss distribution	1	20-11-21		TLM1	
5.	Constructional details	1	23-11-21		TLM1	
6.	Characteristics, variable speed	1	25-11-21		TLM1	
7.	Variable duty cycle systems, RMS hp	1	26-11-21		TLM2	
8.	Voltage variation	1	27-11-21		TLM2	
9.	voltage unbalance	1	30-11-21		TLM2	
10.	Over motoring, motor energy audit	1	02-12-21		TLM2	
No. of classes required to complete UNIT-III: 10					No. of classes taken:	

UNIT-IV: POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Power factor, methods of improvement	1	03-12-21		TLM1	

2.	Pf with nonlinear loads	1	04-12-21		TLM1	
3.	Effect of harmonics on power factor	1	07-12-21		TLM2	
4.	power factor motor controllers	1	09-12-21		TLM2	
5.	Good lighting system design and practice	1	10-12-21		TLM2	
6.	Lighting control, lighting energy audit	1	11-12-21		TLM2	
7.	Energy Instruments	1	14-12-21		TLM2	
8.	Wattmeter, data loggers	1	16-12-21			
9.	Thermocouples, pyrometers	1	17-12-21		TLM2	
10.	Lux meters, tongue testers, Application of PLC's	1	18-12-21		TLM2	
No. of classes required to complete UNIT-IV: 10					No. of classes taken:	

UNIT-V: ECONOMIC ASPECTS AND ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Economics Analysis, Depreciation Methods, time value of money, rate of return,	1	21-12-21		TLM1	
2.	Present worth method, replacement analysis	1	23-12-21		TLM1	
3.	Life cycle costing analysis	1	24-12-21		TLM1	
4.	Energy efficient motors, Calculation of simple payback method	1	28-12-21		TLM1	
5.	Net present worth method	1	30-12-21		TLM1	
6.	Power factor correction, lighting	1	31-12-21		TLM2	
7.	Applications of life cycle costing analysis, return on	1	01-01-22		TLM2	

	investment					
8.	MID-II		04-01-22			
9.	MID-II		06-01-22			
10.	MID-II		07-01-22			
11.	MID-II		08-01-22			
No. of classes required to complete UNIT-V: 7					No. of classes taken:	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

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.

PART-D

PROGRAMME OUTCOMES (POs):

PO a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
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PO e	**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 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
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PO h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
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PO 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

G.TABITA	G.TABITA	Dr. P.Sobha Rani	J. Sivavara Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PROGRAM : EEE,VII-Sem

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE : **JAVA PROGRAMMING & 17CS80**

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : Mr. P Jagadeeswara Rao

COURSE COORDINATOR : Mr. S Nagarjuna Reddy

1. Pre-requisites:

- C , C++ Programming
- Need to know basics of programming language, data types and using loops instructions
- Basic need of Java for quick learning and understanding is Knowledge of basic programming like C/C++

2. Course Educational Objectives (CEOs):

- Concentrates on the methodological and technical aspects of software design and Programming based on OOP.
- Acquire the basic knowledge and skills necessary to implement object-oriented Programming techniques in software development through JAVA.
- Know about the importance of GUI based applications and the development of those Applications through JAVA.
- Get sufficient knowledge to enter the job market related to Web development.

3. Course Outcomes (COs): At the end of the course, the student will be able to:

CO1: Identify Object Oriented concepts through constructs of JAVA.

CO2: Understand the importance of Packages, Interfaces and implement Exception Handling Mechanism.

CO3: Explore the concepts of Exception Handling,Multi-threading

CO4: Design GUI based applications using Applet class and explore the concept of Event Handling using JAVA.

CO5: Design some examples of GUI based applications using AWT controls and Swings.

4. 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	1	2-	-	-	-	-	-	-	-	-	1	3	-	1
CO2	2	3	2	-	1	-	-	-	-	-	-	1	3	-	1
CO3	3	2	3	-	1	-	-	-	-	-	-	1	3	-	1
CO4	3	2	3	-	1	-	-	-	-	-	-	1	3	-	1
CO5	3	2	2	-	1	-	-	-	-	-	-	1	3	3	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**

1- Slight(Low), **2 -** Moderate(Medium), **3 -** Substantial (High).

SYLLABUS

UNIT – I

Introduction: Drawbacks of POP, Object Oriented paradigm, OOP concepts.

Java Language: History of Java, Java Buzzwords, The Byte code, Simple types, Arrays, Type conversion and casting, simple java programs.

Introducing classes: Class fundamentals, declaring objects, access control and recursion, Constructors, garbage collection, Simple example programs of String and StringBuffer classes, Wrapper classes.

UNIT – II

Inheritance &Polymorphism: Inheritance basics, using super keyword, multilevel hierarchy, Method overloading, Method overriding, Dynamic method dispatch, abstract class, Object class and final keyword.

Packages: Defining a package, Accessing a Package, Understanding CLASSPATH, importing packages, exploring java.util package (StringTokenizer, date classes).

Interfaces: Defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Differences between classes and interfaces.

UNIT – III

Exception Handling: Exception handling fundamentals, exception types, usage of try& catch, throw, throws and finally, Java Built-in Exceptions.

Multithreading: Differences between multi-threading and multitasking, java thread model, Creating thread, multiple threads and synchronizing threads.

UNIT – IV

Applet Class: Concepts of Applets, differences between applets and applications, applet architecture, skeleton, creating applets, passing parameters to applets, working with Graphicsclass.

Event Handling: Events handling mechanisms, Events, Event sources, Event classes, Event Listeners interfaces, Delegation event model, handling mouse and keyboard events, Adapterclasses, Inner classes.

UNIT – V

AWT controls: label, button, scrollbars, text components, check box, check box groups, Choices controls, lists, scrollbar, text field, layout managers – border, grid, flow.

Introducing Swing:– Introduction, key features of swings, limitations of AWT, components &containers, swing packages, creating swing applet- JApplet class, JComponents- Labels, text fields, buttons – The JButton class, Tabbed Panes, Scroll Panes, Tables.

TEXT BOOKS

Herbert Schildt, ―Java: The complete reference‖, TMH Publications, 7th edition, 2006.

REFERENCES

1.Dr.R.NageswaraRao,―Core JAVA: An Integrated Approach‖, Dreamtech Press, 1st Edition, 2008.

2.E.Balaguruswamy,―Programming with JAVA‖, TMH Publications, 2ndEdition, 2000.

3.Patrick Niemeyer & Jonathan Knudsen, ―Learning Java‖, O'REILLY Publications, 3rd Edition, 2005.

4.Benjamin J Evans & David Flanagan,―Java–in a Nutshell – A desktop quick reference, O'REILLY Publications, 6th Edition, 2014.

5.David Flanagan, ―Java Examples In a nutshell – A Tutorial companion to java in a nutshell, O'REILLY Publications, 3rd Edition, 2004.

Course Delivery Plan

UNIT-I: Introduction to Java, Introduction to classes

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Drawbacks of POP, Object Oriented paradigm, OOP concepts.	1	28/9/2021		TLM1	CO1	
2.	History of Java, Java Buzzwords, The Byte code, Simple types	1	30/9/2021		TLM1	CO1	
3.	Arrays, Type conversion and casting	1	1/10/2021		TLM1	CO1	
4.	Class fundamentals, declaring objects	1	5/10/2021		TLM1	CO1	
5.	access control and recursion, Constructors	1	7/10/2021		TLM1	CO1	
6.	garbage collection, Simple example programs of String	1	8/10/2021		TLM1	CO1	
7.	StringBuffer classes, Wrapper classes	1	21/10/2021		TLM1	CO1	
	No. of classes required to complete UNIT-I	**7**			**No. of classes taken:**		

Unit-II: Polymorphism, Inheritance and Packages

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
8.	Inheritance basics, using super keyword, multilevel hierarchy	1	22/10/2021		TLM1	CO2	
9.	Method overloading, Method overriding,	1	26/10/2021		TLM1	CO2	

	Dynamic method dispatch						
10.	abstract class, Object class and final keyword.	1	28/10/2021		TLM1	CO2	
11.	Defining, accessing a package, Understanding CLASSPATH, importing packages	1	29/10/2021		TLM1	CO2	
12.	exploring java.util package (StringTokenizer, date classes).	1	02/11/2021		TLM1	CO2	
13.	Defining an interface, implementing interface, applying interfaces	1	05/11/2021		TLM1	CO2	
14.	Mid-I Exams		11/11/2021				
15.	Mid-I Exams		12/11/2021				
	No. of classes required to complete UNIT-II	**06**			**No. of classes taken:**		

UNIT-III: Exception Handling and Multi Threading

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
16.	Exception handling fundamentals, exception types, usage of try& catch,	1	16/11/2021		TLM1	CO3	
17.	throw, throws and finally	1	18/11/2021		TLM1	CO3	
18.	Java Built-in Exceptions	1	19/11/2021		TLM1	CO3	
19.	Java user defined Exceptions	1	23/11/2021		TLM1	CO3	
20.	Differences between multi-threading and multitasking	1	25/11/2021		TLM1	CO3	
21.	java thread model	1	26/11/2021		TLM1	CO3	
22.	Creating thread	1	30/11/2021				

23.	multiple threads and synchronizing threads	1	02/12/2021				
	No. of classes required to complete UNIT-III	**08**			**No. of classes taken:**		

UNIT-IV: Applet Class, Event Handling

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
24.	Concepts of Applets, differences between applets and applications	1	03/12/2021		TLM1	CO4	
25.	applet architecture, skeleton	1	07/12/2021		TLM1	CO4	
26.	creating applets, passing parameters to applets	1	09/12/2021		TLM1	CO4	
27.	working with Graphicsclass	1	10/12/2021		TLM1	CO4	
28.	Events handling mechanisms, Events, Event sources	1	14/12/2021		TLM1	CO4	
29.	Event classes, Event Listeners interfaces	1	16/12/2021		TLM1	CO4	
30.	handling mouse and keyboard events, Adapterclasse, Inner classes	1	17/12/2021		TLM1	CO4	
	No. of classes required to complete UNIT-IV	**07**			**No. of classes taken:**		

UNIT-V: AWT Controls, Swing Components

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
31.	AWT controls: label, button, scrollbars, text components, check box, check box groups	1	21/12/2021		TLM1	CO5	
32.	Choices controls, lists, scrollbar, text field	1	23/12/2021		TLM1	CO5	
33.	layout managers – border, grid, flow.	1	24/12/2021		TLM1	CO5	
34.	Introducing Swing:– Introduction, key features of swings	1	28/12/2021		TLM1	CO5	
35.	limitations of AWT, components &containers, swing	1	30/12/2021		TLM1	CO5	
36.	packages, creating swing applet, JApplet class, JComponents-Labels, text fields, buttons	1	31/12/2021		TLM1	CO5	
37.	Mid-II Exams						
	No. of classes required to complete UNIT-V	**06**			**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	HOD Sign Weekly
10.	Data types and null values Scope rules	1	01-10-2021		TLM1	CO1	
11.	Deadlock of Threads	1	26-10-2021		TLM1	CO3	
12.	Types of applets	1	09-12-2021		TLM1	CO4	

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

EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Assignment-I (Unit-I)	1,2,3,4	A1=5
Assignment-II (Unit-II)	1,2,3,4	A2=5
I-Mid Examination (Units-I & II)	1,2,3,4	M1=20
I-Quiz Examination (Units-I & II)	1,2,3,4	Q1=10
Assignment-III (Unit-III)	1,2,3,4	A3=5
Assignment-IV (Unit-IV)	1,2,3,4	A4=5
Assignment-V (Unit-V)	1,2,3,4	A5=5
II-Mid Examination (Units-III, IV & V)	1,2,3,4	M2=20
II-Quiz Examination (Units-III, IV & V)	1,2,3,4	Q2=10
Attendance	1,2,3,4	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	1,2,3,4	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	1,2,3,4	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)		B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	**1,2,3,4**	**40**
Semester End Examination (SEE)	**1,2,3,4**	**60**
Total Marks = CIE + SEE	**1,2,3,4**	**100**

POs:(Program Outcomes)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. 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.
4. 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.
5. 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.
6. 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.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. 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.
11. 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.
12. 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.

PEOs (Program Educational Objectives):

PE-1: To inculcate the adaptability skills into the students for software design, software development or any other allied fields of computing.
PE-2: To equip the graduates with the ability to analyze, design and synthesize data to create novel products.
PE-3: Ability to understand and analyze engineering issues in a broader perspective with ethical responsibility towards sustainable development.
PE-4: To empower the student with the qualities of effective communication, teamwork, continues learning attitude, leadership needed for a successful computer professional.

Mr. P Jagadeeswara Rao	Mr. S. Nagarjuna Reddy	Dr. Y V Bhaskar Reddy	Dr. D. Veeraiah
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Mr.P.Rathnakar Kumar
Course Name & Code : HIGH VOLTAGE ENGINEERING & 17EE92
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections- A A.Y : 2021-22

Pre-requisites : Electrical Power Transmission, Electrical Engineering Materials

Course Educational Objective: This course enables the student to

- Introduce basics of electrical breakdown and high voltage generation,
- Understand high voltage test systems, measurement and analysis techniques as applied to power system apparatus such as cables, insulators, transformers, and generators.

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

CO 1	Illustrate the fundamental concepts of electric breakdown in liquids, gases, and solids.
CO 2	Test the protection equipment in power system for high voltage applications.
CO 3	Analyze the concept of generation of high voltage AC, DC impulse voltages and currents and their measurements.
CO 4	Compare the principles of insulation co-ordination on HV/EHV systems.

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

Cos	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PSO a	PSO b	PSO c	PSO d
CO1	3	2	2										1			
CO2	3	3		3	3				2	2		2	3	2		
CO3	2	2	2	2	2							1	1	2		2
CO4	3	2	2									1	1	1		2

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

TEXT BOOKS:

1. E.Kuffel, W.S.Zaengl, J.Kuffel, High Voltage Engineering, Elsevier Publications, 2nd Edition,2008.
2. M.S.Naidu and V. Kamaraju High Voltage Engineering, TMH Publication, 3nd Edition,2017.

REFERENCE BOOKS:

1. C.L.Wadhwa, High Voltage Engineering, New Age Internationals (P) Limited, 3rd Edition,2012.
2. Ravindra Arora, Wolfgang Mosch, High Voltage Insulation Engineering, New Age International (P) Limited, 3rd Edition,2011.
3. Dr. Shailendra Jain, "Modeling and Simulation using MATLAB - Simulink" ,Wiley Publication, 2nd Edition,2011.
4. Dr. Vikramaditya Dave,"Electric Power Transmission & Distribution System with PSCAD (Basic) S", Himanshu Publications ,2017.

5. Atousa Yazdani,"Modern Distribution Systems with PSCAD Analysis", CRC Press, 1st edition,2018 .
6. Tharangika Bambaravanage, "Modeling, Simulation and Control of a Medium-Scale Power System ", Springer, 1st edition, 2017.
7. Subir Ray, "An introduction to High Voltage Engineering", PHI Learning Pvt.Ltd,New Delhi, 2nd edition, 2013.

Part - B
COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, Course outcomes, Electric Field Stresses	1	24-08-21		TLM2	
2.	Gas/Vacuum as Insulator, Liquid Dielectrics, Solid dielectrics	1	25-08-21		TLM2	
3.	Composites, Estimation and Control of Electric Stress	1	27-08-21		TLM2	
4.	Numerical methods for electric field computation	1	31-08-21		TLM2	
5.	Numerical methods for electric field computation	1	01-09-21		TLM2	
6.	Surge voltages, their distribution and control	1	03-09-21		TLM2	
7.	Conduction and Breakdown in Gases, Gases as insulating medium	1	07-09-21		TLM2	
8.	Ionization process, Townsend's criteria for breakdown	1	08-09-21		TLM2	
9.	Paschen's law	1	14-09-21		TLM2	
No. of classes required to complete UNIT-I: 9					No. of classes taken:	

UNIT-II: BREAK DOWN IN LIQUID DIELECTRICS

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.	Liquid as Insulator, pure and commercial liquids	1	17-09-21		TLM2	
2.	conduction and breakdown in pure liquids, conduction and breakdown in commercial liquids	1	21-09-21		TLM2	

3.	Transformer oil, Break Down in	1	22-09-21		TLM2	
4.	Solid Dielectrics, Intrinsic breakdown	1	24-09-21		TLM2	
5.	Electromechanical breakdown	1	28-09-21		TLM2	
6.	Thermal breakdown	1	29-09-21		TLM2	
7.	breakdown of solid dielectrics in practice		29-10-21		TLM2	
8.	solid dielectrics used in practice	1	01-10-21		TLM2	
9.	Revision of unit-1 and unit-2		01-10-21		TLM2	
10.	MID-I		05-10-21			
11.	MID-I		06-10-21			
12.	MID-I		08-10-21			
No. of classes required to complete UNIT-II: 7					No. of classes taken:	

UNIT-III: GENERATION OF HIGH VOLTAGES, CURRENTS AND TESTING

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.	Generation of High DC Voltages, Generation of High AC voltages	1	19-10-21		TLM2	
2.	Generation of Impulse Voltages, Generation of Impulse currents	1	20-10-21		TLM2	
3.	Tripping and control of impulse generators.	1	22-10-21		TLM2	
4.	Testing of Insulators and bushings, Testing of Isolators	1	26-10-21		TLM2	
5.	Testing of circuit breakers, Testing of cables	1	27-10-21		TLM2	
6.	Testing of Transformers, Testing of Surge Arresters	1	29-10-21		TLM2	
7.	Radio Interference measurements. Short circuit testing	1	02-11-21		TLM2	
No. of classes required to complete UNIT-III: 7					No. of classes taken:	

UNIT-IV: MEASUREMENT OF HIGH VOLTAGES AND CURRENTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Measurement of High DC voltages	1	03-11-21		TLM2	
2.	Measurement of High AC and impulse voltages	1	05-11-21		TLM2	
3.	Measurement of High DC, AC and Impulse currents	1	09-11-21		TLM2	
4.	Oscilloscope for impulse voltage measurements	1	10-11-21		TLM2	
5.	Oscilloscope for impulse current measurements	1	12-11-21		TLM2	
6.	Partial discharge, acoustic measurement	1	16-11-21		TLM2	
No. of classes required to complete UNIT-IV: 6					No. of classes taken:	

UNIT-V: INSULATION CO-ORDINATION AND GROUNDING OF EHV SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Principles of Insulation Coordination on High voltage	1	17-11-21		TLM2	
2.	Insulation Coordination on High voltage	1	19-11-21		TLM2	
3.	Extra High Voltage power systems	1	23-11-21		TLM2	
4.	Generalized Grounding systems	1	24-11-21		TLM2	
5.	Grounding Grids	1	26-11-21		TLM2	
6.	Revision of unit 1&2	1	30-11-21		TLM2	
7.	Revision of unit 3&4	1	01-12-21		TLM2	
8.	Revision of unit 5	1	03-12-21		TLM2	
9.	MID-II		07-12-21			
10.	MID-II		08-12-21			
11.	MID-II		10-12-21			
No. of classes required to complete UNIT-V: 8					No. of classes taken:	

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Streamers Theory	1	1-10-21		TLM2	
2.	Measurement of voltages and currents-types	1	10-11-21		TLM2	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

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.

PART-D

PROGRAMME OUTCOMES (POs):

PO a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 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.
PO 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.
PO e	**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 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
PO 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.
PO h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO k	**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 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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Mr.P.Rathnakar Kumar	Mrs. P.Rathnakar Kumar	Dr.M.S.Giridhar	Dr.J.Siva Vara Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. M. Raja Nayak
Course Name & Code : HIGH VOLTAGE ENGINEERING & 17EE92
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections- A A.Y :2021-22

Pre-requisites : Electrical Power Transmission, Electrical EngineeringMaterials

Course Educational Objective: This course enables the student to

- Introduce basics of electrical breakdown and high voltagegeneration,
- Understand high voltage test systems, measurement and analysis techniques as applied to power system apparatus such as cables, insulators, transformers, andgenerators.

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

CO 1	Illustrate the fundamental concepts of electric breakdown in liquids, gases, and solids.
CO 2	Test the protection equipment in power system for high voltage applications.
CO 3	Analyze the concept of generation of high voltage AC, DC impulse voltages and currents and their measurements.
CO 4	Compare the principles of insulation co-ordination on HV/EHV systems.

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 A	PSO b	PSO c	PSO d
CO1	3	2	2										1			
CO2	3	3		3	3				2	2		2	3	2		
CO3	2	2	2	2	2							1	1	2		2
CO4	3	2	2									1	1	1		2

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

TEXT BOOKS:

1. E.Kuffel, W.S.Zaengl, J.Kuffel, High Voltage Engineering, Elsevier Publications, 2nd Edition,2008.
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1. C.L.Wadhwa, High Voltage Engineering, New Age Internationals (P) Limited, 3rd Edition,2012.
2. Ravindra Arora, Wolfgang Mosch, High Voltage Insulation Engineering, New Age International (P) Limited, 3rd Edition,2011.
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4. Dr. Vikramaditya Dave,"Electric Power Transmission & Distribution System withPSCAD (Basic) S", Himanshu Publications,2017.
5. Atousa Yazdani,"Modern Distribution Systems with PSCAD Analysis", CRC Press, 1st edition,2018.
6. Tharangika Bambaravanage, "Modeling, Simulation and Control of a Medium-Scale Power System ", Springer, 1st edition,2017.
7. Subir Ray, "An introduction to High Voltage Engineering", PHI Learning Pvt.Ltd,New Delhi, 2nd edition,2013.

Part - B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, Course outcomes, Electric Field Stresses	1	29-9-21		TLM2	
2.	Gas/Vacuum as Insulator, Liquid Dielectrics, Solid dielectrics	1	30-9-21		TLM2	
3.	Composites, Estimation and Control of Electric Stress	1	04-10-21		TLM2	
4.	Numerical methods for electric field computation	1	06-10-21		TLM2	
5.	Numerical methods for electric field computation	1	09-10-21		TLM2	
6.	Surge voltages, their distribution and control	1	11-10-21		TLM2	
7.	Conduction and Breakdown in Gases, Gases as insulating medium	1	18-10-21		TLM2	
8.	Ionization process, Townsend's criteria for breakdown	1	20-10-21		TLM2	
9.	Paschen's law	1	23-10-21		TLM2	
No. of classes required to complete UNIT-I: 9					No. of classes taken:	

UNIT-II: BREAK DOWN IN LIQUID DIELECTRICS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Liquid asInsulator, pure and commercialliquids	1	25-10-21		TLM2	
11.	conduction and	1			TLM2	
	breakdown in pure liquids, conduction and breakdown in commercial liquids		27-10-21			
12.	Transformer oil, Break Down in Solid Dielectrics, Intrinsic breakdown	1	30-10-21		TLM2	
13.	electromechanical breakdown, thermal breakdown	1	01-11-21		TLM2	
14.	breakdown of solid dielectrics in practice	1	03-11-21		TLM2	
15.	Breakdown in composite dielectrics	1	06-11-21		TLM2	
16.	solid dielectrics used in practice	1	06-11-21		TLM2	
17.	MID-I	1	08-11-21			
18.	MID-I		10-11-21			
No. of classes required to complete UNIT-II: 7					No. of classes taken: 7	

UNIT-III: GENERATION OF HIGH VOLTAGES, CURRENTS AND TESTING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Generation of High DC Voltages, Generation of High AC voltages	1	15-11-21		TLM2	
20.	Generation of Impulse Voltages, Generation of Impulse currents	1	17-11-21		TLM2	
21.	Tripping and control of impulse generators.	1	20-11-21		TLM2	
22.	Testing of Insulators and bushings, Testing	1	22-11-21		TLM2	

	of Isolators					
23.	Testing of circuit breakers, Testing of cables	1	24-11-21		TLM2	
24.	Testing of Transformers, Testing of Surge Arresters	1	27-11-21		TLM2	
25.	Radio Interference measurements. Short circuit testing	1	29-11-21		TLM2	
No. of classes required to complete UNIT-III: 7					No. of classes taken:	

UNIT-IV: MEASUREMENT OF HIGH VOLTAGES AND CURRENTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Measurement of High DC voltages	1	27-11-21		TLM2	
27.	Measurement of High AC and impulse voltages	1	29-11-21		TLM2	
28.	Measurementof High DC, AC and Impulsecurrents	1	01-12-21		TLM2	
29.	Measurementof High DC, AC and Impulsecurrents	1	04-12-21		TLM2	
30.	Oscilloscope for impulse voltage measurements	1	06-12-21		TLM2	
31.	Oscilloscope for impulse current measurements	1	08-12-21		TLM2	
32.	Partial discharge, acoustic measurement	1	13-12-21		TLM2	
33.	Partial discharge, acoustic measurement	1	15-12-21		TLM2	
No. of classes required to complete UNIT-IV: 8					No. of classes taken:	

UNIT-V: INSULATION CO-ORDINATION AND GROUNDING OF EHV SYSTEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Text Book followed	HOD Sign Weekly
34.	Principles of Insulation Coordination on High voltage	1	18-12-21		TLM2	
35.	Extra High Voltage power systems	1	20-12-21		TLM2	
36.	Generalized Grounding systems	1	22-12-21		TLM2	

37.	Grounding Grids	1	27-12-21		TLM2	
38.	Grounding Grids	1	29-11-21		TLM2	
39.	Revision		01-12-21			
No. of classes required to complete UNIT-V: 5					No. of classes taken:	

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Streamers Theory	1			TLM2	
2.	Measurement of voltages and currents-types	1			TLM2	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

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

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.

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Mr. M. Raja Nayak	Mr. P.Ratnakar Kumar	Dr. P.Sobha Rani	Dr.J.Siva Vara Prasad
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (Autonomous)
L.B. Reddy Nagar, Mylavaram-521230. Andhra Pradesh, INDIA
Affiliated to JNTUK, Kakinada & Approved by AICTE New Delhi
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., VII-Sem., EEE(A)

ACADEMIC YEAR : 2021-22

COURSE NAME & CODE :**Power Electronics Lab.**& 17EE69

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

COURSE CREDITS : 2

COURSE INSTRUCTOR : Mr.J.V.Pavan Chand, Mr.Ch.Rajesh

COURSE COORDINATOR : Mr.J.V.Pavan Chand

PRE-REQUISITE: **Power Electronics**

COURSE OUTCOMES(CO):

Power Electronics Lab

CO1 Examine the characteristics of Power electronic devices.
CO2 Simulate and analyze the performance of power converters.
CO3 Choose an appropriate power converter with suitable control technique for real time applications

LIST OF EXPERIMENTS

CYCLE1

1. Charcteristics of SCR, IGBT, MOSFET c01
2. Single phase AC voltage controller with R & RL Loads. c02
3. Single phase fully controlled bridge converter With R & RL Loads. C02
4. Single phase IGBT inverter. Co2, co3
5. Three phase fully controlled bridge converter with R Load. Co2, co3
6. Single phase dual converter with RL load. c01
7. Analysis of four Quadrant operation chopper with R-Load co3
8. Analysis of Single phase cyclo converter with R& RL-load co1
9. Single Phase ac to dc converter with LC filter using MATLAB/SIMULINK co3, co2
10. Single phase inverter with current controlled PWM technique ,using MATLAB/SIMULINK co3, co2

SECTION-A SCHEDULE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

DAY: Monday Students: 17761A0250,18761A0201-18761A0232----------(31)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	29-09-21	06-10	20-10	27-10	03-11	17-11	24-11	01-12	8-12	15-12	22-12	29-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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	

DAY: Wednesday

Students: 18761A0233-18761A0252, 19765A0201-19765A0213----------(31)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	27-09-21	04-10	11-10	18-10	25-10	01-11	22-11	29-11	6-12	13-12	20-12	27-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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	

LAB INCHARGE **HEAD OF THE DEPARTMENT**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch.Rajesh, Mr.J.V.Pavan Chand
Course Name & Code : Power Electronics Lab (17EE69)
L-T-P Structure : 0-0-2 Credits : 1
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections-B A.Y : 2021-22

PRE-REQUISITE: Power Electronics (17EE19)
COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to

- Understand the circuits and waveforms of various power electronic converters.
- Make use of hardware modules and software tools to control the performance of various power electronic converters.

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

CO1	Examine the characteristics of Power electronic devices.
CO2	Simulate various power converters using modern tools.
CO3	Analyze the performance of different power converters using hardware kits.
CO4	Develop report writing skills

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

PO →	a	b	c	d	e	f	g	H	i	J	K	l	PSOa	PSOb	PSOc	PSOd
CO1	2	2														
CO2	3	2	1	2												
CO3	2	2	2	2												
CO4								**3**	**2**	**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).

LIST OF EXPERIMENTS

1. Characteristics of SCR, IGBT & Power MOSFET.
2. Single phase AC voltage controller with R & RL Loads.
3. Single phase fully controlled bridge converter With R & RL Loads.
4. Single phase IGBT inverter with R and R-L Loads.
5. Three phase fully controlled bridge converter with R Load.
6. Single phase dual converter with RL load.
7. Four quadrant operation of chopper with R-load.
8. PWM control of Boost converter with R and R-L loads.
9. Single Phase ac to dc converter with LC filter using MATLAB/SIMULINK.
10. Single phase inverter with current controlled PWM technique using MATLAB/SIMULINK.

ADDITIONAL EXPERIMENTS

11. Single Phase ac voltage controller with R and R-L load using MATLAB/SIMULINK.
12. Single phase fully controlled PWM rectifier with R & RL loads using PSCAD.
13. Micro Controller based PWM pulse generation.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Saturday
Students: 18761A0285-18761A02A5, 19765A0214-19765A0226----------(30)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	01-10-21	08-10	22-10	29-10	5-11	19-11	26-11	03-12	10-12	17-12	24-12	31-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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
Students: 17761A0288,18761A0253-18761A0284----------(30)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	09-10-21	09-10	16-10	23-10	30-10	6-11	20-11	27-11	04-12	11-12	18-12	31-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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	

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
DAY-TO-DAY MARKS(A)	10
RECORD MARKS (B)	10
INTERNAL EXAM (C)	10
VIVA-VOCE (D)	05
ATTENDANCE (E)	05
Cumulative Internal Examination (CIE) : A+B+C+D+E	40
EXTERNAL EXAM (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO- a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO- 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.
PO- 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.
PO -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.
PO -e	**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- 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
PO -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.
PO- h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO- i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO -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.
PO- k	**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 -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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO -a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO -b	Design and analyze electrical machines, modern drive and lighting systems
PSO -c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO -d	Design controllers for electrical and electronic systems to improve their performance

Mr.Ch.Rajesh, Mr.J.V.Pavan Chand	Dr.M.S.Giridhar	Dr.J.Siva Vara Prasad
Course Instructor	**Module Coordinator**	**HOD**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. P. Srihari, Dr.P.Sobha Rani, Mrs.G.Tabita
Course Name & Code : Power Systems Lab (17EE70)
L-T-P Structure : 0-0-2 Credits : 1
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections-A A.Y : 2021-22

PRE-REQUISITE: Electrical Power Transmission(17EE12), Power Systems Analysis(17EE18)
COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to Verify the theoretical concepts of power and energy systems through experimentation and analyze the same using simulation tools

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

CO 1	Analyze transmission systems under steady state and transient conditions.
CO 2	Perform fault calculation and network protection.
CO 3	Understand the performance of renewable energy systems. /Apply the knowledge of renewable energy systems to practical applications

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

PO →	a	b	c	d	e	f	g	H	i	J	k	l	PSOa	PSOb	PSOc	PSOd
CO1	3	2	2	2	3				3	3		3	3	2		
CO2	2	2	2	2	3								3	3		2
CO3	2			2		2	2			3		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).

LIST OF EXPERIMENTS

Cycle-I: Simulation based

1. Determination of Receiving end quantities and the line performance of a medium/long transmission line using MATLAB
2. Using MATLAB 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.
4. Transient analysis of a Single Machine Infinite Bus (SMIB) system.
5. Simulation of LG, LL, LLG and LLL faults on a simple power system using PSCAD/MATLAB.
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 MATLAB / PSCAD.

Cycle-II: Experiment based

8. Plot V-I characteristics of Solar panel at various levels of insolation.
9. Study the effects of temperature and irradiance on Solar cell and plot the characteristics.
10. Study the performance of a Wind turbine system at different wind speeds and plot the characteristics.
11. Determination of Earth resistance in humid and dry earth conditions.
12. Study the Over current protection scheme using numerical relay.
13. Determination of Positive, Negative and Zero sequence reactances for a 3-phase alternator.
14. Determination of ABCD parameters and performance of a transmission line.

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	XV Week
Tentative Date	27-09-21	04-10	11-10	18-10	25-10	01-11	22-11	29-11	6-12	13-12	20-12	27-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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	
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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-A

DAY: Wednesday

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	29-09-21	06-10	20-10	27-10	03-11	17-11	24-11	01-12	8-12	15-12	22-12	29-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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	

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
DAY-TO-DAY MARKS(A)	10
RECORD MARKS (B)	10
INTERNAL EXAM (C)	10
VIVA-VOCE (D)	05
ATTENDANCE (E)	05
Cumulative Internal Examination (CIE) : A+B+C+D+E	40
EXTERNAL EXAM (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO- a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO- 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.
PO- 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.
PO -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.
PO -e	**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- 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
PO -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.
PO- h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO- i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO -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.
PO- k	**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 -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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO -a	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power
PSO -b	Design and analyze electrical machines, modern drive and lighting systems
PSO -c	Specify, design, implement and test analog and embedded signal processing electronic systems
PSO -d	Design controllers for electrical and electronic systems to improve their performance

Mr. P.Srihari, Dr.P.Sobha Rani, Mrs.G.Tabita	Dr.M.S.Giridhar	Dr.J.Siva Vara Prasad
Course Instructor	**Module Coordinator**	**HOD**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.G.Tabita, Dr.P.Sobha Rani, Mr. P. Srihari
Course Name & Code : Power Systems Lab (17EE70)
L-T-P Structure : 0-0-2 Credits : 1
Program/Sem/Sec : B.Tech., EEE., VII-Sem., Sections-B A.Y : 2021-22

PRE-REQUISITE: Electrical Power Transmission(17EE12), Power Systems Analysis(17EE18)
COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to Verify the theoretical concepts of power and energy systems through experimentation and analyze the same using simulation tools

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

CO 1	Analyze transmission systems under steady state and transient conditions.
CO 2	Perform fault calculation and network protection.
CO 3	Understand the performance of renewable energy systems. /Apply the knowledge of renewable energy systems to practical applications

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

PO →	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**H**	**i**	**J**	**K**	**l**	**PSOa**	**PSOb**	**PSOc**	**PSOd**
CO1	3	2	2	2	3				3	3		3	3	2		
CO2	2	2	2	2	3								3	3		2
CO3	2			2		2	2			3		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).

LIST OF EXPERIMENTS

Cycle-I: Simulation based

1. Determination of Receiving end quantities and the line performance of a medium/long transmission line using MATLAB
2. Using MATLAB code determine:
   (iii) Bus admittance matrix by inspection method for a 3-bus power system and obtain
   (iv) Power flow solution by Newton-Raphson method.
3. Determination of Sequence components (Positive, Negative and Zero) of an alternator.
4. Transient analysis of a Single Machine Infinite Bus (SMIB) system.
5. Simulation of LG, LL, LLG and LLL faults on a simple power system using PSCAD/MATLAB.
6. Determine steady state frequency error and frequency deviation response for an
   (ii) Isolated power system and (ii) Interconnected power system.
7. Plot the Swing curve for a simple 3 or 4 bus power system using MATLAB / PSCAD.

Cycle-II: Experiment based

8. Plot V-I characteristics of Solar panel at various levels of insolation.
9. Study the effects of temperature and irradiance on Solar cell and plot the characteristics.
10. Study the performance of a Wind turbine system at different wind speeds and plot the characteristics.
11. Determination of Earth resistance in humid and dry earth conditions.
12. Study the Over current protection scheme using numerical relay.
13. Determination of Positive, Negative and Zero sequence reactances for a 3-phase alternator.
14. Determination of ABCD parameters and performance of a transmission line.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

DAY: Friday
Students: 18761A0285-18761A02A5, 19765A0214-19765A0226(30)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	01-10-21	08-10	22-10	29-10	5-11	19-11	26-11	03-12	10-12	17-12	24-12	31-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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: Saturday
Students: 17761A0288,18761A0253-18761A0284----------(30)

B.NO.	I Week	II Week	III Week	IV Week	V Week	VI Week	VII Week	VIII Week	IX Week	X Week	XI Week	XV Week
Tentative Date	09-10-21	09-10	16-10	23-10	30-10	6-11	20-11	27-11	04-12	11-12	18-12	31-12
Actual Date												
B-1	Demo	1	2	3	4	5	6	7	8	9	10	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-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	

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
DAY-TO-DAY MARKS(A)	10
RECORD MARKS (B)	10
INTERNAL EXAM (C)	10
VIVA-VOCE (D)	05
ATTENDANCE (E)	05
Cumulative Internal Examination (CIE) : A+B+C+D+E	40
EXTERNAL EXAM (SEE)	60
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO- a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO- 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.
PO- 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.
PO -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.
PO -e	**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- 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
PO -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.
PO- h	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO- i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO -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.
PO- k	**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 -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.

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