LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous)
Approved by AICTE, New Delhi and Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE, IT, ECE, EEE & ME) under Tier - I
College Code: 76

MASTER OF BUSINESS ADMINISTRATION
COURSE HANDOUT

PART-A

Name of Course Instructor : **Dr. O. Naresh**
Course Name & Code : **MEFA-23HS02**
L-T-P Structure : 2-0-0 Credits: 2
Program/Sem/Sec : **EEE (A/Sec)., IV-Sem.** A. Y : 2025-26
Prerequisite: Basic Knowledge in business activities.

COURSE EDUCATIONAL OBJECTIVES(CEO):
- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview of investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements

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

CO1	Define the concepts related to Managerial Economics, Financial Accounting and Management. **(Understand-L2)**
CO2	Understand the fundament also Economics viz., Demand, Production, cost, revenue and markets. **(Understand-L2)**
CO3	Apply the Concept of Production cost and revenues for effective Business decision **(Apply-L3)**
CO4	Evaluate the capital budgeting techniques **(Analyze-L4)**
CO5	Develop accounting statements and evaluate the financial performance of business entity. **(Analyze-L4)**

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

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

Textbooks:
1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:
1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi. 4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Business Economics

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.	Orientation	1	02/12/25		TLM1	CO1	T1,R2	
2.	Orientation	1	03/12/25		TLM1	CO1	T1,R2	
3.	Introduction to Economics	1	09/12/25		TLM1	CO1	T1,R2	
4.	Explaining about CO-PO	1	10/12/25		TLM1	CO1	T1,R2	
5.	Definitions of Economics-Scarcity, Growth, Nature and Scope of Economics	1	16/12/25		TLM1	CO1	T1,R2	
6	Demand-Law of demand	1	17/12/25		TLM1	CO1	T1,R2	
7	Elasticity of demand	1	23/12/25		TLM1	CO1	T1,R2	
8	Types of Elasticity of demand	1	24/12/25		TLM1	CO1	T1,R2	
9	Demand Forecasting - Methods of demand forecasting	1	30/12/25		TLM3	CO1	T1,R2	
No. of classes required to complete UNIT-I		09		No. of classes taken:				

UNIT-II: Theory of Production and Cost analysis

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Production Function	1	31/12/25		TLM1	CO2	T1,R2	
2.	Isoquant and Isocost	1	6/01/26		TLM1	CO2	T1,R2	
3.	Least Cost Combination of inputs	1	7/01/26		TLM1	CO2	T1,R2	
4.	Law of Returns	1	20/1/26		TLM1	CO2	T1,R2	
5.	Internal and External Economies of Scale	1	20/01/26		TLM1	CO2	T1,R2	
6.	Cost Concepts	1	21/01/26		TLM1	CO2	T1,R2	
7.	Break-even Analysis	1	21/01/26		TLM1	CO2	T1,R2	
8	BEP Problems	1	26/01/26					
No. of classes required to complete UNIT-II		07		No. of classes taken:				

UNIT-III: Markets & Pricing Policies

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.	I Mid exam		26/1/26		TLM1	CO3		
2.	I Mid exam				TLM1	CO3		
3.	I Mid exam				TLM1	CO3		
4.	I Mid exam		31/1/26		TLM1	CO3		
5.	Market structures	1	03/02/26		TLM1	CO3	T2,R4	
6.	Markets-Types of markets	1	04/02/26		TLM1	CO3		
7.	Features and price out determinations under Perfect competition	1	10/02/26		TLM2	CO3		
8.	Features and price out determinations under Monopoly	1	11/02/26		TLM1	CO3		
9.	Features and price out determinations under Monopolistic competition	1	17/02/26		TLM1	CO3		
10.	Pricing –Pricing polices & its Objectives	1	18/02/26		TLM1	CO3	T2,R4	
11.	Pricing Methods and its applications in business.	1	24/02/26		TLM2	CO3	T2,R4	
No. of classes required to complete UNIT-III		11		No. of classes taken:				

UNIT-IV: Capital and Capital Budgeting

S. No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Nature and its significance	1	25/2/26		TLM2	CO4	T2,R4	
2.	Types of Capital	1	03/03/26		TLM2	CO4	T2,R4	
3.	Sources of raising capital	1	04/03/26		TLM1	CO4	T2,R4	
4.	Capital budgeting Significance	1	10/03/26		TLM1	CO4	T2,R4	
5.	Capital budgeting Process	1	11/03/26		TLM1	CO4	T2,R4	
6.	Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).	2	17/03/26		TLM1	CO4	T2,R4	
No. of classes required to complete UNIT-IV		7		No. of classes taken:				

UNIT-V: Financial Accounting and analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Week ly
1.	Accounting – significance- Book Keeping -Double entry system	2	18/3/26		TLM1	CO5	T2,R4	
2.	Journal- Ledger	2	24/3/26		TLM1	CO5	T2,R4	
3.	Trial Balance	1	25/3/26		TLM1	CO5	T2,R4	
4	Final Accounts with simple adjustments	2	31/3/26		TLM1	CO5	T2,R4	
5	Financial Statement Analysis through ratios	1	1/4/26		TLM1	CO5	T2,R4	
6	II Mid exams		6/4/26					
7.	II Mid exams							
8	II Mid exams							
9.	II Mid exams		11/4/26					
No. of classes required to complete UNIT-V		08		No. of classes taken:				

Content beyond syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Complete on	Actual Date of Completion	Teaching Learning Methods	Learning Outcom e COs	Text Book followed	HOD Sign Week ly
1.	Financial accounting	1	27/12/25					
2.	Investment Decisions	1	5/02/26					
		02						

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:

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

PART-D: PROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

Program 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):

PSO 1:	**Communication:** Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2:	**VLSI and Embedded Systems:** Design and Analyze Analog and Digital Electronic Circuits or systems and implement real time applications in the field of VLSI and Embedded Systems using relevant tools
PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Dr.O.Naresh	**Dr.O.Naresh**	**Dr. Adisesha Reddy**	**Dr. K. Deepika**
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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College Code: 76

MASTER OF BUSINESS ADMINISTRATION
COURSE HANDOUT

PART-A

Name of Course Instructor : **Dr. O. Naresh**
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Program/Sem/Sec : **EEE (B/Sec)., IV-Sem.** A. Y : 2025-26
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CO2	Understand the fundament also Economics viz., Demand, Production, cost, revenue and markets. **(Understand-L2)**
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CO5	Develop accounting statements and evaluate the financial performance of business entity. **(Analyze-L4)**

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

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

Textbooks:

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Reference Books:

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2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi. 4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

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https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Business Economics

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completeon	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Orientation	1	03/12/25		TLM1	CO1	T1,R2	
2.	Orientation	1	04/12/25		TLM1	CO1	T1,R2	
3.	Introduction to Economics	1	10/12/25		TLM1	CO1	T1,R2	
4.	Explaining about CO-PO	1	11/12/25		TLM1	CO1	T1,R2	
5.	Definitions of Economics-Scarcity, Growth, Nature and Scope of Economics	1	17/12/25		TLM1	CO1	T1,R2	
6	Demand-Law of demand	1	18/12/25		TLM1	CO1	T1,R2	
7	Elasticity of demand	1	24/12/25		TLM1	CO1	T1,R2	
8	Types of Elasticity of demand	1	31/12/25		TLM1	CO1	T1,R2	
9	Demand Forecasting - Methods of demand forecasting	1	07/01/26		TLM3	CO1	T1,R2	
No. of classes required to complete UNIT-I		09		No. of classes taken:				

UNIT-II: Theory of Production and Cost analysis

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Production Function	1	8/01/26		TLM1	CO2	T1,R2	
2.	Isoquant and Isocost	1	21/01/26		TLM1	CO2	T1,R2	
3.	Least Cost Combination of inputs	1	22/01/26		TLM1	CO2	T1,R2	
4.	Law of Returns	1	04/2/26		TLM1	CO2	T1,R2	
5.	Internal and External Economies of Scale	1	05/02/26		TLM1	CO2	T1,R2	
6.	Cost Concepts	1	11/02/26		TLM1	CO2	T1,R2	
7.	Break-even Analysis	1	12/02/26		TLM1	CO2	T1,R2	
8	BEP Problems	1	18/02/26					
No. of classes required to complete UNIT-II		07		No. of classes taken:				

UNIT-III: Markets & Pricing Policies

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.	I Mid exam		26/2/26		TLM1	CO3		
2.	I Mid exam				TLM1	CO3		
3.	I Mid exam				TLM1	CO3		
4.	I Mid exam		03/03/26		TLM1	CO3		
5.	Market structures	1	04/03/26		TLM1	CO3	T2,R4	
6.	Markets-Types of markets	1	10/03/26		TLM1	CO3		
7.	Features and price out determinations under Perfect competition	1	11/03/26		TLM2	CO3		
8.	Features and price out determinations under Monopoly	1	17/03/26		TLM1	CO3		
9.	Features and price out determinations under Monopolistic competition	1	03/03/26		TLM1	CO3		
10.	Pricing –Pricing polices & its Objectives	1	18/03/26		TLM1	CO3	T2,R4	
11.	Pricing Methods and its applications in business.	1	19/03/26		TLM2	CO3	T2,R4	
No. of classes required to complete UNIT-III		11		No. of classes taken:				

UNIT-IV: Capital and Capital Budgeting

S. No.	Topics to be covered	No. of Classes Requi red	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Nature and its significance	1	25/2/26		TLM2	CO4	T2,R4	
2.	Types of Capital	1	03/03/26		TLM2	CO4	T2,R4	
3.	Sources of raising capital	1	04/03/26		TLM1	CO4	T2,R4	
4.	Capital budgeting Significance	1	10/03/26		TLM1	CO4	T2,R4	
5.	Capital budgeting Process	1	11/03/26		TLM1	CO4	T2,R4	
6.	Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).	2	17/03/26		TLM1	CO4	T2,R4	
No. of classes required to complete UNIT-IV		7		No. of classes taken:				

UNIT-V: Financial Accounting and analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Week ly
1.	Accounting – significance- Book Keeping -Double entry system	2	18/3/26		TLM1	CO5	T2,R4	
2.	Journal- Ledger	2	24/3/26		TLM1	CO5	T2,R4	
3.	Trial Balance	1	25/3/26		TLM1	CO5	T2,R4	
4	Final Accounts with simple adjustments	2	31/3/26		TLM1	CO5	T2,R4	
5	Financial Statement Analysis through ratios	1	1/4/26		TLM1	CO5	T2,R4	
6	II Mid exams		6/4/26					
7.	II Mid exams							
8	II Mid exams							
9.	II Mid exams		12/4/26					
No. of classes required to complete UNIT-V		08		No. of classes taken:				

Content beyond syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Complete on	Actual Date of Completion	Teaching Learning Methods	Learning Outcom e COs	Text Book followed	HOD Sign Week ly
1.	Financial accounting	1	24/12/25					
2.	Investment Decisions	1	7/02/26					
		02						

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:

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

PART-D: PROGRAMME OUTCOMES (POs) & PROGRAMME SPECIFIC OUTCOMES (PSOs):

Program Outcomes (POs):

PO 1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 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.

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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.
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Program Specific Outcomes (PSOs):

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PSO 3:	**Signal Processing:** Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Dr.O.Naresh	**Dr.O.Naresh**	**Dr. Adisesha Reddy**	**Dr. K. Deepika**
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Venkateswara Rao, Sr. Asst.Professor

Course Name & Code :Analog Circuits-23EE06 **Regulation**: R23

L-T-P Structure : 3-0-0 **Credits:** 03

Program/Sem/Sec : B. Tech. IV-Sem., EEE-A **A.Y.:** 2025-26

PRE-REQUISITE: : Electronic Circuits and Devices and semiconductor devices

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to analyse various electronic circuits like amplifiers, feedback and operational amplifiers, oscillators, clippers, clampers comparators, IC 555 timer, ADC/DAC converters.

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

CO1	Understand diode clipping, clamping circuits and different types of biasing circuits of a transistor (**Understand – L2**)
CO2	Analyze the small signal modeling of BJT and feedback amplifiers (**Apply – L3**)
CO3	Understand the operation of oscillators, operational amplifier and their applications (**Understand – L2**)
CO4	Apply the 555 timers in multi-vibrators, Schmitt Trigger and PLL applications (**Apply – L3**)
CO5	Understand the operation of different ADCs and DACs (**Understand – L2**)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-		2	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-
1 - Low **2** –Medium **3** - High																

TEXTBOOKS:

T1	Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
T2	Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCE BOOKS:

R1	Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
R2	Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Diode clipping and clamping circuits, DC biasing of BJTs

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.	Diode clippers, clipping at two independent levels	1	01-12-2025			
2.	Transfer characteristics of clippers	1	03-12-2025			
3.	clamping circuit operation	1	06-12-2025			
4.	Load lines, Operating Point, Bias Stability	1	08-12-2025			
5.	Collector-to-Base Bias, Self-Bias	1	10-12-2025			
6.	Bias Compensation	1	13-12-2025			
7.	Thermal Runaway, Thermal Stability	1	15-12-2025			
8.	**Flipped Class on Diode and Transistor applications.**	1	17-12-2025			
No. of classes required to complete UNIT-I: 8				**No. of classes taken:**		

UNIT-II: Small Signals Modelling of BJT, Feedback Amplifiers

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Analysis of a Transistor Amplifier Circuit using h-parameters Simplified CE Hybrid Model	1	20-12-2025			
10.	Analysis of CE Configuration using Approximate Model	1	22-12-2025			
11.	Analysis of CC, CB Configuration using Approximate Model	1	24-12-2025			
12.	Frequency Response of CE and CC amplifier	1	27-12-2025			
13.	Classification of Amplifiers, the Feedback Concept	1	29-12-2025			
14.	General Characteristics of Negative-Feedback Amplifiers	1	31-12-2025			
15.	Voltage-Series Feedback, Current-Series Feedback amplifiers	1	03-01-2026			
16.	Current-Shunt Feedback, Voltage-Shunt Feedback amplifiers	1	05-01-2026			
17.	**Collaborative Learning on Amplifiers**		07-01-2026			
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Oscillator Circuits, Operational Amplifiers

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Barkhausen Criterion of oscillation, Oscillator operation	1	10-01-2026			
19.	R-C phase shift oscillator	1	19-01-2026			
20.	Wien bridge Oscillator	1	21-01-2026			
21.	Crystal Oscillator	1	24-01-2026			
22.	Introduction, Basic information of Op-Amp	1	02-02-2026			
23.	Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp	1	04-02-2026			
24.	DC characteristics	1	07-02-2026			
25.	AC characteristics	1	09-02-2026			
26.	741 op-amp & its features	1	11-02-2026			
27.	**QUIZ**	1	14-02-2026			
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: OP-AMPS Applications, Comparators and Waveform Generators

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Introduction, Basic Op-Amp Applications	1	16-02-2026			
29.	Instrumentation Amplifier, AC Amplifier	1	18-02-2026			
30.	V to I and I to V Converter, Sample and Hold Circuit	1	21-02-2026			
31.	Log and Antilog Amplifier, Multiplier and Divider	1	23-02-2026			
32.	Differentiator, integrator.	1	25-02-2026			
33.	Introduction, Comparator	1	28-02-2026			
34.	Square Wave Generator, Monostable Multivibrator	1	02-03-2026			
35.	Triangular Wave Generator	1	07-03-2026			
36.	Sine Wave Generators	1	09-03-2026			
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: Timers and Phase Locked Loop, Digital to Analog and Analog to Digital 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
37.	Introduction to 555 timer, functional diagram	1	11-03-2026			
38.	Monostable and A stable operations and applications	1	14-03-2026			
39.	Schmitt Trigger, PLL block schematic, principles and description of individual blocks	1	16-03-2026			
40.	565 PLL, Applications of VCO (566)	1	18-03-2026			
41.	Introduction, basic DAC techniques, weighted resistor DAC	1	23-03-2026			
42.	R-2R ladder DAC, inverted R-2R DAC	1	25-03-2026			
43.	**Converters:**A-D Converters – parallel Comparator type ADC, counter type ADC	1	28-03-2026			
44.	successive approximation ADC and dual slope ADC	1	30-03-2026			
45.	DAC and ADC Specifications	1	01-04-2026			
No. of classes required to complete UNIT-V: 09				**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
46.	CMOS Analog IC Design Applications	1	04-04-2026			

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 (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 EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO 2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO 3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO 4	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 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.

Date: 01-12-2025

Title	**Course Instructor**	**Course coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.P. Venkateswara Rao**	**Mrs.K.Balavani**	**Dr.B.V.N.R.Siva kumar**	**Dr.G.Srinivasulu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
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Accredited by NAAC with "A" Grade and NBA (ECE, EEE, CSE, IT, MECH, CE & ASE) Under Tier-I
L B Reddy Nagar, Mylavaram-521 230, NTR District, Andhra Pradesh.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. K.Balavani, Sr. Asst.Professor

Course Name & Code	**:**Analog Circuits-23EE06	**Regulation**: R23
L-T-P Structure	**:** 3-0-0	**Credits:** 03
Program/Sem/Sec	: B. Tech. IV-Sem., EEE-B	**A.Y.:** 2025-26

PRE-REQUISITE: : Electronic Circuits and Devices and semiconductor devices

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course enables the student to analyse various electronic circuits like amplifiers, feedback and operational amplifiers, oscillators, clippers, clampers comparators, IC 555 timer, ADC/DAC converters.

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

CO1	Understand diode clipping, clamping circuits and different types of biasing circuits of a transistor (**Understand – L2**)
CO2	Analyze the small signal modeling of BJT and feedback amplifiers (**Apply – L3**)
CO3	Understand the operation of oscillators, operational amplifier and their applications (**Understand – L2**)
CO4	Apply the 555 timers in multi-vibrators, Schmitt Trigger and PLL applications (**Apply – L3**)
CO5	Understand the operation of different ADCs and DACs (**Understand – L2**)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-		2	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-

1 - Low **– 2** Medium **3 -** High

TEXTBOOKS:

T1	Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
T2	Linear Integrated Circuits **–** D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCE BOOKS:

R1	Electronic Devices and Circuit Theory **–** Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
R2	Operational Amplifiers and Linear Integrated Circuits **–**Gayakwad R.A, Prentice Hall India, 2002.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Diode clipping and clamping circuits, DC biasing of BJTs

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.	Diode clippers, clipping at two independent levels	1	01-12-2025			
2.	Transfer characteristics of clippers	1	02-12-2025			
3.	clamping circuit operation	1	05-12-2025			
4.	Load lines, Operating Point, Bias Stability	1	08-12-2025			
5.	Collector-to-Base Bias, Self-Bias	1	09-12-2025			
6.	Bias Compensation	1	12-12-2025			
7.	Thermal Runaway, Thermal Stability, problems	2	15-12-2025 16-12-2025			
8.	**Flipped Class on Diode and Transistor applications.**	1	19-12-2025			
No. of classes required to complete UNIT-I: 9				**No. of classes taken:**		

UNIT-II: Small Signals Modelling of BJT, Feedback Amplifiers

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Analysis of a Transistor Amplifier Circuit using h-parameters Simplified CE Hybrid Model	1	22-12-2025			
10.	Analysis of CE Configuration using Approximate Model	1	23-12-2025			
11.	Analysis of CC, CB Configuration using Approximate Model	1	26-12-2025			
12.	Frequency Response of CE and CC amplifier	1	29-12-2025			
13.	Classification of Amplifiers, the Feedback Concept	1	30-12-2025			
14.	General Characteristics of Negative-Feedback Amplifiers	1	02-01-2026			
15.	Voltage-Series Feedback, Current-Series Feedback amplifiers	1	05-01-2026			
16.	Current-Shunt Feedback, Voltage-Shunt Feedback amplifiers	1	06-01-2026			
17.	**Collaborative Learning on Amplifiers.**	1	09-01-2026			
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Oscillator Circuits, Operational Amplifiers

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Barkhausen Criterion of oscillation, Oscillator operation	1	19-01-2026			
19.	R-C phase shift oscillator, Wien bridge Oscillator	1	20-01-2026			
20.	Crystal Oscillator, Problems	1	23-01-2026			
21.	Introduction, Basic information of Op-Amp	1	02-02-2026			
22.	Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp	1	03-02-2026			
23.	DC characteristics	1	06-02-2026			
24.	AC characteristics	1	09-02-2026			
25.	741 op-amp & its features	1	10-02-2026			
26.	Problems	1	13-02-2026			
27.	Introduction, Basic Op-Amp Applications	1	16-02-2026			
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: OP-AMPS Applications, Comparators and Waveform Generators

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Instrumentation Amplifier, AC Amplifier	1	17-02-2026			
29.	V to I and I to V Converter, Sample and Hold Circuit	1	20-02-2026			
30.	Log and Antilog Amplifier, Multiplier and Divider	1	23-02-2026			
31.	Differentiator, integrator.	1	24-02-2026			
32.	Introduction, Comparator	1	27-02-2026			
33.	Square Wave Generator, Monostable Multivibrator	1	02-03-2026			
34.	Triangular Wave Generator	1	03-03-2026			
35.	Sine Wave Generators	1	06-03-2026			
36.	**QUIZ**	1	09-03-2026			
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: Timers and Phase Locked Loop, Digital to Analog And Analog to Digital 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
37.	Introduction to 555 timer, functional diagram	1	10-03-2026			
38.	Monostable and A stable operations and applications	1	13-03-2026			
39.	Schmitt Trigger, PLL block schematic, principles and description of individual blocks	1	16-03-2026			
40.	565 PLL, Applications of VCO (566)	1	17-03-2026			
41.	Introduction, basic DAC techniques, weighted resistor DAC	1	20-03-2026			
42.	R-2R ladder DAC, inverted R-2R DAC	1	23-03-2026			
43.	**Converters:**A-D Converters–parallel Comparator type ADC, counter type ADC	1	24-03-2026			
44.	successive approximation ADC and dual slope ADC	1	27-03-2026			
45.	DAC and ADC Specifications	1	30-03-2026			
46.	**Revision**	1	31-03-2026			
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	CMOS Analog IC Design Applications	1	03-04-2026			

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 (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 EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.
PEO 2	Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.
PEO 3	Work effectively as individuals and as team members in multidisciplinary projects.
PEO 4	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 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.

Date: 01-12-2025

Title	**Course Instructor**	**Course coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mrs.K. Balavani**	**Mrs. K.Balavani**	**Dr.B.V.N.R.Siva kumar**	**Dr.G.Srinivasulu**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.Nageswara Rao
Course Name & Code : 23EE07-Power Systems-I
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/IV/A **A.Y.:** 2025-26

Pre-requisite: Electrical Circuit Analysis

Course Objectives: The course aims to provide a comprehensive understanding of the principles of operation and major components of hydro, thermal, nuclear, and renewable power plants, as well as the construction and operational aspects of air and gas insulated substations. It also covers the various types of cables and distribution systems, along with an analysis of different load curves and tariff structures applicable to consumers

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

CO1: Understand the different types of non-renewable power plants and their operational principles.(Understand-L2)
CO2: Understand the different types renewable power plants and their operational principles. (Understand-L2)
CO3: Describe the components and configurations of air and gas insulated substations.
CO4: Analyze the construction and characteristics of single core and three core cables, and various distribution system configurations. (Apply-L3)
CO5: Analyze economic factors related to power generation and evaluate different tariff methods. (Analyse-L4)

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

COS	O1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSOa	PSOb	PSOc	PSOd
CO1																
CO2																
CO3																
CO4																
CO5																

Text Books:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J.B.Gupta, Transmission and Distribution of Electrical Power, S.K.Kataria and sons,10th Edition, 2012

Reference Books:

1. I.J. Nagarath& D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. TuranGonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985. 5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Hydroelectric Power Stations**	1	2/12/25		TLM2	
2.	Hydroelectric Power Plant	1	3/12/25		TLM1	
3.	**Thermal Power Stations**	1	4/12/25		TLM2	
4.	Description Of Components	1	9/12/25		TLM1	
5.	Electrostatic Precipitator	1	10/12/25		TLM2	
6.	Condensers	1	11/12/25		TLM1	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	**Nuclear Power Stations**	1	6/12/25		TLM2	
8.	Nuclear Reactor	1	16/12/25		TLM1	
9.	Description of PWR, BWR and FBR.	2	17/12,18/12		TLM1	
10.	**Renewable Power Stations (Wind and Solar)**	2	23/12.24/12		TLM1	
11.	Layout of a wind turbine	1	30/12/25		TLM1	
12.	solar-thermal power Plant	1	31/12/25		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	**Air Insulated Substations**	1	6/1/26		TLM1	
14.	Indoor & Outdoor Substations	1	7/1/26		TLM1	
15.	Bus bar arrangements	1	8/1/26		TLM1	
16.	circuit breakers	2	20/1, 21/1		TLM1	
17.	**Gas Insulated Substations (GIS)**	2	22/1. 3/2		TLM2	
18.	constructional aspects	2	4/2, 5/2		TLM1	
No. of classes required to complete UNIT-III: 9				**No. of classes taken:**		

Unit-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	**Underground Cables**	2	10/2,11/2		TLM1	
20.	Types of cables	2	12/2,17/2		TLM1	
21.	Grading of cables	2	18/2. 19/2		TLM1	
22.	**Distribution Systems**	2	24/2,25/2		TLM1	
23.	A.C Distribution	2	26/2,3/3		TLM1	
24.	Design considerations	2	3/3,10/3		TLM1	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	**Economic Aspects**	2	11/3,12/3		TLM1	
26.	Base And Peak Load Plants	2	17/3, 18/3		TLM2	

27.	**Tariff Methods**	2	19/3,24/3		TLM1	
28.	characteristics of a tariff	1	25/3/26		TLM1	
No. of classes required to complete UNIT-V: 08				**No. of classes taken:**		

S.No	**Content Beyond Syllabus**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
1.	**Burden on Power Grid**	1	6/1/2026		TLM2	
2.	**Electric Vehicles**	1	22/1/2026		TLM2	
3.	**Batteries**	1	1/4/2026		TLM2	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	**Dr.M.S.Giridhar**	**Dr.P.Sobha Rani-**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.Nageswara Rao
Course Name & Code : 23EE07-Power Systems-I
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/IV/B **A.Y.:** 2025-26

Pre-requisite: Electrical Circuit Analysis

Course Objectives: The course aims to provide a comprehensive understanding of the principles of operation and major components of hydro, thermal, nuclear, and renewable power plants, as well as the construction and operational aspects of air and gas insulated substations. It also covers the various types of cables and distribution systems, along with an analysis of different load curves and tariff structures applicable to consumers

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

CO1: Understand the different types of non-renewable power plants and their operational principles.(Understand-L2)
CO2: Understand the different types renewable power plants and their operational principles. (Understand-L2)
CO3: Describe the components and configurations of air and gas insulated substations.
CO4: Analyze the construction and characteristics of single core and three core cables, and various distribution system configurations. (Apply-L3)
CO5: Analyze economic factors related to power generation and evaluate different tariff methods. (Analyse-L4)

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

COS	O1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSOa	PSOb	PSOc	PSOd
CO1	2	2											3	2		
CO2	2	2											3			
CO3	2	2											3			
CO4	2	2											3			
CO5	3	2											3			

Text Books:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J.B.Gupta, Transmission and Distribution of Electrical Power, S.K.Kataria and sons,10th Edition, 2012

Reference Books:

1. I.J. Nagarath& D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. TuranGonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985. 5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Hydroelectric Power Stations**	1	1/12/25		TLM2	
2.	Hydroelectric Power Plant	2	5/12,6/12		TLM1	
3.	**Thermal Power Stations**	1	8/12/25		TLM2	
4.	Description Of Components	2	12/12/25		TLM1	
5.	Electrostatic Precipitator	2	13/12/25		TLM2	
6.	Condensers	2	15/12,19/12		TLM1	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
7.	**Nuclear Power Stations**	2	20/12,22/12		TLM2	
8.	Nuclear Reactor	2	26/12,27/12		TLM1	
9.	Description of PWR, BWR and FBR.	3	29/12/25		TLM1	
10.	**Renewable Power Stations (Wind and Solar)**	2	2/1/2026		TLM1	
11.	Layout of a wind turbine	1	3/1,5/1		TLM1	
12.	solar-thermal power Plant	2	9/1,10/1		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	**Air Insulated Substations**	2	19/1,23/1		TLM1	
14.	Indoor & Outdoor Substations	2	24/1/26		TLM1	
15.	Bus bar arrangements	2	2/2,6/2		TLM1	
16.	circuit breakers	1	7/2,9/2		TLM1	
17.	**Gas Insulated Substations (GIS)**	1	13/2,14/2		TLM2	
18.	constructional aspects	1	16/2,20/2		TLM1	
No. of classes required to complete UNIT-III: 9				**No. of classes taken:**		

Unit-IV

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	**Underground Cables**	2	21/2,23/2		TLM1	
20.	Types of cables	1	27/2,28/2		TLM1	
21.	Grading of cables	2	2/3/26		TLM1	
22.	**Distribution Systems**	1	6/3/6		TLM1	
23.	A.C Distribution	1	9/3/26		TLM1	
24.	Design considerations	1	13/3,14/3		TLM1	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	**Economic Aspects**	2	14/3/26		TLM1	
26.	Base And Peak Load Plants	2	16/3/26		TLM2	

27.	**Tariff Methods**	2	20/3/26		TLM1	
28.	characteristics of a tariff	2	23/3,27,3		TLM1	
No. of classes required to complete UNIT-V: 08				**No. of classes taken:**		

S.No	**Content Beyond Syllabus**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
1.	**Burden on Power Grid**	1	28/3/26		TLM2	
2.	**Electric Vehicles**	1	30/3/26		TLM2	
3.	**Batteries**	1	4/4/26		TLM2	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.G.Nageswara Rao**	**Dr.G.Nageswara Rao**	**Dr.M.S.Giridhar**	**Dr.P.Sobha Rani**
Signature				

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. J. V. PAVAN CHAND
Course Name & Code : Induction and Synchronous Machines-23EE08
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV/A **A.Y.:** 2025-26

Pre-requisites: Principles of Electromechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

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

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

CO1	Analyze the performance of three-phase induction motor. **(Apply-L3)**
CO2	Understand the operation of single-phase induction motor. **(Understand-L2)**
CO3	Examine the performance of synchronous generators. **(Apply-L3)**
CO4	Analyse the performance of Synchronous motors. **(Apply-L3)**

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

TEXT BOOKS:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021, First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

REFERENCE:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons, 2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: 3-phase induction motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Subject & Course Outcomes	1	1-Dec-25		TLM1	
2.	Construction of Squirrel cage & Slip-ring induction motor	1	5-Dec-25		TLM1	
3.	Production of rotating magnetic field	1	6-Dec-25		TLM1	
4.	Principle of operation of 3-ph induction motor	1	8-Dec-25		TLM1	
5.	Rotor EMF and rotor frequency	1	12-Dec-25		TLM1	
6.	Rotor current and power factor at standstill and during running conditions	1	13-Dec-25		TLM1	
7.	Rotor power input, rotor copper loss and mechanical power developed & their relationship	1	15-Dec-25		TLM1	
8.	Equivalent circuit	1	19-Dec-25		TLM2	
9.	Phasor diagram	1	20-Dec-25		TLM1	
No. of classes required to complete UNIT-I: 09				**No. of classes taken:**		

UNIT-II: Performance of 3-Phase induction motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Torque equation, Expressions for maximum torque and starting torque	1	22-Dec-25		TLM1	
11.	Torque-slip characteristics	1	26-Dec-25		TLM1	
12.	Double cage and deep bar rotors	1	27-Dec-25		TLM1	
13.	No load and Brake test	1	29-Dec-25		TLM1	
14.	Blocked rotor test	1	2-Jan-26		TLM1	
15.	Circle diagram of 3-ph IM	1	3-Jan-26		TLM1	
16.	Starting methods of 3-ph induction motor: DOL starter & Auto Transformer Starter	1	5-Jan-26		TLM1	
17.	Star-delta starter & Rotor resistance	1	9-Jan-26		TLM2	

	starter					
18.	Speed control of induction motor with V/f control method	1	10-Jan-26		TLM1	
19.	Rotor resistance control and rotor EMF injection technique	1	12-Jan-26		TLM1	
20.	Crawling and cogging	1	16-Jan-26		TLM1	
21.	Induction generator operation.	1	17-Jan-26		TLM2	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Single Phase Motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Single phase induction motors: Constructional features	1	19-Jan-26			
23.	Double revolving field theory & Cross field theory	1	23-Jan-26			
24.	Equivalent circuit of 1-ph IM	1	24-Jan-26			
25.	Starting methods: capacitor start capacitor run	1	2-Feb-26			
26.	Capacitor start induction run & split phase IM	1	6-Feb-26			
27.	Shaded pole IM & AC series motor	1	7-Feb-26			
No. of classes required to complete UNIT-III: 6				**No. of classes taken:**		

UNIT-IV: Synchronous Generator

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.	Constructional features of non-salient alternator	1	9-Feb-26		TLM1	
29.	Constructional features of salient pole type alternator	1	13-Feb-26		TLM2	
30.	Armature windings – distributed and concentrated windings	1	14-Feb-26		TLM1	
31.	Distribution& pitch factors	1	16-Feb-26		TLM1	
32.	E.M.F equation	1	20-Feb-26		TLM1	
33.	Armature reaction	1	21-Feb-26			
34.	Voltage regulation by synchronous impedance method	1	23-Feb-26		TLM4	

35.	MMF method	1	27-Feb-26		TLM1	
36.	Potier triangle method	1	28-Feb-26		TLM1	
37.	Two reaction analysis of salient pole machines	1	2-Mar-26		TLM1	
38.	Methods of synchronization: 3 dark lamp method	1	6-Mar-26		TLM1	
39.	2 bright and 1 dark method and Synchroscope method	1	7-Mar-26		TLM1	
40.	Slip test & Parallel operation of alternators	1	9-Mar-26		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Synchronous Motor

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.	Synchronous motor principle & Theory of operation	1	13-Mar-26		TLM1	
42.	Effect of excitation on current and power factor	1	14-Mar-26		TLM1	
43.	Synchronous condenser & Expression for power developed	1	16-Mar-26		TLM1	
44.	Synchronous condenser & Expression for power developed	1	20-Mar-26		TLM1	
45.	Synchronous condenser & Expression for power developed	1	21-Mar-26		TLM1	
46.	Hunting and its suppression	1	23-Mar-26		TLM3	
47.	Methods of starting	1	27-Mar-26		TLM2	
48.	**ASSIGNMENT-II**	1	28-Mar-26		TLM1	
49.	**Contend Beyond Syllabus**	1	30-Mar-26		TLM1	
50.	Contend Beyond Syllabus	1	4-Apr-26		TLM1	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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	**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):

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

Mr.J.V.Pavan Chand	**Mr.J.V.Pavan Chand**	**Mr. P. Deepak Reddy**	**Dr.P.Shobha Rani**
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.J.V.PAVAN CHAND
Course Name & Code : Induction and Synchronous Machines-23EE08
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV/B **A.Y.:** 2025-26

Pre-requisites: Principles of Electromechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

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

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

CO1	Analyze the performance of three-phase induction motor. **(Apply-L3)**
CO2	Understand the operation of single-phase induction motor. **(Understand-L2)**
CO3	Examine the performance of synchronous generators. **(Apply-L3)**
CO4	Analyse the performance of Synchronous motors. **(Apply-L3)**

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

TEXT BOOKS:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021, First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

REFERENCE:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons, 2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: 3-phase induction motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Subject & Course Outcomes	1	2-Dec-25		TLM1	
2.	Construction of Squirrel cage & Slip-ring induction motor	1	3-Dec-25		TLM1	
3.	Production of rotating magnetic field	1	4-Dec-25		TLM1	
4.	Principle of operation of 3-ph induction motor	1	9-Dec-25		TLM1	
5.	Rotor EMF and rotor frequency	1	10-Dec-25		TLM1	
6.	Rotor current and power factor at standstill and during running conditions	1	11-Dec-25		TLM1	
7.	Rotor power input, rotor copper loss and mechanical power developed & their relationship	1	16-Dec-25		TLM1	
8.	Equivalent circuit ,	1	16-Dec-25		TLM2	
9.	Phasor Diagram	1	17-Dec-25		TLM1	
No. of classes required to complete UNIT-I: 09				**No. of classes taken:**		

UNIT-II: Performance of 3-Phase induction motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Torque equation, Expressions for maximum torque and starting torque	1	17-Dec-25		TLM1	
11.	Torque-slip characteristics	1	18-Dec-25		TLM1	
12.	Double cage and deep bar rotors	1	18-Dec-25		TLM1	
13.	No load and Brake test	1	23-Dec-25		TLM1	
14.	Blocked rotor test	1	23-Dec-25		TLM1	
15.	Circle diagram of 3-ph IM	1	24-Dec-25		TLM1	
16.	Starting methods of 3-ph induction motor: DOL starter & Auto	1	24-Dec-25		TLM1	

	Transformer Starter					
17.	Star-delta starter & Rotor resistance starter	1	30-Dec-25		TLM2	
18.	Speed control of induction motor with V/f control method	1	31-Dec-25		TLM1	
19.	Rotor resistance control and rotor EMF injection technique	1	6-Jan-26		TLM1	
20.	Crawling and cogging	1	7-Jan-26		TLM1	
21.	Induction generator operation.	1	8-Jan-26		TLM2	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Single Phase Motors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	Single phase induction motors: Constructional features	1	20-Jan-26			
23.	Double revolving field theory & Cross field theory	1	21-Jan-26			
24.	Equivalent circuit of 1-ph IM	1	22-Jan-26			
25.	Starting methods: capacitor start capacitor run	1	3-Feb-26			
26.	Capacitor start induction run & split phase IM	1	4-Feb-26			
27.	Shaded pole IM & AC series motor	1	5-Feb-26			
No. of classes required to complete UNIT-III: 6				**No. of classes taken:**		

UNIT-IV: Synchronous Generator

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.	Constructional features of non-salient alternator	1	10-Feb-26		TLM1	
29.	Constructional features of salient pole type alternator	1	11-Feb-26		TLM2	
30.	Armature windings – distributed and concentrated windings	1	12-Feb-26		TLM1	
31.	Distribution& pitch factors	1	17-Feb-26		TLM1	
32.	E.M.F equation	1	18-Feb-26		TLM1	

33.	Armature reaction	1	19-Feb-26			
34.	Voltage regulation by synchronous impedance method	1	24-Feb-26		TLM4	
35.	MMF method	1	25-Feb-26		TLM1	
36.	Potier triangle method	1	26-Feb-26		TLM1	
37.	Two reaction analysis of salient pole machines	1	3-Mar-26		TLM1	
38.	Methods of synchronization: 3 dark lamp method	1	5-Mar-26		TLM1	
39.	2 bright and 1 dark method and Synchroscope method	1	10-Mar-26		TLM1	
40.	Slip test & Parallel operation of alternators	1	11-Mar-26		TLM1	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Synchronous Motor

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.	Synchronous motor principle & Theory of operation	1	12-Mar-26		TLM1	
42.	Effect of excitation on current and power factor	1	17-Mar-26		TLM1	
43.	Effect of excitation on current and power factor	1	18-Mar-26		TLM1	
44.	Synchronous condenser & Expression for power developed	1	20-Mar-26		TLM1	
45.	Synchronous condenser & Expression for power developed	1	24-Mar-26		TLM1	
46.	Hunting and its suppression	1	25-Mar-26		TLM3	
47.	Hunting and its suppression	1	27-Mar-26		TLM2	
48.	Methods of starting	1	27-Mar-26		TLM2	
49.	**ASSIGNMENT-II**	1	31-Mar-26		TLM2	
50.	Contend Beyond Syllabus	1	1-Apr-26		TLM2	
51.	Contend Beyond Syllabus	1	2-Apr-26		TLM2	
No. of classes required to complete UNIT-V:11				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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	**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):

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

Mr.J.V.Pavan Chand	**Mr.J.V.Pavan Chand**	**Mr. P. Deepak Reddy**	**Dr.P.Shobha Rani**
Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K.R.L.Prasad
Course Name & Code : CONTROL SYSTEMS – 23EE09
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem/Sec : B.Tech/**EEE**/IV/A **A.Y.:** 2025-26

Pre-requisites: Engineering Mathematics, Electrical Circuit Analysis

Course Objectives:

The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.

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

CO1	Derive the transfer function of physical systems using block diagram algebra and signal flow graphs (Apply-L3).
CO2	Obtain the time response of first order and specifications of second order systems (Apply-L3).
CO3	Analyze the stability of LTI systems using Routh's stability criterion and root locus method. (Apply-L3)
CO4	Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. (Apply-L3)
CO5	Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability (Apply-L3)

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

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1.Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL MODELLING OF CONTROL SYSTEMS

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
1	Classification of Control Systems	1	02-12-2025		TLM1&TLM2	
2	Open and Closed Loop control systems	1	04-12-2025		TLM1&TLM2	
3	Tutorial	1	05-12-2025		TLM3	
4	Feedback Characteristics	2	06-12-2025 09-12-2025		TLM1&TLM2	
5	Transfer function of linear systems	1	11-12-2025		TLM1&TLM2	
6	Tutorial	1	12-12-2025		TLM3	
7	Differential equations of electrical networks	1	16-12-2025		TLM1&TLM2	
8	Translational & rotational mechanical systems	1	18-12-2025		TLM1&TLM2	
9	Tutorial	1	19-12-2025		TLM3	
10	TF of DC servo motor	1	20-12-2025		TLM1&TLM2	
11	Block diagram algebra	1	23-12-2025		TLM1&TLM2	
12	Signal flow graph – Mason's gain formula	1	25-12-2025		TLM1&TLM2	
13	Tutorial	1	26-12-2025		TLM3	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT – II: TIME RESPONSE ANALYSIS-I

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
14	Standard test signals and Step response of first order systems	1	27-12-2025		TLM1&TLM2	
15	Step response of second order systems	1	30-12-2025		TLM1&TLM2	
16	Tutorial	1	02-01-2026		TLM3	
17	Time response specifications of second order systems	1	06-01-2026		TLM1&TLM2	
18	steady state errors and error constants	1	08-01-2026		TLM1&TLM2	
19	Tutorial	1	09-01-2026		TLM3	
20	Controllers	2	20-01-2026 22-01-2026		TLM1&TLM2	
21	Tutorial	1	23-01-2026		TLM3	
22	Effects of Controllers	1	24-01-2026		TLM1&TLM2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT – III: TIME RESPONSE ANALYSIS-II

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
23	Concepts of stability	1	03-02-2026		TLM1&TLM2	
24	Routh stability criterion	1	05-02-2026		TLM1&TLM2	
25	Tutorial	1	06-02-2026		TLM3	
26	Root locus concept	1	07-02-2026		TLM1&TLM2	
27	Construction of root loci	2	10-02-2026 12-02-2026		TLM1&TLM2	
28	Tutorial	1	13-02-2026		TLM3	
29	Effect of adding poles and zeros	1	17-02-2026		TLM1&TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT – IV: FREQUENCY RESPONSE 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
30	Frequency domain specifications	1	19-02-2026		TLM1&TLM2	
31	Tutorial	1	20-02-2026		TLM3	
32	Bode Plot	1	21-02-2026		TLM1&TLM2	
33	determination of frequency domain specifications	1	24-02-2026		TLM1&TLM2	
34	Transfer function from the Bode Plot	1	26-02-2026		TLM1&TLM2	
35	Tutorial	1	27-02-2026		TLM3	
36	Nyquist Stability criteria	1	28-02-2026		TLM1&TLM2	
37	Nyquist Plot	1	05-03-2026		TLM1&TLM2	
38	Tutorial	1	06-03-2026		TLM3	
39	Lag, Lead, Lead-Lag Compensator	1	07-03-2026		TLM1&TLM2	
40	Design using Bode plot	1	10-03-2026		TLM1&TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT – V: STATE SPACE ANALYSIS of LTI Systems

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
41	Concept of state, state variables	1	12-03-2026		TLM1&TLM2	
42	Tutorial	1	13-03-2026		TLM3	
43	State space from TF	1	17-03-2026		TLM1&TLM2	
44	Tutorial	1	20-03-2026		TLM3	
45	Canonical forms	1	24-03-2026		TLM1&TLM2	
46	Tutorial	1	27-03-2026		TLM3	
47	Solution of state equations	1	28-03-2026		TLM1&TLM2	
48	State transition matrix and it's properties	1	31-03-2026		TLM1&TLM2	
49	Concepts of controllability	1	02-04-2026		TLM1&TLM2	
50	Concepts of observability	1	04-04-2026		TLM1&TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.K.R.L.PRASAD**	**Dr. K.R.L. Prasad**		
Signature				

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K.R.L.Prasad
Course Name & Code : CONTROL SYSTEMS – 23EE09
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Branch/Sem/Sec : B.Tech/**EEE**/IV/B **A.Y.:** 2025-26

Pre-requisites: Engineering Mathematics, Electrical Circuit Analysis

Course Objectives:

The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.

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

CO1	Derive the transfer function of physical systems using block diagram algebra and signal flow graphs (Apply-L3).
CO2	Obtain the time response of first order and specifications of second order systems (Apply-L3).
CO3	Analyze the stability of LTI systems using Routh's stability criterion and root locus method. (Apply-L3)
CO4	Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. (Apply-L3)
CO5	Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability (Apply-L3)

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

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1.Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: MATHEMATICAL MODELLING OF CONTROL SYSTEMS

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
1	Classification of Control Systems	1	01-12-2025		TLM1&TLM2	
2	Open and Closed Loop control systems	1	02-12-2025		TLM1&TLM2	
3	Tutorial	1	03-12-2025		TLM3	
4	Feedback Characteristics	2	06-12-2025		TLM1&TLM2	
5	Transfer function of linear systems	1	08-12-2025		TLM1&TLM2	
6	Differential equations of electrical networks	1	09-12-2025		TLM1&TLM2	
7	Tutorial	1	10-12-2025		TLM3	
8	Translational & rotational mechanical systems	1	15-12-2025		TLM1&TLM2	
9	TF of DC servo motor	1	16-12-2025		TLM1&TLM2	
10	Tutorial	1	17-12-2025		TLM3	
11	Block diagram algebra	1	20-12-2025		TLM1&TLM2	
12	Signal flow graph – Mason's gain formula	2	22-12-2025 23-12-2025		TLM1&TLM2	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT – II: TIME RESPONSE ANALYSIS-I

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
13	Tutorial	1	24-12-2025		TLM1&TLM2	
14	Standard test signals and Step response of first order systems	1	27-12-2025		TLM3	
15	Step response of second order systems	1	29-12-2025		TLM1&TLM2	
16	Time response specifications of second order systems	2	30-12-2025 05-01-2026		TLM1&TLM2	
17	Tutorial	1	31-12-2025			
18	steady state errors and error constants	1	06-01-2026		TLM1&TLM2	
19	Tutorial	1	07-01-2026		TLM3	
20	Controllers	2	19-01-2026 20-01-2026		TLM1&TLM2	
21	Tutorial	1	21-01-2026		TLM3	
22	Effects of Controllers	1	24-01-2026		TLM1&TLM2	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT – III: TIME RESPONSE ANALYSIS-II

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching - Learning Methods	HOD Sign Weekly
23	Concepts of stability	1	02-02-2026		TLM1&TLM2	
24	Routh stability criterion	1	03-02-2026		TLM1&TLM2	
25		1	04-02-2026		TLM3	
	Root locus concept	1	07-02-2026		TLM1&TLM2	
26	Construction of root loci	2	09-02-2026 10-02-2026		TLM1&TLM2	
27	Tutorial	1	11-02-2026		TLM3	
28	Effect of adding poles and zeros	1	16-02-2026		TLM1&TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:s**		

UNIT – IV: FREQUENCY RESPONSE 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
29	Frequency domain specifications	1	17-02-2026		TLM1&TLM2	
30	Tutorial		18-02-2026		TLM3	
31	Bode Plot	2	21-02-2026 23-02-2026		TLM1&TLM2	
32	determination of frequency domain specifications	1	24-02-2026		TLM1&TLM2	
33	Tutorial	1	25-02-2026		TLM3	
35	Transfer function from the Bode Plot	1	28-02-2026		TLM1&TLM2	
36	Nyquist Stability criteria	1	02-03-2026		TLM1&TLM2	
37	Tutorial	1	07-03-2026		TLM3	
38	Lag, Lead, Lead-Lag Compensator	2	09-03-2026 10-03-2026		TLM1&TLM2	
39	Tutorial	1	11-03-2026		TLM3	
40	Design using Bode plot	2	16-03-2025		TLM1&TLM2	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT – V: STATE SPACE 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
39	Concept of state, state variables	1	17-03-2026		TLM1&TLM2	
40	Tutorial	1	18-03-2026		TLM3	
41	State space from TF - Canonical forms	2	23-03-2026 24-03-2026		TLM1&TLM2	
42	Tutorial	1	25-03-2026		TLM3	
43	Solution of state equations	1	28-03-2026		TLM1&TLM2	
44	State transition matrix and it's properties	1	30-03-2026		TLM1&TLM2	
45	Concepts of controllability	1	31-03-2026		TLM1&TLM2	
46	Tutorial	1	01-04-2026		TLM3	
47	Concepts of observability	1	04-04-2026		TLM1&TLM2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.K.R.L.PRASAD**	**Dr. K.R.L. Prasad**		
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT
PART-A

Name of Course Instructor : Dr Sivanagaraju Vallabhuni
Course Name & Code : Principles of Artificial Intelligence & 23AMM1
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./EEE/IV/A&B **A.Y.:** 2025-26

Pre-requisites: Computer Programming, Mathematical Foundations of Computer Science, linear algebra, data structures and algorithms

Course Objectives: The main objectives of the course is to

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

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

CO1: Enumerate the history & foundation of AI. **(Understand- L2)**
CO2: Apply the searching algorithms for AI in problem solving. **(Apply- L3)**
CO3: Choose the appropriate representation of knowledge. **(Apply- L2)**
CO4: Choose the appropriate logic concepts**. (Apply- L2)**
CO5: understand Expert systems techniques in AI **(Understand-L2)**

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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			

Textbooks:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Online Learning Resources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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.	What Is AI?, Definition of AI	1	04-12-2025		TLM2	
2.	The Foundations of Artificial Intelligence	1	05-12-2025		TLM2	
3.	The History of Artificial Intelligence	1	06-12-2025		TLM2	
4.	The State of the Art	1	11-12-2025		TLM2	
5.	Agents and Environments	1	12-12-2025		TLM2	
6.	Agents and Environments	1	13-12-2025		TLM2	
7.	Good Behavior: The Concept of Rationality	1	18-12-2025		TLM2	
8.	The Nature of Environments	1	19-12-2025		TLM2	
9.	The Structure of Agents.	1	20-12-2025		TLM2	
No. of classes required to complete UNIT-I: 09				**No. of classes taken:**		

UNIT-II: Searching.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Problem Solving: Problem-Solving Agents	1	26-12-2025		TLM1	
11.	Example Problems	1	27-12-2025			
12.	Searching for solutions	1	01-01-2026		TLM1	
13.	uniformed search strategies Breadth first search	1	02-01-2026		TLM1	
14.	Depth first Search.	1	03-01-2026		TLM1	
15.	Search with partial information (Heuristic search) Hill climbing	1	08-01-2026		TLM1	
16.	A* Algorithms	1	09-01-2026		TLM1	
17.	AO* Algorithms	1	10-01-2026		TLM1	
18.	CSP	1	22-01-2026		TLM1	

19.	Applications of Artificial Intelligence to real world.	1	23-01-2026		TLM1	
I MID EXAMINATIONS (26-01-2026 TO 31-01-2026)						
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Representation of Knowledge

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.	Game Playing-Adversial search	1	24-01-2026		TLM2	
21.	Games, mini-max algorithm,	1	05-02-2026		TLM2	
22.	optimal decisions in multiplayer games	1	06-02-2026		TLM2	
23.	Problem in Game playing	1	07-02-2026		TLM2	
24.	Alpha-Beta pruning	1	12-02-2026		TLM2	
25.	Evaluation functions	1	13-02-2026		TLM2	
26.	Decision Trees	1	14-02-2026		TLM2	
27.	Bayes' Probabilistic Interferences.	1	19-02-2026		TLM2	
28.	Tutorial	1	20-02-2026		TLM2	
No. of classes required to complete UNIT-III: 9				**No. of classes taken:**		

UNIT-IV: Logic concepts

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.	Knowledge Representation: Knowledge-Based Agents	1	21-02-2026		TLM2	
30.	Logic	1	26-0-2026		TLM2	
31.	Propositional Logic: A Very Simple Logic	1	27-02-2026		TLM2	
32.	Introduction to Predicate Logic	1	28-02-2026		TLM2	
33.	First Order Logic	1	05-03-2026		TLM2	
34.	Syntax, Substitution	1	06-03-2026		TLM2	
35.	Unification, Deduction	1	07-03-2026		TLM2	
36.	Soundness, Completeness,	1	12-03-2026		TLM2	
37.	Consistency, Satisfiability	1	13-03-2026		TLM2	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: Expert Systems.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Expert Systems	1	14-03-2026		TLM2	
39.	Architecture of Expert Systems	1	21-03-2026		TLM2	
40.	Roles of Expert Systems	1	27-03-2026		TLM2	
41.	Knowledge Acquisition	1	28-03-2026		TLM2	
42.	Meta Knowledge Heuristics	1	01-04-2026		TLM2	
43.	Typical Expert Systems – MYCIN, DART	1	02-04-2026		TLM2	
44.	XCON; Expert Systems Shells	1	03-04-2026		TLM2	
No. of classes required to complete UNIT-V: 07				**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	1	01-04-2026		TLM2	CO5	T1	
No. of classes		01			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.
PSO 3	To develop innovative AI and machine learning solutions that strategically leverage data-driven and technical expertise to effectively solve complex, real-world problems.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr Sivanagaraju Vallabhuni**	**Dr Sivanagaraju Vallabhuni**	**Dr Shaik Salma Asiya Begum**	**Dr S Jayaprada**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. P. NARENDRA BABU
Course Name & Code : Introduction to Artificial Intelligence and Data Science– 23ADM1
L-T-P Structure : **3-0-0** **Credits:**3
Program/Branch/Sem : **B.Tech/Minor /IV** **A.Y.: 2025-26**

PRE-REQUISITE: Knowledge of Computer fundamentals & Data structures & algorithms

Course Educational Objective:

The objective of the course is to provide a strong foundation of fundamental concepts in Artificial Intelligence and a basic exposition to the goals and methods of Artificial Intelligence and provide fundamentals of Data Science.

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

CO1	Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
CO2	Apply the basic principles of AI in problem solving. **(Apply-L3).**
CO3	Choose the appropriate representation of Knowledge. **(Understand-L2)**
CO4	Enumerate the fundamentals of data science and NumPy. **(Understand-L2)**
CO5	Summarize and compute descriptive statistics using pandas. **(Understand-L2)**

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

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

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

BOS APPROVED TEXT BOOKS:

T1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach",3rd edition, Prentice Hall, 2009.
T2. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2072.
T3. Rachel Schutt&O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449- 35865-5, 1st edition, October 2073.

BOS APPROVED REFERENCE BOOKS:

R1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2071
R2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
R3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2070.
R4. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
R5. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2075
R6. Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2076.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I : INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to	1	04-12-2025		-	
2.	Introduction: What Is AI?,	1	05-12-2025		TLM1	
3.	The Foundations of Artificial Intelligence	1	06-12-2025		TLM1	
4.	The History of Artificial Intelligence,	1	11-12-2025		TLM1	
5.	The State of the Art.	1	12-12-2025		TLM1	
6.	Agents and Environments	1	13-12-2025		TLM1	
7.	Types of agents	1	18-12-2025		TLM2	
8.	Good Behavior: The Concept of Rationality	1	19-12-2025		TLM1	
9.	Omniscience vs Rational agent	1	20-12-2025		TLM1	
10.	The Nature of Environments	1	16-12-2025		TLM1	
11.	The Structure of Agents	1	27-12-2025		TLM1	
No. of classes required to complete UNIT-I: 11						

UNIT-II: PROBLEM SOLVING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Problem-Solving Agents	1	02-01-2026		TLM1	
2.	Example Problems	1	03-01-2026		TLM1	
3.	Searching for Solutions	1	08-01-2026		TLM1	
4.	Uninformed Search Strategies	2	09-01-2026 10-01-2026		TLM1	
5.	Informed (Heuristic) Search Strategies	2	10-01-2026 23-01-2026		TLM1	
6.	Local Search Algorithms	1	24-01-2026		TLM1	
No. of classes required to complete UNIT-II: 08						

UNIT-III: KNOWLEDGE REPRESENTATION TECHNIQUES

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.	Knowledge-Based Agents	1	05-02-2026		TLM1	
2.	Propositional Logic	2	06-02-2026 07-02-2026		TLM1	
3.	Ontological Engineering	1	12-02-2026		TLM1	
4.	Categories and Objects	2	13-02-2026 14-02-2026		TLM1	
5.	Events	3	19-02-2026 20-02-2026 21-02-2026		TLM1	
6.	Reasoning Systems for Categories	1	26-02-2026		TLM1	
No. of classes required to complete UNIT-III: 10						

UNIT-IV: DATA SCIENCE

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 & Datafication	2	27-02-2026 28-02-2026		TLM1	
2.	Exploratory Data Analysis	2	05-03-2026 06-03-2026		TLM1	

3.	**NumPy Basics**: A Multidimensional Array Object	1	07-03-2026		TLM1	
4.	Creating ndarrays	1	12-03-2026		TLM1	
5.	Data Types for ndarrays	2	13-03-2026 14-03-2026		TLM1	
6.	Basic Indexing and Slicing	2	19-03-2026 20-03-2026		TLM1	
7.	Boolean Indexing,	1	21-03-2026		TLM2	
8.	Fancy Indexing	1	26-03-2026		TLM1	
No. of classes required to complete UNIT-IV: 12						

UNIT-V: GETTING STARTED WITH PANDAS

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 pandas	1	27-03-2026		-	
2.	Library Architecture, Features, Applications	1	30-03-2026		TLM1	
3.	Data Structures Operations	1	02-04-2026		TLM1	
4.	Series, Data frame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis	1	03-04-2026		TLM1	
5.	Indexing and selection	1	04-04-2026		TLM1	
6.	Pandas Operations	1	04-10-2025		TLM1	
No. of classes required to complete UNIT-V: 06						

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

PART-C

EVALUATION PROCESS (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

PART-D

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. P. NARENDRA BABU**	**Mr. P. NARENDRA BABU**	**Dr.V. Suryanarayana**	**Dr. P. Bhagath**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
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
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.V.Suresh
Course Name & Code : 23QT01 – Survey of Quantum Technologies and Applications
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV SEM **A.Y.:** 2025-26
Regulations : R23

PREREQUISITE: Quantum Physics, DLD, Network Security

COURSE EDUCATIONAL OBJECTIVES (CEOs):

This course is meant to give an overview of the field of quantum technologies and make the students familiar with state-of-the-art in all four verticals. The emphasis is not on depth in this course, but on covering the exciting aspects of the field. The general physical principles of realizing qubits for computation

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

CO1	Summarize the foundational concepts of quantum physics quantum states, wavefunctions, superposition, tunneling, and entanglement and outline their relevance to quantum technologies. (**L2–Understand**)
CO2	Apply the principles of qubits and basic quantum gates to construct simple quantum circuits and identify key quantum algorithms and physical qubit platforms. **(L3–Apply)**
CO3	Apply the principles of quantum sensing to interpret the functioning of devices such as atomic clocks, gravimeters, and quantum magnetometers. **(L3–Apply)**
CO4	Summarize the key ideas of quantum communication and differentiate fiber-based, free-space, and satellite quantum links with respect to security and performance. **(L2–Understand)**
CO5	Classify major quantum materials including topological insulators, superconductors, Mott insulators, and 2D materials and outline their applications in quantum technologies. **(L2–Understand)**

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

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

TEXTBOOKS:

T1	Quantum Information Science – Manenti R., Motta M., 1st Edition, Oxford University Press (2023)
T2	Quantum computation and quantum information – Nielsen M. A., and Chuang I. L., 10th Anniversary edition, Cambridge University Press (2010)

REFERENCE BOOKS:

R1	Elements of Quantum Computation and Quantum Communication, A. Pathak, Boca Raton, CRC Press (2015)
R2	An Introduction to Quantum Computing, Phillip Kaye, Raymond Laflamme, and Michele Mosca, Oxford University Press (2006)
R3	Quantum computing explained, David McMahon, Wiley (2008)

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Quantum Technologies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
UNIT-I						
1.	Introduction to Quantum Technologies – Four Verticals; Motivation for Quantum Technologies;	1	04-12-2025		TLM1, 2	
2.	Quantum States; Wavefunctions;	1	05-12-2025		TLM1, 2	
3.	Probabilistic Interpretation; Physical Observables;	1	06-12-2025		TLM1, 2	
4.	Hermitian Operators; Expectation Values; Heisenberg Uncertainty Principle; Schrödinger Equation;	1	11-12-2025		TLM1, 2	
5.	Time Evolution; Distinction from Classical Physics; Superposition; Tunnelling; Entanglement	1	12-12-2025		TLM1, 2	
6.	No-Cloning Theorem; Simulating Classical Systems; Feynman's Quantum Simulator Idea	1	13-12-2025		TLM1, 2	
No. of classes required to complete UNIT-I: 6				**No. of classes taken:**		

UNIT-II: Quantum Computation

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.	Basics of Qubits – What is a Qubit?; Difference Between Classical Bits and Qubits	1	18-12-2025		TLM1,2	
8.	Review of Classical Logic Gates; Basics of Qubit Gates; Quantum Circuits; Physical implementation of Qubits; Semiconducting Qubits – Quantum Dots	1	19-12-2025		TLM1,2	
9.	Spin Qubits; Superconducting Qubits – Charge/Flux/Phase; Topological Qubits; Trapped Ions Rydberg Atoms; Neutral Atoms	2	20-12-2025 25-12-2025		TLM1,2	
10.	Photon Qubits – Linear Optical Setups; Integrated Photonics; NMR Qubits; NV Centres	2	26-12-2025 27-12-2025		TLM1,2	
11.	RSA Algorithm; Shor's Algorithm; Quantum Advantage; Long-Term Strategies; Error Correction	2	01-01-2026 02-01-2026		TLM1,2	
No. of classes required to complete UNIT-II:8				**No. of classes taken:**		

UNIT-III: Quantum Sensing

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.	Basics of Quantum Sensing. Single Photon Generation. Entangled Photon Generation. Photon Detection; Gravimetry	3	03-01-2026 08-01-2026 09-01-2026		TLM1,2	
13.	Atomic Clocks; Magnetometry	2	10-01-2026 15-01-2026		TLM1,2	
14.	State of the Art in Quantum; Sensing	3	16-01-2026 17-01-2026 22-01-2026		TLM1,2	
No. of classes required to complete UNIT-III: 6				**No. of classes taken:**		

UNIT-IV: Quantum Communications

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Basics of Digital Communication; Shannon Entropy; Basics of Quantum Communication	3	23-01-2026 24-01-2026 05-02-2026		TLM1,2	
16.	Quantum Security Eavesdropping & Countermeasures; Fibre-Based Quantum Communication	3	06-02-2026 07-02-2026 12-02-2026		TLM1,2	
17.	Free-Space Quantum Communication	3	13-02-2026 14-02-2026 19-02-2026		TLM1,2	
18.	Satellite-Based Quantum Communication	3	20-02-2026 21-02-2026 26-02-2026		TLM1,2	
19.	Achievements in Quantum Communication	3	27-02-2026 28-02-2026 05-03-2026		TLM1,2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Introduction to Quantum Materials

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 Quantum Materials; Importance of Quantum Materials; Applications – Quantum Computing, Spintronics	3	06-03-2026 07-03-2026 12-03-2026		TLM1,2	
21.	Topological Insulators; Superconductors	3	13-03-2026 14-03-2026 19-03-2026		TLM1,2	
22.	Mott Insulators; 2D Materials Quantum Spin Liquids	3	20-03-2026 21-03-2026		TLM1,2	
No. of classes required to complete UNIT-V: 7				**No. of classes taken:**		

Contents beyond the Syllabus

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.					**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, 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+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 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.
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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	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	**Dr. G. V. Suresh**	**Dr. G. V. Suresh**		**Dr. S. Nagarjuna Reddy**
Signature				