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 & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.R. Padma
Course Name & Code : **Electrical Measurements and Instrumentation & 23EE15**
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech, EEE-A., VI-Sem. A.Y : 2025-26

Pre-requisites : Basics of Electrical and Electronics Engineering.

Course Educational Objective: This course enables the students to understand the construction and working principle of different types of meters. It provides knowledge on DC bridges, AC bridges and transducers.

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

CO 1	Understand the construction and working of various types of analog instruments. **(Understand-L2)**
CO 2	Analyze the construction and working of wattmeter and power factor meters **(Apply-L3)**
CO 3	Understand the construction and working various bridges for the measurement resistance inductance and capacitance **(Understand-L2)**
CO 4	Analyze the operational concepts of various transducers **(Understand-L2)**
CO5	Understand the construction and operation of digital meters **(Understand-L2)**

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

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

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

TEXT BOOKS:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.

REFERENCE BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition.
3. Electrical Measurements by Buckingham and Price - Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

Part - B
COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : Analog Ammeter and Voltmeters

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, CEO's &CO's	1	01-12-2025		TLM1	
2.	Classification	1	02-12-2025		TLM2	
3.	deflecting, control and damping torques	1	04-12-2025		TLM2	
4.	PMMC, moving iron type	1	08-12-2025		TLM2	
5.	electrostatic instruments-Construction	1	09-12-2025		TLM2	
6.	Torque equation, Range extension	1	11-12-2025		TLM2	
7.	Errors and compensations	1	15-12-2025		TLM2	
8.	advantages and disadvantages	1	16-12-2025		TLM2, TLM6	
9.	Instrument transformers: Current Transformer	1	18-12-2025		TLM2, TLM6	
10.	Potential Transformer, Numerical Problems	1	22-12-2025		TLM2, TLM2, TLM4	
No. of classes required to complete UNIT-I : 10					No. of classes taken:	

UNIT-II : Analog Ammeter and Voltmeters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11	Electrodynamometer type wattmeter (LPF and UPF)	1	23-12-2025		TLM1	
12	Power factor meters, Dynamometer	1	25-12-2025		TLM2	
13	M.I type (Single phase and Three phase) Construction	1	29-12-2025		TLM1	
14	torque equation, advantages and disadvantages.	1	30-12-2025		TLM1	
15	Potentiometers: Principle and operation of D.C Crompton's potentiometer	1	30-12-2025		TLM2	
16	Standardization, Applications	1	05-01-2026		TLM1, TLM4	

17	AC Potentiometer (Polar and coordinate types)	1	06-01-2026		TLM1, TLM4	
18	Standardization, Applications	1	08-01-2026		TLM1, TLM2	
19	Numerical Problems	1	12-01-2026		TLM1, TLM2	
No. of classes required to complete UNIT-II : 10					No. of classes taken:	

UNIT-III: Measurements of Electrical parameters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20	Introduction: **DC Bridges:**	1	19-01-2026		TLM2	
21	Method of measuring low, medium and high resistance	1	20-01-2026		TLM2	
22	Wheat stone's bridge for measuring medium resistance	1	22-01-2026		TLM2	
23	Kelvin's double bridge for measuring low resistance	1	02-02-2026		TLM2	
24	Loss of charge method for measurement of high resistance	1	03-02-2026		TLM1, TLM2	
25	Megger – measurement of earth resistance, Numerical Problems	1	05-02-2026		TLM1, TLM2	
26	**AC Bridges:** Measurement of inductance and quality factor	1	09-02-2026		TLM1, TLM2	
27	Maxwell's bridge, Hay's bridge	1	10-02-2026		TLM1, TLM2	
28	Anderson's bridge, Measurement of capacitance and loss angle	1	12-02-2026		TLM2	
29	Desauty's bridge, Schering Bridge	1	16-02-2026		TLM1, TLM2	
30	Wien's bridge, Numerical Problems	1	17-02-2026			
No. of classes required to complete UNIT-III : 11					No. of classes taken:	

UNIT-IV : Transducers

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31	Introduction	1	19-02-2026		TLM2	
32	Definition ,Classification	1	23-02-2026		TLM2	
33	Resistive, Inductive Transducer	1	24-02-2026		TLM2	
34	Capacitive Transducer	1	26-02-2026		TLM2	
35	LVDT, Strain Gauge	1	02-03-2026		TLM2	

36	Thermistors, Thermocouples	1	03-03-2026		TLM1, TLM2	
37	Piezo electric Transducers	1	05-03-2026		TLM2, TLM6	
38	Photo Diode Transducers	1	09-03-2026		TLM1, TLM2	
39	Hall effect sensors	1	10-03-2026		TLM1, TLM2	
40	Numerical Problems.	1	12-03-2026		TLM1, TLM2	
No. of classes required to complete UNIT-IV : 10					No. of classes taken:	

UNIT-V: Digital meters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	**Teaching Learning Methods**	HOD Sign Weekly
41	Digital Voltmeters Introduction	1	16-03-2026		TLM2	
42	Successive approximation DVM	1	17-03-2026		TLM2	
43	Ramp type DVM, Integrating type DVM	1	19-03-2026		TLM1, TLM2	
44	Digital frequency meter, Digital multimeter	1	23-03-2026		TLM1, TLM2	
45	Digital tachometer, Digital Energy Meter, Q meter	1	24-03-2026		TLM1, TLM2	
46	CRO, measurement of phase difference	1	30-03-2026		TLM1, TLM2	
47	Frequency using lissajious patterns	1	31-03-2026		TLM2	
48	Numerical Problems.	1	02-04-2026		TLM1, TLM2	
No. of classes required to complete UNIT-V : 08					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
49					TLM2, TLM6	

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 (R23 Regulation):

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

EVALUATION PROCESS (R23 Regulation):

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions	01-12-2025	24-01-2026	8 W
I Mid Examinations	26-01-2026	31-01-2026	1 W
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	06-04-2026	11-04-2026	1 W
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	20-04-2026	02-05-2026	2 W
Internship	04-05-2026	27-06-2026	8W

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO2: Design and analyze electrical machines, modern drive and lighting systems.
PSO3: Specify, design, implement and test analog and embedded signal processing electronic systems.
PSO4: Design controllers for electrical and electronic systems to improve their performance.

Mrs R.Padma	Dr.P.Sobha Rani		Dr. P. Sobha Rani
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.P.Sobha Rani
Course Name & Code : **Electrical Measurements and Instrumentation** & **23EE15**
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech, EEE-B., VI-Sem. A.Y : 2025-26

Pre-requisites : Basics of Electrical and Electronics Engineering.

Course Educational Objective: This course enables the students to understand the construction and working principle of different types of meters. It provides knowledge on DC bridges, AC bridges and transducers.

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

CO 1	Understand the construction and working of various types of analog instruments. **(Understand-L2)**
CO 2	Analyze the construction and working of wattmeter and power factor meters **(Apply-L3)**
CO 3	Understand the construction and working various bridges for the measurement resistance inductance and capacitance **(Understand-L2)**
CO 4	Analyze the operational concepts of various transducers **(Understand-L2)**
CO5	Understand the construction and operation of digital meters **(Understand-L2)**

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

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

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

TEXT BOOKS:

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3. Electrical Measurements by Buckingham and Price - Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

Part - B
COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : Analog Ammeter and Voltmeters

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, CEO's &CO's	1	01-12-2025		TLM1	
2.	Classification	1	05-12-2025		TLM2	
3.	deflecting, control and damping torques	1	06-12-2025		TLM2	
4.	PMMC, moving iron type	1	08-12-2025		TLM2	
5.	electrostatic instruments-Construction	1	12-12-2025		TLM2	
6.	Torque equation, Range extension	1	13-12-2025		TLM2	
7.	Errors and compensations	1	15-12-2025		TLM2	
8.	advantages and disadvantages	1	19-12-2025		TLM2, TLM6	
9.	Instrument transformers: Current Transformer	1	20-12-2025		TLM2, TLM6	
10.	Potential Transformer, Numerical Problems	1	22-12-2025		TLM2, TLM2, TLM4	
No. of classes required to complete UNIT-I : 10					No. of classes taken:	

UNIT-II : Analog Ammeter and Voltmeters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11	Electrodynamometer type wattmeter (LPF and UPF)	1	26-12-2025		TLM1	
12	Power factor meters, Dynamometer	1	27-12-2025		TLM2	
13	M.I type (Single phase and Three phase) Construction	1	29-12-2025		TLM1	
14	torque equation, advantages and disadvantages.	1	02-01-2026		TLM1	
15	Potentiometers: Principle and operation of D.C Crompton's potentiometer	1	03-01-2026		TLM2	
16	Standardization, Applications	1	05-01-2026		TLM1, TLM4	

17	AC Potentiometer (Polar and coordinate types)	1	09-01-2026		TLM1, TLM4	
18	Standardization, Applications	1	10-01-2026		TLM1, TLM2	
19	Numerical Problems	1	12-01-2026		TLM1, TLM2	
No. of classes required to complete UNIT-II : 10					No. of classes taken:	

UNIT-III: Measurements of Electrical parameters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20	Introduction: **DC Bridges:**	1	19-01-2026		TLM2	
21	Method of measuring low, medium and high resistance	1	23-01-2026		TLM2	
22	Wheat stone's bridge for measuring medium resistance	1	24-01-2026		TLM2	
23	Kelvin's double bridge for measuring low resistance	1	02-02-2026		TLM2	
24	Loss of charge method for measurement of high resistance	1	06-02-2026		TLM1, TLM2	
25	Megger – measurement of earth resistance, Numerical Problems	1	07-02-2026		TLM1, TLM2	
26	**AC Bridges:** Measurement of inductance and quality factor	1	09-02-2026		TLM1, TLM2	
27	Maxwell's bridge, Hay's bridge	1	13-02-2026		TLM1, TLM2	
28	Anderson's bridge, Measurement of capacitance and loss angle	1	14-02-2026		TLM2	
29	Desauty's bridge, Schering Bridge	1	16-02-2026		TLM1, TLM2	
30	Wien's bridge, Numerical Problems	1	20-02-2026			
No. of classes required to complete UNIT-III : 11					No. of classes taken:	

UNIT-IV : Transducers

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31	Introduction	1	21-02-2026		TLM2	
32	Definition ,Classification	1	23-02-2026		TLM2	
33	Resistive, Inductive Transducer	1	27-02-2026		TLM2	
34	Capacitive Transducer	1	28-02-2026		TLM2	
35	LVDT, Strain Gauge	1	02-03-2026		TLM2	

36	Thermistors, Thermocouples	1	06-03-2026		TLM1, TLM2	
37	Piezo electric Transducers	1	07-03-2026		TLM2, TLM6	
38	Photo Diode Transducers	1	09-03-2026		TLM1, TLM2	
39	Hall effect sensors	1	13-03-2026		TLM1, TLM2	
40	Numerical Problems.	1	14-03-2026		TLM1, TLM2	
No. of classes required to complete UNIT-IV : 10					No. of classes taken:	

UNIT-V: Digital meters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	**Teaching Learning Methods**	HOD Sign Weekly
41	Digital Voltmeters Introduction	1	16-03-2026		TLM2	
42	Successive approximation DVM	1	20-03-2026		TLM2	
43	Ramp type DVM, Integrating type DVM	1	23-03-2026		TLM1, TLM2	
44	Digital frequency meter, Digital multimeter	1	27-03-2026		TLM1, TLM2	
45	Digital tachometer, Digital Energy Meter, Q meter	1	28-03-2026		TLM1, TLM2	
46	CRO, measurement of phase difference	1	30-03-2026		TLM1, TLM2	
47	Frequency using lissajious patterns	1	03-04-2026		TLM2	
48	Numerical Problems.	1	04-04-2026		TLM1, TLM2	
No. of classes required to complete UNIT-V : 08					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
49					TLM2, TLM6	

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 (R23 Regulation):

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

EVALUATION PROCESS (R23 Regulation):

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions	01-12-2025	24-01-2026	8 W
I Mid Examinations	26-01-2026	31-01-2026	1 W
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	06-04-2026	11-04-2026	1 W
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	20-04-2026	02-05-2026	2 W
Internship	04-05-2026	27-06-2026	8W

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):

PSO1: Specify, design and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO2: Design and analyze electrical machines, modern drive and lighting systems.
PSO3: Specify, design, implement and test analog and embedded signal processing electronic systems.
PSO4: Design controllers for electrical and electronic systems to improve their performance.

Dr.P.Sobha Rani	Dr.P.Sobha Rani		Dr. P. Sobha Rani
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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Department of Electrical and Electronics Engineering
Accredited by NBA under Tier-I

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.Harinadha Reddy
Course Name & Code : Basic Microprocessors and Microcontrollers –23EE16
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/A **A.Y.:** 2025-26

Pre-requisite: Basic knowledge in digital electronics, fundamentals of computers.

Course Educational Objectives: In this course student will learn about the Architecture of Microprocessors and Microcontroller and their Assembly Language Programming, interfacing Memory and Various Peripherals with 8086 Microprocessor/8051 Microcontroller and concepts of Interrupts and Serial Communication in reference to 8086.

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

CO1	Understand the concepts of the Microprocessor capability and explore the evaluation of microprocessors. (Understand–L2)
CO2	Analyze the instruction sets, addressing modes and modes operations of 8086 Microprocessors (Apply–L3)
CO3	Analyze the Microcontroller and interfacing capability (Apply–L3)
CO4	Understand the architecture and interfacing of 8051 controller (Understand–L2)
CO5	Analyze the concepts of PIC micro controller and its programming. (Understand–L2)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3	PSO4
CO1	3														2	
CO2	2	3													2	
CO3	2	3													2	
CO4	3														2	
CO5	2	3													2	

TEXT BOOKS:

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing"- Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - "The 8051 Microcontroller Architecture- Programming and Applications" - Thomson Publishers - 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18. -Muhammad Ali Mazidi – Rolind D.Mckinay - Danny causey -Pearson Publisher 21st Impression.

REFERENCE:

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.
2. R.S. Kaler - "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.
3. Ajay V. Deshmukh - "Microcontrollers – Theory and Applications" - Tata McGraw–Hill Companies – 2005.
4. Ajit Pal - "Microcontrollers – Principles and Applications" - PHI Learning Pvt Ltd - 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Microprocessor Architecture

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 COs	1	02-12-2025		TLM1	
2.	Introduction and evolution of Microprocessors	1	03-12-2025		TLM1	
3.	Architecture of 8086	1	06-12-2025		TLM2	
4.	Memory Organization of 8086	1	09-12-2025		TLM1	
5.	Register Organization of 8086	1	10-12-2025		TLM1	
6.	Register Organization of 8086	1	13-12-2025		TLM1	
7.	Introduction to 80286	1	16-12-2025		TLM1	
8.	Introduction to 80386	1	17-12-2025		TLM1	
9.	Introduction to 80486	1	20-12-2025		TLM1	
10.	Introduction to Pentium	1	23-12-2025		TLM2	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Minimum and Maximum Mode Operations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Instruction sets of 8086	1	24-12-2025		TLM1	
12.	Addressing modes	1	27-12-2025		TLM1	
13.	Simple Programs	1	30-12-2025		TLM4	
14.	Simple Programs	1	31-12-2025		TLM4	
15.	General bus operation of 8086	1	03-01-2026		TLM1	
16.	Minimum mode operations of 8086	1	06-01-2026		TLM2	
17.	Maximum mode operations of 8086	1	07-01-2026		TLM3	
18.	8086 Control signal interfacing	1	10-01-2026		TLM1	
19.	Read and write cycle timing diagrams	1	17-01-2026		TLM2	
20.	**Assignment-1 discussion**	1	20-01-2026		TLM6	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT – III: Microprocessors I/O interfacing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	8255 PPI	1	21-01-2026		TLM1	
22.	Architecture of 8255	1	24-01-2026		TLM2	
23.	Modes of operation	1	03-02-2026		TLM1	
24.	Interfacing I/O devices to 8086 using 8255	1	04-02-2026		TLM1	
25.	Interfacing A to D converters	1	07-02-2026		TLM1	
26.	Interfacing D to A converters	1	10-02-2026		TLM1	
27.	Stepper motor interfacing	1	11-02-2026		TLM1	
28.	Static memory interfacing with 8086	1	14-02-2026		TLM1	
29.	Architecture and interfacing of DMA controller (8257)	1	17-02-2026		TLM1	
30.	**Simple programs**	1	18-02-2026		TLM3	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT – IV: 8051 Microcontroller

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Overview of 8051 Microcontroller	1	21-02-2026		TLM1	
32.	Architecture	1	24-02-2026		TLM2	
33.	Memory Organization	1	25-02-2026		TLM1	
34.	Register set	1	28-02-2026		TLM1	
35.	Instruction set	1	03-03-2026		TLM1	
36.	Simple Programs	1	07-03-2026		TLM3	
37.	I/O ports and Interrupts	1	10-03-2026		TLM1	
38.	Timers and Counters	1	11-03-2026		TLM2	
39.	Serial Communication	1	14-03-2026		TLM1	
40.	Interfacing of peripherals.	1	17-03-2026		TLM1	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT – V: PIC Architecture

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Block diagram of basic PIC 18 micro controller	1	18-03-2026		TLM2	
42.	Registers I/O ports	1	21-03-2026		TLM1	
43.	Programming in C for PIC	1	24-03-2026		TLM1	
44.	Data types, I/O programming	1	25-03-2026		TLM1	
45.	logical operations	1	28-03-2026		TLM1	
46.	data conversion	1	31-03-2026		TLM1	
47.	**Assignment-II Discussion**	1	01-04-2026		TLM6	
48.	Contend Beyond Syllabus	1	04-04-2026		TLM3	
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 (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Signature				
Name of the Faculty	**Dr.K.Harinadha Reddy**	**Dr.K.Harinadha Reddy**	**Mr.R.Anjaneyulu Naik**	**Dr.P.Sobha Rani**
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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Department of Electrical and Electronics Engineering
Accredited by NBA under Tier-I

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.K.Harinadha Reddy
Course Name & Code : Basic Microprocessors and Microcontrollers –23EE16
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/B **A.Y.:** 2025-26

Pre-requisite: Basic knowledge in digital electronics, fundamentals of computers.

Course Educational Objectives: In this course student will learn about the Architecture of Microprocessors and Microcontroller and their Assembly Language Programming, interfacing Memory and Various Peripherals with 8086 Microprocessor/8051 Microcontroller and concepts of Interrupts and Serial Communication in reference to 8086.

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

CO1	Understand the concepts of the Microprocessor capability and explore the evaluation of microprocessors. (Understand–L2)
CO2	Analyze the instruction sets, addressing modes and modes operations of 8086 Microprocessors (Apply–L3)
CO3	Analyze the Microcontroller and interfacing capability (Apply–L3)
CO4	Understand the architecture and interfacing of 8051 controller (Understand–L2)
CO5	Analyze the concepts of PIC micro controller and its programming. (Understand–L2)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3	PSO4
CO1	3														2	
CO2	2	3													2	
CO3	2	3													2	
CO4	3														2	
CO5	2	3													2	

TEXT BOOKS:

1. Ray and Burchandi - "Advanced Microprocessors and Interfacing"- Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - "The 8051 Microcontroller Architecture- Programming and Applications" - Thomson Publishers - 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18. -Muhammad Ali Mazidi – Rolind D.Mckinay - Danny causey -Pearson Publisher 21st Impression.

REFERENCE:

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2. R.S. Kaler - "A Text book of Microprocessors and Micro Controllers" - I.K. International Publishing House Pvt. Ltd.
3. Ajay V. Deshmukh - "Microcontrollers – Theory and Applications" - Tata McGraw–Hill Companies – 2005.
4. Ajit Pal - "Microcontrollers – Principles and Applications" - PHI Learning Pvt Ltd - 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Microprocessor Architecture

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 COs	1	01-12-2025		TLM1	
2.	Introduction and evolution of Microprocessors	1	02-12-2025		TLM1	
3.	Architecture of 8086	1	04-12-2025		TLM2	
4.	Memory Organization of 8086	1	08-12-2025		TLM1	
5.	Register Organization of 8086	1	09-12-2025		TLM1	
6.	Register Organization of 8086	1	11-12-2025		TLM1	
7.	Introduction to 80286	1	15-12-2025		TLM1	
8.	Introduction to 80386	1	16-12-2025		TLM1	
9.	Introduction to 80486	1	18-12-2025		TLM1	
10.	Introduction to Pentium	1	22-12-2025		TLM2	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Minimum and Maximum Mode Operations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Instruction sets of 8086	1	23-12-2025		TLM1	
12.	Addressing modes	1	29-12-2025		TLM1	
13.	Simple Programs	1	30-12-2025		TLM4	
14.	General bus operation of 8086	1	05-01-2026		TLM1	
15.	Minimum mode operations of 8086	1	06-01-2026		TLM2	
16.	Maximum mode operations of 8086	1	08-01-2026		TLM3	
17.	8086 Control signal interfacing	1	12-01-2026		TLM1	
18.	Read and write cycle timing diagrams	1	19-01-2026		TLM2	
19.	**Assignment-1 discussion**	1	20-01-2026		TLM6	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT – III: Microprocessors I/O interfacing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	8255 PPI	1	22-01-2026		TLM1	
21.	Architecture of 8255	1	02-02-2026		TLM2	
22.	Modes of operation	1	03-02-2026		TLM1	
23.	Interfacing I/O devices to 8086 using 8255	1	05-02-2026		TLM1	
24.	Interfacing A to D converters	1	09-02-2026		TLM1	
25.	Interfacing D to A converters	1	10-02-2026		TLM1	
26.	Stepper motor interfacing	1	12-02-2026		TLM1	
27.	Static memory interfacing with 8086	1	16-02-2026		TLM1	
28.	Architecture and interfacing of DMA controller (8257)	1	17-02-2026		TLM1	
No. of classes required to complete UNIT-III: 9				**No. of classes taken:**		

UNIT – IV: 8051 Microcontroller

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Overview of 8051 Microcontroller	1	19-02-2026		TLM1	
30.	Architecture	1	23-02-2026		TLM2	
31.	Memory Organization	1	24-02-2026		TLM1	
32.	Register set	1	26-02-2026		TLM1	
33.	Instruction set	1	02-03-2026		TLM1	
34.	Simple Programs	1	03-03-2026		TLM3	
35.	I/O ports and Interrupts	1	05-03-2026		TLM1	
36.	Timers and Counters	1	09-03-2026		TLM2	
37.	Serial Communication	1	10-03-2026		TLM1	
38.	Interfacing of peripherals.	1	12-03-2026		TLM1	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT – V: PIC Architecture

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Block diagram of basic PIC 18 micro controller	1	16-03-2026		TLM2	
40.	Registers I/O ports	1	17-03-2026		TLM1	
41.	Programming in C for PIC	1	19-03-2026		TLM1	
42.	Data types, I/O programming	1	23-03-2026		TLM1	
43.	logical operations	1	24-03-2026		TLM1	
44.	data conversion	1	30-03-2026		TLM1	
45.	**Assignment-II Discussion**	1	31-03-2026		TLM6	
46.	Contend Beyond Syllabus	1	02-04-2026		TLM3	
No. of classes required to complete UNIT-V: 8				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Signature				
Name of the Faculty	**Dr.K.Harinadha Reddy**	**Dr.K.Harinadha Reddy**	**Mr.R.Anjaneyulu Naik**	**Dr.P.Sobha Rani**
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF EEE

COURSE HANDOUT
PART-A

Name of Course Instructor: Dr. M.UmaVani
Course Name & Code : **Power System Analysis** (23EE17)
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/A & B **A.Y.: 2025-26**

PREREQUISITE: Concepts of electrical circuits and power systems-II.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the students to develop the impedance diagram (p.u), formation of Ybus and also learn the different load flow methods, unsymmetrical faults and their effects. It also covers the stability of power systems and method to improve stability.

COURSE OUTCOMES (COs) and COURSE ARTICULATION MATRIX

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

CO1: Formulate network matrices (Apply-L3)
CO2: Represent impedance diagrams with per unit quantities (ApplyL3)
CO3: Apply the load flow solution to a power system using different methods. (ApplyL3)
CO4: Determine fault currents for Symmetrical and Unsymmetrical faults. (Apply-L3)
CO5: Analyse the stability concepts of a power system. (Apply-L3)

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3										2	1	1
CO2	2	2	3										2	1	1
CO3	2	3											2	1	1
CO4	2	2	3										2	1	1
CO5	2	3											2	1	2
1 - Low					**2** –Medium						**3** - High				

Text Books:

1.Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.2003

2. Modern Power system Analysis – by I.J.Nagrath & D .P.Kothari: Tata McGraw–Hill Publishing Company - 3 rd edition - 2007.

Reference Books:

1. Power System Analysis – by A.R.Bergen - Prentice Hall - 2 nd edition - 2009.
2. Power System Analysis by HadiSaadat – Tata McGraw–Hill 3rd edition - 2010.
3. Power System Analysis by B.R.Gupta - A H Wheeler Publishing Company Limited - 1998.
4. Power System Analysis and Design by J.Duncan Glover - M.S.Sarma - T.J.Overbye – Cengage Learning publications - 5 th edition - 2011.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/108/107/108107167
2. https://archive.nptel.ac.in/courses/108/105/108105167

PART-B

COURSE DELIVERY PLAN (LESSON PLAN-A/Sec)

(Commencement of Classwork: 01-12-2025)

UNIT – I: Circuit Topology & Per Unit Representation

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.	OBE & Introduction to Power Systems Analysis	1	4-12-2025		TLM1/2	
2.	Graph theory definitions – Formation of element node incidence and bus incidence matrices	2	5-12-2025, 5-12-2025		TLM1/2	
3.	Primitive network representation – Formation of Ybus matrix by singular transformation and direct inspection methods	2	6-12-2025, 11-12-2025		TLM1/2	
4.	Per Unit Representation: Per Unit Quantities– Single line diagram	2	12-12-2025, 12-12-2025		TLM1/2	
5.	Impedance diagram of a power system – Numerical Problems.	2	18-12-2025, 19-12-2025		TLM1/2	
6.	**GATE Questions discussion**	1	19-12-2025		TLM3	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT – II: Power Flow Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	Necessity of power flow studies, Derivation of static power flow equations	2	20-12-2025, 26-12-2025		TLM1/2	
8.	Power flow solution using Gauss-Seidel Method	2	26-12-2025, 27-12-2025		TLM1/2	
9.	Newton Raphson Method (Rectangular and polar coordinates form)	3	2-1-2026, 2-1-2026, 3-1-2026		TLM1/2	
10.	Decoupled and Fast Decoupled methods- Algorithmic approach	2	8-1-2026, 9-1-2026		TLM1/2	
11.	Numerical Problems on 3–bus system only.	3	9-1-2026, , 22-1-2026 23-1-2026		TLM1/2	
12.	**GATE Questions discussion**	1	23-1-2026		TLM3	
No. of classes required to complete UNIT-II:13				**No. of classes taken:**		

UNIT – III: Z-Bus Algorithm & Symmetrical Fault Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Z-Bus Algorithm: Formation of Zbus	2	24-1-2026, 5-2-2026		TLM1/2	
14.	Algorithm for the Modification of Zbus Matrix (without mutual impedance)	2	6-2-2026, 6-2-2026		TLM1/2	
15.	Numerical Problems	2	7-2-2026, 12-2-2026		TLM1/2	
16.	Symmetrical Fault Analysis: Reactance's of Synchronous Machine	2	13-2-2026, 13-2-2026		TLM1/2	
17.	Three Phase Short Circuit Currents	2	19-2-2026, 20-2-2026		TLM1/2	
18.	Short circuit MVA calculations for Power Systems – Numerical Problems.	2	20-2-2026, 21-2-2026		TLM1/2	
19.	**GATE Questions discussion**	1	26-2-2026		TLM3	
No. of classes required to complete UNIT-III:13				**No. of classes taken:**		

UNIT – IV: Unsymmetrical Fault analysis using Symmetrical Components

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Definition of symmetrical components –symmetrical components of unbalanced three phase systems	1	27-2-2026		TLM1/2	
21.	Power in symmetrical components	1	27-2-2026		TLM1/2	
22.	Sequence impedances and Sequence networks of Synchronous generator , Transformers and Transmission line	3	28-2-2026, 5-3-2026, 6-3-2026		TLM1/2	
23.	Numerical Problems	2	6-3-2026, 7-3-2026		TLM1/2	
24.	Unsymmetrical Fault analysis: Various types of faults: LG– LL– LLG and LLL on unloaded alternator	2	12-3-2026, 13-3-2026		TLM1/2	
25.	Numerical problems.	2	13-3-2026, 20-3-2026		TLM1/2	
26.	**GATE Questions discussion**	1	20-3-2026		TLM3	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT – V: Power System Stability 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
27.	Elementary concepts of Steady state – Dynamic and Transient Stabilities	1	27-3-2026		TLM1/2	
28.	Swing equation – Steady state stability	1	27-3-2026		TLM1/2	
29.	Equal area criterion of stability – Applications of Equal area criterion	1	28-3-2026		TLM1/2	
30.	Factors affecting transient stability	1	2-4-2026		TLM1/2	
31.	Methods to improve steady state and transient stability	1	4-4-2026		TLM1/2	
32.	Numerical problems	3	Extra classes to be planned		TLM1/2	
33.	**GATE Questions discussion**	1	Extra class to be planned		TLM3	
No. of classes required to complete UNIT-V: 9				**No. of classes taken:**		
Mid-I from 25-1-2026 to 31-1-2026 **Mid-II from 6-4-2026 to 11-4-2026**						

Content Beyond the Syllabus (one or two topics may be covered here)

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.	The Role of Power System Analysis in Grid Integration of Renewables	1	Extra class to be planned		TLM4	

PART-B

COURSE DELIVERY PLAN (LESSON PLAN-B/Sec)

(Commencement of Classwork: 01-12-2025)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	OBE & Introduction to Power Systems Analysis	1	2-12-2025		TLM1/2	
35.	Graph theory definitions – Formation of element node incidence and bus incidence matrices	2	3-12-2025, 4-12-2025		TLM1/2	
36.	Primitive network representation – Formation of Ybus matrix by singular transformation and direct inspection methods	2	5-12-2025, 9-12-2025		TLM1/2	
37.	Per Unit Representation: Per Unit Quantities– Single line diagram	2	10-12-2025, 11-12-2025		TLM1/2	
38.	Impedance diagram of a power system – Numerical Problems.	2	12-12-2025, 16-12-2025		TLM1/2	
39.	**GATE Questions discussion**	1	17-12-2025		TLM3	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT – II: Power Flow Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Necessity of power flow studies, Derivation of static power flow equations	2	18-12-2025, 19-12-2025		TLM1/2	
41.	Power flow solution using Gauss-Seidel Method	2	23-12-2025, 24-12-2025		TLM1/2	
42.	Newton Raphson Method (Rectangular and polar coordinates form)	3	26-12-2025, 30-12-2025, 31-12-2025		TLM1/2	
43.	Decoupled and Fast Decoupled methods-Algorithmic approach	2	2-1-2026, 6-1-2026		TLM1/2	
44.	Numerical Problems on 3–bus system only.	3	7-1-2026, , 8-1-2026 9-1-2026		TLM1/2	
45.	**GATE Questions discussion**	1	20-1-2026		TLM3	
No. of classes required to complete UNIT-II:13				**No. of classes taken:**		

UNIT – III: Z-Bus Algorithm & Symmetrical Fault Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
46.	Z-Bus Algorithm: Formation of Zbus	2	21-1-2026, 22-1-2026		TLM1/2	
47.	Algorithm for the Modification of Zbus Matrix (without mutual impedance)	2	23-1-2026, 27-1-2026		TLM1/2	
48.	Numerical Problems	2	28-1-2026, 29-1-2026		TLM1/2	
49.	Symmetrical Fault Analysis: Reactance's of Synchronous Machine	2	30-1-2026, 3-2-2026		TLM1/2	
50.	Three Phase Short Circuit Currents	2	4-2-2026, 5-2-2026		TLM1/2	
51.	Short circuit MVA calculations for Power Systems – Numerical Problems.	2	6-2-2026, 10-2-2026		TLM1/2	
52.	**GATE Questions discussion**	1	11-2-2026		TLM3	
No. of classes required to complete UNIT-III:13				**No. of classes taken:**		

UNIT – IV: Unsymmetrical Fault analysis using Symmetrical Components

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
53.	Definition of symmetrical components –symmetrical components of unbalanced three phase systems	1	12-2-2026		TLM1/2	
54.	Power in symmetrical components	1	13-2-2026		TLM1/2	
55.	Sequence impedances and Sequence networks of Synchronous generator , Transformers and Transmission line	3	17-2-2026, 18-2-2026, 19-2-2026		TLM1/2	
56.	Numerical Problems	2	20-2-2026 24-2-2026		TLM1/2	
57.	Unsymmetrical Fault analysis: Various types of faults: LG– LL– LLG and LLL on unloaded alternator	2	25-2-2026, 26-2-2026		TLM1/2	
58.	Numerical problems.	2	27-2-2026, 4-3-2026		TLM1/2	
59.	**GATE Questions discussion**	1	5-3-2026		TLM3	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT – V: Power System Stability 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
60.	Elementary concepts of Steady state – Dynamic and Transient Stabilities	1	6-3-2026		TLM1/2	
61.	Swing equation – Steady state stability	1	10-3-2026		TLM1/2	
62.	Equal area criterion of stability – Applications of Equal area criterion	1	11-3-2026		TLM1/2	
63.	Factors affecting transient stability	1	12-3-2026		TLM1/2	
64.	Methods to improve steady state and transient stability	1	13-3-2026		TLM1/2	
65.	Numerical problems	3	17-3-2026, 18-3-2026, 20-3-2026		TLM1/2	
66.	**GATE Questions discussion**	1	24-3-2026		TLM3	
67.	**Revision class**		27-3-2026			
68.	**Revision class**		1-4-2026			
69.	**Revision class**		2-4-2026			
No. of classes required to complete UNIT-V: 9				**No. of classes taken:**		
Mid-I from 25-1-2026 to 31-1-2026 **Mid-II from 6-4-2026 to 11-4-2026**						

Content Beyond the Syllabus (one or two topics may be covered here)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
2.	The Role of Power System Analysis in Grid Integration of Renewables	1	25-3-2026		TLM4	

PART-C

EVALUATION PROCESS (R20 Regulation)

Evaluation Task	Marks
Assignment-I [Units-I, II]	A1=5
I-Descriptive Examination [Units-I, II]	D1=15
I- Short Answer Examination [Units-I, II]	SA1=10
Assignment-II [Units-III, IV & V]	A2=5
II- Descriptive Examination [Units-III, IV & V]	M2=15
II-Short Answer Examination [Units-III, IV & V]	SA2=10
Mid Marks = 80% of Max ((M1+SA1+A1), (M2+SA2+A2)) + 20% of Min ((M1+SA1+A1), (M2+SA2+A2))	M=30
Cumulative Internal Examination (CIE): D+SA+A	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs)

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for 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	Engineering and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of 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, making effective presentations, and give and receive clear instructions.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Specify, design, and analyze systems that efficiently generate, transmit and distribute electrical power.
PSO 2	Design and analyze electrical machines, modern drive and lighting systems.
PSO 3	Specify, design, implement and test analog and embedded signal processing electronic systems.
PSO 4	Design controllers for electrical and electronic systems to improve their performance.

Title	Course Instructor	Course Coordinator	Module Coordinator	HoD
Name of the Faculty	Dr.M.UmaVani	Dr.M.UmaVani	Dr. M.S.Giridhar	Dr.P.Sobha Rani
Signature				

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Estd. 1998
ASE,CE,CSE,ECE, EEE, IT & ME Under Tier-I
NAAC CGPA: 3.20/4

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Mrs.K.S.L.LAVANYA
Course Name & Code : Switchgear and Protection& 23EE18
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech, EEE. VI-Sem,A Sec A.Y : 2025-26

Pre-requisites : --NIL

Course Educational Objective: This course enables the students to understand the principles and applications of circuit breakers in power systems, electromagnetic protection mechanisms and over-voltage protection systems including lightning arresters and neutral grounding methods to safeguard the power system

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

CO 1	Understand the operation of various circuit breakers. (**Understand-L2**)
CO 2	Analyze relay-based protection systems and their roles in overcurrent undervoltage, and fault detection. (**Apply-L3**)
CO 3	Design protection schemes for generators and transformers. (**Apply-L3)**
CO 4	Implement feeder and busbar protection using advanced relays such as distance, impedance, and static relays. (**Apply-L3**)
CO5	Analyze over-voltage protection strategies and grounding concepts. (**Apply-L3**)

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

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

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

TEXT BOOKS:

1. Badri Ram and D.N Viswakarma, "Power System Protection and Switchgear", TMH Publications, 2nd Edition, 2011.
2. T.S.Madhava Rao, "Power system protection- Static Relays with microprocessor applications", Tata McGraw Hill, 2017.

REFERENCE :

1. C L Wadhwa, "Electrical Power Systems", New Age International Publisher, 8th edition(Multi Colour), 2022.
2. Paithankar and S.R.Bhide, "Fundamentals of Power System Protection", PHI, 2010.
3. C R Mason, "Art & Science of Protective Relaying", Wiley Eastern Ltd.

Part - B
COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : 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.	Introduction to CEO's &Co's	1	1-12-2025		TLM1,TLM2	
2.	Miniature Circuit Breaker(MCB)	1	3-12-2025		TLM1,TLM2	
3.	Elementary principles of arc interruption	1	6-12-2025		TLM1,TLM2	
4.	Restriking Voltage and Recovery voltages, Restriking phenomenon	1	8-12-2025		TLM1,TLM2	
5.	RRRV, Average and Max. RRRV	1	10-12-2025		TLM1,TLM2	
6.	Current chopping and Resistance switching	1	13-12-2025		TLM1,TLM2	
7.	Concept of oil circuit breakers, Description and operation of Air Blast	1	15-12-2025		TLM1,TLM6	
8.	Vacuum and SF6 circuit breaker	1	17-12-2025		TLM1,TLM2	
9.	Circuit Breaker ratings and specifications	1	20-12-2025		TLM1,TLM2	
10.	Concept of Auto reclosin	1	22-12-2025		TLM1,TLM2	
11.	Problems on RRRV		24-12-2025		TLM1	
12.	QUIZ		27-12-2025		TLM6	
No. of classes required to complete UNIT-I : 12					No. of classes taken:	

UNIT-II : ELECTROMAGNETIC 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
13	Relay connection – Balanced beam type attracted armature relay	1	29-12-2025		TLM1,TLM2	
14	induction disc and induction cup relays– Torque equation	1	31-12-2025		TLM1,TLM2	
15	Relays classification– Instantaneous– DMT and IDMT types–	1	3-1-2026		TLM1,TLM2	
16	Application of relays: Over current	1	5-1-2026		TLM1,TLM2	

	and under voltage relays					
17	Directional relays– Differential relays	1	7-1-2026		TLM1	
18	percentage differential relays– Universal torque equation	1	10-1-2026		TTLM2	
19	Distance relays: Impedance– Reactance– Mho and offset mho relays	1	17-1-2026		TLM2,TLM6	
20	Characteristics of distance relays and comparison.	1	19-01-2026		TLM2	
21	QUIZ		21-01-2026		TLM6	
No. of classes required to complete UNIT-II : 10					No. of classes taken:	

UNIT-III: Generator protection & Transformer 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
22	Protection of generators against stator faults	1	24-01-2026		TLM1 &TLM2	
23	Rotor faults and abnormal conditions		2-2-2026		TLM1,TLM2	
24	restricted earth fault		4-2-2026		TLM1,TLM2	
25	Inter turn fault protection		7-2-2026		TLM1,TLM2	
26	Numerical examples.		9-2-2026		TLM1,TLM2	
27	Percentage differential protection		11-2-2026		TLM1,TLM6	
28	Design of CT's ratio		14-2-2026		TLM1,TLM2	
29	Buchholz relay protection		16-2-2026		TLM1,TLM2	
30	Numerical examples		18-2-2026		TLM1	
No. of classes required to complete UNIT-III : 10					No. of classes taken:	

UNIT-IV : Feeder and Bus bar Protection & Static Relays

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31	Over current Protection schemes		21-2-2026		TLM1,TLM2	
32	PSM - TMS – Numerical examples		23-2-2023		TLM1,TLM2	
33	Carrier current and three zone distance relay using impedance relays		25-2-2026		TLM1,TLM2	

34	Carrier current and three zone distance relay using impedance relays		28-2-2026		TLM1,TLM2	
35	Protection of bus bars by using Differential protection.		2-3-2026		TLM1,TLM6	
36	Static relays: Introduction		4-3-2026		TLM1,TLM2	
37	Classification of Static Relays	2	7-3-2026		TLM1&TLM2	
38	Classification of Static Relays	1	9-3-2026		TLM1&TLM2	
No. of classes required to complete UNIT-IV : 11					No. of classes taken:	

UNIT-V: Protection against over voltage and grounding

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	**Teaching Learning Methods**	HOD Sign Weekly
39	Causes of over voltages	1	11-3-2026		TLM1 &TLM2	
40	Protection against lightning over voltages	1	14-3-2026		TLM1 &TLM2	
41	Valve type and zinc oxide lighting arresters	1	16-3-2026		TLM1 &TLM2	
42	Grounded and ungrounded neutral systems	1	18-3-2026		TLM1 &TLM2	
43	Effects of ungrounded neutral on system performance	1	23-3-2026		TLM1 &TLM2	
44	Methods of neutral grounding	1	25-3-2026		TLM1 &TLM2	
45	Solid–resistance &Reactance	1	28-3-2026		TLM1 &TLM2	
46	Arcing grounds and grounding Practices.	1	30-3-2026		TLM1 &TLM6	
47	quiz		1-4-2026		TLM2	
No. of classes required to complete UNIT-V : 12					No. of classes taken:	

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
48	Application of AI to protection	1	4-4-2026		TLM1/ TLM2	CO5	T2,R1,R2	

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

ACADEMIC CALENDAR:

B.Tech (VI Semester)			
Commencement of Class Work	**01-12-2025**		
I Phase of Instructions	01-12-2025	24-01-2026	8 W
I MID Examinations	**26-01-2026**	**31-01-2026**	**1 W**
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II MID Examinations	**06-04-2026**	**11-04-2026**	**1 W**
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	**20-04-2026**	**02-05-2026**	**2 W**
Internship	04-05-2026	27-06-2026	8 W
Commencement of Next Semester Class Work		**29-06-2026**	

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical
PSO2	Design and analyze electrical machines, modern drive and lighting systems.
PSO3	Specify, design, implement and test analog and embedded signal processing electronic system
PSO4	PSO4: Design controllers for electrical and electronic systems to improve their performance.

K.S.L.LAVANYA	K.S.L.LAVANYA	Dr.M.S.Giridhar	Dr.P.Sobha rani
Course Instructor	Course Coordinator	Module Coordinator	HOD

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ASE,CE,CSE,ECE, EEE, IT & ME Under Tier-I
NAAC CGPA: 3.20/4

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Mrs.K.S.L.LAVANYA
Course Name & Code : Switchgear and Protection& 23EE18
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech, EEE. VI-Sem,B Sec A.Y : 2025-26

Pre-requisites : --NIL

Course Educational Objective: This course enables the students to understand the principles and applications of circuit breakers in power systems, electromagnetic protection mechanisms and over-voltage protection systems including lightning arresters and neutral grounding methods to safeguard the power system

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

CO 1	Understand the operation of various circuit breakers. (**Understand-L2**)
CO 2	Analyze relay-based protection systems and their roles in overcurrent undervoltage, and fault detection. (**Apply-L3**)
CO 3	Design protection schemes for generators and transformers. (**Apply-L3)**
CO 4	Implement feeder and busbar protection using advanced relays such as distance, impedance, and static relays. (**Apply-L3**)
CO5	Analyze over-voltage protection strategies and grounding concepts. (**Apply-L3**)

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

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

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

TEXT BOOKS:

1. Badri Ram and D.N Viswakarma, "Power System Protection and Switchgear", TMH Publications, 2nd Edition, 2011.
2. T.S.Madhava Rao, "Power system protection- Static Relays with microprocessor applications", Tata McGraw Hill, 2017.

REFERENCE :

1. C L Wadhwa, "Electrical Power Systems", New Age International Publisher, 8th edition(Multi Colour), 2022.
2. Paithankar and S.R.Bhide, "Fundamentals of Power System Protection", PHI, 2010.
3. C R Mason, "Art & Science of Protective Relaying", Wiley Eastern Ltd.

Part - B
COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : 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.	Introduction to CEO's &Co's	1	2-12-2025		TLM1,TLM2	
2.	Miniature Circuit Breaker(MCB)	1	3-12-2025		TLM1,TLM2	
3.	Elementary principles of arc interruption	1	5-12-2025		TLM1,TLM2	
4.	Restriking Voltage and Recovery voltages, Restriking phenomenon	1	9-12-2025		TLM1,TLM2	
5.	RRRV, Average and Max. RRRV	1	10-12-2025		TLM1,TLM2	
6.	Current chopping and Resistance switching	1	12-12-2025		TLM1,TLM2	
7.	Concept of oil circuit breakers, Description and operation of Air Blast	1	16-12-2025		TLM1,TLM6	
8.	Vacuum and SF6 circuit breaker	1	17-12-2025		TLM1,TLM2	
9.	Circuit Breaker ratings and specifications	1	19-12-2025		TLM1,TLM2	
10.	Concept of Auto reclosin	1	23-12-2025		TLM1,TLM2	
11.	Problems on RRRV		24-12-2025		TLM1	
12.	QUIZ		26-12-2025		TLM6	
No. of classes required to complete UNIT-I : 12					No. of classes taken:	

UNIT-II : ELECTROMAGNETIC 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
13	Relay connection – Balanced beam type attracted armature relay	1	30-12-2025		TLM1,TLM2	
14	induction disc and induction cup relays– Torque equation	1	31-12-2025		TLM1,TLM2	
15	Relays classification– Instantaneous– DMT and IDMT types–	1	2-1-2026		TLM1,TLM2	

16	Application of relays: Over current and under voltage relays	1	6-1-2026		TLM1,TLM2	
17	Directional relays– Differential relays	1	7-1-2026		TLM1	
18	percentage differential relays– Universal torque equation	1	9-1-2026		TTLM2	
19	Distance relays: Impedance– Reactance– Mho and offset mho relays	1	20-1-2026		TLM2,TLM6	
20	Characteristics of distance relays and comparison.	1	21-01-2026		TLM2	
21	QUIZ		23-01-2026		TLM6	
No. of classes required to complete UNIT-II : 10					No. of classes taken:	

UNIT-III: Generator protection & Transformer 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
22	Protection of generators against stator faults	1	3-02-2026		TLM1 &TLM2	
23	Rotor faults and abnormal conditions		4-2-2026		TLM1,TLM2	
24	restricted earth fault		6-2-2026		TLM1,TLM2	
25	Inter turn fault protection		10-2-2026		TLM1,TLM2	
26	Numerical examples.		11-2-2026		TLM1,TLM2	
27	Percentage differential protection		13-2-2026		TLM1,TLM6	
28	Design of CT's ratio		17-2-2026		TLM1,TLM2	
29	Buchholz relay protection		18-2-2026		TLM1,TLM2	
30	Numerical examples		20-2-2026		TLM1	
No. of classes required to complete UNIT-III : 10					No. of classes taken:	

UNIT-IV : Feeder and Bus bar Protection & Static Relays

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31	Over current Protection schemes		24-2-2026		TLM1,TLM2	
32	PSM - TMS – Numerical examples		25-2-2023		TLM1,TLM2	
33	Carrier current and three		27-2-2026		TLM1,TLM2	

	zone distance relay using impedance relays					
34	Carrier current and three zone distance relay using impedance relays		3-3-2026		TLM1,TLM2	
35	Protection of bus bars by using Differential protection.		4-3-2026		TLM1,TLM6	
36	Static relays: Introduction		6-3-2026		TLM1,TLM2	
37	Classification of Static Relays	2	10-3-2026		TLM1&TLM2	
38	Classification of Static Relays	1	11-3-2026		TLM1&TLM2	
No. of classes required to complete UNIT-IV : 11					No. of classes taken:	

UNIT-V: Protection against over voltage and grounding

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	**Teaching Learning Methods**	HOD Sign Weekly
39	Causes of over voltages	1	13-3-2026		TLM1 &TLM2	
40	Protection against lightning over voltages	1	17-3-2026		TLM1 &TLM2	
41	Valve type and zinc oxide lighting arresters	1	18-3-2026		TLM1 &TLM2	
42	Grounded and ungrounded neutral systems	1	20-3-2026		TLM1 &TLM2	
43	Effects of ungrounded neutral on system performance	1	24-3-2026		TLM1 &TLM2	
44	Methods of neutral grounding	1	25-3-2026		TLM1 &TLM2	
45	Solid–resistance &Reactance	1	27-3-2026		TLM1 &TLM2	
46	Arcing grounds and grounding Practices.	1	31-3-2026		TLM1 &TLM6	
No. of classes required to complete UNIT-V : 12					No. of classes taken:	

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47	Application of AI to protection	1	1-4-2026		TLM1/ TLM2	CO5	T2,R1,R2	

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

ACADEMIC CALENDAR:

B.Tech (VI Semester)			
Commencement of Class Work	**01-12-2025**		
I Phase of Instructions	01-12-2025	24-01-2026	8 W
I MID Examinations	**26-01-2026**	**31-01-2026**	**1 W**
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II MID Examinations	**06-04-2026**	**11-04-2026**	**1 W**
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	**20-04-2026**	**02-05-2026**	**2 W**
Internship	04-05-2026	27-06-2026	8 W
Commencement of Next Semester Class Work		**29-06-2026**	

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to

	the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1	Specify, design and analyze systems that efficiently generate, transmit and distribute electrical
PSO2	Design and analyze electrical machines, modern drive and lighting systems.
PSO3	Specify, design, implement and test analog and embedded signal processing electronic system
PSO4	PSO4: Design controllers for electrical and electronic systems to improve their performance.

K.S.L.LAVANYA	K.S.L.LAVANYA	Dr.M.S.Giridhar	Dr.P.Sobha rani
Course Instructor	Course Coordinator	Module Coordinator	HOD

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

COURSE HANDOUT

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

ACADEMIC YEAR : 2025-26

COURSE NAME & CODE : **Electric Drives** - 23EE22

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : **P.Deepak Reddy**

COURSE COORDINATOR : **P.Deepak Reddy**

PRE-REQUISITES: Electrical Circuit Analysis, Power electronics, Electrical Machines and Control Systems.

COURSE EDUCATIONAL OBJECTIVE: This course enables the students to learn the fundamentals of electric drive, different electric braking methods and the performance of various convertercontrolled dc motors, induction motors and synchronous motors.

COURSE OUTCOMES(COs)

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

CO1: Understand the fundamentals of electric drive and different electric braking methods. **(Understand-L2)**

CO2: Analyze the operation of three-phase converter fed dc motor drive. **(Apply-L3)**

CO3: Analyze the operation of DC-DC converter fed control of dc motor drive **(ApplyL3)**

CO4: Understand the concept of speed control of induction motor by using stator side and rotor side control. **(Understand-L2)**

CO5: Understand the concepts of speed control of synchronous motor with different methods. **(Understand-L2)**

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

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

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

Text Books:

1. Fundamentals of Electric Drives – G K Dubey - Narosa Publications - 2 nd edition – 2002.
2. Power Semiconductor Drives - S.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.

Reference Books:

1. Electric Motors and Drives Fundamentals - Types and Apllications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications - 1987.
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3 rd edition - 2009.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/108/104/108104140**
2. **https://nptel.ac.in/courses/108104011**

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : FUNDAMENTALS OF ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Electric drive and its components	1	2-12-25		**TLM1**	CO1	1	
2.	Fundamental torque equation	1	3-12-25		**TLM1**	CO1	1	
3.	Load torque components	1	5-12-25		**TLM1**	CO1	1	
4.	Nature and classification of load torques	1	9-12-25		**TLM1**	CO1	1	
5.	Steady state stability	1	10-12-25		**TLM1**	CO1	1	
6.	Load equalization	1	12-12-25		**TLM1**	CO1	1	
7.	Four quadrant operation of drive (hoist control)	1	16-12-25		**TLM1**	CO1	1	
8.	Braking methods: Dynamic Braking,	1	17-12-25		**TLM1**	CO1	1	
9.	Plugging and Regenerative Braking	1	19-12-25		**TLM1**	CO1	1	
10.	Numerical problems	1	23-12-25		**TLM1**	CO1	1	
11.	Numerical problems	1	24-12-25		**TLM1**	CO1	1	
12.	Numerical problems	1	26-12-25		**TLM1**	CO1	1	
No. of classes required to complete UNIT-I		12			No. of classes taken:			

UNIT-II : CONVERTER FED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	3-phase half controlled converter fed separately excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	30-12-25		**TLM1**	CO2	1	
14.	3-phase half controlled converter fed self-excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	31-12-25		**TLM1**	CO2	1	
15.	3-phase fully-controlled converter fed separately excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	2-1-26		**TLM4**	CO2	1	
16.	3-phase fully-controlled converter fed self-excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	6-1-26		**TLM1**	CO2	1	
17.	3-phase Dual converter fed DC motor drives	1	7-1-26		**TLM1**	CO2	1	
18.	Numerical problems.	1	9-1-26		**TLM1**	CO2	1	
19.	Numerical problems.	1	20-1-26		**TLM1**	CO2	1	
20.	Numerical problems.	1	21-1-26		**TLM1**	CO2	1	
21.	Numerical problems.	1	23-1-26		**TLM1**	CO2	1	
No. of classes required to complete UNIT-II		09			No. of classes taken:			
I MID EXAMIANTIONS 26-1-26 TO 31-1-26								

UNIT-III : DC–DC CONVERTER FED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
22.	Single quadrant, DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	3-2-26 4-2-26		**TLM1**	CO3	1	
23.	two quadrant DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	6-2-26 10-2-26		**TLM1**	CO3	1	

24.	four quadrant DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	11-2-26 13-2-26		**TLM4**	CO3	1	
25.	Closed loop operation (qualitative treatment only)	1	17-2-26		**TLM1**	CO3	1	
26.	Numerical problems.	1	18-2-26		**TLM1**	CO3	1	
27.	Numerical problems.	1	20-2-26		**TLM1**	CO3	1	
28.	Numerical problems.	1	24-2-26		**TLM1**	CO3	1	
No. of classes required to complete UNIT-III		10			No. of classes taken:			

UNIT-IV : CONTROL OF 3-PHASE INDUCTION MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
29.	Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics	2	25-2-26 27-2-26		**TLM4**	CO4	1	
30.	Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter	1	3-3-26		**TLM4**	CO4	1	
31.	Closed loop V/f control of induction motor drives (qualitative treatment only)	1	6-3-26		**TLM1**	CO4	1	
32.	Static rotor resistance control	1	10-3-26		**TLM4**	CO4	1	
33.	Slip power recovery schemes	1	11-3-26		**TLM4**	CO4	1	
34.	Static Scherbius drive, Performance and speed torque characteristics	1	13-3-26		**TLM1**	CO4	1	
35.	Static Kramer drive, Performance and speed torque characteristics	1	17-3-26		**TLM1**	CO4	1	
36.	Numerical problems	1	18-3-26		**TLM1**	CO4	1	
No. of classes required to complete UNIT-V		9			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	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
37.	Separate and self-control of synchronous motor	2	20-3-26 24-3-26		**TLM1**	CO5	1	
38.	self-control of synchronous motor employing load commutated thyristor inverter	2	25-3-26 27-3-26		**TLM1**	CO5	1	
39.	closed loop control of synchronous motor drive (qualitative treatment only)	1	31-3-26		**TLM1**	CO5	1	
40.	PMSM: Basic operation and advantages	1	1-4-26		**TLM4**	CO5	1	
41.	Numerical problems	1	2-4-26		**TLM1**	CO5	1	
No. of classes required to complete UNIT-V		7			No. of classes taken:			
II-MID EXAMINATIONS(06-4-2026 TO 11-4-2026)								

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
42.	3-phase fully-controlled converter fed separately excited DC motor drive				**TLM2**	CO2	1	
43.	Simulation of four quadrant DC-DC converter				**TLM4**	CO3	1	

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 (R23 Regulation):

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO3	Work effectively as individuals and as team members in multidisciplinary projects.

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

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

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

P.Deepak Reddy	P.Deepak Reddy	P.Deepak Reddy	Dr.P.Sobha Rani
Course Instructor	Course Coordinator	Module Coordinator	HOD

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

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

ACADEMIC YEAR : 2025-26

COURSE NAME & CODE : **Electric Drives** - 23EE22

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : **P.Deepak Reddy**

COURSE COORDINATOR : **P.Deepak Reddy**

PRE-REQUISITES: Electrical Circuit Analysis, Power electronics, Electrical Machines and Control Systems.

COURSE EDUCATIONAL OBJECTIVE: This course enables the students to learn the fundamentals of electric drive, different electric braking methods and the performance of various convertercontrolled dc motors, induction motors and synchronous motors.

COURSE OUTCOMES(COs)

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

CO1: Understand the fundamentals of electric drive and different electric braking methods. **(Understand-L2)**

CO2: Analyze the operation of three-phase converter fed dc motor drive. **(Apply-L3)**

CO3: Analyze the operation of DC-DC converter fed control of dc motor drive **(ApplyL3)**

CO4: Understand the concept of speed control of induction motor by using stator side and rotor side control. **(Understand-L2)**

CO5: Understand the concepts of speed control of synchronous motor with different methods. **(Understand-L2)**

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3												2	2		
CO2	2	3											2	2		
CO3	2	3											2	2		

CO4	3												2	2		
CO5	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).

Text Books:

1. Fundamentals of Electric Drives – G K Dubey - Narosa Publications - 2 nd edition – 2002.
2. Power Semiconductor Drives - S.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.

Reference Books:

1. Electric Motors and Drives Fundamentals - Types and Apllications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications - 1987.
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3 rd edition - 2009.

Online Learning Resources:
1. https://archive.nptel.ac.in/courses/108/104/108104140
2. https://nptel.ac.in/courses/108104011

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : FUNDAMENTALS OF ELECTRIC DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Electric drive and its components	1	2-12-25		**TLM1**	CO1	1	
2.	Fundamental torque equation	1	4-12-25		**TLM1**	CO1	1	
3.	Load torque components	1	5-12-25		**TLM1**	CO1	1	
4.	Nature and classification of load torques	1	9-12-25		**TLM1**	CO1	1	
5.	Steady state stability	1	11-12-25		**TLM1**	CO1	1	
6.	Load equalization	1	12-12-25		**TLM1**	CO1	1	
7.	Four quadrant operation of drive (hoist control)	1	16-12-25		**TLM1**	CO1	1	
8.	Braking methods: Dynamic Braking,	1	18-12-25		**TLM1**	CO1	1	
9.	Plugging and Regenerative Braking	1	19-12-25		**TLM1**	CO1	1	

10.	Numerical problems	1	23-12-25		**TLM1**	CO1	1	
11.	Numerical problems	1	24-12-25		**TLM1**	CO1	1	
12.	Numerical problems	1	26-12-25		**TLM1**	CO1	1	
No. of classes required to complete UNIT-I		12			No. of classes taken:			

UNIT-II : CONVERTER FED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	3-phase half controlled converter fed separately excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	30-12-25		**TLM1**	CO2	1	
14.	3-phase half controlled converter fed self-excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	2-1-26		**TLM1**	CO2	1	
15.	3-phase fully-controlled converter fed separately excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	6-1-26		**TLM4**	CO2	1	
16.	3-phase fully-controlled converter fed self-excited DC motor drive, Output voltage and current waveforms, Speed-torque characteristics and expressions	1	8-1-26		**TLM1**	CO2	1	
17.	3-phase Dual converter fed DC motor drives	1	9-1-26		**TLM1**	CO2	1	
18.	Numerical problems.	1	20-1-26		**TLM1**	CO2	1	
19.	Numerical problems.	1	22-1-26		**TLM1**	CO2	1	
20.	Numerical problems.	1	23-1-26		**TLM1**	CO2	1	
No. of classes required to complete UNIT-II		08			No. of classes taken:			
I MID EXAMIANTIONS 26-1-26 TO 31-1-26								

UNIT-III : DC–DC CONVERTER FED DC MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly

21.	Single quadrant, DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	3-2-26 5-2-26		**TLM1**	CO3	1	
22.	two quadrant DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	6-2-26 10-2-26		**TLM1**	CO3	1	
23.	four quadrant DC-DC converter fed separately excited and self-excited DC motors, Continuous Current Mode of operation - Output voltage and current waveforms	2	12-2-26 13-2-26		**TLM4**	CO3	1	
24.	Closed loop operation (qualitative treatment only)	1	17-2-26		**TLM1**	CO3	1	
25.	Numerical problems.	1	19-2-26		**TLM1**	CO3	1	
26.	Numerical problems.	1	20-2-26		**TLM1**	CO3	1	
27.	Numerical problems.	1	24-2-26		**TLM1**	CO3	1	
No. of classes required to complete UNIT-III		10			No. of classes taken:			

UNIT-IV : CONTROL OF 3-PHASE INDUCTION MOTOR DRIVES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
28.	Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics	2	26-2-26 27-2-26		**TLM4**	CO4	1	
29.	Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter	1	3-3-26		**TLM4**	CO4	1	
30.	Closed loop V/f control of induction motor drives (qualitative treatment only)	1	5-3-26		**TLM1**	CO4	1	
31.	Static rotor resistance control	1	6-3-26		**TLM4**	CO4	1	
32.	Slip power recovery schemes	1	10-3-26		**TLM4**	CO4	1	
33.	Static Scherbius drive, Performance and speed torque characteristics	1	12-3-26		**TLM1**	CO4	1	

34.	Static Kramer drive, Performance and speed torque characteristics	1	13-3-26		**TLM1**	CO4	1	
35.	Numerical problems	1	17-3-26		**TLM1**	CO4	1	
No. of classes required to complete UNIT-V		9			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	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
36.	Separate and self-control of synchronous motor	2	19-3-26 20-3-26		**TLM1**	CO5	1	
37.	self-control of synchronous motor employing load commutated thyristor inverter	2	24-3-26 27-3-26		**TLM1**	CO5	1	
38.	closed loop control of synchronous motor drive (qualitative treatment only)	1	31-3-26		**TLM1**	CO5	1	
39.	PMSM: Basic operation and advantages	1	2-4-26		**TLM4**	CO5	1	
40.	Numerical problems	1	3-4-26		**TLM1**	CO5	1	
No. of classes required to complete UNIT-V		7			No. of classes taken:			
II-MID EXAMINATIONS(06-4-2026 TO 11-4-2026)								

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
41.	3-phase fully-controlled converter fed separately excited DC motor drive				**TLM2**	CO2	1	
42.	Simulation of four quadrant DC-DC converter				**TLM4**	CO3	1	

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

EVALUATION PROCESS (R23 Regulation):

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

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

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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

P.Deepak Reddy	P.Deepak Reddy	P.Deepak Reddy	Dr.P.Sobha Rani
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PROGRAM : **B. TECH-EEE**-VI-Sem - A Sec

ACADEMIC YEAR : 2025-26

COURSE NAME & CODE : **INTRODUCTION TO JAVA PROGRAMMING & 23CS81**

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : **Mr. D. Sainath**

COURSE COORDINATOR : **Mr. D. Sainath**

1. Pre - requisites: Introduction to Programming.

2. Course Educational Objectives (CEO s):

Concentrates on the methodological and technical aspects of software design and Programming based on Object Oriented Programming (OOP). Acquire the basic knowledge and skills necessary to implement Object-Oriented Programming Techniques in software Development through JAVA.

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

CO1	Understand Object Oriented Programming Concepts through Constructs of JAVA **(Understand-L2)**
CO2	Apply the concept of Inheritance Polymorphism on real1-world applications. **(Apply-L3)**
CO3	Impalement re-usability using interface and packages. **(Understand-L2)**
CO4	Construct robust applications using exception handling. **(Apply-L3)**
CO5	Understand multi-threading concepts.**(Understand-L2)**

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	2										2	2	2	
CO2	3	2										2	2	2	
CO3	3	2										2	2	3	3
CO4	3	2										2	3	3	3
CO5	3	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).

SYLLABUS

UNIT – I: Introduction to OOP & JAVA:

Java Basics: Java Buzzwords/Features OOP Concepts, Java History, Advantages, Data types, operators, expressions, control statements, methods and recursion, sample programs.

Java Anatomy: Java Objects and References, Constructors, this keyword, Arrays (single and multi-dimensional), String, StringBuffer, StringTokenizer Classes.

UNIT – II: Extending Classes/ Reusability:

Inheritance: Introduction, Derived Classes, Advantages and Types of Inheritance, Implementation, Inheritance and Member Accessibility. Overriding, super keyword, Abstract Classes and Methods, final keyword, Final Classes and Final Methods, Dynamic Binding, Polymorphism.

UNIT – III: Interfaces & Packages:

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

Packages: Defining, Creating and Accessing a Package, importing packages, access controls (public, protected, default and private). Wrapper Classes (Like Integer, Float, Double).

UNIT – IV: Exception Handling:

Exception Handling: Concepts of exception handling, benefits of exception handling, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception.

UNIT – V: Multithreading:

Multithreading: Thread life cycle, creating threads, synchronizing and intercommunication of threads.

TEXT BOOKS:

T1	Java Fundamentals - A Comprehensive Introduction,Herbert Schildt and Dale Skrien,TMH.

REFERENCE BOOKS:

R1	The JavaTM Programming Language: Ken Anold, James Gosling, Pearson
R2	Introduction to Java Programming /e, Brief version, Y.Daniel Liang, Pearson
R3	Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java; How to Pregran P.J.Dcitel and H.M.Dcitel, PHI

Course Delivery Plan

UNIT-I: Introduction to OOP and JAVA

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.	Java Basics: java Buzzwords/Features	01	01-12-2025		TLM1	CO1	
2.	OOPs Concepts	02	03-12-2025 &05-12-2025		TLM1	CO1	
3.	Java History	01	05-12-2025		TLM1	CO1	
4.	Advantages	01	05-12-2025		TLM1	CO1	
5.	Data Types	02	08-12-2025& 08-12-2025		TLM1	CO1	
6.	Operators	02	10-12-2025 &10-12-2025		TLM1	CO1	
7.	Expressions	01	12-12-2025		TLM1	CO1	
8.	Control Statements	01	15-12-2025		TLM1	CO1	
9.	Methods And Recursions	01	17-12-2025		TLM1	CO1	
10.	Sample Programs	01	18-01-2026		TLM1	CO1	
11.	Java Objects and References	01	18-01-2026		TLM1	CO1	
12.	Constructors	01	19-12-2025		TLM1	CO1	
13.	This Keyword	01	19-12-2025		TLM1	CO1	
14.	Arrays	02	24-12-2025& 26-12-2025		TLM1	CO1	
15.	Strings	01	26-12-2025		TLM1	CO1	
16.	String Buffer,String Tokenizer	01	29-12-2025		TLM1	CO1	
	No. of classes	**23**			**No. of**		

	required to complete UNIT-I				**classes taken:**	

UNIT-II: Extending Classes/Reusability.

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
17.	Inheritance : Introduction	01	31-12-2025		TLM1	CO2	
18.	Derived Class,Advantages	01	02-01-2026		TLM1	CO2	
19.	Types Of Inheritance	02	05-01-2026 & 07-01-2026		TLM1	CO2	
20.	Implementation	01	09-01-2026		TLM1	CO2	
21.	Inheritance and Member Accessibility	01	19-01-2026		TLM1	CO2	
22.	Overriding,super keyword	01	19-01-2026		TLM1	CO2	
23.	Abstract Classes and Methods	01	21-01-2026		TLM1	CO2	
24.	Final Keyword	01	21-01-2026		TLM1	CO2	
25.	Final Classes And Final Methods	01	23-01-2026		TLM1	CO2	
26.	Dynamic Binding , polymorphism	01	23-01-2026		TLM1	CO2	
	No. of classes required to complete UNIT-II	**12**			**No. of classes taken:**		

UNIT-III: Interfaces & 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
27.	Interfaeegs : Differences between classesand interfaces	01	02-02-2026		TLM1	CO3	
28.	defining interface &Implementing interface	01	02-02-2026		TLM1	CO3	
29.	Variables in interface, extending	02	04-02-2026 &06-02-2026		TLM1	CO3	

	interfaces						
30.	Packagess: Defining	01	09-02-2026		TLM1	CO3	
31.	Creating and Accessing a Package, importing packages	02	11-02-2026 & 13-02-2026		TLM1	CO3	
32.	access controls	01	13-02-2026		TLM1	CO3	
33.	Wrapper Classes	01	16-02-2026		TLM1	CO3	
	No. of classes required to complete UNIT-III	**09**			**No. of classes taken:**		

UNIT-IV: Exception Harcdlling

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
34.	Exception Handling: Concepts of exception handling,	02	18-02-2026 &20-02-2026		TLM1	CO4	
35.	benefits of exception banding	01	20-02-2026		TLM1	CO4	
36.	usage of Try,catch, throw, throws and finally.	02	23-02-2026 & 25-02-2026		TLM1	CO4	
37.	built in exceptions, creating own exception	01	27-02-2026		TLM1	CO4	
	No. of classes required to complete UNIT-IV	**05**			**No. of classes taken:**		

UNIT-V: Multithreading

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
38.	Multi-threading: Thread. life cycle	02	02-03-2026 & 04-03-2026		TLM1	CO5	
39.	creating tinreads	02	06-03-2026 & 09-03-2026		TLM1	CO5	
40.	synchronizing and	02	11-03-2026		TLM1	CO5	

	intercommunicatio n of threads.		& 13-03-2026				
	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
1.	Frameworks	02	18-03-2026 & 20-03-2026		TLM1	CO1	

Teaching Learning Methods

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	01-12-2025	24-01-2025	8W
I Mid Examinations	**26-01-2026**	**31-01-2026**	**1W**
II Phase of Instructions	02-02-2026	04-04-2026	9W
II Mid Examinations	**06-04-2026**	**11-04-2026**	**1W**
Preparation and Practical's	13-04-2026	18-04-2026	1W
Semester End Examinations	20-04-2026	02-05-2026	2W
Internship	04-05-2026	27-06-2026	8W

EVALUATION PROCESS:(R23 Regulation)

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

POs:(Program Outcomes)

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
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	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. D. Sainath**	**Mr.P.Nagababu**	**Dr. Y.Vijay Bhaskar Reddy**	**Dr. S .Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(An Autonomous Institution since 2010)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PROGRAM : **B. TECH-EEE**-VI-Sem - B Sec

ACADEMIC YEAR : 2025-26

COURSE NAME & CODE : **INTRODUCTION TO JAVA PROGRAMMING & 23CS81**

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : **Mr. P. Nagababu**

COURSE COORDINATOR : **Mr. P. Nagababu**

1. Pre - requisites: Introduction to Programming.

2. Course Educational Objectives (CEO s):

Concentrates on the methodological and technical aspects of software design and Programming based on Object Oriented Programming (OOP). Acquire the basic knowledge and skills necessary to implement Object-Oriented Programming Techniques in software Development through JAVA.

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

CO1	Understand Object Oriented Programming Concepts through Constructs of JAVA **(Understand-L2)**
CO2	Apply the concept of Inheritance Polymorphism on real1-world applications. **(Apply-L3)**
CO3	Impalement re-usability using interface and packages. **(Understand-L2)**
CO4	Construct robust applications using exception handling. **(Apply-L3)**
CO5	Understand multi-threading concepts.**(Understand-L2)**

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	2										2	2	2	
CO2	3	2										2	2	2	
CO3	3	2										2	2	3	3
CO4	3	2										2	3	3	3
CO5	3	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).

SYLLABUS

UNIT – I: Introduction to OOP & JAVA:

Java Basics: Java Buzzwords/Features OOP Concepts, Java History, Advantages, Data types, operators, expressions, control statements, methods and recursion, sample programs.

Java Anatomy: Java Objects and References, Constructors, this keyword, Arrays (single and multi-dimensional), String, StringBuffer, StringTokenizer Classes.

UNIT – II: Extending Classes/ Reusability:

Inheritance: Introduction, Derived Classes, Advantages and Types of Inheritance, Implementation, Inheritance and Member Accessibility. Overriding, super keyword, Abstract Classes and Methods, final keyword, Final Classes and Final Methods, Dynamic Binding, Polymorphism.

UNIT – III: Interfaces & Packages:

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

Packages: Defining, Creating and Accessing a Package, importing packages, access controls (public, protected, default and private). Wrapper Classes (Like Integer, Float, Double).

UNIT – IV: Exception Handling:

Exception Handling: Concepts of exception handling, benefits of exception handling, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception.

UNIT – V: Multithreading:

Multithreading: Thread life cycle, creating threads, synchronizing and intercommunication of threads.

TEXT BOOKS:

T1	Java Fundamentals - A Comprehensive Introduction,Herbert Schildt and Dale Skrien,TMH.

REFERENCE BOOKS:

R1	The JavaTM Programming Language: Ken Anold, James Gosling, Pearson
R2	Introduction to Java Programming /e, Brief version, Y.Daniel Liang, Pearson
R3	Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education (OR) Java; How to Pregran P.J.Dcitel and H.M.Dcitel, PHI

Course Delivery Plan

UNIT-I: Introduction to OOP and JAVA

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.	Java Basics: java Buzzwords/Features	01	01-12-2025		TLM1	CO1	
2.	OOPs Concepts	02	04-12-2025 &06-12-2025		TLM1	CO1	
3.	Java History	01	08-12-2025		TLM1	CO1	
4.	Advantages	01	11-12-2025		TLM1	CO1	
5.	Data Types	02	13-12-2025& 15-12-2025		TLM1	CO1	
6.	Operators	02	18-12-2025 &20-12-2025		TLM1	CO1	
7.	Expressions	01	22-12-2025		TLM1	CO1	
8.	Control Statements	02	25-12-2025 &27-12-2025		TLM1	CO1	
9.	Methods And Recursions	02	29-12-2025 &01-01-2026		TLM1	CO1	
10.	Sample Programs	01	03-01-2026		TLM1	CO1	
11.	Java Objects and References	01	05-01-2026		TLM1	CO1	
12.	Constructors	02	08-01-2026 &10-01-2026		TLM1	CO1	
13.	This Keyword	01	12-01-2026		TLM1	CO1	
14.	Arrays	02	15-01-2026& 17-01-2026		TLM1	CO1	
15.	Strings	01	19-01-2026		TLM1	CO1	
16.	String Buffer,String Tokenizer	01	22-01-2026		TLM1	CO1	
	No. of classes	**23**			**No. of**		

	required to complete UNIT-I				**classes taken:**	

UNIT-II: Extending Classes/Reusability.

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
17.	Inheritance : Introduction	01	24-01-2026		TLM1	CO2	
18.	Derived Class,Advantages	01	02-02-2026		TLM1	CO2	
19.	Types Of Inheritance	02	05-02-2026 & 07-02-2026		TLM1	CO2	
20.	Implementation	01	09-02-2026		TLM1	CO2	
21.	Inheritance and Member Accessibility	01	12-02-2026		TLM1	CO2	
22.	Overriding,super keyword	01	14-02-2026		TLM1	CO2	
23.	Abstract Classes and Methods	02	16-02-2026 & 19-02-2026		TLM1	CO2	
24.	Final Keyword	01	21-02-2026		TLM1	CO2	
25.	Final Classes And Final Methods	01	23-02-2026		TLM1	CO2	
26.	Dynamic Binding , polymorphism	01	26-02-2026		TLM1	CO2	
	No. of classes required to complete UNIT-II	**12**			**No. of classes taken:**		

UNIT-III: Interfaces & 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
27.	Interfaeegs : Differences between classesand interfaces	01	28-02-2026		TLM1	CO3	
28.	defining interface &Implementing interface	01	02-03-2026		TLM1	CO3	
29.	Variables in	02	05-03-2026 &07-03-2026		TLM1	CO3	

	interface, extending interfaces						
30.	Packagess: Defining	01	09-03-2026		TLM1	CO3	
31.	Creating and Accessing a Package, importing packages	02	12-03-2026 & 14-03-2026		TLM1	CO3	
32.	access controls	01	16-03-2026		TLM1	CO3	
33.	Wrapper Classes	01	19-03-2026		TLM1	CO3	
	No. of classes required to complete UNIT-III	**09**			**No. of classes taken:**		

UNIT-IV: Exception Harcdlling

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
34.	Exception Handling: Concepts of exception handling,	02	21-03-2026 &23-03-2026		TLM1	CO4	
35.	benefits of exception banding	01	26-03-2026		TLM1	CO4	
36.	usage of Try,catch, throw, throws and finally.	01	26-03-2026		TLM1	CO4	
37.	built in exceptions, creating own exception	01	28-03-2026		TLM1	CO4	
	No. of classes required to complete UNIT-IV	**05**			**No. of classes taken:**		

UNIT-V: Multithreading

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
38.	Multi-threading: Thread. life cycle	01	28-03-2026		TLM1	CO5	
39.	creating tinreads	02	30-03-2026 & 02-04-2026		TLM1	CO5	

40.	synchronizing and intercommunicatio n of threads.	01	02-04-2026		TLM1	CO5	
	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
1.	Frameworks	01	04-04-2026		TLM1	CO1	

Teaching Learning Methods

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	01-12-2025	24-01-2025	8W
I Mid Examinations	**26-01-2026**	**31-01-2026**	**1W**
II Phase of Instructions	02-02-2026	04-04-2026	9W
II Mid Examinations	**06-04-2026**	**11-04-2026**	**1W**
Preparation and Practical's	13-04-2026	18-04-2026	1W
Semester End Examinations	20-04-2026	02-05-2026	2W
Internship	04-05-2026	27-06-2026	8W

EVALUATION PROCESS:(R23 Regulation)

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

POs:(Program Outcomes)

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
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	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.P.Nagababu**	**Mr.P.Nagababu**	**Dr. Y.Vijay Bhaskar Reddy**	**Dr. S .Nagarjuna Reddy**
Signature				

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Department of Electrical and Electronics Engineering
Accredited by NBA under Tier-I

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.G.Tabita
Course Name & Code : Advance Power Converters – 23PEH2
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VI/A **A.Y.:** 2025-26

Pre-requisite: Power Electronics.

Course Educational Objectives: This course deals with principles and basic topologies of non-isolated and isolated converters. It also deals the switching losses, conduction losses taking place in switched mode converters and soft switching converter topologies.

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

CO1	Identify the various types of non-isolated power converter topologies.(Understand-L2)
CO2	Analyze the performance of isolated power converter topologies. (Apply-L3)
CO3	Understand soft switching techniques and its control techniques. (Understand-L2)
CO4	Understand the Power Factor Correction Circuits. (Understand-L2)

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

TEXT BOOKS:

1. Ned Mohan, Undeland and Robbin, 'Power Electronics: converters, Application and design', John Wiley and sons.Inc, Newyork, 2006.
2. Robert Erickson and Dragon Maksivimovic "Fundamentals of Power Electronics", Springer Publications.

REFERENCE:

1. Philip T.Krein "Elements of Power Electronics", Oxford University Press.
2. L. Umanand "Power Electronics Essentials & Applications", Wiley India Private Limited.
3. Issa Batarseh "Power Electronics Circuits", John Wiely, 2004.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: NON-ISOLATED SWICHMODE POWER CONVERSION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to COs	1	02-12-2025		TLM1	
2.	Analysis of Buck	1	03-12-2025		TLM2	

	converters					
3.	Designing of Buck converters	1	04-12-2025		TLM2	
4.	Analysis of Boost converters	1	09-12-2025		TLM2	
5.	Designing of Boost converters	1	10-12-2025		TLM1	
6.	Analysis of Buck - Boost converters	1	11-12-2025		TLM2	
7.	Designing of Buck - Boost converters	1	16-12-2025		TLM1	
8.	Analysis of Cuk converters	1	17-12-2025		TLM2	
9.	Designing of Cuk converters	1	28-12-2025		TLM1	
10.	Applications Non isolated Converters	1	23-12-2025		TLM2	
11.	Numericals on Non Isolated Converters	1	24-12-2025		TLM2	
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: ISOLATED SWICHMODE POWER CONVERSION

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Requirement for isolation in SMPS	1	30-12-2025		TLM1	
13.	transformer connection	1	31-12-2025		TLM1	
14.	Steady State analysis of Forward converters	1	06-01-2026		TLM2	
15.	Steady State analysis of fly back converters	1	07-01-2026		TLM4	
16.	Applications of Forward and fly back converters	1	18-01-2026		TLM1	
17.	Push-Pull topologies and applications	1	20-01-2026		TLM2	
18.	Steady State analysis of Half bridge converters	1	21-01-2026		TLM2	
19.	Steady State analysis of full bridge converters	1	22-01-2026		TLM1	
No. of classes required to complete UNIT-II: 08				**No. of classes taken:**		

UNIT – III : SOFT SWITCHING CONVERTERS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Classification of Resonant Converters	1	03-02-2026		TLM1	
21.	Analysis of Series resonant circuit ana	1	04-02-2026		TLM2	
22.	Analysis of Parallel resonant circuits-	1	05-02-2026		TLM1	

23.	Resonant switches	1	10-02-2026		TLM1	
24.	Concept of Zero voltage switching	1	11-02-2026		TLM2	
25.	Principle of operation, analysis of M-type Buck/ boost Converters	1	12-02-2026		TLM2	
26.	Principle of operation, analysis of L-type Buck/ boost Converters	1	17-02-2026		TLM1	
27.	Concept of Zero current switching	1	18-02-2026		TLM2	
28.	Principle of operation and analysis of M-type & L-type Buck or boost Converter	1	19-02-2026		TLM2	
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT – IV: CONTROL METHODS FOR SWITCHING POWER CONVERTERS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Control methods for buck dc-dc converters using State-space Modelling	1	24-02-2026		TLM1	
30.	Control methods for boost dc-dc converters using State-space Modelling	1	25-02-2026		TLM2	
31.	Control methods for forward dc-dc converters using State-space Modelling	1	26-02-2026		TLM1	
32.	Control methods for buck dc-dc converters using Converter Transfer Functions	1	03-03-2026		TLM1	
33.	Control methods for boost dc-dc converters using Converter Transfer Functions	1	05-03-2026		TLM1	
34.	Control methods for forward dc-dc converters using Converter Transfer Functions	1	10-03-2026		TLM2	
35.	Control methods for buck dc-dc converters using Pulse Width Modulator Transfer Functions	1	11-03-2026		TLM1	
36.	Control methods for Boost and forward dc-dc converters using Pulse Width Modulator Transfer Functions	1	12-03-2026		TLM2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT – V: POWER FACTOR CORRECTION CIRCUITS

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction of PF and THD, Power Factor Correction	1	17-03-2026		TLM2	
38.	Energy Balance in PFC Circuits	1	18-03-2026		TLM1	
39.	Energy Balance in PFC Circuits	1	24-03-2026		TLM2	
40.	Passive Power Factor Corrector	1	25-03-2026		TLM2	
41.	Passive Power Factor Corrector	1	31-03-2026		TLM2	
42.	Basic Circuit Topologies of Active Power Factor Correctors	1	01-04-2026		TLM2	
43.	System Configurations of PFC Power Supply.	1	02-04-2026		TLM2	
44.	Revision	1	02-04-2026		TLM2	
No. of classes required to complete UNIT-V: 07				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Signature				
Name of the Faculty	**Mrs.G.Tabita**	**Mrs.G.Tabita**	**Mr.P.Deepak Reddy**	**Dr.P.Sobha Rani**
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. CHIRANJEEVI RAMPILLA
Course Name & Code : Foundations of Machine Learning & 23AMM2 (Minors)
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./EEE, ASE/VI/A&B **A.Y.:** 2025-26

Pre-requisites: Probability and Statistics, Data Warehousing and Data Mining

Course Objectives: The main objectives of the course is to

- Understand the fundamental concepts, models, and algorithms in Machine Learning.
- Learn to apply core ML techniques to solve real-world problems using modern software tools.
- Develop the ability to independently explore, implement, and evaluate machine learning models
- Gain experience through research-oriented tasks and hands-on practice with recent ML frameworks.

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

CO1: Identify the characteristics of machine learning. **(Understand- L2)**
CO2: Understand the Model building and evaluation approache **(Understand- L2)**
CO3: Apply regression algorithms for real-world Problems. **(Apply- L3)**
CO4: Handle classification problems via supervised learning algorithms. **(Apply- L3)**
CO5: Learn advanced learning techniques to deal with complex data **(Apply- L3)**

Course Articulation Matrix (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	-	-	-	-	-	-	-	-	2	2	2
CO2	2	3	2	-	-	-	-	-	-	-	-	2	2	2
CO3	2	3	2	-	-	-	-	-	-	-	-	2	2	3
CO4	2	3	2	-	-	-	-	-	-	-	-	2	2	3
CO5	3	2	2	-	-	-	-	-	-	-	-	2	2	3
1-Low						2 –Medium						3-High		

Text books:

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition,2015.
2. Tom M. Mitchell, "Machine Learning', MGH, 1997

Reference books:

1. Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge.

2. Peter Harington, “Machine Learning in Action” , Cengage, 1st edition, 2012.
3. Peter Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge university press,2012.
4. Jason Brownlee, “Machine Learning Mastery with Python Understand Your Data, Create 5. Accurate Models and Work Projects End-To-End”, Edition: v1.4, 2011.

E-Reources:

1. https://www.datacamp.com/blog/what-is-machine-learning
2. https://www.tutorialspoint.com/machine_learning/machine_learning_regression_ _analysis.htm

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

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.	Co’s & Po’s	1	02-12-2025		TLM2	
2.	Introduction to ML & Types	1	03-12-2025		TLM2	
3.	Applications & Issues of ML	1	04-12-2025		TLM2	
4.	Preparing to Model- Introduction	1	09-12-2025		TLM2	
5.	Machine Learning Activities	1	10-12-2025		TLM2	
6.	Basic Types of Data in Machine Learning,	1	11-12-2025		TLM2	
7.	Exploring Structure of Data	1	16-12-2025		TLM2	
8.	Data Quality and Remediation	1	17-12-2025		TLM2	
9.	Data Pre-Processing	1	18-12-2025		TLM2	
10.	Revision	1	23-12-2025		TLM2	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Modelling & Evaluation, Basics of Feature Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Modelling & Evaluation- Introduction	1	24-12-2025		TLM2	
12.	Selecting & Training a Model	1	30-12-2025		TLM2	
13.	Model Representation and Interpretability	1	31-12-2025		TLM2	
14.	Evaluating Performance of a Model. Basics of Feature Engineering- Introduction.	1	06-01-2026		TLM2	
15.	Feature Transformation – Feature Construction	1	07-01-2026		TLM2	
16.	Feature Extraction, PCA	1	08-01-2026		TLM2	
17.	Singular Value Decomposition (SVD) & Linear Discriminant Analysis (LDA)	1	20-01-2026		TLM2	
18.	Singular Value Decomposition	1	21-01-2026		TLM2	
19.	Feature Subset Selection	1	22-01-2026		TLM2	

I MID EXAMINATIONS (26-01-2026 TO 31-06-2026)	
No. of classes required to complete UNIT-II: 09	**No. of classes taken:**

UNIT-III: Regression

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Introduction to regression analysis	1	03-02-2026		TLM2	
21.	Simple & Multiple linear regression	1	04-02-2026		TLM2	
22.	Assumptions & Main Problems in Regression Analysis	1	05-02-2026		TLM2	
23.	Improving Accuracy of the linear regression model	1	10-02-2026		TLM2	
24.	Polynomial Regression Model	1	11-02-2026		TLM2	
25.	Logistic Regression.	1	12-02-2026		TLM2	
26.	Regularization: Regularized Linear Regression & Regularized Logistic Regression	1	17-02-2026		TLM2	
27.	Revision	1	18-02-2026		TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: Supervised Learning: Classification

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Classification- Introduction	1	19-02-2026		TLM2	
29.	Example of Supervised Learning,	1	24-02-2026		TLM2	
30.	Classification Model	1	25-02-2026		TLM2	
31.	Classification Learning Steps	1	26-02-2026		TLM2	
32.	Common Classification Algorithms - k-Nearest Neighbour (kNN)	1	03-03-2026		TLM2	
33.	Support vector Machines (SVM)	1	04-03-2026		TLM2	
34.	Random Forest model.	1	05-03-2026		TLM2	
35.	Revision	1	10-03-2026		TLM2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Other Types of Learning.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Ensemble Learning- Bagging	1	11-03-2026		TLM2	
37.	Boosting	1	12-03-2026		TLM2	
38.	Stacking and its impact on bias and variance	1	17-03-2026		TLM2	
39.	AdaBoost	1	18-03-2026		TLM2	
40.	Gradient Boosting Machines	1	19-03-2026		TLM2	
41.	XGBoost	1	24-03-2026		TLM2	
42.	Reinforcement Learning - Introduction	1	25-03-2026		TLM2	
43.	Q Learning	1	26-03-2026		TLM2	
44.	Revision	1	31-03-2026		TLM2	
No. of classes required to complete UNIT-V: 09				**No. of classes taken:**		

Content Beyond 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	Textbook followed	HOD Sign
1.	Neural Networks	2	01-04-2026 02-04-2026		TLM2	CO5	T1	
No. of classes		02			No. of classes taken:			
II MID EXAMINATIONS (06-04-2026 TO 11-04-2026)								

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, IV & V)	Q2=10

Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr.R.CHIRANJEEVI**	**Dr SK.JAMEER**	**Dr SK SALMA ASIYA BEGUM**	**Dr S.JAYAPRADA**
Signature				

LAKIREDDYBALIREDDYCOLLEGEOFENGINEERING
(AnAutonomousInstitutionsince2010)
AccreditedbyNAACwith'A'Grade&NBA(UnderTier- I),
AnISO21001:2018,14001:2015,50001:2018CertifiedInstitution
ApprovedbyAICTE,NewDelhiandAffiliatedtoJNTUK, Kakinada
L.B.REDDYNAGAR,MYLAVARAM,KRISHNA DIST.,A.P.-521230.
hodcse@lbrce.ac.in,cseoffice@lbrce.ac.in,Phone:08659-222933,Fax:08659-222931

COURSEHANDOUT

PART-A

Nameof CourseInstructor: Mr. Y. Babu
CourseName&Code: SoftwareEngineering Fundamentals & 23CSM5

L-T-P Structure: **:3-0-0** **Credits:**3
Program/Sem: :B.Tech,VI-Sem(Minors) **A.Y.** **:**2025-26

PREREQUISITE: ObjectOrientedProgramming.

COURSEEDUCATIONALOBJECTIVES(CEOs):

Theobjectiveofthecourseistoprovideanunderstandingofdifferents/wprocessmodelsand how to choose one among them by gathering the requirements from a client and specifying them. Usingthoserequirements inthedesignofthesoftwarearchitecturebased on thechoiceswiththe help ofmodules andinterfaces.Toenables/w development, by usingdifferent testing techniques likeunit, integration and functional testing, quality assurance can be achieved.

CO1	Understandthefundamentalsofsoftwareengineeringconceptsandsoftware Process models. **(Understand-L2)**
CO2	Applytherequirementelicitationtechniquesforpreparing SRSanddesign engineering. **(Apply-L3)**
CO3	UnderstandingthebasicbuildingblocksofUML,Class,andobjectdiagrams. **(Understand-L2)**
CO4	Applybehavioralmodelsforrealworldapplications.**(Apply-L3)**
CO5	Demonstratedifferentsoftwaretestingapproachesfortestingrealtimeapplications. **(Understand-L2)**

COURSEARTICULATIONMATRIX(CorrelationbetweenCOs,POs&PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2		2											2	1	
CO3	3												3	2	
CO4		2												3	1
CO5	2	2													3
1 -Low					**2** –Medium						**3** -High				

TEXTBOOKS:

T1 RogerS.Pressman,"Softwareengineering-Apractitioner'sApproach",TMHInternationalEdition, 6th edition,2005.

T2 GradyBooch,JamesRumbaugh,Ivar Jacobson,"TheUnifiedModelingLanguage User Guide", PEARSON,4thImpression,2012.

REFERENCEBOOKS:

R1SoftwareEngineering-Conceptsandpractices:UgrasenSuman,Cengage learning

R2 Object- oriented analysis and design using UML",Mahesh P. Matha, PHI

R3FundamentalsofSoftwareEngineering,RajibMall,ThirdEdition,PHI **R4.**

https://onlinecourses.nptel.ac.in/noc20_cs68**[1,2,3,4,5]**

PART-B

COURSEDELIVERYPLAN(LESSONPLAN):

UNIT-I:SoftwareandsoftwareEngineering

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOsandCOs discussion	1	02/12/2025		TLM2	
2.	Theevolvingrole ofSoftware	1	03/12/2025		TLM2	
3.	CharacteristicsofSoftware	1	04/12/2025		TLM2	
4.	Importanceofsoftware Engineering	1	09/12/2025		TLM2	
5.	Changingnatureofsoftware	1	10/12/2025		TLM2	
6.	LegacySoftware, SoftwareMyths	1	11/12/2025		TLM2	
7.	Softwareprocessmodel:layered. technology	1	16/12/2025		TLM2	
8.	Processframework Theprocessandproduct	1	17/12/2025		TLM2	
9.	Waterfallmodel, Incrementalmodel	1	18/12/2025		TLM2	
10.	SpiralandVmodel	1	23/12/2025		TLM2	
11.	Componentbaseds/w development	1	24/12/2025		TLM2	
12.	UnifiedProcessmodel	1	30/12/2025		TLM2	
No.of classesrequiredtocompleteUNIT-I:12				**No.of classestaken:**		

UNIT-II:Requirements AnalysisandSoftwaredesign

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Requirements gathering	1	31/12/2025		TLM2	
14.	Requirementanalysis	1	01/01/2026		TLM2	
15.	Softwarerequirementspecification	1	06/01/2026		TLM2	
16.	SRSdocumentcasestudy	1	07/01/2026		TLM2	
17.	Overviewof design process	1	08/01/2026		TLM2	
18.	Design concepts	1	20/01/2026		TLM2	
19.	Architecturalconcepts	1	21/01/2026		TLM2	
20.	Examples, Revision	1	22/01/2026		TLM2	
No.ofclassesrequiredtocomplete UNIT-II: 08				**No.of classestaken:**		

UNIT-III:DesignusingUML

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	BuildingBlocksofUML	1	03/02/2026		TLM2	
22.	Definingthings	1	04/02/2026		TLM2	
23.	Definingrelationshipsanddiagrams	1	05/02/2026		TLM2	
24.	CommonMechanisminUML	1	10/02/2026		TLM2	
25.	Classdiagrams, Examples	1	11/02/2026		TLM2	
26.	Objectdiagramsand examples, Revision	1	12/02/2026		TLM2	
No.ofclassesrequiredtocomplete UNIT-III:06				**No.of classestaken:**		

UNIT-IV:BehavioralModeling

S. No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	Actual Dateof Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Interactions	1	17/02/2026		TLM2	
28.	Interactiondiagrams	1	18/02/2026		TLM2	
29.	Use-cases	1	24/02/2026		TLM2	
30.	Use-casediagrams	1	25/02/2026		TLM2	
31.	Activitydiagrams	1	03/03/2026		TLM2	
32.	Eventsandsignals,state machines	1	04/03/2026		TLM2	
33.	processesandThreads,time, and space, Statechart diagrams	1	05/03/2026		TLM2	
34.	Componentdiagrams, Deployment diagrams, Revision	1	10/03/2026		TLM2	
No.ofclassesrequiredtocompleteUNIT-IV:08				**No.of classestaken:**		

UNIT-V:TestingTechniques

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Softwaretestingfundamentals	1	11/03/2026		TLM2	
36.	Unittesting	1	12/03/2026		TLM2	
37.	Integrationtesting	1	17/03/2026		TLM2	
38.	Blackbox testing	1	18/03/2026		TLM2	
39.	Whitebox testing	1	24/03/2026		TLM2	
40.	Debugging	1	25/03/2026		TLM2	
41.	Systemtesting	1	26/03/2026			
42.	Examples, Revision	1	31/03/2026		TLM2	
No.ofclassesrequiredtocomplete UNIT-V: 08				**No.of classestaken:**		

ContentBeyondthe Syllabus:

SNo	Topicstobe covered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Casestudyversion control	1	01/04/2026		TLM6	
44.	Casestudytestcasepreparation	1	02/04/2026		TLM6	

TeachingLearning Methods			
TLM1	ChalkandTalk	**TLM4**	Demonstration(Lab/FieldVisit)
TLM2	PPT	**TLM5**	ICT(NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial/Assignment	**TLM6**	GroupDiscussion/Project

PART-C

EVALUATIONPROCESS(R20 Regulation):

Evaluation Task	Marks
Assignment-I(Units-I,II&UNIT-III(Halfofthe Syllabus))	A1=5
I-DescriptiveExamination(Units-I,II&UNIT-III(HalfoftheSyllabus))	M1=15
I-QuizExamination(Units-I, II&UNIT-III(Halfofthe Syllabus))	Q1=10
Assignment-II(Unit-III(RemainingHalfoftheSyllabus),IV&V)	A2=5
II-DescriptiveExamination(UNIT-III(RemainingHalfoftheSyllabus),IV&V)	M2=15
II-QuizExamination(UNIT-III(RemainingHalfoftheSyllabus),IV&V)	Q2=10
MidMarks=80%ofMax((M1+Q1+A1),(M2+Q2+A2))+20%ofMin((M1+Q1+A1),(M2+Q2+A2))	M=30
CumulativeInternalExamination(CIE):M	30
SemesterEndExamination(SEE)	70
TotalMarks =CIE+SEE	100

PART-D

PROGRAMMEOUTCOMES(POs):

PO1	**Engineeringknowledge:**Applytheknowledgeofmathematics,science,engineering fundamentals,andanengineeringspecializationtothesolutionofcomplexengineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesof mathematics,naturalsciences,andengineeringsciences.
PO3	**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 environmentalconsiderations.
PO4	**Conductinvestigationsofcomplexproblems:**Useresearch-basedknowledgeand researchmethodsincludingdesignofexperiments,analysisandinterpretationofdata, andsynthesisofthe informationtoprovidevalidconclusions.
PO5	**Moderntoolusage:**Create,select,andapplyappropriatetechniques,resources,and modernengineeringandITtoolsincludingpredictionandmodellingtocomplex engineering activities with an understanding of the limitations
PO6	**Theengineerandsociety:Apply**reasoninginformedbythecontextualknowledgeto assesssocietal,health,safety,legalandculturalissuesandtheconsequentresponsibilities relevant to the professional engineering practice
PO7	**Environmentandsustainability:**Understandtheimpactoftheprofessionalengineering solutionsin societalandenvironmentalcontexts,anddemonstratethe knowledge of,and needforsustainabledevelopment.
PO8	**Ethics:**Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilitiesand normsoftheengineeringpractice.
PO9	**Individualand team work:**Function effectively as anindividual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:**Communicateeffectivelyoncomplexengineeringactivitieswiththe engineering community and with society at large, such as, being able to
PO11	**Projectmanagementandfinance:**Demonstrateknowledgeandunderstandingofthe engineeringandmanagementprinciplesandapplythesetoone'sownwork, asamember andleaderinateam,tomanageprojectsandinmultidisciplinaryenvironments.
PO12	**Life-longlearning:**Recognizetheneedfor,andhavethepreparationandabilitytoengage in independent and life-long learning in the broadest context of technological change.

PROGRAMMESPECIFICOUTCOMES(PSOs):

PSO1	TheabilitytoapplySoftwareEngineeringpracticesandstrategiesinsoftwareproject developmentusingopen-sourceprogrammingenvironmentforthesuccessoforganization.
PSO2	Theabilitytodesignanddevelopcomputerprogramsinnetworking,webapplicationsand IoT as per the society needs.
PSO3	Toinculcateanabilitytoanalyze,designandimplementdatabaseapplications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of theFaculty	**Mr.Y.Babu**	**Mr. Y.Babu**	**Dr.D.V.Subbaiah**	**Dr.S.NagarjunaReddy**
Signature				