LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific & Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. T. Anil Raju

Course Name & Code : Advanced Digital Signal Processing – 20EC22

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

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section- A A.Y : 2025-26

PRE-REQUISITE: Signals and Systems, Probability and Random Processes, Digital Signal Processing.

COURSE OBJECTIVE: This course provides the knowledge on random signals, correlations functions and power spectrum. The course will give an idea about linear prediction models. The course also gives non-parametric methods and parametric methods for the estimation of Power spectrum.

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

CO1	Understand random signals, correlation functions and power spectrum.**(Understand – L2)**
CO2	Understand random signals, correlation functions and power spectrum.**(Understand – L2)**
CO3	Apply the concepts of normal equation solution for analyzing Wiener Filter. **(ApplyL3)**
CO4	Apply the concepts of normal equation solution for analyzing Wiener Filter. **(ApplyL3)**

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

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

TEXTBOOKS:

1. J.G.Proakis & D. G. Manolokis, "*Digital Signal Processing: Principles, Algorithms and Applications*", PHI Publishers.

REFERENCES:

1. Alan V Oppenheim & Ronald W Schaffer, "*Discrete Time Signal Processing*", PHI Publishers.
2. Dimitris G. Manolakis & Vinay K. Ingle "*Applied Digital Signal Processing*", Cambridge University Press.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Random Signals, Correlation Functions and Power Spectrum

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 Course	1	02-07-25			
2.	Random processes	1	02-07-25			
3.	Stationary random processes	1	03-07-25			
4.	Statistical Averages **Activity-Simulation using MATLAB**	1	03-07-25			
5.	Statistical Averages for Joint Random Processes	1	09-07-25			
6.	Power Density Spectrum	1	09-07-25			
7.	Problems	1	10-07-25			
8.	Discrete-Time signals	1	10-07-25			
9.	Time Averages for Discrete-Time Random Processes	1	16-07-25			
10.	Mean-Ergodic Process **Activity-Concept Matching**	1	16-07-25			
11.	Correlation-Ergodic processes	1	17-07-25			
12.	Tutorials	1	17-07-25			
No. of classes required to complete UNIT-I		**12**	No. of classes taken			

UNIT-II: Linear Prediction

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 Linear Prediction	1	23-07-25			
2.	Representation of a Stationary Random Process	1	23-07-25			
3.	Non-Stationary Random Process		24-07-25			
4.	Rational power spectra	1	24-07-25			
5.	Filter Parameters	1	30-07-25			
6.	Autocorrelation **Activity: Noise Analysis**	1	30-07-25			
7.	Relationship between filter parameters and autocorrelation sequences	1	31-07-25			
8.	Problems	1	31-07-25			
9.	Forward linear prediction **Activity: Speech signal modeling with LPC.**	1	06-08-25			
10.	Backward linear prediction	1	06-08-25			
11.	Problems	1	07-08-25			
12.	Tutorials	1	07-08-25			
No. of classes required to complete UNIT-II		**12**	No. of classes taken			

UNIT-III: Normal Equations and Wiener Filters

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	13-08-25			
2.	Normal Equations	1	13-08-25			
3.	Solutions of Normal Equations	1	14-08-25			
4.	Problems	1	14-08-25			
5.	Levinson-Durbin Algorithm **Activity: Simulation using MATLAB**	1	20-08-25			
6.	FIR Wiener Filter	1	20-08-25			
7.	Tutorials	1	23-08-25			
8.	Concept of Orthogonality	1	23-08-25			
9.	Orthogonality Principle in Linear Mean-Square Estimation **Activity: Simulation using**	1	17-09-25			
10.	IIR Wiener Filter	1	17-09-25			
11.	Noncausal Wiener Filter	1	18-09-25			
12.	Activity -1	1	18-09-25			
No. of classes required to complete UNIT-III			**12**	No. of classes taken		

UNIT-IV: Nonparametric Methods for Power Spectrum Estimation:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	24-09-25			
2.	Bartlett Method	1	24-09-25			
3.	Periodogram	1	25-09-25			
4.	Averaging Periodograms **Activity: ECG and EEG Signals**	1	25-09-25			
5.	Welch Method	1	01-10-25			
6.	Averaging Modified Periodograms	1	01-10-25			
7.	Blackman and Tukey Method **Activity: Implementation Task**	1	08-10-25			
8.	Smoothing the Periodogram	1	08-10-25			
9.	Power Spectrum Estimators	1	09-10-25			
10.	Problems	1	09-10-25			
11.	Performance Characteristics of Nonparametric Power Spectrum Estimators	1	15-10-25			
12.	Tutorials	1	15-10-25			
No. of classes required to complete UNIT-IV			**12**	No. of classes taken		

UNIT-V: Parametric Methods for Power Spectrum Estimation

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	16-10-25			
2.	Autocorrelation	1	16-10-25			
3.	Modal Parameters	1	22-10-25			
4.	Relationships Between the Autocorrelation and the Model Parameters	1	22-10-25			
5.	Problems	1	23-10-25			
6.	AR Model Parameters **Activity: Solve a Real-Time Problem**	1	23-10-25			
7.	Yule-Walker Method for the AR Model	1	29-10-25			
8.	Derivation of the Yule-Walker Method	1	29-10-25			
9.	Problems	1	30-10-25			
10.	Burg Method for the AR Model	1	30-10-25			
11.	Problems	1	04-11-25			
12.	Unconstrained Least-Squares Method for the AR Model Parameters **Activity: Collection of Research Paper**	1	04-11-25			
13.	Derivation Unconstrained Least-Squares	1	05-11-25			
14.	Problems	1	05-11-25			
15.	Tutorials	1	05-11-25			
No. of classes required to complete UNIT-V		**15**	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.	Speech Processing	1	12-11-25			
2.	Biomedical Signals (EEG, ECG),	1	12-11-25			
3.	Non-stationary Signals	1	13-11-25			
4.	Programming Examples	1	13-11-25			

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 & 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
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

Program Educational Objectives (PEOs):

PEO 1:	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
PEO 2:	To Function professionally in the rapidly changing world with advances in technology.
PEO 3:	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.
PEO 4:	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

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 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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. T Anil Raju	Mr. T Anil Raju	Dr. G L N Murthy	Dr. G Srinivasulu

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L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.M.V.Sudhakar
Course Name & Code : WIRELESS SENSOR NETWORKS, 20EC26
L-T-P Structure :**3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/VII/A **A.Y.:** 2025-2026

PREREQUISITE: Digital communications and Computer Networks

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide knowledge on applications, architectures and protocols of wireless sensor networks. The course also gives the overview regarding the software platforms and tools required for wireless sensor networks.

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

CO1	**Interpret** the operation of wireless sensor network elements. **(Understand-L2)**
CO2	**Examine** different communication protocols of wireless sensor networks and its applications. **(Apply-L3)**
CO3	**Outline** sensor tasking and techniques used to establish infrastructure of wireless sensor networks. **(Understand-L2)**
CO4	**Apply** the knowledge of sensor network platforms and tools for sensor network application development. **(Apply-L3)**

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

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

TEXTBOOKS:

T1 Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

T2 Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

REFERENCE BOOKS:

R1	1. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007
R2	2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Overview of Wireless Sensor Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	01-07-25			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	03-07-25			
3.	Wireless sensor networks- classification, advantages, limitations	1	04-07-25			
4.	Applications of WSNs	1	05-07-25			
5.	Application examples and types of applications	1	08-07-25			
6.	Unique constraints and Challenges	1	10-07-25			
7.	Characteristic Requirements and mechanisms	1	11-07-25			
8.	Advantages of Sensor Networks	1	12-07-25			
9.	Collaborative processing and Key definitions	1	15-07-25			
10.	Difference between Mobile Ad-hoc and Sensor Networks **Activity: Debate**	1	17-07-25			
11.	Enabling technologies	1	18-07-25			
12.	Application case study **Activity: Case Study**	1	19-07-25			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Architectures

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.	Single node architecture- examples of sensor nodes-mote	1	22-07-25			
14.	Hardware components of sensor nodes- description	1	24-07-25			
15.	Energy Consumption of Sensor Nodes	1	25-07-25			
16.	Operating states with different Power Consumption	1	29-07-25			
17.	Energy consumption of Transceiver,	1	31-07-25			
18.	Energy consumption of Micro controller; Memory **Activity: Project Based Learning**	1	01-08-25			
19.	Dynamic Voltage Scaling, Relation between Computation and Communication	1	02-08-25			
20.	commercially available sensor nodes, Sensor Network architecture	1	05-08-25			
21.	Sensor Network Scenarios, moving object detection **Activity: Simulation based learning CupcarbonIoTsimulator**	1	07-08-25			
22.	Optimization Goals of sensor networks, Figures of Merit	1	08-08-25			
23.	Gateway Concepts.	1	09-08-25			

No. of classes required to complete UNIT-II: 11	No. of classes taken:

UNIT-III: Networking Sensors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Wireless channel and Communication fundamentals	1	12-08-25			
25.	Fundamental concepts of protocol architectures- cross layer architecture	1	14-08-25			
26.	Physical Layer and Transceiver design considerations in WSNs	1	19-08-25			
27.	MAC Protocols for Wireless Sensor Networks	1	21-08-25			
28.	Low Duty Cycle protocols	1	22-08-25			
29.	Wakeup radio concepts , S-MAC	1	23-08-25			
30.	The IEEE 802.15.4 MAC protocol **Activity: Flipped Class room**	1	16-09-25			
31.	Routing Protocols for WSN	1	18-09-25			
32.	Energy efficient	1	19-09-25			
33.	Geographic routing	1	20-09-25			
34.	Position based routing	1	23-09-25			
35.	Routing Challenges and Design Issues in wireless sensor networks.	1	25-09-25			
36.	Routing protocol simulation for WSN **Activity: Simulation Based Learning using MATLAB**	1	26-09-25			
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Infrastructure Establishment

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.	Need for topology control in wireless sensor networks	1	27-09-25			
38.	Possible options for topology control	1	07-10-25			
39.	Examples and types for topology control- LMST	1	09-10-25			
40.	Clustering	1	10-10-25			
41.	Different types of clustering-methods **Activity: Problem Based Learning**	1	11-10-25			
42.	Time synchronization	1	14-10-25			
43.	Clocks and communication delays	1	16-10-25			
44.	Interval methods and reference broadcast methods	1	17-10-25			
45.	Localization and positioning	1	18-10-25			
46.	Sensor Tasking & Control	1	23-10-25			
47.	Task driven sensing,	1	24-10-25			
48.	Role of sensor nodes & utilities, Information based sensor tasking. **Activity: Puzzle Based Learning/Quiz**	1	25-10-25			
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Sensor Network Platforms and Tools

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

49.	Operating Systems for Wireless Sensor Networks	1	28-10-25			
50.	Types of Sensor Node Hardware	1	30-10-25			
51.	Berkeley Motes	1	31-10-25			
52.	Programming Challenges	1	01-11-25			
53.	Node-level software platforms	1	04-11-25			
54.	TinyOS, Latest node level OS and tools for WSN **Activity: Lab Demonstration**	1	06-11-25			
55.	TinyOS application example, nesC	1	07-11-25			
56.	Components of node level simulator	1	08-11-25			
57.	Network simulator-NS-2, Installation and example programs in NS-2	1	11-11-25			
58.	Different types of Node-level Simulators, State-centric programming	1	13-11-25			
59.	WSN Usage examples of simulation tools **Activity: Project Based Learning**	1	14-11-25			
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Concepts 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
60.	Security issues, Research trends to improve energy efficiency of WSN, Case study using Simulation tools-Matlab/NS-3/cupcarbon	1	15-11-25			

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

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

PART-D

PROGRAMME OUTCOMES (POs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. M.V Sudhakar	Dr. P. Venkat rao	Dr. M.V Sudhakar	Dr. G. Srinivasulu

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section - A

Course Instructor : Mrs. K. Balavani , Sr. Asst. Professor, ECE

Course Name & Code : LOW POWER VLSI DESIGN – 20EC27

L-T-P-Cr Structure : 3-0-0-3

Academic Year : 2025-26

Pre requisite: Digital Electronic Circuits and VLSI Design

Course Educational Objective: This course provides knowledge on fundamentals of low power VLSI design concepts, circuits and subsystems.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1	Summarize the Fundamental concepts of Low Power VLSI Design. (Understand – L2)
CO 2	Apply Low Power Design Approaches for IC designs. (Apply – L3)
CO 3	Analyze low voltage low power memories using mathematical models. (Analyze – L4)
CO 4	Design low voltage low power adders and multipliers. (Apply – L3)

CO's	Co-Po Attainment Table														
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2										2		3	
CO2	3	3	3		2		2					2		3	
CO3	3	3		2	3							2		3	2
CO4	3	3	3	2	3		2		1	1	1	2		3	2

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Fundamentals of Low Power CMOS VLSI Design [11 Hrs]						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to COs	1	01.07.2025			
2.	Introduction	1	02.07.2025			
3.	Sources of Power Dissipation	1	03.07.2025			
4.	Static Power Dissipation	1	04.07.2025			
5.	Short Circuit Power Dissipation	1	08.07.2025			
6.	Leakage Power Dissipation, Glitch Power Dissipation	1	09.07.2025			
7.	Short Channel Effects –Drain Induced Barrier Lowering	1	10.07.2025			
8.	Body effect	1	11.07.2025			
9.	Gate-induced Drain Leakage	1	15.07.2025			
10.	Active power dissipation.	1	16.07.2025			
11.	**Tutorial/Assignment**	1	17.07.2025			

UNIT- II: Circuit techniques for Low-Power Reduction [11 Hrs]						
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.	Concepts of leakage power	1	18.07.2025			
13.	Circuit techniques for Leakage power reduction	2	22.07.2025 23.07.2025			
14.	Power Gating, Body Biasing Techniques	1	24.07.2025			
15.	Standby leakage control	1	25.07.2025			
16.	Multi-Vth technique	1	29.07.2025			
17.	Supply voltage scaling	1	30.07.2025			
18.	VTMOS circuits	1	31.07.2025			
19.	DTMOS circuits	1	05.08.2025			
20.	Dynamic-Vth technique	1	06.08.2025			
21.	**Tutorial /Assignment**	1	07.08.2025			

UNIT – III: Low-Voltage Low-Power Adders [12 Hrs]						
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.	Introduction,	1	08.08.2025			
23.	Standard Adder Cells	1	12.08.2025			
24.	CMOS Adder's Architectures	1	13.08.2025 14.08.2025			
25.	Carry Look-Ahead Adder	1	19.08.2025			
26.	Ripple Carry Adders,	1	20.08.2025			
27.	Carry Select Adders	1	21.08.2025			
28.	Mid-1 Review	1	22.08.2025			
29.	Carry Save Adders	1	16.09.2025			
30.	Performance evaluation of various adder architectures	1	17.09.2025			

31.	Performance evaluation of various adder architectures	1	18.09.2025			
32.	**Tutorial/Assignment**	1	19.09.2025			

UNIT – IV: Low-Voltage Low-Power Multipliers [12 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
33.	Review of Multiplication	1	23.09.2025			
34.	Multiplier Architectures	1	24.09.2025			
35.	Multiplier Architectures	1	25.09.2025			
36.	Braun Multiplier	1	26.09.2025			
37.	Braun Multiplier	1	01.10.2025			
38.	Baugh-Wooley Multiplier	1	03.10.2025			
39.	Baugh-Wooley Multiplier	1	07.10.2025			
40.	Booth Multiplier	1	08.10.2025			
41.	Booth Multiplier	1	09.10.2025			
42.	Introduction to Wallace Tree Multiplier.	1	10.10.2025			
43.	Wallace Tree Multiplier.	1	14.10.2025			
44.	**Tutorial/Assignment**	1	15.10.2025			

UNIT – V: Low-Voltage Low-Power Memories [14 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
45.	Basics of ROM	1	16.10.2025			
46.	Low-Power ROM Technology	1	17.10.2025			
47.	Future Trend and Development of ROMs	1	22.10.2025			
48.	Future Trend and Development of ROMs	1	23.10.2025			
49.	Basics of SRAM	1	24.10.2025			
50.	Memory Cell	1	28.10.2025			
51.	Precharge and Equalization Circuit	1	29.10.2025			
52.	Precharge and Equalization Circuit	1	30.10.2025			
53.	Low-Power SRAM Technologies	1	31.10.2025			
54.	Basics of DRAM	2	04.11.2025 05.11.2025			
55.	Self-Refresh Circuit	1	06.11.2025			
56.	Future Trend and Development of DRAM.	1	07.11.2025			
57.	**Tutorial/Assignment**	1	11.11.2025			

BEYOND THE SYLLABUS & REVISION [3 HRS]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
58.	Advanced Power Reduction Techniques	1	12-11-2025			
59.	Sub-threshold and Near-threshold Logic	1	13-11-2025			
60.	Low Power Design Metrics	1	14-11-2025			

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	30-06-2025		
I Phase of Instructions	30-06-2025	23-08-2025	8W
Technical Training	25-08-2025	06-09-2025	2W
I Mid Examinations	08-09-2025	13-09-2025	1W
II Phase of Instructions	15-09-2025	15-11-2025	9W
II Mid Examinations	17-11-2025	22-11-2025	1W
Preparation and Practical's	24-11-2025	29-11-2025	1W
Semester End Examinations	01-12-2025	13-12-2025	2W

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mrs.K.Balavani]	[Mrs.M.Ramya Harika]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. M.Sabitha
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : **3-0-0** **Credits:**3
Program/Branch/Sem : **B.Tech/ECE- A /VII** **A.Y.: 2025-26**

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

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	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(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. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmeling, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction	1	01-07-2025		-	CO1	-	
2.	Introduction: What Is AI?,	1	02-07-2025		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	03-07-2025		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	04-07-2025		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	08-07-2025		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	09-07-2025		TLM1	CO1	T1,T2	
7.	Types of agents	1	10-07-2025		TLM2	CO1	T1,T2	
8.	Types of agents	1	11-07-2025		TLM2	CO1	T1,T2	
9.	Types of agents	1	15-07-2025		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	16-07-2025		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	17-07-2025		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	18-07-2025		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	22-07-2025		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-1	1	23-07-2025		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 14					**No. of classes taken:**			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	2	24-07-2025 25-07-2025		TLM1	CO2	T1,T2	
16.	Searching for Solutions, Uninformed Search Strategies	1	29-07-2025		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	30-07-2025		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	31-07-2025		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	01-08-2025		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	05-08-2025		TLM2	CO2	T1,T2	
21.	A* Algorithm	1	06-08-2025		TLM2	CO2	T1,T2	
22.	AO* Algorithm	1	07-08-2025		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	08-08-2025		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	12-08-2025		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	13-08-2025		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	14-08-2025		TLM1	CO2	-	
No. of classes required to complete UNIT-II: 13					**No. of classes taken:**			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	19-08-2025		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	2	20-08-2025 21-08-2025		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	22-08-2025		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	16-09-2025		TLM2	CO3	T1,T2	
31.	Depth limited search	1	17-09-2025		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	18-09-2025		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	19-09-2025		TLM2	CO3	T1,T2	

34.	Bidirectional Search.	1	23-09-2025		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	24-09-2025		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 10					**No. of classes taken:**			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	25-09-2025		TLM1	CO4	T1,T2	
37.	Minimax algorithm	1	26-09-2025		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	1	01-10-2025		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	1	03-10-2025		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	07-10-2025		TLM1	CO4	T1,T2	
41.	Representation mappings	1	08-10-2025		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	2	09-10-2025 10-10-2025		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	14-10-2025		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	15-10-2025		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	2	16-10-2025 17-10-2025		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	22-10-2025		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 13					**No. of classes taken:**			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	23-10-2025		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	1	24-10-2025		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	28-10-2025		TLM1	CO4	T1,T2	
50.	Ontological Engineering	2	29-10-2025 30-10-2025		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	1	31-10-2025		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	04-11-2025		TLM1	CO5	T1,T2	

53.	What is reasoning and Types	1	05-11-2025		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	06-11-2025		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	2	07-11-2025 11-11-2025		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	12-11-2025		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	13-11-2025		TLM1	CO5	-	
No. of classes required to complete UNIT-V:13					**No. of classes taken:**			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	14-11-2025		**TLM1**			

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 (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 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 professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, 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	**M. Sabitha**	**P. Gandhi Prakash**	**Dr.V. Surya Narayana**	**Dr. P. Bhagath**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Ch. Poorna Venkata Srinivasa Rao
Course Name & Code : CYBER SECURITY AND DIGITAL FORENSICS & 201T84
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech-ECE – A/VII SEM
A.Y. : 2025-26

PRE-REQUISITE: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to provide the basic concepts of cybersecurity and digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relaxation to computer crime. It enables students to gain experience to do independent study and research

CO1	Understand the implementation of cybercrime. **(Understand - L2)**
CO2	Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
CO3	Under the Concepts of Cyber Forensics. **(Understand- L2)**
CO4	Apply Cyber Forensics in collection of digital evidence and sources of evidence **(Apply- L3)**
CO5	Analyze the cyber forensics tools for present and future**(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	1	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	3	1	-	-	-	-	-	1	-	-	-
CO3	1	-	-	1	3	1	-	-	-	-	-	1	-	-	-
CO4	1	1	-	3	1	-	-	-	-	-	-	1	-	-	-
CO5	-	-	1	-	3	1	-	1	-	-	-	1	-	-	-
1 - Low					2 – Medium						3 - High				

TEXT BOOKS:

1. Dejey, Dr.Murugan, "cyber Forensics", Oxford University Press, India, 2018

2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY,2011

REFERENCE BOOKS:

1. Michael Simpson, Kent Blackman and James e. Corley, "Hands on Ethical Hacking and Network Defense", Cengage, 2019
2. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi
3. Alfred Basta, Nadine Basta, Mary Brown and Ravindra Kumar "Cyber Security and Cyber Laws", Cengage, 2018

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): SECTION A

UNIT-I: Introduction to Cybercrime

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
1	Introduction to CSDF	1	01-07-2025		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	01-07-2025		**TLM1**	CO1	
3	Cybercrime and Information Security	1	02-07-2025		**TLM2**	CO1	
4	Cybercriminals	1	03-07-2025		**TLM7**	CO1	
5	Classifications of Cybercrime	1	05-07-2025		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	08-07-2025 09-07-2025		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	10-07-2025 15-07-2025		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	16-07-2025 17-07-2025		**TLM2**	CO1	
9	Unit-I Assignment Test	1	19-07-2025		**TLM6**	CO1	
No. of classes required to complete UNIT-I		12	No. of classes taken:				

UNIT-II: Tools and Methods

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
10	Proxy Servers and Anonymizers	1	22-07-2025		**TLM2**	CO2	
11	Phishing, Password Cracking	2	23-07-2025 24-07-2025		**TLM7**	CO2	
12	Key loggers and Spywares Virus and Worms	1	29-07-2025		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	30-07-2025		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	31-07-2025 02-08-2025		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	05-08-2025		**TLM2**	CO2	
16	Unit-II Assignment Test	1	06-08-2025		**TLM6**	CO2	
No. of classes required to complete UNIT-2		09	No. of classes taken:				

UNIT – III: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
17	Cyber Forensics Definition	1	07-08-2025		**TLM2**	CO3	
18	Disk Forensics	2	12-08-2025 13-08-2025		**TLM1**	CO3	
19	Network Forensics	1	14-08-2025		**TLM2**	CO3	
20	Wireless Forensics	1	19-08-2025		**TLM2**	CO3	
21	Database Forensics	2	20-08-2025		**TLM2**	CO3	
22	Malware Forensics	1	21-08-2025		**TLM2**	CO3	

23	Mobile Forensics	1	23-08-2025		**TLM2**	CO3	
24	Email Forensics	1	16-09-2025		**TLM1**	CO3	
25	Unit-III Assignment Test	1	17-09-2025		**TLM6**	CO3	
No. of classes required to complete UNIT-3		11	No. of classes taken:				

UNIT-IV: Digital Evidence

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
26	Introduction to Digital Evidence and Evidence Collection procedure	2	18-09-2025 20-09-2025		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	23-09-2025 24-09-2025		**TLM7**	CO4	
28	File System Windows Registry	2	25-09-2025 27-09-2025		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	03-10-2025 07-10-2025		**TLM2**	CO4	
30	Linux Artifact	2	08-10-2025 09-10-2025		**TLM1**	CO4	
31	Digital evidence on the internet	2	14-10-2025 15-10-2025		**TLM3**	CO4	
32	Impediments to collection of Digital Evidence	1	16-10-2025		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	18-10-2025 22-10-2025		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	23-10-2025		**TLM6**	CO4	
No. of classes required to complete UNIT-4		16	No. of classes taken:				

UNIT-V: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
35	The Present and The Future Forensics Tools	1	25-10-2025		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	28-10-2025		**TLM5**	CO5	
37	Tools for Integrity Verification and Hashing	1	29-10-2025		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	30-10-2025		**TLM5**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	04-11-2025 05-11-2025		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	11-11-2025		**TLM2**	CO5	
41	Unit -5 Assignment test.	1	12-11-2025		**TLM6**	CO5	
No. of classes required to complete UNIT-5		8	No. of classes taken:				

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Using AI/ML to Analyze Cyber Threats	1	13-11-2025		TLM2	
2.	Cloud Security	1	15-11-2025		TLM2	

TLM1	Chalk and Talk - 8	**TLM6**	Assignment / Quiz - 5
TLM2	PPT - 24	**TLM7**	Seminar / Group Discussion - 3
TLM3	Tutorial -1	**TLM8**	Lab Demo
TLM4	Demonstration (Lab/Field Visit)	**TLM9**	Case Study
TLM5	ICT (NPTEL/Swayam Prabha/MOOCS) - 2		

Part – C

EVALUATION PROCESS:

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	30-06-2025		
I Phase of Instructions	30-06-2025	23-08-2025	8W
Technical Training	25-08-2025	06-09-2025	2W
I Mid Examinations	08-09-2025	13-09-2025	1W
II Phase of Instructions	15-09-2025	15-11-2025	9W
II Mid Examinations	17-11-2025	22-11-2025	1W
Preparation and Practical's	24-11-2025	29-11-2025	1W
Semester End Examinations	01-12-2025	13-12-2025	2W

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Pursue a successful career in the area of Information Technology or its allied fields.
PEO 2	Exhibit sound knowledge in the fundamentals of Information Technology and apply practical experience with programming techniques to solve real world problems.
PEO 3	Able to demonstrate self-learning, life-long learning and work in teams on multidisciplinary projects.
PEO 4	Able to understand the professional code of ethics and demonstrate ethical behavior, effective communication and team work and leadership skills in their job.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**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.
PO5	**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.
PO6	**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.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solution sin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **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.

PO11 **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.

PO12 **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 Organize, Analyze and Interpret the data to extract meaningful conclusions.

PSO2 Design, Implement and Evaluate a computer-based system to meet desired needs.

PSO3 Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Ch.Poorna Venkata Srinivasa Rao	Dr. K Phaneendra	Mr. G.Rajendra	Dr. D. Ratna Kishore
Signature				

DEPARTMENT OF ECE
COURSE HANDOUT
PART - A

PROGRAM : B.Tech. - VII-Sem. - ECE – A Section
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : Management Science for Engineers – 20HS02
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Mr. S.Srinivasa reddy, Sr. Assistant Professor
COURSE COORDINATOR : Dr. A.Nageswara Rao, Sr. Assistant Professor
PER-REQUISITE : NIL

COURSE EDUCATIONAL OBJECTIVES:
1. To make students understand management, its principles, contribution to management, organization,
and its basic issues and types.
2. To make students understand the concept of plant location and its factors and plant layout and types,
method of production and work study importance.
3. To understand the purpose and function of statistical quality control. And understand the material management techniques.

COURSE OUTCOMES:
After completion of the course student will be able to:
CO1: Understand management principles to practical situations based on the organization structures. (L2)
CO2: Design Effective plant Layouts by using work study methods. (L2)
CO3: Apply quality control techniques for improvement of quality and materials management. (L3)
CO4: Develop best practices of HRM in corporate Business to raise employee productivity. (L2)
CO5: Identify critical path and project completion time by using CPM and PERT techniques. (L3)

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

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

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

BOS APPROVED TEXT BOOKS:
1. Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

References:

1. Koontz & weihrich – Essentials of management, TMH, 10th edition, 2015
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
3. O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction To Management	1	30-06-25		TLM1	CO1	T1	
2.	Definition, Nature, Importance of management	1	01-07-25		TLM1	CO1	T1	
3.	Functions of Management	1	02-07-25		TLM1	CO1	T1	
4.	Taylor's scientific management theory	1	04-07-25		TLM1	CO1	T1	
CRT Classes 25-08-25 TO 06-09-25								
5.	Fayal's principles of management	1	07-07-25		TLM3	CO1	T1	
6.	Contribution of Elton mayo, Maslow	1	08-07-25		TLM1	CO1	T1	
7.	Herzberg, Douglas MC Gregor principles of management	1	11-07-25		TLM1	CO1	T1	
8.	Basic Concepts of Organization, Authority, Responsibility	1	14-07-25		TLM1	CO1	T1	
9.	Delegation of Authority, Span of control	1	15-07-25		TLM1	CO1	T1, R1	
	Departmentation and Decentralization, Organization structures	1	16-07-25		TLM1	CO1	T1, R1	
	Line and Functional staff organization,	1	18-07-25		TLM1	CO1	T1, R1	
	Committee and Matrix organization	1	21-07-25		TLM1	CO1	T1	
No. of classes required to complete UNIT-I		12	22-07-25		No. of classes taken:			

UNIT-II: OPERATIONS MANAGEMENT

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
	Introduction	1	23-07-25		TLM1	CO2	T1, R3	
	Plant location	1	25-07-25		TLM1	CO2	T1, R3	

10.								
11.	Factors influencing location	1	28-07-25		TLM1	CO2	T1, R3	
12.	Principles of plant layouts	1	29-07-25		TLM1	CO2	T1, R3	
13.	Types of plant layouts	1	30-07-25		TLM1	CO2	T1, R3	
14.	Methods of produ ction	1	01-08-25		TLM3	CO2	T1, R3	
15.	Work study	1	04-08-25		TLM1	CO2	T1	
16.		1	05-08-25		TLM1	CO2	T1	
17.	Basic procedure involved in method study	1	06-08-25		TLM1	CO2	T1	
18.	Work measurement	1	08-08-25		TLM3	CO2	T1	
No. of classes required to complete UNIT-II		10	11-08-25		No. of classes taken:			

UNIT-III: STATISTICAL QUALITY CONTROL & MATERIALS MANAGEMENT

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
	Introduction, Concept of Quality	1	12-08-25		TLM1	CO3	T1	
	Quality Control functions	1	13-08-25		TLM1	CO3	T1, R1	
	Meaning of SQC, Variables and attributes	1	18-08-25		TLM1	CO3	T1, R1	
	X chart, R Chart	1	19-08-25		TLM1	CO3	T1	
	C Chart, P Chart	1	20-08-25		TLM3	CO3	T1, R1	
	Simple problems	1	22-08-25		TLM1	CO3	T1, R1	
	Acceptance sampling	1	22-08-25		TLM1	CO3	T1	
MID-I 08-09-25 TO 19-09-25								
	Sampling plans	1	15-09-25		TLM1	CO3	T1, R1	
	Deming's contribution to quality	1	16-09-25		TLM1	CO3	T1, R1	
	Materials management Meaning and objectives	1	17-09-25		TLM1	CO3	T1	
	Inventory control	1	19-09-25		TLM3	CO3	T1	
	Need for inventory control	1	22-09-25		TLM1	CO3	T2	
	Purchase procedure, Store records	1	23-09-25		TLM1	CO3	T1	
	EOQ, ABC analysis	1	24-09-25		TLM1	CO3	T1, R2	
	Stock levels	1	26-09-25		TLM1	CO3	T1, R2	

19.								
No. of classes required to complete UNIT-III		15	04-10-25		No. of classes taken:			

UNIT-IV: HUMAN RESOURCE MANAGEMENT (HRM)

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
	Introduction	1	06-10-25		TLM1	CO4	T1	
	Concepts of HRM	1	07-10-25		TLM1	CO4	T1	
	Basic functions of HR manager	1	08-10-25		TLM1	CO4	T1, R2	
	Man power planning	1	10-10-25		TLM3	CO4	T1, R2	
	Recruitment	1	13-10-25		TLM1	CO4	T1, R2	
	Selection,	1	14-10-25		TLM1	CO4	T1, R1	
	Training & developmemt	1	15-10-25		TLM1	CO4	T1, R1	
	Placement	1	17-10-25		TLM1	CO4	T1	
	Wage and salary administration	1	20-10-25		TLM3	CO4	T1, R1	
	Promotion, Transfers Separation	1	22-10-25		TLM1	CO4	T1, R1	
	Performance appraisal	1	24-10-25		TLM1	CO4	T1	
	Job evaluation and merit rating	1	27-10-25		TLM3	CO4	T1	
No. of classes required to complete UNIT-IV		12	28-10-25		No. of classes taken:			

UNIT-V: PROJECT MANAGEMENT

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
	Introduction	1	29-10-25		TLM1	CO5	T1,R2	
	Early techniques in project management	1	31-10-25		TLM1	CO5	T1, R2	
	Network analysis	1	03-11-25		TLM1	CO5	T1,R2	
	Programme Evaluation and Review Technique (PERT)	1	04-11-25		TLM1	CO5	T1,R2	
	Problems	1	05-11-25		TLM1	CO5	T1,R2	
	Critical path method (CPM)	1	07-11-25		TLM1	CO5	T1, R2	
	Identifying critical path	1	10-11-25		TLM1	CO5	T1,R2	
	Probability of completing project within given time	1	12-11-25		TLM1	CO5	T1,R2	
	Project cost analysis	1	13-11-25		TLM1	CO5	T1,R2	
	project	1	14-11-25		TLM1	CO5	T1, R2	

20.	crashing							
No. of classes required to complete UNIT-V		10			No. of classes taken:			

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

Part – C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2,3	B1=15
Quiz – 1	1,2,3	Q1=10
Assignment 3	3	A3=5
Assignment 4	4	A4=5
Assignment 5	5	A5=5
II-Mid Examination	3,4,5	B2=15
Quiz – 2	3,4,5	Q2=10
Evaluation of Assignment: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=15
Evaluation of Quiz Marks: Q=75% of Max(Q1,Q2)+25% of Min(Q1,Q2	1,2,3,4,5	Q=10
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	CIE=30
Semester End Examinations	1,2,3,4,5	SEE=70
Total Marks: CIE+SEE	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Pursue higher education, entrepreneurship and research to compete at global level.
PEO2: Design and develop products innovatively in the area of computer science and engineering ar in

Other allied fields.

PEO3: Function effectively as individuals and as members of a team in the conduct of interdisciplinary

Projects and even at all the levels with ethics and necessary attitude.

PEO4: Serve ever-changing needs of the society with a pragmatic perception.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - 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.

PO3 - Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - 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.

PO5 - 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.

PO6 - 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.

PO7 - 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.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - 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.

PO11 - Project Management and Finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO1: The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.

PSO2: The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.

PSO3: To inculcate an ability to analyze, design and implement database applications.

Mr. S.Srinivasa reddy	Dr. A.Nageswara Rao	Mr. J. Subba Reddy	Dr. M.B.S.Sreekara Reddy
Course Instructor	Course Coordinator	Module Coordinator	HoD

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Name of Course Instructor: Mrs. K. Balavani
Course Name & Code : INTERNET OF THINGS-20EC30
L-T-P Structure :**1-0-2** **Credits:** 2
Program/Sem/Sec : B.Tech/VII/A **A.Y.:** 2025-2026

Pre requisite: EMI, MPMC, Python Programming.

Course Educational Objective: In this course, student will learn about basics of IoT and procedure to develop prototypes for engineering applications.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1 : Understand the programming concepts of IOT. (**Understand – L2)**

CO 2 : Develop real time applications using Internet of Things. (**Apply – L3)**

CO 3 **:** Demonstrate the integration of sensors with IOT. (**Understand – L2)**

CO 4 : Adapt effective Communication, presentation and report writing skills **(Apply – L3)**

UNIT – I: IoT Basics:
IoT, Frame work, Architectural View, Technology, Sources, M2M communication, Sensors, Participatory sensing, RFID, Wireless sensor network elements

UNIT – II: IoT Applications:
Prototyping embedded devices for M2M and IoT, M2M and IoT case studies.

TEXT BOOK:
1. Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hill Publication, 2017.
2. Zach Shelby, Carsten Bormann: "The Wireless Embedded Internet", Wiley, 1st Edition.

REFERENCES:
1. Arshdeep Bahga and Vijay Madisetti, Internet of Things – A Hands-on Approach, University Press, 2015
2. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford Press.

HANDS – ON Laboratory Sessions:
1. Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino
2. Interfacing Ultrasonic sensor and PIR sensor using Arduino
3. Design of Traffic Light Simulator using Arduino
4. Design of Water flow detection using an Arduino board
5. Interfacing of LED, Push button with Raspberry Pi and Python Program
6. Design of Motion Sensor Alarm using PIR Sensor
7. Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi
8. Interfacing DS18B20 Temperature Sensor with Raspberry Pi
9. Implementation of DC Motor and Stepper Motor Control with Raspberry Pi
10. Raspberry Pi based Smart Phone Controlled Home Automation
11. Smart Traffic light Controller

12. Smart Health Monitoring System

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT – I: IoT Basics						
S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs, POs	1	01-07-2025		TLM2	
2.	IoT Introduction and Frame work	1	08-07-2025		TLM2	
3.	Architectural View of IoT	1	15-07-2025		TLM2	
4.	IoT Technology and Sources,	1	22-07-2025		TLM2	
5.	M2M communication	1	29-07-2025		TLM2	
6.	Sensors for IoT	1	05-08-2025		TLM2	
7.	Participatory sensing	1	12-08-2025		TLM2	
8.	RFID	1	19-08-2025		TLM2	
9.	Wireless sensor network elements	1	25-08-2025		TLM2	

UNIT – II: IoT Applications						
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.	Prototyping embedded devices for M2M	2	16-09-2025 23-09-2025		TLM2	
11.	Prototyping embedded devices for IoT	2	07-10-2025 14-10-2025		TLM2	
12.	M2M case studies.	2	28-10-2025 04-11-2025		TLM2	
13.	IoT case studies.	1	11-11-2025		TLM2	

Hands – on Laboratory Session						
S.No.	Experiments to be conducted	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	CYCLE-1					
1.	Introduction to Lab/Demo	3	30-06-2025		TLM4	
2.	Interfacing LED. DHT11-Temperature and, humidity sensor using Arduino	3	07-07-2025		TLM4	
3.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	3	14-07-2025		TLM4	
4.	Design of Traffic Light Simulator using Arduino	3	21-07-2025		TLM4	
5.	Design of Water flow detection using an Arduino board	3	28-07-2025		TLM4	
6.	Discussion of Arduino based Projects and Demo	3	04-08-2025		TLM6	
7.	Discussion of Arduino based Projects and Demo	3	11-08-2025		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	3	18-08-2025		TLM4	
9.	Design of Motion Sensor Alarm using PIR Sensor	3	15-09-2025		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	3	22-09-2025		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	3	29-09-2025		TLM4	

12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	3	06-10-2024		TLM4
13.	Raspberry Pi based Smart Phone Controlled Home Automation	3	13-10-2024		TLM4
14.	Smart Traffic light Controller Smart Health Monitoring	3	20-10-2024		TLM4
15.	Implementation of Wireless Sensor Network using Raspberry Pi boards	3	27-10-2024		TLM4
16.	Discussion of Raspberry Pi based Projects and Demo	3	03-11-2024		TLM6
17.	Project Report writing & Verification	3	10-11-2024		TLM6
No. of classes required to complete:		**51**	**No. of classes conducted:**		

PART-C

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

EVALUATION PROCESS

Evaluation Task	**Marks**
Report	10
Quality of work	10
Presentation	20
Interaction / Queries	10
Total Marks:	**50**

PART – D

PROGRAMME OUTCOMES (POs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mrs.K. Balavani]	[Dr.P.Lachi Reddy]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific & Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. P. Lachi Reddy
Course Name & Code : VLSI Testing and Verification – 20ECH4
L-T-P Structure : 3-1-0 Credits : 4
Program/Sem/Sec : B. Tech., ECE, VII-Sem., Honors A.Y : 2025-26

PRE-REQUISITE: VLSI Design

COURSE EDUCATIONAL OBJECTIVES (CEOs):
In this course student will learn about testable design, test generation algorithms for combinational and sequential circuits, design verification and verification tools, timing and physical design verification.

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

CO 1	Identify the significance of testable design **(Understand – L2)**
CO 2	Implement combinational and sequential circuit test generation algorithms **(Apply – L3)**
CO 3	Understand the importance of Design verification **(Understand – L2)**
CO 4	Learn verification tools **(Apply – L3)**
CO 5	Analyze the static timing verification and physical design verification **(Analyze – L4)**

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

CO	PO1	PO 2	PO3	PO4	PO5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	-	-	-	-	-	--	-	-	1	-	2	-
CO2	1	2	2	1	2	-	-	-	-	-	-	1	-	2	-
CO3	1	2	3	1	2	-	-	-	-	-	-	2	-	3	-
CO4	1	2	3	2	3	-	-	-	-	-	-	2	-	3	-
CO5	3	2	3	2	3	-	-	-	-	-	-	2	-	3	-

Correlation Levels: **1-**Slight (Low), **2-**Moderate (Medium), **3-**Substantial (High) and No correlation: **'-'**

TEXT BOOKS:
1. P. K. Lala, **"Digital Circuit Testing and Testability"**, Academic Press.
2. M.L. Bushnell and V.D. Agrawal, **"Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits"**, Kluwer Academic Publishers.

REFERENCE BOOKS:
1. M. Abramovici, M.A. Breuer and A.D. Friedman, **"Digital Systems and Testable Design"**, Jaico Publishing House, 2002.
2. Janick Bergeron, **"Writing test benches: functional verification of HDL models"**, 2nd edition, Kluwer Academic Publishers, 2003.
3. Jayaram Bhasker, Rakesh Chadha, **"Static Timing Analysis for Nanometer Designs"** A practical approach, Springer publications.
4. Prakash Rashinkar, Peter Paterson, Leena Singh **"System on a Chip Verification"**, Kluwer Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Testing; Test Generation for Combinational Logic Circuits

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	General Interaction & Introduction to the course, Course Objective and Outcomes, POs, PSOs and Mapping with COs	2	04-07-2025		-	
2.	Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends Affecting Testing	2	05-07-2025		-	
3.	Faults in Digital Circuits: Failures and Faults, Modeling of Faults, Temporary Faults	2	11-07-2025		TLM1	
4.	Fault Diagnosis of Digital Circuits, Test Generation Techniques for Combinational Circuits	2	18-07-2025		TLM2	
5.	Test Generation Techniques for Combinational Circuits, Detection of Multiple Fauls in Combinational Logic Circuits	2	19-07-2025		TLM2	
No. of classes required to complete UNIT-I		**10**	**No. of classes taken**			

UNIT-II: Design of Testable Sequential Circuits; Built-In Self-Test

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Controllability and Observability, Ad Hoc Design Rules for Improving Testability, Design of Dignosable Sequential Circuits	2	25-07-2025		TLM2	
2.	The Scan-Path Technique for Testable Sequential Circuit Design, Level-Sensitive Scan Design, Random Access Scan Technique	2	01-08-2025		TLM2	
3.	Partial Scan, Testable Sequential Circuit Design Using Nonscan Techniques, Cross Check, Boundry Scan	2	02-08-2025		TLM2	
4.	Built-In Self-Test: Test Pattern Generation for BIST, Output Response Analysis	2	08-08-2025		TLM2	
5.	Circular BIST, BIST Architectures	2	22-08-2025		TLM2	
No. of classes required to complete UNIT-II		**10**	**No. of classes taken**			

UNIT-III: Testable Memory Design; Importance of Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	RAM Fault Models, Test Algorithms for RAMs, Detection of Pattern Sensitive Faults	2	23-08-2025		TLM2	
2.	BIST Techniques for Ram Chips, Test Generation and BIST for Embedded RAMs	2	05-09-2025		TLM2	
3.	What is verification? What is attest bench? The importance of verification, Reconvergence model	2	06-09-2025		TLM2	
4.	Formal verification, Equivalence checking, Model checking, Functional verification	2	12-09-2025		TLM2	
No. of classes required to complete UNIT-III		**08**	**No. of classes taken**			

UNIT-IV: Verification Tools; The verification plan

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Linting tools: Limitations of linting tools, lintingverilog source code, linting VHDL source code, lintingOpenVera and esource code, code reviews	2	19-09-2025		TLM2	
2.	Simulators: Stimulus and response, Event based simulation, cycle based simulation, Co-simulators, verification intellectual property: hardware modelers, waveform viewers	2	20-09-2025		TLM2	
3.	The role of verification plan: specifying the verification plan, defining the first success, Levels of verification: unit level verification, reusable components verification	2	26-09-2025		TLM2	
4.	ASIC and FPGA verification, system level verification, board level verification, verifying strategies, verifying responses	2	27-09-2025		TLM2	
No. of classes required to complete UNIT-IV		**08**	**No. of classes taken**			

UNIT-V: Static Timing Verification; Physical Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of static timing analysis, Cross talk and noise, Limitations of STA, Slew of a wave form, Skew between the signals	2	10-10-2025		TLM2	
2.	Timing arcs and unateness, Min and Max timing paths, clock domains, operating conditions	2	17-10-2025		TLM2	

3.	critical path analysis, false paths, Timing models, Layout rule checks and electrical rule checks	2	18-10-2025		TLM2	
4.	Parasitic extraction, Antenna, Crosstalk and Noise: Cross talk glitch analysis	2	24-10-2025		TLM2	
5.	crosstalk delay analysis, timing verification	2	25-10-2025		TLM2	
No. of classes required to complete UNIT-V		**10**	**No. of classes taken**			

Contents beyond the Syllabus

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hardware/software co-verification	**2**	01-11-2025		TLM4	

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 & 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
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):

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 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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. G. Srinivasulu

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch. Srinivasa Rao
CourseName&Code **Introduction to Software Engineering** &20CSM6
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem : B.Tech,VII-Sem(Minors) **A.Y.** **:** 2025-26

PREREQUISITE: Object Oriented Programming.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to provide an understanding of different s/w process models and how to choose one among them by gathering the requirements from a client and specifying them. Using those requirements in the design of the software architecture based on the choices with the help of modules and interfaces. To enable s/w development, by using different testing techniques like unit, integration and functional testing, quality assurance can be achieved.

CO1	Understand the fundamentals of software engineering concepts and software Process models. **(Understand-L2)**
CO2	Apply the requirement elicitation techniques for preparing SRS and design engineering. **(Apply-L3)**
CO3	Understanding the basic building blocks of UML, Class, and object diagrams. **(Understand-L2)**
CO4	Apply behavioral models for real world applications. **(Apply-L3)**
CO5	Demonstrate different software testing approaches for testing real time applications. **(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
CO1	3												3		
CO2		2											2	1	
CO3	3												3	2	
CO4		2												3	1
CO5	2	2													3
1 - Low						**2 –**Medium						**3 -** High			

TEXTBOOKS:

T1 Roger S. Pressman, "Software engineering- A practitioner 's Approach", TMH InternationalEdition, 6th edition, 2005.

T2 Grady Booch, James Rum baugh, Ivar Jacobson, "The Unified Modeling Language User Guide", PEARSON,4thImpression,2012.

REFERENCE BOOKS:

R1 Software Engineering- Concepts and practices: Ugrasen Suman, Cengage learning

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

R3 Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI **R4 .**

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Software and software Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs discussion	1	04/07/2025		TLM2	
2.	The evolving role of Software	1	04/07/2025		TLM2	
3.	Characteristics of Software	1	05/07/2025		TLM2	
4.	Importance of software Engineering	1	05/07/2025		TLM2	
5.	Changing nature of software	1	11/07/2025		TLM2	
6.	Legacy Software	1	11/07/2025		TLM2	
7.	Software Myths	1	12/07/2025		TLM2	
8.	Software process model: layered. technology	1	12/07/2025		TLM2	
9.	Process framework The process and product	1	18/07/2025		TLM2	
10.	Waterfall model	1	18/07/2025		TLM2	
11.	Incremental model	1	19/07/2025		TLM2	
12.	Spiral and V model	1	19/07/2025		TLM2	
13.	Component based s/w development	1	25/07/2025		TLM2	
14.	Unified Process model	1	25/07/2025		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Requirements Analysis and Software design

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.	Requirements gathering	1	01/08/2025		TLM2	
16.	Requirement analysis	1	01/08/2025		TLM2	
17.	Software requirement specification	1	02/08/2025		TLM2	
18.	SRS document case study	1	02/08/2025		TLM2	
19.	Overview of design process	1	08/08/2025		TLM2	
20.	Design concepts	1	08/08/2025		TLM2	
21.	Architectural concepts	1	09/08/2025		TLM2	
22.	Examples	1	09/08/2025		TLM2	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Design using UML

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Building Blocks of UML	1	22/08/2025		TLM2	
25.	Defining things	1	22/08/2025		TLM2	
26.	Defining relationships and diagrams	1	23/08/2025		TLM2	
27.	Common Mechanism in UML	1	23/08/2025		TLM2	
28.	Class diagrams	1	19/09/2025		TLM2	
29.	Examples	1	19/09/2025		TLM2	
30.	Object diagrams and examples	1	20/09/2025		TLM2	
31.	Revision	1	20/09/2025		TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: Behavioral Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Interactions	1	26/09/2025		TLM2	
33.	Interaction diagrams	1	26/09/2025		TLM2	
34.	Use-cases	1	27/09/2025		TLM2	
35.	Use-case diagrams	1	27/09/2025		TLM2	
36.	Activity diagrams	1	03/10/2025		TLM2	
37.	Events and signals, state machines	1	03/10/2025		TLM2	
38.	processes and Threads, time, and space	1	04/10/2025		TLM2	
39.	State chart diagrams	1	04/10/2025		TLM2	
40.	Component diagrams	1	10/10/2025		TLM2	
41.	Deployment diagrams	1	10/10/2025		TLM2	
42.	Examples	1	11/10/2025		TLM2	
43.	Revision	1	11/10/2025		TLM2	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Testing 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
44.	Software testing fundamentals	1	17/10/2025		TLM2	
45.	Unit testing	1	17/10/2025		TLM2	
46.	Integration testing	2	18/10/2025		TLM2	
47.	Blackbox testing	1	24/10/2025		TLM2	
48.	Whitebox testing	1	24/10/2025		TLM2	
49.	Debugging	2	25/10/2025		TLM2	
50.	System testing	2	31/10/2025		TLM2	
51.	Examples	2	01/11/2025		TLM2	
52.	Revision	2	07/11/2025		TLM2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond the Syllabus:

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50	Case study version control	2	08/11/2025		TLM6	
51	Case study test case preparation	2	14/11/2025		TLM6	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial/Assignment	**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
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	**Ch. Srinivasa Rao**	**Ch. Srinivasa Rao**	**Dr.D.V. Subbaiah**	**Dr. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. V SOWJANYA
Course Name & Code : Introduction to Deep Learning (20ADM5)
L-T-P Structure : 3-1-0 **Credits:** 3
Program/Sem/Sec :**IV B.Tech/ VII Sem/ Minor** **A.Y.:** 2025-26

PREREQUISITE: Probability and Statistics, LATT, Statistical reasoning in machine learning

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objectives of this course are to:

1. Provide a strong mathematical foundation for deep learning through linear algebra, probability, and optimization.
2. Introduce the fundamentals of machine learning and its relevance to deep learning.
3. Familiarize students with various architectures of deep neural networks.
4. Enable students to design and implement Convolutional Neural Networks (CNNs).
5. Equip students to build and train Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks for sequence modelling tasks.

COURSE OUTCOMES (CO's): After successful completion of the course the students are able to

CO1	Demonstrate the mathematical foundation of Neural network **(Understand -L2)**
CO2	Describe the basics of machine learning **(Understand- L2)**
CO3	Compare the different architectures of Deep Neural Network **(Analyze- L4)**
CO4	Build a convolutional Neural Network **(Apply- L3)**
CO5	Build and train RNN and LSTMs. **(Apply- L3)**

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

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

1 - Low **2** –Medium **3** – High

TEXTBOOKS:

T1 Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courvile, MIT Press, 2016

T2 Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

REFERENCE BOOKS:

R1 Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019

R2 Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Linear Algebra & Probability and information Theory

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**UNIT-1 Linear Algebra:** Introduction about CO's & PO's related to Course,	1	04.7.2025		TLM 1, 2	
2.	Scalars, Vectors, Matrices and Tensors, Matrix Operations, Types of Matrices, Norms	1	04.7.2025		TLM 1, 2	
3.	Eigen Decomposition, Singular Value Decomposition, Principal Component Analysis	2	05.7.2025		TLM 1, 2	
4.	**Probability and Information Theory:** Random Variables, Probability Distributions, Marginal Probability, Conditional Probability	2	11.7.2025		TLM 1, 2	
5.	Expectation, Variance and Covariance, Bayes' Rule,	2	12.7.2025		TLM 1, 2	
6.	**Information Theory.** Numerical Computation: Overflow and Underflow.	2	18.7.2025		TLM 1, 2	
7.	Gradient-Based Optimization, Constrained Optimization, Linear Least Squares	2	19.7.2025		TLM 1, 2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Machine Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	**Machine Learning:** Basics and Underfitting, Hyper parameters and Validation Sets, Estimators	2	25.7.2025		TLM 1, 2	
9.	Bias and Variance, Maximum Likelihood, Bayesian Statistics,	2	01.8.2025		TLM 1, 2	
10.	Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning.	2	02.8.2025		TLM 1, 2	
11.	**Deep Feed forward Networks:** Learning XOR,	1	08.8.2025		TLM 1, 2	
12.	Gradient-Based Learning, Hidden Units	1	09.8.2025		TLM 1, 2	
13.	Architecture Design, Back-Propagation and other Differentiation Algorithms	2	22.8.2025		TLM 1, 2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Regularization for Deep Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization	2	23.8.2025		TLM 1, 2	
15.	Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness	2	19.9.2025		TLM 1, 2	
16.	Semi-Supervised Learning, Multi-Task Learning, Early Stopping	2	20.9.2025		TLM 1, 2	
17.	Parameter Tying and Parameter Sharing, Sparse Representations,	2	26.9.2025		TLM 1, 2	
18.	Bagging and Other Ensemble Methods, Dropout, Adversarial Training,	2	27.9.2025		TLM 1, 2	
19.	Tangent Distance, Tangent Prop and Manifold Tangent Classifier.	2	10.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Convolutional networks

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.	**Convolutional Networks**: The Convolution Operation, Pooling.	2	11.10.2025		TLM 1, 2	
21.	Convolution, Basic Convolution Functions, Structured Outputs, Data Types	2	17.10.2025		TLM 1, 2	
22.	Efficient Convolution Algorithms, Random Unsupervised Features	2	18.10.2025		TLM 1, 2	
23.	Basis for Convolutional Networks	2	24.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Sequence Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	**Sequence Modeling: Recurrent and Recursive Nets:** Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs	2	25.10.2025		TLM 1, 2	
25.	Encoder-Decoder Sequence-to-Sequence Architectures	2	31.10.2025		TLM 1, 2	
26.	Deep Recurrent Networks, Recursive Neural Networks	2	01.11.2025		TLM 1, 2	
27.	Echo State Networks Models, LSTM, Gated RNNs	2	07.11.2025		TLM 1, 2	
28.	Optimization for Long-Term Dependencies	2	08.11.2025		TLM 1, 2	
29.	Auto encoders, Deep Generative	2	14.11.2025		TLM 1, 2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Transformers and Attention Mechanism (used in models like BERT, GPT).	1	15.11.2025		TLM 1, 2	
31.	Graph Neural Networks (GNNs)	1	15.11.2025		TLM 1, 2	

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 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 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software projects development using open-source programming environment for the success of Organization.
PSO 2	The ability to design and develop computer programs in networking and 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	**Ms V Sowjanya**	**Ms V Sowjanya**	**Dr V Surya Narayana**	**Dr. P. Bhagath**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

Course Instructor : Mrs.K.Lakshmi Devi

Course Name & Code : OBJECT ORIENTED ANALYSIS AND DESIGN USING UML-**20ITM5**

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

Program/Sem/Sec **:** B.Tech, VII SEM **A.Y.:** 2025-26

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

CO1: Understand the basic concepts of object and Elements of object model (Understand -L2)
CO2: Identify the design patterns to solve object oriented design problems (Understand -L2)
CO3: Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)
CO4: Design Interaction diagrams for a given application. (Analyze –L3)
CO5: Design use case, activity, Implementation diagrams for any application (Analyze –L3)

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	-	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	1	3	-	-	-	-	-	-	-	-	-	-	1	-

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

BOS APPROVED TEXT BOOKS:

1. Grady Booch, ―Object Oriented Analysis & Design with Applications‖, 2 Edition, Pearson Education 1999. 2. Ali Bahrami, ―Object Oriented Systems Development – Using the Unified Modeling Language‖. TGH International Editions, Computer Science Series, 1999.

BOS APPROVED REFERENCE BOOKS:

1. James Rumbaugh, Ivan Jacobson and Grady Booch, ―Unified Modeling Language Reference Manual‖, PHI, 1999.

2. Jacobson et al., the ―Unified Software Development Process‖. AW, 1999.

3. Tom Pender, ―UML Bible‖, John Wiley & Sons. 2003.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

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.	The Object Model – Overview of Object Oriented system Development	1	04.07.25		TLM2	
2.	Object Basic – Object – Oriented Systems Development Life Cycle	2	04.07.25 05.07.25		TLM2	
3.	Object Oriented Analysis Process	1	05.07.25		TLM1	
4.	Identifying use cases: Introduction.	1	11.07.25		TLM2	
5.	Why Analysis is a Difficult Activity	1	11.07.25		TLM7	
6.	Business Object Analysis: Understanding the Business Layer	1	18.07.25		TLM2	
7.	Use-Case Driven Object-Oriented Analysis: The Unified Approach	1	18.07.25		TLM2	
8.	Business Process Modeling	1	19.07.25		TLM1	
9.	Use-Case Model, Developing Effective Documentation	1	19.07.25		TLM2	
10.	Use-Case Model, Developing Effective Documentation	1	25.07.25		TLM2	
11.	Assignment	1	25.07.24		TLM6	
No. of classes required to complete UNIT-I		12	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
1.	Unified Modeling Language (UML): Introduction	1	26.07.25		TLM2	
2.	Static and Dynamic Models	1	26.07.25		TLM2	
3.	Why Modeling?	1	27.07.25		TLM2	
4.	Introduction to the Unified Modeling Language, UML Diagrams.	2	27.07.25 01.08.25		TLM2	
5.	UML Use Case Diagram- Use case descriptions	1	01.08.25		TLM2	
6.	Actors and actor descriptions	1	02.08.25		TLM2	
7.	Use case relationships: communication association, include	1	02.08.25		TLM1	
8.	Extend and Generalization, System Boundary,	1	08.08.25		TLM2	
9.	Case study Via Net Bank ATM.	1	08.08.25		TLM1	
10.	Tutorial	1	16.08.25		TLM3	
No. of classes required to complete UNIT-II		11	No. of classes taken:			

UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Identifying Object Relationships, Attributes and Methods: Introduction, Associations, Super Sub Class Relationships	1	16.08.25		TLM2	
2.	A-Part-of Relationships-Aggregation, Class Responsibility, Identifying Attributes and Methods	1	17.08.25		TLM2	
3.	Class Responsibility, Defining Attributes by Analyzing Use Cases and Other UML Diagrams	2	17.08.25 23.08.25		TLM2	
4.	Object Responsibility: Methods and Messages	1	23.08.25		TLM1	
5.	Static Modeling: UML Class Diagram: Class, interface	2	19.09.25 19.09.25		TLM9	
6.	Package, Relationships between classes and other Notations of Class Diagram	1	20.09.25		TLM9	
7.	Package, Relationships between classes and other Notations of Class Diagram	2	20.09.25 26.09.25		TLM9	
8.	Case study ViaNet Bank ATM.	1	26.09.25		TLM9	
9.	Assignment	1	27.09.25		TLM6	
No. of classes required to complete UNIT-III		12	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
10.	UML Interaction Diagrams – UML Sequence Diagram: object, life line,	1	27.09.25		TLM2	
11.	Activation Bar, Types of Messages.	2	10.10.25 10.10.25		TLM2	
12.	UML Collaboration Diagram: object, object Connection	1	11.10.25		TLM9	
13.	Message with sequence numbers, case study ViaNet Bank ATM	1	11.10.25		TLM9	
14.	UML State-Chart Diagram: object State, Initial/Final State	2	17.10.25 17.10.25		TLM2	
15.	Simple/Complex Transitions	1	18.10.25		TLM1	
16.	UML Activity Diagram: Activity State, Transition	1	18.10.25		TLM2	
17.	Swim Lane, Initial state, Final State	1	24.10.25		TLM2	
18.	Synchronization Bar, Branching, case study Via Net Bank ATM	1	24.10.25		TLM9	
19.	TUTORIALS	1	25.10.25		TLM3	
No. of classes required to complete UNIT-IV		12	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
20.	Implementation Diagrams – Component Diagram: Component, Dependency and Interface,	1	25.10.25		TLM2	
21.	Deployment Diagram: Node, Communication Association, case study Via Net Bank ATM.	1	31.10.25		TLM2	
22.	Model Management: Packages and Model Organization	1	31.10.25		TLM2	
23.	UML Extensibility, UML Meta Model.	2	01.11.25 01.11.25		TLM2	
24.	Designing Classes: Introduction, The Object-Oriented Design Philosophy, UML Object Constraint Language	1	07.11.25		TLM7	
25.	Designing Classes: The Process, Class Visibility: Designing Well-Defined Public, Private, and Protected Protocols	2	07.11.25 08.11.25		TLM2	
26.	Designing Classes: Refining Attributes, Designing Methods and Protocols	1	08.11.25		TLM2	
27.	Packages and Managing Classes, case study Via Net Bank ATM.	1	15.11.25		TLM9	
28.	Assignment		15.11.25		TLM6	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

Teaching Learning Methods			
TLM1	Chalk and Talk-6	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT-27	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial-2	**TLM6**	Group Discussion/Project-2

PART-C

EVALUATION PROCESS (R20 Regulations):

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

PSO1: Organize, Analyze, and interpret the data to extract meaningful conclusions.

PSO2: Design, Implement and Evaluate a computer-based system to meet desired needs

PSO3: Develop IT application services with the help of different current engineering tools.

Course Name	CO s	CO Name	PI s
OOAD	CO1	Understand the basic concepts of object and Elements of object model (Understand -L2)	2.1, 3.1
	CO2	Identify the design patterns to solve object oriented design problems (Understand -L2)	2.2
	CO3	Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)	2.1
	CO4	Design Interaction diagrams for a given application. (Analyze –L3)	1.3
	CO5	Design use case, activity, Implementation diagrams for any application (Analyze –L3)	2.1

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs. K.Lakshmi Devi			Dr D.Ratna Kishore
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section - B

Course Instructor : Dr. Y. Amar Babu, Professor of ECE

Course Name & Code : ASIC Design – 20EC21

L-T-P-Cr Structure : 3-0-0-3

Academic Year : 2025-26

Pre requisite: VLSI Design

Course Educational Objective: In this course, the student will learn various ASIC architectures, ASIC design flow, issues in ASIC design and testing of ASICs and also about SoC Design.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1	Understand ASIC Design Styles, Design Issues, Design Techniques and Construction.
CO 2	Apply design techniques, resources and tools to develop ASIC modules.
CO 3	Analyze the characteristics and performance of ASICs and judge independently the best suited device for fabrication of smart devices.
CO 4	Evaluate Design issues, simulation and testing of ASICs

CO's	Co-Po Attainment Table														
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	3	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	-	3	-
CO3	2	3	2	1	-	-	-	-	-	-	-	2	-	3	-
CO4	1	2	3	2	-	-	-	-	-	-	-	2	-	3	-

Prescribed Syllabus:

UNIT-I: [9 Hrs]

ASIC DESIGN STYLES: Introduction – categories-Gate arrays-Standard cells- Cell based

ASICs-Mixed mode and analogue ASICs – PLDs.

ASICS– PROGRAMMABLE LOGIC DEVICES: Overview – PAL –based PLDs:

Structures; PAL Characteristics – FPGAs: Introduction, selected families –design outline.

UNIT-II: [8 Hrs]

ASICS–DESIGN ISSUES: Design methodologies and design tools – design for testability –

economies.

ASICS-CHARACTERISTICS AND PERFORMANCE: Design styles, gate arrays, standard cell -based ASICs, Mixed mode and analogue ASICs.

UNIT-III: [8 Hrs]

ASICS-DESIGN TECHNIQUES: Design flow and methodology- Hardware description

languages- simulation and checking-commercial design tools- FPGA Design tools: XILINX,

ALTERA.

UNIT-IV: [9 Hrs]

LOGIC SYNTHESIS, SIMULATION AND TESTING: Verilog and logic

synthesis -VHDL and logic synthesis - types of simulation -boundary scan test-fault simulationautomatic test pattern generation

ASIC-CONSTRUCTION: Floor planning, placement and routing system

partition.

UNIT-V: [8 Hrs]

FPGA PARTITIONING: Partitioning Methods-Floor Planning- Placement- Physical

Design Flow-GlobalRouting-Detailed Routing –Special Routing-Circuit Extraction-DRC.

TEXT BOOK:

1. M.J.S.Smith, “Application - Specific integrated circuits”, Addison-WesleyLongman Inc

1997.

2. L.J.Herbst, “Integrated circuit engineering”, OXFORD SCIENCE Publications,1996.

REFERENCE BOOKS:

1. Wayne Wolf, —FPGA-Based System Design , Prentice Hall PTR, 2009.

2. Farzad Nekoogar and Faranak Nekoogar,-From ASICs to SOCs: A Practical Approach,

PrenticeHall PTR, 2003.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: ASIC DESIGN STYLES						
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, categories	1	30-06-2025			
2.	**Gate Arrays, Standard Cells**	1	01-07-2025			
3.	**Cell based ASICs**	1	03-07-2025			
4.	Mixed mode and Analogue ASICs-PLDs	1	04-07-2025			
5.	**PLDs Overview,** PAL based PLDs: structures	1	04-07-2025			
6.	PAL Characteristics	1	07-07-2025			
7.	FPGAs: Introduction, Selected families	1	08-07-2025			
8.	Design Outline	1	10-07-2025			
9.	**Tutorial,/Assignment**	1	11-07-2025			

UNIT- II: ASIC DESIGN ISSUES						
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.	ASIC Design Issues	1	11-07-2025			
11.	Design methodologies	1	14-07-2025			
12.	**Design Tools**	1	15-07-2025			
13.	DFT, Economies	1	17-07-2025			
14.	ASIC characteristics and performance	1	18-07-2025			
15.	**Design styles, gate arrays**	1	18-07-2025			
16.	Standard cell based ASIC,	1	21-07-2025			
17.	Mixed mode, Analog ASICs	1	22-07-2025			
18.	**Tutorial,/Assignment**	1	24-07-2025			

UNIT – III: ASIC Design 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**
19.	Design flow and Methodology	1	25-07-2025			
20.	Hardware description Language	1	25-07-2025			
21.	**Simulation and Checking**	1	28-07-2025			
22.	**Commercial design Tools**	1	29-07-2025			
23.	FPGA Design Tools: Xilinx	2	31-08-2025 01-08-2025			
24.	ALTERA	2	01-08-2025 04-08-2025			
25.	**Tutorial,/Assignment/Mid-1 Review**	1	05-08-2025			

UNIT – IV: Logic Synthesis, Simulation and Testing						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
26.	Verilog and logic synthesis	1	07-08-2025			
27.	VHDL and logic Synthesis	1	08-08-2025			
28.	Types of Simulation	1	08-08-2025			
29.	**Boundary Scan Test**	1	11-08-2025			
30.	**Fault Simulation**	1	12-08-2025			
31.	Automatic Test Pattern Generation	1	14-08-2025			
32.	ASIC Construction: Floor Planning	1	18-08-2025			
33.	Placement and Routing, System Partition	1	19-08-2025			
34.	**Tutorial,/Assignment**	1	21-08-2025			

UNIT – V: FPGA Partitioning						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
35.	Partitioning Methods	1	22-08-2025			
36.	Floor Planning	1	22-08-2025			
37.	Placement	1	15-09-2025			
38.	Physical Design Flow	1	16-09-2025			
39.	Global Routing	1	18-09-2025			
40.	Detailed Routing	1	19-09-2025			
41.	Special Routing	1	19-09-2025			
42.	Circuit Extraction	1	22-09-2025			
43.	DRC	1	23-09-2025			
44.	**Tutorial,/Assignment**	1	25-09-2025			

27-03-2025

BEYOND THE SYLLABUS & REVISION [3 HRS]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
45.	SoC Architectures		26-09-2025			
46.	NoC Architectures		26-09-2025			

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

Academic Calendar: 2025 – 26 (VII Semester)

B.Tech VI Semester - 2020 Admitted Batch			
Class work Commence From	**21-02-2022**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	30-06-2025	23-08-2025	8 Weeks
I Mid Examinations	08-09-2025	13-09-2025	1 Week
II Phase Instructions	15-09-2025	15-11-2025	8 Weeks
II Mid Examinations	17-11-2025	22-11-2025	1 Week
Preparation & Practicals	24-11-2025	29-11-2025	1 Week
Semester End Examinations	21-04-2025	03-05-2025	2 Weeks
Internship	01-12-2025	13-12-2025	6 Weeks

EVALUATION PROCESS:

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
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**

CO 1	Understand the architecture of 8086, 8051 and ARM Controller **(Understand)**	Describe, Explain, Paraphrase, Restate ,Associate, Contrast, Summarize, Differentiate, Interpret, Discuss
CO 2	Apply Assembly Language instructions for Processor and Controller based applications **(Apply)**	Calculate, Predict, Apply, Solve, Illustrate, Use, Demonstrate, Determine, Model, Experiment, Show, Examine, Modify
CO 3	Analyze the operating modes and interrupt structures of processors and controllers **(Analyze)**	Classify, Outline, Break down, Categorize, Analyze, Diagram, Illustrate, Infer, Select
CO 4	Develop the ARM based interfacing systems for Real time applications **(Apply)**	Categorize, Analyze, Illustrate, Infer Select

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Dr. Y. Amar Babu]	[Dr. Y. Amar Babu]	[Dr.P.LACHI REDDY]	[Dr.G.SRINIVASULU]

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.M.V.Sudhakar
Course Name & Code **:** WIRELESS SENSOR NETWORKS, 20EC26
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/VII/B **A.Y.:** 2025-2026

PREREQUISITE: Digital communications and Computer Networks

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide knowledge on applications, architectures and protocols of wireless sensor networks. The course also gives the overview regarding the software platforms and tools required for wireless sensor networks.

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

CO1	**Interpret** the operation of wireless sensor network elements. **(Understand-L2)**
CO2	**Examine** different communication protocols of wireless sensor networks and its applications. **(Apply-L3)**
CO3	**Outline** sensor tasking and techniques used to establish infrastructure of wireless sensor networks. **(Understand-L2)**
CO4	**Apply** the knowledge of sensor network platforms and tools for sensor network application development. **(Apply-L3)**

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

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

TEXTBOOKS:

T1 Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

T2 Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

REFERENCE BOOKS:

R1	1. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007
R2	2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Overview of Wireless Sensor Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	01-07-25			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	02-07-25			
3.	Wireless sensor networks- classification, advantages, limitations	1	04-07-25			
4.	Applications of WSNs	1	05-07-25			
5.	Application examples and types of applications	1	08-07-25			
6.	Unique constraints and Challenges	1	09-07-25			
7.	Characteristic Requirements and mechanisms	1	11-07-25			
8.	Advantages of Sensor Networks	1	12-07-25			
9.	Collaborative processing and Key definitions	1	15-07-25			
10.	Difference between Mobile Ad-hoc and Sensor Networks **Activity: Debate**	1	16-07-25			
11.	Enabling technologies	1	18-07-25			
12.	Application case study **Activity: Case Study**	1	19-07-25			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Architectures

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.	Single node architecture- examples of sensor nodes-mote	1	22-07-25			
14.	Hardware components of sensor nodes- description	1	23-07-25			
15.	Energy Consumption of Sensor Nodes	1	25-07-25			
16.	Operating states with different Power Consumption	1	29-07-25			
17.	Energy consumption of Transceiver,	1	30-07-25			
18.	Energy consumption of Micro controller; Memory **Activity: Project Based Learning**	1	01-08-25			
19.	Dynamic Voltage Scaling, Relation between Computation and Communication	1	02-08-25			
20.	commercially available sensor nodes, Sensor Network architecture	1	05-08-25			
21.	Sensor Network Scenarios, moving object detection **Activity: Simulation based learning CupcarbonIoTsimulator**	1	06-08-25			
22.	Optimization Goals of sensor networks, Figures of Merit	1	08-08-25			
23.	Gateway Concepts.	1	09-08-25			

No. of classes required to complete UNIT-II: 11	No. of classes taken:

UNIT-III: Networking Sensors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Wireless channel and Communication fundamentals	1	12-08-25			
25.	Fundamental concepts of protocol architectures- cross layer architecture	1	13-08-25			
26.	Physical Layer and Transceiver design considerations in WSNs	1	19-08-25			
27.	MAC Protocols for Wireless Sensor Networks	1	20-08-25			
28.	Low Duty Cycle protocols	1	22-08-25			
29.	Wakeup radio concepts , S-MAC	1	23-08-25			
30.	The IEEE 802.15.4 MAC protocol **Activity: Flipped Class room**	1	16-09-25			
31.	Routing Protocols for WSN	1	17-09-25			
32.	Energy efficient	1	19-09-25			
33.	Geographic routing	1	20-09-25			
34.	Position based routing	1	23-09-25			
35.	Routing Challenges and Design Issues in wireless sensor networks.	1	24-09-25			
36.	Routing protocol simulation for WSN **Activity: Simulation Based Learning using MATLAB**	1	26-09-25			
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Infrastructure Establishment

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.	Need for topology control in wireless sensor networks	1	27-09-25			
38.	Possible options for topology control	1	07-10-25			
39.	Examples and types for topology control- LMST	1	08-10-25			
40.	Clustering	1	10-10-25			
41.	Different types of clustering-methods **Activity: Problem Based Learning**	1	11-10-25			
42.	Time synchronization	1	14-10-25			
43.	Clocks and communication delays	1	15-10-25			
44.	Interval methods and reference broadcast methods	1	17-10-25			
45.	Localization and positioning	1	18-10-25			
46.	Sensor Tasking & Control	1	22-10-25			
47.	Task driven sensing,	1	24-10-25			
48.	Role of sensor nodes & utilities, Information based sensor tasking. **Activity: Puzzle Based Learning/Quiz**	1	25-10-25			
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Sensor Network Platforms and Tools

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

49.	Operating Systems for Wireless Sensor Networks	1	28-10-25			
50.	Types of Sensor Node Hardware	1	29-10-25			
51.	Berkeley Motes	1	31-10-25			
52.	Programming Challenges	1	01-11-25			
53.	Node-level software platforms	1	04-11-25			
54.	TinyOS, Latest node level OS and tools for WSN **Activity: Lab Demonstration**	1	05-11-25			
55.	TinyOS application example, nesC	1	07-11-25			
56.	Components of node level simulator	1	08-11-25			
57.	Network simulator-NS-2, Installation and example programs in NS-2	1	11-11-25			
58.	Different types of Node-level Simulators, State-centric programming	1	12-11-25			
59.	WSN Usage examples of simulation tools **Activity: Project Based Learning**	1	14-11-25			
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Concepts 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
60.	Security issues, Research trends to improve energy efficiency of WSN, Case study using Simulation tools-Matlab/NS-3/cupcarbon	1	15-11-25			

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

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

PART-D

PROGRAMME OUTCOMES (POs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. M.V Sudhakar**	**Dr. P. Venkat rao**	**Dr. M.V Sudhakar**	**Dr. G. Srinivasulu**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(Autonomous Status Since the Academic Year 2010-11 & Extended up to 2031-32)
NAAC Accredited with CGPA of 3.20 on 4-point scale at 'A' Grade
NIRF-2022 (Positioned in the Band of 251-300 in the Engineering Category)
NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
NBA Accredited under Tier-I (ECE, EEE, CSE, IT, ME, CIV, ASE)
Recognized as Scientific Industrial Research Organization(SIRO) by DSIR
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section - B

Course Instructor : Mrs. M.Ramya Harika, Sr.Asst. Professor, ECE

Course Name & Code : LOW POWER VLSI DESIGN – 20EC27

L-T-P-Cr Structure : 3-0-0-3

Academic Year : 2025-26

Pre requisite: Digital Electronic Circuits and VLSI Design

Course Educational Objective: This course provides knowledge on fundamentals of low power VLSI design concepts, circuits and subsystems.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1	Summarize the Fundamental concepts of Low Power VLSI Design. (Understand – L2)
CO 2	Apply Low Power Design Approaches for IC designs. (Apply – L3)
CO 3	Analyze low voltage low power memories using mathematical models. (Analyze – L4)
CO 4	Design low voltage low power adders and multipliers. (Apply – L3)

CO's	Co-Po Attainment Table														
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2										2		3	
CO2	3	3	3		2		2					2		3	
CO3	3	3		2	3							2		3	2
CO4	3	3	3	2	3		2		1	1	1	2		3	2

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Fundamentals of Low Power CMOS VLSI Design [11 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
1.	Introduction to COs	1	30.06.2025			
2.	Introduction	1	01.07.2025			
3.	Sources of Power Dissipation	1	03.07.2025			
4.	Static Power Dissipation	1	04.07.2025			
5.	Short Circuit Power Dissipation	1	05.07.2025			
6.	Leakage Power Dissipation, Glitch Power Dissipation	1	08.07.2025			
7.	Short Channel Effects –Drain Induced Barrier Lowering	1	10.07.2025			
8.	Body effect	1	11.07.2025			
9.	Gate-induced Drain Leakage	1	15.07.2025			
10.	Active power dissipation.	1	17.07.2025			
11.	**Tutorial/Assignment**	1	18.07.2025			

UNIT- II: Circuit techniques for Low-Power Reduction [10 Hrs]						
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.	Concepts of leakage power	1	19.07.2025			
13.	Circuit techniques for Leakage power reduction	1	22.07.2025			
14.	Power Gating, Body Biasing Techniques	1	24.07.2025			
15.	Standby leakage control	1	25.07.2025			
16.	Multi-Vth technique	1	29.07.2025			
17.	Supply voltage scaling	1	31.07.2025			
18.	VTMOS circuits	1	01.08.2025			
19.	DTMOS circuits	1	02.08.2025			
20.	Dynamic-Vth technique	1	05.08.2025			
21.	**Tutorial /Assignment**	1	07.08.2025			

UNIT – III: Low-Voltage Low-Power Adders [11 Hrs]						
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.	Introduction,	1	08.08.2025			
23.	Standard Adder Cells	1	12.08.2025			
24.	CMOS Adder's Architectures	1	14.08.2025			
25.	Carry Look-Ahead Adder	1	19.08.2025			
26.	Ripple Carry Adders,	1	21.08.2025			
27.	Carry Select Adders	1	22.08.2025			
28.	Mid-1 Review	1	23.08.2025			
29.	Carry Save Adders	1	16.09.2025			
30.	Performance evaluation of various adder architectures	1	18.09.2025			
31.	Performance evaluation of various adder architectures	1	19.09.2025			
32.	**Tutorial/Assignment**	1	20.09.2025			

UNIT – IV: Low-Voltage Low-Power Multipliers [12 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
33.	Review of Multiplication	1	23.09.2025			
34.	Multiplier Architectures	1	25.09.2025			
35.	Multiplier Architectures	1	26.09.2025			
36.	Braun Multiplier	1	27.09.2025			
37.	Braun Multiplier	1	03.10.2025			
38.	Baugh-Wooley Multiplier	1	04.10.2025			
39.	Baugh-Wooley Multiplier	1	07.10.2025			
40.	Booth Multiplier	1	09.10.2025			
41.	Booth Multiplier	1	10.10.2025			
42.	Introduction to Wallace Tree Multiplier.	1	14.10.2025			
43.	Wallace Tree Multiplier.	1	16.10.2025			
44.	**Tutorial/Assignment**	1	17.10.2025			

UNIT – V: Low-Voltage Low-Power Memories [13 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
45.	Basics of ROM	1	18.10.2025			
46.	Low-Power ROM Technology	1	23.10.2025			
47.	Future Trend and Development of ROMs	1	24.10.2025			
48.	Future Trend and Development of ROMs	1	25.10.2025			
49.	Basics of SRAM	1	28.10.2025			
50.	Memory Cell	1	30.10.2025			
51.	Precharge and Equalization Circuit	1	31.10.2025			
52.	Precharge and Equalization Circuit	1	1-11-2025			
53.	Low-Power SRAM Technologies	1	4-11-2025			
54.	Basics of DRAM	1	6-11-2025			
55.	Self-Refresh Circuit	1	7-11-2025			
56.	Future Trend and Development of DRAM.	1	8-11-2025			
57.	**Tutorial/Assignment**	1	11-11-2025			

BEYOND THE SYLLABUS & REVISION [3 HRS]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
58.	Advanced Power Reduction Techniques	1	13-11-2025			
59.	Sub-threshold and Near-threshold Logic	1	14-11-2025			
60.	Low Power Design Metrics	1	15-11-2025			

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	30-06-2025		
I Phase of Instructions	30-06-2025	23-08-2025	8W
Technical Training	25-08-2025	06-09-2025	2W
I Mid Examinations	08-09-2025	13-09-2025	1W
II Phase of Instructions	15-09-2025	15-11-2025	9W
II Mid Examinations	17-11-2025	22-11-2025	1W
Preparation and Practical's	24-11-2025	29-11-2025	1W
Semester End Examinations	01-12-2025	13-12-2025	2W

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mrs.M.Ramya Harika]	[Mrs.M.Ramya Harika]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P.GANDHI PRAKASH
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : 3-0-0 **Credits:**3
Program/Branch/Sem : B.Tech/ECE- B /VII **A.Y.: 2025-26**

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

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	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(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. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmeling, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction	1	01-07-2025		-	CO1	-	
2.	Introduction: What Is AI?,	1	02-07-2025		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	03-07-2025		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	05-07-2025		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	08-07-2025		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	09-07-2025		TLM1	CO1	T1,T2	
7.	Types of agents	1	10-07-2025		TLM2	CO1	T1,T2	
8.	Types of agents	1	12-07-2025		TLM2	CO1	T1,T2	
9.	Types of agents	1	15-07-2025		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	16-07-2025		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	17-07-2025		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	19-07-2025		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	22-07-2025		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	23-07-2025		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 14					**No. of classes taken:**			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	2	24-07-2025 29-07-2025		TLM1	CO2	T1,T2	
16.	Searching for Solutions, Uninformed Search Strategies	1	30-07-2025		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	31-07-2025		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	05-08-2025		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	06-08-2025		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	07-08-2025		TLM2	CO2	T1,T2	
21.	A* Algorithm	2	09-08-2025 12-08-2025		TLM2	CO2	T1,T2	
22.	AO* Algorithm	2	13-08-2025 14-08-2025		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	19-08-2025		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	20-08-2025		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	21-08-2025		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	23-08-2025		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II: 15					**No. of classes taken:**			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	16-09-2025		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	17-09-2025		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	18-09-2025		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	20-09-2025		TLM2	CO3	T1,T2	
31.	Depth limited search	1	23-09-2025		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	24-09-2025		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	25-09-2025		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	27-09-2025		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	07-10-2025		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 09					**No. of classes taken:**			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	08-10-2025		TLM1	CO4	T1,T2	
37.	Minimax algorithm	1	09-10-2025		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	1	11-10-2025		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	1	14-10-2025		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	15-10-2025		TLM1	CO4	T1,T2	
41.	Representation mappings	1	16-10-2025		TLM1	CO4	T1,T2	
42.	Inference Engine: Forward chaining/reasoning	1	18-10-2025		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	22-10-2025		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	23-10-2025		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	1	25-10-2025		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	28-10-2025		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 11					**No. of classes taken:**			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	29-10-2025		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	1	30-10-2025		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	01-11-2025		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	04-11-2025		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	1	05-11-2025		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	06-11-2025		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	08-11-2025		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	11-11-2025		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	1	12-11-2025		TLM2	CO5	T1,T2	

56.	The Internet Shopping World	1	13-11-2025		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	13-11-2025		TLM1	CO5	-	
No. of classes required to complete UNIT-V:11					**No. of classes taken:**			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	15-11-2025		**TLM1**			

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 (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 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 professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, 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	**P. Gandhi Prakash**	**P. Gandhi Prakash**	**Dr.V. Surya Narayana**	**Dr. P. Bhagath**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Ch. Poorna Venkata Srinivasa Rao
Course Name & Code : CYBER SECURITY AND DIGITAL FORENSICS & 201T84
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech-ECE – B/VII SEM
A.Y. : 2025-26

PRE-REQUISITE: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to provide the basic concepts of cybersecurity and digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relaxation to computer crime. It enables students to gain experience to do independent study and research

CO1	Understand the implementation of cybercrime. **(Understand - L2)**
CO2	Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
CO3	Under the Concepts of Cyber Forensics. **(Understand- L2)**
CO4	Apply Cyber Forensics in collection of digital evidence and sources of evidence **(Apply- L3)**
CO5	Analyze the cyber forensics tools for present and future**(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	1	1	-	-	1	1	-	1	-	-	-	1	-	-	-
CO2	-	1	1	-	3	1	-	-	-	-	-	1	-	-	-
CO3	1	-	-	1	3	1	-	-	-	-	-	1	-	-	-
CO4	1	1	-	3	1	-	-	-	-	-	-	1	-	-	-
CO5	-	-	1	-	3	1	-	1	-	-	-	1	-	-	-
1 - Low					**2 –**Medium						**3 -** High				

TEXT BOOKS:

1. Dejey, Dr.Murugan, "cyber Forensics", Oxford University Press, India, 2018

2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY,2011

REFERENCE BOOKS:

1. Michael Simpson, Kent Blackman and James e. Corley, "Hands on Ethical Hacking and Network Defense", Cengage, 2019
2. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi
3. Alfred Basta, Nadine Basta, Mary Brown and Ravindra Kumar "Cyber Security and Cyber Laws", Cengage, 2018

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): SECTION B

UNIT-I: Introduction to Cybercrime

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
1	Introduction to CSDF	1	30-06-2025		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	01-07-2025		**TLM1**	CO1	
3	Cybercrime and Information Security	1	03-07-2025		**TLM2**	CO1	
4	Cybercriminals	1	05-07-2025		**TLM7**	CO1	
5	Classifications of Cybercrime	1	07-07-2025		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	08-07-2025 10-07-2025		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	14-07-2025 15-07-2025		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	17-07-2025 19-07-2025		**TLM2**	CO1	
9	Unit-I Assignment Test	1	21-07-2025		**TLM6**	CO1	
No. of classes required to complete UNIT-I		12	No. of classes taken:				

UNIT-II: Tools and Methods

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
10	Proxy Servers and Anonymizers	1	22-07-2025		**TLM2**	CO2	
11	Phishing, Password Cracking	2	24-07-2025 28-07-2025		**TLM7**	CO2	
12	Key loggers and Spywares Virus and Worms	1	29-07-2025		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	31-07-2025		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	02-08-2025 04-08-2025		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	05-08-2025		**TLM2**	CO2	
16	Unit-II Assignment Test	1	07-08-2025		**TLM6**	CO2	
No. of classes required to complete UNIT-2		09	No. of classes taken:				

UNIT – III: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
17	Cyber Forensics Definition	1	11-08-2025		**TLM2**	CO3	
18	Disk Forensics	2	12-08-2025 14-08-2025		**TLM1**	CO3	
19	Network Forensics	1	18-08-2025		**TLM2**	CO3	
20	Wireless Forensics	1	19-08-2025		**TLM2**	CO3	
21	Database Forensics	2	21-08-2025		**TLM2**	CO3	
22	Malware Forensics	1	23-08-2025		**TLM2**	CO3	

23	Mobile Forensics	1	15-09-2025		**TLM2**	CO3	
24	Email Forensics	1	16-09-2025		**TLM1**	CO3	
25	Unit-III Assignment Test	1	18-09-2025		**TLM6**	CO3	
No. of classes required to complete UNIT-3		11	No. of classes taken:				

UNIT-IV: Digital Evidence

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
26	Introduction to Digital Evidence and Evidence Collection procedure	2	20-09-2025 22-09-2025		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	23-09-2025 25-09-2025		**TLM7**	CO4	
28	File System Windows Registry	2	27-09-2025 29-09-2025		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	04-10-2025 06-10-2025		**TLM2**	CO4	
30	Linux Artifact	2	07-10-2025 09-10-2025		**TLM1**	CO4	
31	Digital evidence on the internet	2	13-10-2025 14-10-2025		**TLM3**	CO4	
32	Impediments to collection of Digital Evidence	1	16-10-2025		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	18-10-2025 20-10-2025		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	23-10-2025		**TLM6**	CO4	
No. of classes required to complete UNIT-4		16	No. of classes taken:				

UNIT-V: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
35	The Present and The Future Forensics Tools	1	25-10-2025		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	27-10-2025		**TLM5**	CO5	
37	Tools for Integrity Verification and Hashing	1	28-10-2025		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	30-10-2025		**TLM5**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	01-11-2025 03-11-2025		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	04-11-2025		**TLM2**	CO5	
41	Unit -5 Assignment Test.	1	06-11-2025		**TLM6**	CO5	
No. of classes required to complete UNIT-5		8	No. of classes taken:				

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Cloud Security, Using AI/ML to Analyze	1	10-11-2025		TLM2	
2.	Cyber Threats	1	12-11-2025		TLM2	

TLM1	Chalk and Talk - 8	**TLM6**	Assignment / Quiz - 5
TLM2	PPT - 24	**TLM7**	Seminar / Group Discussion - 3
TLM3	Tutorial -1	**TLM8**	Lab Demo
TLM4	Demonstration (Lab/Field Visit)	**TLM9**	Case Study
TLM5	ICT (NPTEL/Swayam Prabha/MOOCS) - 2		

Part – C

EVALUATION PROCESS:

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	30-06-2025		
I Phase of Instructions	30-06-2025	23-08-2025	8W
Technical Training	25-08-2025	06-09-2025	2W
I Mid Examinations	08-09-2025	13-09-2025	1W
II Phase of Instructions	15-09-2025	15-11-2025	9W
II Mid Examinations	17-11-2025	22-11-2025	1W
Preparation and Practical's	24-11-2025	29-11-2025	1W
Semester End Examinations	01-12-2025	13-12-2025	2W

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Pursue a successful career in the area of Information Technology or its allied fields.
PEO 2	Exhibit sound knowledge in the fundamentals of Information Technology and apply practical experience with programming techniques to solve real world problems.
PEO 3	Able to demonstrate self-learning, life-long learning and work in teams on multidisciplinary projects.
PEO 4	Able to understand the professional code of ethics and demonstrate ethical behavior, effective communication and team work and leadership skills in their job.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**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.
PO5	**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.
PO6	**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.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solution sin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **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.

PO11 **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.

PO12 **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 Organize, Analyze and Interpret the data to extract meaningful conclusions.

PSO2 Design, Implement and Evaluate a computer-based system to meet desired needs.

PSO3 Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Ch.Poorna Venkata Srinivasa Rao	Dr. K Phaneendra	Mr. G.Rajendra	Dr. D. Ratna Kishore
Signature				

DEPARTMENT OF ECE
COURSE HANDOUT
PART - A

PROGRAM : B.Tech. - VII-Sem. - ECE – B Section
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : Management Science for Engineers – 20HS02
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Mr. S.Srinivasa reddy, Sr. Assistant Professor
COURSE COORDINATOR : Dr. A.Nageswara Rao, Sr. Assistant Professor
PER-REQUISITE : NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To make students understand management, its principles, contribution to management, organization, and its basic issues and types.
2. To make students understand the concept of plant location and its factors and plant layout and types, method of production and work study importance.
3. To understand the purpose and function of statistical quality control. And understand the material management techniques.

COURSE OUTCOMES:
After completion of the course student will be able to:
CO1: Understand management principles to practical situations based on the organization structures. (L2)
CO2: Design Effective plant Layouts by using work study methods. (L2)
CO3: Apply quality control techniques for improvement of quality and materials management. (L3)
CO4: Develop best practices of HRM in corporate Business to raise employee productivity. (L2)
CO5: Identify critical path and project completion time by using CPM and PERT techniques. (L3)

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

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

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

BOS APPROVED TEXT BOOKS:

1. Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

References:

1. Koontz & weihrich – Essentials of management, TMH, 10th edition, 2015
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
3. O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction To Management	1	30-06-25		TLM1	CO1	T1	
2.	Definition, Nature, Importance of management	1	01-07-25		TLM1	CO1	T1	
3.	Functions of Management	1	02-07-25		TLM1	CO1	T1	
4.	Taylor's scientific management theory	1	04-07-25		TLM1	CO1	T1	
CRT Classes 25-08-25 TO 06-09-25								
5.	Fayal's principles of management	1	07-07-25		TLM3	CO1	T1	
6.	Contribution of Elton mayo, Maslow	1	08-07-25		TLM1	CO1	T1	
7.	Herzberg, Douglas MC Gregor principles of management	1	11-07-25		TLM1	CO1	T1	
8.	Basic Concepts of Organization, Authority, Responsibility	1	14-07-25		TLM1	CO1	T1	
9.	Delegation of Authority, Span of control	1	15-07-25		TLM1	CO1	T1, R1	
	Departmentation and Decentralization, Organization structures	1	16-07-25		TLM1	CO1	T1, R1	
	Line and Functional staff organization,	1	18-07-25		TLM1	CO1	T1, R1	
	Committee and Matrix organization	1	21-07-25		TLM1	CO1	T1	
No. of classes required to complete UNIT-I		12		22-07-25	No. of classes taken:			

UNIT-II: OPERATIONS MANAGEMENT

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
	Introduction	1	23-07-25		TLM1	CO2	T1, R3	
	Plant location	1	25-07-25		TLM1	CO2	T1, R3	

10.								
11.	Factors influencing location	1	28-07-25		TLM1	CO2	T1, R3	
12.	Principles of plant layouts	1	29-07-25		TLM1	CO2	T1, R3	
13.	Types of plant layouts	1	30-07-25		TLM1	CO2	T1, R3	
14.	Methods of production	1	01-08-25		TLM3	CO2	T1, R3	
15.	Work study	1	04-08-25		TLM1	CO2	T1	
16.		1	05-08-25		TLM1	CO2	T1	
17.	Basic procedure involved in method study	1	06-08-25		TLM1	CO2	T1	
18.	Work measurement	1	08-08-25		TLM3	CO2	T1	
No. of classes required to complete UNIT-II		10	11-08-25		No. of classes taken:			

UNIT-III: STATISTICAL QUALITY CONTROL & MATERIALS MANAGEMENT

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
	Introduction, Concept of Quality	1	12-08-25		TLM1	CO3	T1	
	Quality Control functions	1	13-08-25		TLM1	CO3	T1, R1	
	Meaning of SQC, Variables and attributes	1	18-08-25		TLM1	CO3	T1, R1	
	X chart, R Chart	1	19-08-25		TLM1	CO3	T1	
	C Chart, P Chart	1	20-08-25		TLM3	CO3	T1, R1	
	Simple problems	1	22-08-25		TLM1	CO3	T1, R1	
	Acceptance sampling	1	22-08-25		TLM1	CO3	T1	
MID-I 08-09-25 TO 19-09-25								
	Sampling plans	1	15-09-25		TLM1	CO3	T1, R1	
	Deming's contribution to quality	1	16-09-25		TLM1	CO3	T1, R1	
	Materials management Meaning and objectives	1	17-09-25		TLM1	CO3	T1	
	Inventory control	1	19-09-25		TLM3	CO3	T1	
	Need for inventory control	1	22-09-25		TLM1	CO3	T2	
	Purchase procedure, Store records	1	23-09-25		TLM1	CO3	T1	
	EOQ, ABC analysis	1	24-09-25		TLM1	CO3	T1, R2	
	Stock levels	1	26-09-25		TLM1	CO3	T1, R2	

19.								
No. of classes required to complete UNIT-III		15		04-10-25	No. of classes taken:			

UNIT-IV: HUMAN RESOURCE MANAGEMENT (HRM)

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
	Introduction	1	06-10-25		TLM1	CO4	T1	
	Concepts of HRM	1	07-10-25		TLM1	CO4	T1	
	Basic functions of HR manager	1	08-10-25		TLM1	CO4	T1, R2	
	Man power planning	1	10-10-25		TLM3	CO4	T1, R2	
	Recruitment	1	13-10-25		TLM1	CO4	T1, R2	
	Selection,	1	14-10-25		TLM1	CO4	T1, R1	
	Training & developmemt	1	15-10-25		TLM1	CO4	T1, R1	
	Placement	1	17-10-25		TLM1	CO4	T1	
	Wage and salary administration	1	20-10-25		TLM3	CO4	T1, R1	
	Promotion, Transfers Separation	1	22-10-25		TLM1	CO4	T1, R1	
	Performance appraisal	1	24-10-25		TLM1	CO4	T1	
	Job evaluation and merit rating	1	27-10-25		TLM3	CO4	T1	
No. of classes required to complete UNIT-IV		12	28-10-25					

UNIT-V: PROJECT MANAGEMENT

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
	Introduction	1	29-10-25		TLM1	CO5	T1,R2	
	Early techniques in project management	1	31-10-25		TLM1	CO5	T1, R2	
	Network analysis	1	03-11-25		TLM1	CO5	T1,R2	
	Programme Evaluation and Review Technique (PERT)	1	04-11-25		TLM1	CO5	T1,R2	
	Problems	1	05-11-25		TLM1	CO5	T1,R2	
	Critical path method (CPM)	1	07-11-25		TLM1	CO5	T1, R2	
	Identifying critical path	1	10-11-25		TLM1	CO5	T1,R2	
	Probability of completing project within given time	1	12-11-25		TLM1	CO5	T1,R2	
	Project cost analysis	1	13-11-25		TLM1	CO5	T1,R2	
	project	1	14-11-25		TLM1	CO5	T1, R2	

20.	crashing							
No. of classes required to complete UNIT-V		10			No. of classes taken:			

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

Part – C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2,3	B1=15
Quiz – 1	1,2,3	Q1=10
Assignment 3	3	A3=5
Assignment 4	4	A4=5
Assignment 5	5	A5=5
II-Mid Examination	3,4,5	B2=15
Quiz – 2	3,4,5	Q2=10
Evaluation of Assignment: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=15
Evaluation of Quiz Marks: Q=75% of Max(Q1,Q2)+25% of Min(Q1,Q2	1,2,3,4,5	Q=10
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	CIE=30
Semester End Examinations	1,2,3,4,5	SEE=70
Total Marks: CIE+SEE	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Pursue higher education, entrepreneurship and research to compete at global level.
PEO2: Design and develop products innovatively in the area of computer science and engineering ar
in
Other allied fields.
PEO3: Function effectively as individuals and as members of a team in the conduct of interdisciplinary
Projects and even at all the levels with ethics and necessary attitude.
PEO4: Serve ever-changing needs of the society with a pragmatic perception.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - 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.

PO3 - Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - 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.

PO5 - 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.

PO6 - 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.

PO7 - 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.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - 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.

PO11 - Project Management and Finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO1: The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.

PSO2: The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.

PSO3: To inculcate an ability to analyze, design and implement database applications.

Mr. S.Srinivasa reddy	Dr. A.Nageswara Rao	Mr. J. Subba Reddy	Dr. M.B.S.Sreekara Reddy
Course Instructor	Course Coordinator	Module Coordinator	HoD

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Name of Course Instructor: Mrs. M. Ramya Harika
Course Name & Code : INTERNET OF THINGS-20EC30
L-T-P Structure :**1-0-2** **Credits:** 2
Program/Sem/Sec : B.Tech/VII/B **A.Y.:** 2025-2026

Pre requisite: EMI, MPMC, Python Programming.

Course Educational Objective: In this course, student will learn about basics of IoT and procedure to develop prototypes for engineering applications.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1 : Understand the programming concepts of IOT. (**Understand – L2)**

CO 2 : Develop real time applications using Internet of Things. (**Apply – L3)**

CO 3 **:** Demonstrate the integration of sensors with IOT. (**Understand – L2)**

CO 4 : Adapt effective Communication, presentation and report writing skills **(Apply – L3)**

UNIT – I: IoT Basics:
IoT, Frame work, Architectural View, Technology, Sources, M2M communication, Sensors, Participatory sensing, RFID, Wireless sensor network elements

UNIT – II: IoT Applications:
Prototyping embedded devices for M2M and IoT, M2M and IoT case studies.

TEXT BOOK:
1. Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hill Publication, 2017.
2. Zach Shelby, Carsten Bormann: "The Wireless Embedded Internet", Wiley, 1st Edition.

REFERENCES:
1. Arshdeep Bahga and Vijay Madisetti, Internet of Things – A Hands-on Approach, University Press, 2015
2. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford Press.

HANDS – ON Laboratory Sessions:
1. Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino
2. Interfacing Ultrasonic sensor and PIR sensor using Arduino
3. Design of Traffic Light Simulator using Arduino
4. Design of Water flow detection using an Arduino board
5. Interfacing of LED, Push button with Raspberry Pi and Python Program
6. Design of Motion Sensor Alarm using PIR Sensor
7. Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi
8. Interfacing DS18B20 Temperature Sensor with Raspberry Pi
9. Implementation of DC Motor and Stepper Motor Control with Raspberry Pi
10. Raspberry Pi based Smart Phone Controlled Home Automation
11. Smart Traffic light Controller
12. Smart Health Monitoring System

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT – I: IoT Basics						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
1.	Introduction, COs, POs	1	30-06-2025		TLM2	
2.	IoT Introduction and Frame work	1	07-07-2025		TLM2	
3.	Architectural View of IoT	1	14-07-2025		TLM2	
4.	IoT Technology and Sources,	1	21-07-2025		TLM2	
5.	M2M communication	1	28-07-2025		TLM2	
6.	Sensors for IoT	1	04-08-2025		TLM2	
7.	Participatory sensing	1	11-08-2025		TLM2	
8.	RFID	1	18-08-2025		TLM2	
9.	Wireless sensor network elements	1	25-08-2025		TLM2	

UNIT – II: IoT Applications						
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.	Prototyping embedded devices for M2M	2	15-09-2025 22-09-2025		TLM2	
11.	Prototyping embedded devices for IoT	2	06-10-2025 13-10-2025		TLM2	
12.	M2M case studies.	2	20-10-2025 27-10-2025		TLM2	
13.	IoT case studies.	2	03-11-2025 10-11-2025		TLM2	

Hands – on Laboratory Session						
S.No.	**Experiments to be conducted**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
	CYCLE-1					
1.	Introduction to Lab/Demo	3	24-06-2025		TLM4	
2.	Interfacing LED. DHT11-Temperature and, humidity sensor using Arduino	3	01-07-2025		TLM4	
3.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	3	08-07-2025		TLM4	
4.	Design of Traffic Light Simulator using Arduino	3	15-07-2025		TLM4	
5.	Design of Water flow detection using an Arduino board	3	22-07-2025		TLM4	
6.	Discussion of Arduino based Projects and Demo	3	29-07-2025		TLM6	
7.	Discussion of Arduino based Projects and Demo	3	05-08-2025		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	3	12-08-2025		TLM4	
9.	Design of Motion Sensor Alarm using PIR Sensor	3	19-08-2025		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	3	09-09-2025		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	3	23-09-2025		TLM4	

12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	3	30-09-2024		TLM4
13.	Raspberry Pi based Smart Phone Controlled Home Automation	3	07-10-2024		TLM4
14.	Smart Traffic light Controller Smart Health Monitoring	3	14-10-2024		TLM4
15.	Implementation of Wireless Sensor Network using Raspberry Pi boards	3	21-10-2024		TLM4
16.	Discussion of Raspberry Pi based Projects and Demo	3	28-10-2024		TLM6
17.	Project Report writing & Verification	3	04-11-2024		TLM6
No. of classes required to complete:		**51**	**No. of classes conducted:**		

PART-C

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

EVALUATION PROCESS

Evaluation Task	**Marks**
Report	10
Quality of work	10
Presentation	20
Interaction / Queries	10
Total Marks:	**50**

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mrs.M.Ramya Harika]	[Dr.P.Lachi Reddy]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
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Department of Electronics and Communication Engineering

COURSE HANDOUT
PART-A

Name of Course Instructor : Dr. P. Lachi Reddy
Course Name & Code : VLSI Testing and Verification – 20ECH4
L-T-P Structure : 3-1-0 Credits : 4
Program/Sem/Sec : B. Tech., ECE, VII-Sem., Honors A.Y : 2025-26

PRE-REQUISITE: VLSI Design

COURSE EDUCATIONAL OBJECTIVES (CEOs):
In this course student will learn about testable design, test generation algorithms for combinational and sequential circuits, design verification and verification tools, timing and physical design verification.

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

CO 1	Identify the significance of testable design **(Understand – L2)**
CO 2	Implement combinational and sequential circuit test generation algorithms **(Apply – L3)**
CO 3	Understand the importance of Design verification **(Understand – L2)**
CO 4	Learn verification tools **(Apply – L3)**
CO 5	Analyze the static timing verification and physical design verification **(Analyze – L4)**

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

CO	PO1	PO 2	PO3	PO4	PO5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	-	-	-	-	-	--	-	-	1	-	2	-
CO2	1	2	2	1	2	-	-	-	-	-	-	1	-	2	-
CO3	1	2	3	1	2	-	-	-	-	-	-	2	-	3	-
CO4	1	2	3	2	3	-	-	-	-	-	-	2	-	3	-
CO5	3	2	3	2	3	-	-	-	-	-	-	2	-	3	-

Correlation Levels: **1**-Slight (Low), **2**-Moderate (Medium), **3**-Substantial (High) and No correlation: **'-'**

TEXT BOOKS:
1. P. K. Lala, **"Digital Circuit Testing and Testability"**, Academic Press.
2. M.L. Bushnell and V.D. Agrawal, **"Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits"**, Kluwer Academic Publishers.

REFERENCE BOOKS:
1. M. Abramovici, M.A. Breuer and A.D. Friedman, **"Digital Systems and Testable Design"**, Jaico Publishing House, 2002.
2. Janick Bergeron, **"Writing test benches: functional verification of HDL models"**, 2nd edition, Kluwer Academic Publishers, 2003.
3. Jayaram Bhasker, Rakesh Chadha, **"Static Timing Analysis for Nanometer Designs"** A practical approach, Springer publications.
4. Prakash Rashinkar, Peter Paterson, Leena Singh **"System on a Chip Verification"**, Kluwer Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Testing; Test Generation for Combinational Logic Circuits

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	General Interaction & Introduction to the course, Course Objective and Outcomes, POs, PSOs and Mapping with COs	2	04-07-2025		-	
2.	Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends Affecting Testing	2	05-07-2025		-	
3.	Faults in Digital Circuits: Failures and Faults, Modeling of Faults, Temporary Faults	2	11-07-2025		TLM1	
4.	Fault Diagnosis of Digital Circuits, Test Generation Techniques for Combinational Circuits	2	18-07-2025		TLM2	
5.	Test Generation Techniques for Combinational Circuits, Detection of Multiple Fauls in Combinational Logic Circuits	2	19-07-2025		TLM2	
No. of classes required to complete UNIT-I		**10**	**No. of classes taken**			

UNIT-II: Design of Testable Sequential Circuits; Built-In Self-Test

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Controllability and Observability, Ad Hoc Design Rules for Improving Testability, Design of Dignosable Sequential Circuits	2	25-07-2025		TLM2	
2.	The Scan-Path Technique for Testable Sequential Circuit Design, Level-Sensitive Scan Design, Random Access Scan Technique	2	01-08-2025		TLM2	
3.	Partial Scan, Testable Sequential Circuit Design Using Nonscan Techniques, Cross Check, Boundry Scan	2	02-08-2025		TLM2	
4.	Built-In Self-Test: Test Pattern Generation for BIST, Output Response Analysis	2	08-08-2025		TLM2	
5.	Circular BIST, BIST Architectures	2	22-08-2025		TLM2	
No. of classes required to complete UNIT-II		**10**	**No. of classes taken**			

UNIT-III: Testable Memory Design; Importance of Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	RAM Fault Models, Test Algorithms for RAMs, Detection of Pattern Sensitive Faults	2	23-08-2025		TLM2	
2.	BIST Techniques for Ram Chips, Test Generation and BIST for Embedded RAMs	2	05-09-2025		TLM2	
3.	What is verification? What is attest bench? The importance of verification, Reconvergence model	2	06-09-2025		TLM2	
4.	Formal verification, Equivalence checking, Model checking, Functional verification	2	12-09-2025		TLM2	
No. of classes required to complete UNIT-III		**08**	**No. of classes taken**			

UNIT-IV: Verification Tools; The verification plan

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Linting tools: Limitations of linting tools, lintingverilog source code, linting VHDL source code, lintingOpenVera and esource code, code reviews	2	19-09-2025		TLM2	
2.	Simulators: Stimulus and response, Event based simulation, cycle based simulation, Co-simulators, verification intellectual property: hardware modelers, waveform viewers	2	20-09-2025		TLM2	
3.	The role of verification plan: specifying the verification plan, defining the first success, Levels of verification: unit level verification, reusable components verification	2	26-09-2025		TLM2	
4.	ASIC and FPGA verification, system level verification, board level verification, verifying strategies, verifying responses	2	27-09-2025		TLM2	
No. of classes required to complete UNIT-IV		**08**	**No. of classes taken**			

UNIT-V: Static Timing Verification; Physical Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of static timing analysis, Cross talk and noise, Limitations of STA, Slew of a wave form, Skew between the signals	2	10-10-2025		TLM2	
2.	Timing arcs and unateness, Min and Max timing paths, clock domains, operating conditions	2	17-10-2025		TLM2	

3.	critical path analysis, false paths, Timing models, Layout rule checks and electrical rule checks	2	18-10-2025		TLM2	
4.	Parasitic extraction, Antenna, Crosstalk and Noise**:** Cross talk glitch analysis	2	24-10-2025		TLM2	
5.	crosstalk delay analysis, timing verification	2	25-10-2025		TLM2	
No. of classes required to complete UNIT-V		**10**	**No. of classes taken**			

Contents beyond the Syllabus

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hardware/software co-verification	**2**	01-11-2025		TLM4	

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 & 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
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):

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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. G. Srinivasulu

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DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch. Srinivasa Rao

CourseName&Code **Introduction to Software Engineering** &20CSM6

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

Program/Sem : B.Tech,VII-Sem(Minors) **A.Y. :** 2025-26

PREREQUISITE: Object Oriented Programming.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to provide an understanding of different s/w process models and how to choose one among them by gathering the requirements from a client and specifying them. Using those requirements in the design of the software architecture based on the choices with the help of modules and interfaces. To enable s/w development, by using different testing techniques like unit, integration and functional testing, quality assurance can be achieved.

CO1	Understand the fundamentals of software engineering concepts and software Process models. **(Understand-L2)**
CO2	Apply the requirement elicitation techniques for preparing SRS and design engineering. **(Apply-L3)**
CO3	Understanding the basic building blocks of UML, Class, and object diagrams. **(Understand-L2)**
CO4	Apply behavioral models for real world applications. **(Apply-L3)**
CO5	Demonstrate different software testing approaches for testing real time applications. **(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
CO1	3												3		
CO2		2											2	1	
CO3	3												3	2	
CO4		2												3	1
CO5	2	2													3
1 - Low						**2** –Medium							**3** - High		

TEXTBOOKS:

T1 Roger S. Pressman, "Software engineering- A practitioner 's Approach", TMH InternationalEdition, 6th edition, 2005.

T2 Grady Booch, James Rum baugh, Ivar Jacobson, "The Unified Modeling Language User Guide", PEARSON,4thImpression,2012.

REFERENCE BOOKS:

R1 Software Engineering- Concepts and practices: Ugrasen Suman, Cengage learning

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

R3 Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI **R4 .**

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Software and software Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs discussion	1	04/07/2025		TLM2	
2.	The evolving role of Software	1	04/07/2025		TLM2	
3.	Characteristics of Software	1	05/07/2025		TLM2	
4.	Importance of software Engineering	1	05/07/2025		TLM2	
5.	Changing nature of software	1	11/07/2025		TLM2	
6.	Legacy Software	1	11/07/2025		TLM2	
7.	Software Myths	1	12/07/2025		TLM2	
8.	Software process model: layered. technology	1	12/07/2025		TLM2	
9.	Process framework The process and product	1	18/07/2025		TLM2	
10.	Waterfall model	1	18/07/2025		TLM2	
11.	Incremental model	1	19/07/2025		TLM2	
12.	Spiral and V model	1	19/07/2025		TLM2	
13.	Component based s/w development	1	25/07/2025		TLM2	
14.	Unified Process model	1	25/07/2025		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Requirements Analysis and Software design

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.	Requirements gathering	1	01/08/2025		TLM2	
16.	Requirement analysis	1	01/08/2025		TLM2	
17.	Software requirement specification	1	02/08/2025		TLM2	
18.	SRS document case study	1	02/08/2025		TLM2	
19.	Overview of design process	1	08/08/2025		TLM2	
20.	Design concepts	1	08/08/2025		TLM2	
21.	Architectural concepts	1	09/08/2025		TLM2	
22.	Examples	1	09/08/2025		TLM2	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Design using UML

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Building Blocks of UML	1	22/08/2025		TLM2	
25.	Defining things	1	22/08/2025		TLM2	
26.	Defining relationships and diagrams	1	23/08/2025		TLM2	
27.	Common Mechanism in UML	1	23/08/2025		TLM2	
28.	Class diagrams	1	19/09/2025		TLM2	
29.	Examples	1	19/09/2025		TLM2	
30.	Object diagrams and examples	1	20/09/2025		TLM2	
31.	Revision	1	20/09/2025		TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: Behavioral Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Interactions	1	26/09/2025		TLM2	
33.	Interaction diagrams	1	26/09/2025		TLM2	
34.	Use-cases	1	27/09/2025		TLM2	
35.	Use-case diagrams	1	27/09/2025		TLM2	
36.	Activity diagrams	1	03/10/2025		TLM2	
37.	Events and signals, state machines	1	03/10/2025		TLM2	
38.	processes and Threads, time, and space	1	04/10/2025		TLM2	
39.	State chart diagrams	1	04/10/2025		TLM2	
40.	Component diagrams	1	10/10/2025		TLM2	
41.	Deployment diagrams	1	10/10/2025		TLM2	
42.	Examples	1	11/10/2025		TLM2	
43.	Revision	1	11/10/2025		TLM2	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Testing 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
44.	Software testing fundamentals	1	17/10/2025		TLM2	
45.	Unit testing	1	17/10/2025		TLM2	
46.	Integration testing	2	18/10/2025		TLM2	
47.	Blackbox testing	1	24/10/2025		TLM2	
48.	Whitebox testing	1	24/10/2025		TLM2	
49.	Debugging	2	25/10/2025		TLM2	
50.	System testing	2	31/10/2025		TLM2	
51.	Examples	2	01/11/2025		TLM2	
52.	Revision	2	07/11/2025		TLM2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond the Syllabus:

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50	Case study version control	2	08/11/2025		TLM6	
51	Case study test case preparation	2	14/11/2025		TLM6	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial/Assignment	**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
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	**Ch. Srinivasa Rao**	**Ch. Srinivasa Rao**	**Dr.D.V. Subbaiah**	**Dr. Nagarjuna Reddy**
Signature				

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L.B.REDDY NAGAR, MYLAVARAM. NTR District, AP, India. 521230.
hodads@lbrce.ac.in , ads@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. V SOWJANYA
Course Name & Code : Introduction to Deep Learning (20ADM5)
L-T-P Structure : 3-1-0 **Credits:** 3
Program/Sem/Sec :IV B.Tech/ VII Sem/ Minor **A.Y.:** 2025-26

PREREQUISITE: Probability and Statistics, LATT, Statistical reasoning in machine learning

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objectives of this course are to:

1. Provide a strong mathematical foundation for deep learning through linear algebra, probability, and optimization.
2. Introduce the fundamentals of machine learning and its relevance to deep learning.
3. Familiarize students with various architectures of deep neural networks.
4. Enable students to design and implement Convolutional Neural Networks (CNNs).
5. Equip students to build and train Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks for sequence modelling tasks.

COURSE OUTCOMES (CO's): After successful completion of the course the students are able to

CO1	Demonstrate the mathematical foundation of Neural network **(Understand -L2)**
CO2	Describe the basics of machine learning **(Understand- L2)**
CO3	Compare the different architectures of Deep Neural Network **(Analyze- L4)**
CO4	Build a convolutional Neural Network **(Apply- L3)**
CO5	Build and train RNN and LSTMs. **(Apply- L3)**

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

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

TEXTBOOKS:

T1 Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courvile, MIT Press, 2016

T2 Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

REFERENCE BOOKS:

R1 Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019

R2 Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Linear Algebra & Probability and information Theory

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**UNIT-1 Linear Algebra:** Introduction about CO's & PO's related to Course,	1	04.7.2025		TLM 1, 2	
2.	Scalars, Vectors, Matrices and Tensors, Matrix Operations, Types of Matrices, Norms	1	04.7.2025		TLM 1, 2	
3.	Eigen Decomposition, Singular Value Decomposition, Principal Component Analysis	2	05.7.2025		TLM 1, 2	
4.	**Probability and Information Theory:** Random Variables, Probability Distributions, Marginal Probability, Conditional Probability	2	11.7.2025		TLM 1, 2	
5.	Expectation, Variance and Covariance, Bayes' Rule,	2	12.7.2025		TLM 1, 2	
6.	**Information Theory.** Numerical Computation: Overflow and Underflow.	2	18.7.2025		TLM 1, 2	
7.	Gradient-Based Optimization, Constrained Optimization, Linear Least Squares	2	19.7.2025		TLM 1, 2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Machine Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	**Machine Learning:** Basics and Underfitting, Hyper parameters and Validation Sets, Estimators	2	25.7.2025		TLM 1, 2	
9.	Bias and Variance, Maximum Likelihood, Bayesian Statistics,	2	01.8.2025		TLM 1, 2	
10.	Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning.	2	02.8.2025		TLM 1, 2	
11.	**Deep Feed forward Networks:** Learning XOR,	1	08.8.2025		TLM 1, 2	
12.	Gradient-Based Learning, Hidden Units	1	09.8.2025		TLM 1, 2	
13.	Architecture Design, Back-Propagation and other Differentiation Algorithms	2	22.8.2025		TLM 1, 2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Regularization for Deep Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization	2	23.8.2025		TLM 1, 2	
15.	Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness	2	19.9.2025		TLM 1, 2	
16.	Semi-Supervised Learning, Multi-Task Learning, Early Stopping	2	20.9.2025		TLM 1, 2	
17.	Parameter Tying and Parameter Sharing, Sparse Representations,	2	26.9.2025		TLM 1, 2	
18.	Bagging and Other Ensemble Methods, Dropout, Adversarial Training,	2	27.9.2025		TLM 1, 2	
19.	Tangent Distance, Tangent Prop and Manifold Tangent Classifier.	2	10.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Convolutional networks

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.	**Convolutional Networks**: The Convolution Operation, Pooling.	2	11.10.2025		TLM 1, 2	
21.	Convolution, Basic Convolution Functions, Structured Outputs, Data Types	2	17.10.2025		TLM 1, 2	
22.	Efficient Convolution Algorithms, Random Unsupervised Features	2	18.10.2025		TLM 1, 2	
23.	Basis for Convolutional Networks	2	24.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Sequence Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	**Sequence Modeling: Recurrent and Recursive Nets:** Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs	2	25.10.2025		TLM 1, 2	
25.	Encoder-Decoder Sequence-to-Sequence Architectures	2	31.10.2025		TLM 1, 2	
26.	Deep Recurrent Networks, Recursive Neural Networks	2	01.11.2025		TLM 1, 2	
27.	Echo State Networks Models, LSTM, Gated RNNs	2	07.11.2025		TLM 1, 2	
28.	Optimization for Long-Term Dependencies	2	08.11.2025		TLM 1, 2	
29.	Auto encoders, Deep Generative	2	14.11.2025		TLM 1, 2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Transformers and Attention Mechanism (used in models like BERT, GPT).	1	15.11.2025		TLM 1, 2	
31.	Graph Neural Networks (GNNs)	1	15.11.2025		TLM 1, 2	

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

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 projects development using open-source programming environment for the success of Organization.
PSO 2	The ability to design and develop computer programs in networking and 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	**Ms V Sowjanya**	**Ms V Sowjanya**	**Dr V Surya Narayana**	**Dr. P. Bhagath**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

Course Instructor : Mrs.K.Lakshmi Devi

Course Name & Code : OBJECT ORIENTED ANALYSIS AND DESIGN USING UML-**20ITM5**

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

Program/Sem/Sec **:** B.Tech, VII SEM **A.Y.:** 2025-26

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

CO1: Understand the basic concepts of object and Elements of object model (Understand -L2)
CO2: Identify the design patterns to solve object oriented design problems (Understand -L2)
CO3: Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)
CO4: Design Interaction diagrams for a given application. (Analyze –L3)
CO5: Design use case, activity, Implementation diagrams for any application (Analyze –L3)

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	-	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	1	3	-	-	-	-	-	-	-	-	-	-	1	-

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

BOS APPROVED TEXT BOOKS:

1. Grady Booch, ―Object Oriented Analysis & Design with Applications‖,
2 Edition, Pearson Education 1999. 2. Ali Bahrami, ―Object Oriented Systems Development – Using the Unified Modeling Language‖. TGH International Editions, Computer Science Series, 1999.

BOS APPROVED REFERENCE BOOKS:

1. James Rumbaugh, Ivan Jacobson and Grady Booch, ―Unified Modeling Language Reference Manual‖, PHI, 1999.

2. Jacobson et al., the ―Unified Software Development Process‖. AW, 1999.

3. Tom Pender, ―UML Bible‖, John Wiley & Sons. 2003.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

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.	The Object Model – Overview of Object Oriented system Development	1	04.07.25		TLM2	
2.	Object Basic – Object – Oriented Systems Development Life Cycle	2	04.07.25 05.07.25		TLM2	
3.	Object Oriented Analysis Process	1	05.07.25		TLM1	
4.	Identifying use cases: Introduction.	1	11.07.25		TLM2	
5.	Why Analysis is a Difficult Activity	1	11.07.25		TLM7	
6.	Business Object Analysis: Understanding the Business Layer	1	18.07.25		TLM2	
7.	Use-Case Driven Object-Oriented Analysis: The Unified Approach	1	18.07.25		TLM2	
8.	Business Process Modeling	1	19.07.25		TLM1	
9.	Use-Case Model, Developing Effective Documentation	1	19.07.25		TLM2	
10.	Use-Case Model, Developing Effective Documentation	1	25.07.25		TLM2	
11.	Assignment	1	25.07.24		TLM6	
No. of classes required to complete UNIT-I		12	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
1.	Unified Modeling Language (UML): Introduction	1	26.07.25		TLM2	
2.	Static and Dynamic Models	1	26.07.25		TLM2	
3.	Why Modeling?	1	27.07.25		TLM2	
4.	Introduction to the Unified Modeling Language, UML Diagrams.	2	27.07.25 01.08.25		TLM2	
5.	UML Use Case Diagram- Use case descriptions	1	01.08.25		TLM2	
6.	Actors and actor descriptions	1	02.08.25		TLM2	
7.	Use case relationships: communication association, include	1	02.08.25		TLM1	
8.	Extend and Generalization, System Boundary,	1	08.08.25		TLM2	
9.	Case study Via Net Bank ATM.	1	08.08.25		TLM1	
10.	Tutorial	1	16.08.25		TLM3	
No. of classes required to complete UNIT-II		11	No. of classes taken:			

UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Identifying Object Relationships, Attributes and Methods: Introduction, Associations, Super Sub Class Relationships	1	16.08.25		TLM2	
2.	A-Part-of Relationships-Aggregation, Class Responsibility, Identifying Attributes and Methods	1	17.08.25		TLM2	
3.	Class Responsibility, Defining Attributes by Analyzing Use Cases and Other UML Diagrams	2	17.08.25 23.08.25		TLM2	
4.	Object Responsibility: Methods and Messages	1	23.08.25		TLM1	
5.	Static Modeling: UML Class Diagram: Class, interface	2	19.09.25 19.09.25		TLM9	
6.	Package, Relationships between classes and other Notations of Class Diagram	1	20.09.25		TLM9	
7.	Package, Relationships between classes and other Notations of Class Diagram	2	20.09.25 26.09.25		TLM9	
8.	Case study ViaNet Bank ATM.	1	26.09.25		TLM9	
9.	Assignment	1	27.09.25		TLM6	
No. of classes required to complete UNIT-III		12	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
10.	UML Interaction Diagrams – UML Sequence Diagram: object, life line,	1	27.09.25		TLM2	
11.	Activation Bar, Types of Messages.	2	10.10.25 10.10.25		TLM2	
12.	UML Collaboration Diagram: object, object Connection	1	11.10.25		TLM9	
13.	Message with sequence numbers, case study ViaNet Bank ATM	1	11.10.25		TLM9	
14.	UML State-Chart Diagram: object State, Initial/Final State	2	17.10.25 17.10.25		TLM2	
15.	Simple/Complex Transitions	1	18.10.25		TLM1	
16.	UML Activity Diagram: Activity State, Transition	1	18.10.25		TLM2	
17.	Swim Lane, Initial state, Final State	1	24.10.25		TLM2	
18.	Synchronization Bar, Branching, case study Via Net Bank ATM	1	24.10.25		TLM9	
19.	TUTORIALS	1	25.10.25		TLM3	
No. of classes required to complete UNIT-IV		12	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
20.	Implementation Diagrams – Component Diagram: Component, Dependency and Interface,	1	25.10.25		TLM2	
21.	Deployment Diagram: Node, Communication Association, case study Via Net Bank ATM.	1	31.10.25		TLM2	
22.	Model Management: Packages and Model Organization	1	31.10.25		TLM2	
23.	UML Extensibility, UML Meta Model.	2	01.11.25 01.11.25		TLM2	
24.	Designing Classes: Introduction, The Object-Oriented Design Philosophy, UML Object Constraint Language	1	07.11.25		TLM7	
25.	Designing Classes: The Process, Class Visibility: Designing Well-Defined Public, Private, and Protected Protocols	2	07.11.25 08.11.25		TLM2	
26.	Designing Classes: Refining Attributes, Designing Methods and Protocols	1	08.11.25		TLM2	
27.	Packages and Managing Classes, case study Via Net Bank ATM.	1	15.11.25		TLM9	
28.	Assignment		15.11.25		TLM6	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

Teaching Learning Methods			
TLM1	Chalk and Talk-6	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT-27	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial-2	**TLM6**	Group Discussion/Project-2

PART-C

EVALUATION PROCESS (R20 Regulations):

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

PSO1: Organize, Analyze, and interpret the data to extract meaningful conclusions.

PSO2: Design, Implement and Evaluate a computer-based system to meet desired needs

PSO3: Develop IT application services with the help of different current engineering tools.

Course Name	CO s	CO Name	PI s
OOAD	CO1	Understand the basic concepts of object and Elements of object model (Understand -L2)	2.1, 3.1
	CO2	Identify the design patterns to solve object oriented design problems (Understand -L2)	2.2
	CO3	Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)	2.1
	CO4	Design Interaction diagrams for a given application. (Analyze –L3)	1.3
	CO5	Design use case, activity, Implementation diagrams for any application (Analyze –L3)	2.1

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs. K.Lakshmi Devi			Dr D.Ratna Kishore
Signature				

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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section - C

Course Instructor : Dr. Y. Amar Babu, Professor of ECE

Course Name & Code : ASIC Design – 20EC21

L-T-P-Cr Structure : 3-0-0-3

Academic Year : 2025-26

Pre requisite: VLSI Design

Course Educational Objective: In this course, the student will learn various ASIC architectures, ASIC design flow, issues in ASIC design and testing of ASICs and also about SoC Design.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1	Understand ASIC Design Styles, Design Issues, Design Techniques and Construction.
CO 2	Apply design techniques, resources and tools to develop ASIC modules.
CO 3	Analyze the characteristics and performance of ASICs and judge independently the best suited device for fabrication of smart devices.
CO 4	Evaluate Design issues, simulation and testing of ASICs

CO's	Co-Po Attainment Table														
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	3	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	-	3	-
CO3	2	3	2	1	-	-	-	-	-	-	-	2	-	3	-
CO4	1	2	3	2	-	-	-	-	-	-	-	2	-	3	-

Prescribed Syllabus:

UNIT-I: [9 Hrs]

ASIC DESIGN STYLES: Introduction – categories-Gate arrays-Standard cells- Cell based

ASICs-Mixed mode and analogue ASICs – PLDs.

ASICS– PROGRAMMABLE LOGIC DEVICES: Overview – PAL –based PLDs:

Structures; PAL Characteristics – FPGAs: Introduction, selected families –design outline.

UNIT-II: [8 Hrs]

ASICS–DESIGN ISSUES: Design methodologies and design tools – design for testability –

economies.

ASICS-CHARACTERISTICS AND PERFORMANCE: Design styles, gate arrays, standard cell -based ASICs, Mixed mode and analogue ASICs.

UNIT-III: [8 Hrs]

ASICS-DESIGN TECHNIQUES: Design flow and methodology- Hardware description

languages- simulation and checking-commercial design tools- FPGA Design tools: XILINX,

ALTERA.

UNIT-IV: [9 Hrs]

LOGIC SYNTHESIS, SIMULATION AND TESTING: Verilog and logic

synthesis -VHDL and logic synthesis - types of simulation -boundary scan test-fault simulationautomatic test pattern generation

ASIC-CONSTRUCTION: Floor planning, placement and routing system

partition.

UNIT-V: [8 Hrs]

FPGA PARTITIONING: Partitioning Methods-Floor Planning- Placement- Physical

Design Flow-GlobalRouting-Detailed Routing –Special Routing-Circuit Extraction-DRC.

TEXT BOOK:

1. M.J.S.Smith, “Application - Specific integrated circuits”, Addison-WesleyLongman Inc

1997.

2. L.J.Herbst, “Integrated circuit engineering”, OXFORD SCIENCE Publications,1996.

REFERENCE BOOKS:

1. Wayne Wolf, —FPGA-Based System Design , Prentice Hall PTR, 2009.

2. Farzad Nekoogar and Faranak Nekoogar,-From ASICs to SOCs: A Practical Approach,

PrenticeHall PTR, 2003.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: ASIC DESIGN STYLES						
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, categories	1	30-06-2025			
2.	**Gate Arrays, Standard Cells**	1	02-07-2025			
3.	**Cell based ASICs**	1	03-07-2025			
4.	Mixed mode and Analogue ASICs-PLDs	1	05-07-2025			
5.	**PLDs Overview,** PAL based PLDs: structures	1	05-07-2025			
6.	PAL Characteristics	1	07-07-2025			
7.	FPGAs: Introduction, Selected families	1	09-07-2025			
8.	Design Outline	1	10-07-2025			
9.	**Tutorial,/Assignment**	1	14-07-2025			

UNIT- II: ASIC DESIGN ISSUES						
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.	ASIC Design Issues	1	16-07-2025			
11.	Design methodologies	1	17-07-2025			
12.	**Design Tools**	1	19-07-2025			
13.	DFT, Economies	1	19-07-2025			
14.	ASIC characteristics and performance	1	21-07-2025			
15.	**Design styles, gate arrays**	1	23-07-2025			
16.	Standard cell based ASIC,	1	24-07-2025			
17.	Mixed mode, Analog ASICs	1	28-07-2025			
18.	**Tutorial,/Assignment**	1	30-07-2025			

UNIT – III: ASIC Design 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**
19.	Design flow and Methodology	1	31-07-2025			
20.	Hardware description Language	1	02-08-2025			
21.	**Simulation and Checking**	1	02-08-2025			
22.	**Commercial design Tools**	1	04-08-2025			
23.	FPGA Design Tools: Xilinx	2	06-08-2025 07-08-2025			
24.	ALTERA	2	09-08-2025 09-08-2025			
25.	**Tutorial,/Assignment/Mid-1 Review**	1	11-08-2025			

UNIT – IV: Logic Synthesis, Simulation and Testing						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
26.	Verilog and logic synthesis	1	13-08-2025			
27.	VHDL and logic Synthesis	1	14-08-2025			
28.	Types of Simulation	1	16-08-2025			
29.	**Boundary Scan Test**	1	16-08-2025			
30.	**Fault Simulation**	1	18-08-2025			
31.	Automatic Test Pattern Generation	1	20-08-2025			
32.	ASIC Construction: Floor Planning	1	21-08-2025			
33.	Placement and Routing, System Partition	1	23-08-2025			
34.	**Tutorial,/Assignment**	1	23-08-2025			

UNIT – V: FPGA Partitioning						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
35.	Partitioning Methods	1	15-09-2025			
36.	Floor Planning	1	17-09-2025			
37.	Placement	1	18-09-2025			
38.	Physical Design Flow	1	20-09-2025			
39.	Global Routing	1	20-09-2025			
40.	Detailed Routing	1	22-09-2025			
41.	Special Routing	1	24-09-2025			
42.	Circuit Extraction	1	25-09-2025			
43.	DRC	1	27-09-2025			
44.	**Tutorial,/Assignment**	1	27-09-2025			

27-03-2025

BEYOND THE SYLLABUS & REVISION [3 HRS]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
45.	SoC Architectures		29-09-2025			
46.	NoC Architectures		1-10-2025			

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

Academic Calendar: 2025 – 26 (VII Semester)

B.Tech VI Semester - 2020 Admitted Batch			
Class work Commence From	**21-02-2022**		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	**30-06-2025**	23-08-2025	8 Weeks
I Mid Examinations	**08-09-2025**	**13-09-2025**	1 Week
II Phase Instructions	15-09-2025	**15-11-2025**	8 Weeks
II Mid Examinations	**17-11-2025**	**22-11-2025**	1 Week
Preparation & Practicals	24-11-2025	29-11-2025	1 Week
Semester End Examinations	**21-04-2025**	**03-05-2025**	2 Weeks
Internship	01-12-2025	13-12-2025	6 Weeks

EVALUATION PROCESS:

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
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**

CO 1	Understand the architecture of 8086, 8051 and ARM Controller **(Understand)**	Describe, Explain, Paraphrase, Restate ,Associate, Contrast, Summarize, Differentiate, Interpret, Discuss
CO 2	Apply Assembly Language instructions for Processor and Controller based applications **(Apply)**	Calculate, Predict, Apply, Solve, Illustrate, Use, Demonstrate, Determine, Model, Experiment, Show, Examine, Modify
CO 3	Analyze the operating modes and interrupt structures of processors and controllers **(Analyze)**	Classify, Outline, Break down, Categorize, Analyze, Diagram, Illustrate, Infer, Select
CO 4	Develop the ARM based interfacing systems for Real time applications **(Apply)**	Categorize, Analyze, Illustrate, Infer Select

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Dr. Y. Amar Babu]	[Dr. Y. Amar Babu]	[Dr.P.LACHI REDDY]	[Dr.G.SRINIVASULU]

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Department of Electronics and Communication Engineering

COURSE HANDOUT

PART-A:

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section - C

Course Instructor : Mrs. K. Balavani , Sr. Asst. Professor, ECE

Course Name & Code : LOW POWER VLSI DESIGN – 20EC27

L-T-P-Cr Structure : 3-0-0-3

Academic Year : 2025-26

Pre requisite: Digital Electronic Circuits and VLSI Design

Course Educational Objective: This course provides knowledge on fundamentals of low power VLSI design concepts, circuits and subsystems.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1	Summarize the Fundamental concepts of Low Power VLSI Design. (Understand – L2)
CO 2	Apply Low Power Design Approaches for IC designs. (Apply – L3)
CO 3	Analyze low voltage low power memories using mathematical models. (Analyze – L4)
CO 4	Design low voltage low power adders and multipliers. (Apply – L3)

CO's	Co-Po Attainment Table														
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO1	3	2										2		3	
CO2	3	3	3		2		2					2		3	
CO3	3	3		2	3							2		3	2
CO4	3	3	3	2	3		2		1	1	1	2		3	2

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Fundamentals of Low Power CMOS VLSI Design [11 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
1.	Introduction to COs	1	30.06.2025			
2.	Introduction	1	03.07.2025			
3.	Sources of Power Dissipation	1	04.07.2025			
4.	Static Power Dissipation	1	05.07.2025			
5.	Short Circuit Power Dissipation	1	07.07.2025			
6.	Leakage Power Dissipation, Glitch Power Dissipation	1	10.07.2025			
7.	Short Channel Effects –Drain Induced Barrier Lowering	1	11.07.2025			
8.	Body effect	1	12.07.2025			
9.	Gate-induced Drain Leakage	1	14.07.2025			
10.	Active power dissipation.	1	17.07.2025			
11.	**Tutorial/Assignment**	1	18.07.2025			

UNIT- II: Circuit techniques for Low-Power Reduction [10 Hrs]						
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.	Concepts of leakage power	1	19.07.2025			
13.	Circuit techniques for Leakage power reduction	1	21.07.2025			
14.	Power Gating, Body Biasing Techniques	1	24.07.2025			
15.	Standby leakage control	1	25.07.2025			
16.	Multi-Vth technique	1	28.07.2025			
17.	Supply voltage scaling	1	31.07.2025			
18.	VTMOS circuits	1	01.08.2025			
19.	DTMOS circuits	1	02.08.2025			
20.	Dynamic-Vth technique	1	04.08.2025			
21.	**Tutorial /Assignment**	1	07.08.2025			

UNIT – III: Low-Voltage Low-Power Adders [11 Hrs]						
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.	Introduction,	1	08.08.2025			
23.	Standard Adder Cells	1	09.08.2025			
24.	CMOS Adder's Architectures	1	11.08.2025			
25.	Carry Look-Ahead Adder	1	14.08.2025			
26.	Ripple Carry Adders,	1	18.08.2025			
27.	Carry Select Adders	1	21.08.2025			
28.	Mid-1 Review	1	22.08.2025			
29.	Carry Save Adders	1	23.09.2025			
30.	Performance evaluation of various adder architectures	1	15.09.2025			
31.	Performance evaluation of various adder architectures	1	18.09.2025			
32.	**Tutorial/Assignment**	1	19.09.2025			

UNIT – IV: Low-Voltage Low-Power Multipliers [12 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
33.	Review of Multiplication	1	20.09.2025			
34.	Multiplier Architectures	1	22.09.2025			
35.	Multiplier Architectures	1	25.09.2025			
36.	Braun Multiplier	1	26.09.2025			
37.	Braun Multiplier	1	27.09.2025			
38.	Baugh-Wooley Multiplier	1	29.09.2025			
39.	Baugh-Wooley Multiplier	1	03.10.2025			
40.	Booth Multiplier	1	04.10.2025			
41.	Booth Multiplier	1	06.10.2025			
42.	Introduction to Wallace Tree Multiplier.	1	09.10.2025			
43.	Wallace Tree Multiplier.	1	10.10.2025			
44.	**Tutorial/Assignment**	1	11.10.2025			

UNIT – V: Low-Voltage Low-Power Memories [15 Hrs]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
45.	Basics of ROM	1	13.10.2025			
46.	Low-Power ROM Technology	1	16.10.2025			
47.	Future Trend and Development of ROMs	1	17.10.2025			
48.	Future Trend and Development of ROMs	1	18.10.2025			
49.	Basics of SRAM	1	20.10.2025			
50.	Memory Cell	1	23.10.2025			
51.	Precharge and Equalization Circuit	1	24.10.2025			
52.	Precharge and Equalization Circuit	1	25.10.2025			
53.	Low-Power SRAM Technologies	1	27.10.2025			
54.	Basics of DRAM	2	31.10.2025 01.11.2025			
55.	Self-Refresh Circuit	1	03.11.2025			
56.	Future Trend and Development of DRAM.	2	06.11.2025 07.11.2025			
57.	**Tutorial/Assignment**	1	08.11.2025			

BEYOND THE SYLLABUS & REVISION [3 HRS]						
S.No.	**Topics to be covered**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
58.	Advanced Power Reduction Techniques	1	13-11-2025			
59.	Sub-threshold and Near-threshold Logic	1	14-11-2025			
60.	Low Power Design Metrics	1	15-11-2025			

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	30-06-2025		
I Phase of Instructions	30-06-2025	23-08-2025	8W
Technical Training	25-08-2025	06-09-2025	2W
I Mid Examinations	08-09-2025	13-09-2025	1W
II Phase of Instructions	15-09-2025	15-11-2025	9W
II Mid Examinations	17-11-2025	22-11-2025	1W
Preparation and Practical's	24-11-2025	29-11-2025	1W
Semester End Examinations	01-12-2025	13-12-2025	2W

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:	**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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
[Mrs.K.Balavani]	[Mrs.M.Ramya Harika]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
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Phone: 08659-222933, Fax: 08659-222931

Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.P. Venkat Rao
Course Name & Code : WIRELESS SENSOR NETWORKS, 20EC26
L-T-P Structure :3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/VII/C **A.Y.:** 2025-2026

PREREQUISITE: Digital communications and Computer Networks

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide knowledge on applications, architectures and protocols of wireless sensor networks. The course also gives the overview regarding the software platforms and tools required for wireless sensor networks.

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

CO1	**Interpret** the operation of wireless sensor network elements. **(Understand-L2)**
CO2	**Examine** different communication protocols of wireless sensor networks and its applications. **(Apply-L3)**
CO3	**Outline** sensor tasking and techniques used to establish infrastructure of wireless sensor networks. **(Understand-L2)**
CO4	**Apply** the knowledge of sensor network platforms and tools for sensor network application development. **(Apply-L3)**

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

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

TEXTBOOKS:

T1 Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
T2 Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, 2005.

REFERENCE BOOKS:

R1	1. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007
R2	2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Overview of Wireless Sensor Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	30-06-25			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	01-07-25			
3.	Wireless sensor networks- classification, advantages, limitations	1	04-07-25			
4.	Applications of WSNs	1	04-07-25			
5.	Application examples and types of applications	1	07-07-25			
6.	Unique constraints and Challenges	1	08-07-25			
7.	Characteristic Requirements and mechanisms	1	11-07-25			
8.	Advantages of Sensor Networks	1	11-07-25			
9.	Collaborative processing and Key definitions	1	14-07-25			
10.	Difference between Mobile Ad-hoc and Sensor Networks **Activity: Debate**	1	15-07-25			
11.	Enabling technologies	1	18-07-25			
12.	Application case study **Activity: Case Study**	1	18-07-25			
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Architectures

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.	Single node architecture- examples	1	21-07-25			
14.	Hardware components of nodes	1	22-07-25			
15.	Energy Consumption of Nodes	1	25-07-25			
16.	Operating states with different Power Consumption	1	25-07-25			
17.	Energy consumption of Transceiver,	1	28-07-25			
18.	Energy consumption of Micro controller,Memory **Activity: Project Based Learning**	1	29-07-25			
19.	Dynamic Voltage Scaling	1	01-08-25			
20.	Relation between Computation and Communication	1	01-08-25			
21.	commercially available sensor nodes	1	04-08-25			
22.	Sensor Network architecture	1	05-08-25			
23.	Sensor Network Scenarios, moving object detection **Activity: Simulation based learning Cupcarbon IoT simulator**	1	08-08-25			
24.	Optimization Goals of sensor networks	1	08-08-25			
25.	Figures of Merit	1	11-08-25			
26.	Gateway Concepts.	1	12-08-25			
No. of classes required to complete UNIT-II: 14				**No. of classes taken:**		

UNIT-III: Networking Sensors

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Wireless channel and Communication fundamentals	1	18-08-25			
28.	Fundamental concepts of protocol architectures	1	19-08-25			
29.	Physical Layer and Transceiver design considerations in WSNs	1	22-08-25			
30.	MAC Protocols for WSNs	1	22-08-25			
31.	Low Duty Cycle protocols	1	25-08-25			
32.	Wakeup radio concepts	1	26-08-25			
33.	S-MAC	1	29-08-25			
34.	The IEEE 802.15.4 MAC protocol **Activity: Flipped Classroom**	1	29-08-25			
35.	Routing Protocols for WSN	1	29-08-25			
36.	Energy efficient	1	01-09-25			
37.	Geographic routing	1	02-09-25			
38.	Position based routing	1	15-09-25			
39.	Routing Challenges and Design Issues in wireless sensor networks.	1	15-09-25			
40.	Routing protocol simulation for WSN **Activity: Simulation Based Learning using MATLAB**	1	16-09-25			
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Infrastructure Establishment

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.	Need for topology control in WSNs	1	19-09-25			
42.	Possible options for topology control	1	19-09-25			
43.	Ttypes for topology control- LMST	1	22-09-25			
44.	Clustering	1	23-09-25			
45.	Different types of clustering-methods **Activity: Problem Based Learning**	1	26-09-25			
46.	Time synchronization	1	26-09-25			
47.	Clocks and communication delays	1	29-09-25			
48.	Interval methods and reference broadcast methods	1	30-09-25			
49.	Localization and positioning	1	06-10-25			
50.	Sensor Tasking & Control	1	07-10-25			
51.	Task driven sensing	1	10-10-25			
52.	Role of sensor nodes & utilities,	1	10-10-25			
53.	Information based sensor tasking. **Activity: Puzzle Based Learning/Quiz**	1	13-10-25			
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Sensor Network Platforms and Tools

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
54.	Operating Systems for Wireless Sensor Networks	1	14-10-25			
55.	Types of Sensor Node Hardware	1	17-10-25			

56.	Berkeley Motes	1	17-10-25			
57.	Programming Challenges	1	20-10-25			
58.	Node-level software platforms	1	24-10-25			
59.	TinyOS and latest node level OS and tools for WSN **Activity: Lab Demonstration**	2	24-10-25 27-10-25			
60.	TinyOS application example	1	28-10-25			
61.	nesC	1	31-10-25			
62.	Components of node level simulator	1	31-10-25			
63.	Network simulator-NS-2	1	03-11-25			
64.	Installation and example programs in NS-2	1	04-11-25			
65.	Different types of Node-level Simulators	1	07-11-25			
66.	State-centric programming	1	07-11-25			
67.	WSN Usage examples of simulation tools **Activity: Project Based Learning**	1	11-11-25			
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Concepts 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
68.	Security issues Research trends to improve energy efficiency of WSN	1	12-11-25			
69.	Case studies using Simulation tools-MATLAB/NS-3/cupcarbon	2	14-11-25			

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 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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. P. Venkat Rao**	**Dr. P. Venkat rao**	**Dr. M.V Sudhakar**	**Dr. G. Srinivasulu**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P.GANDHI PRAKASH
Course Name & Code : INTRODUCTION TO ARTIFICIAL INTELLIGENCE – 20AD81
L-T-P Structure : 3-0-0 **Credits:**3
Program/Branch/Sem : B.Tech/ECE- C /VII **A.Y.: 2025-26**

PRE-REQUISITE: Basic Engineering Mathematics Knowledge

Course Educational Objective:

The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic, reasoning, and learning. Students will implement a small AI system in a team environment. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

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	Explain the different searching algorithms to find and optimize the solution for the given Problem. **(Understand-L2)**
CO4	Illustrate the different gaming algorithms and identify the importance of knowledge Representation in Artificial Intelligence. **(Apply-L3)**
CO5	Describe the use of predicate logic and rule-based system to represent the knowledge in AI domain. **(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. Can also use 2nd Ed., Pearson Education International, 2003.
T2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

BOS APPROVED REFERENCE BOOKS:

R1. Nils Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann, 1998.
R2. David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge Univ. Press, 2010.
R3. Ronald Brachman, "Knowledge Representation and Reasoning", Morgan Kaufmann, 2004.
R4. Frank van Harmeling, Vladimir Lifschitz, Bruce Porter (Eds), "Handbook of Knowledge representation", Elsevier, 2008.
R5. Ivan Bratko, "Prolog Programming for Artificial Intelligence", 4th Ed., Addison-Wesley, 2011.

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction	1	30-06-2025		-	CO1	-	
2.	Introduction: What Is AI?,	1	01-07-2025		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	04-07-2025		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	05-07-2025		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	07-07-2025		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	08-07-2025		TLM1	CO1	T1,T2	
7.	Types of agents	1	11-07-2025		TLM2	CO1	T1,T2	
8.	Types of agents	1	12-07-2025		TLM2	CO1	T1,T2	
9.	Types of agents	1	14-07-2025		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	15-07-2025		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	18-07-2025		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	19-07-2025		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	21-07-2025		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	22-07-2025		TLM1	CO1	-	
No. of classes required to complete UNIT-I: 14					**No. of classes taken:**			

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Problem-Solving Agents, Example Problems	2	25-07-2025 28-07-2025		TLM1	CO2	T1,T2	
16.	Searching for Solutions, Uninformed Search Strategies	1	29-07-2025		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	01-08-2025		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	02-08-2025		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	04-08-2025		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	05-08-2025		TLM2	CO2	T1,T2	
21.	A* Algorithm	2	08-08-2025 09-08-2025		TLM2	CO2	T1,T2	
22.	AO* Algorithm	2	11-08-2025 12-08-2025		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	18-08-2025		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	19-08-2025		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	22-08-2025		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	23-08-2025		TLM1	CO2	T1,R1	
No. of classes required to complete UNIT-II: 15					**No. of classes taken:**			

UNIT-III : SEARCH ALGORITHMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
27.	Introduction	1	15-09-2025		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	1	16-09-2025		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	19-09-2025		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	20-09-2025		TLM2	CO3	T1,T2	
31.	Depth limited search	1	22-09-2025		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	23-09-2025		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	26-09-2025		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	27-09-2025		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	07-10-2025		TLM1	CO3	-	
No. of classes required to complete UNIT-III: 09					**No. of classes taken:**			

UNIT-IV: ADVERSARIAL SEARCH/ GAME PLAYING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
36.	Introduction	1	10-10-2025		TLM1	CO4	T1,T2	
37.	Minimax algorithm	1	11-10-2025		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	1	13-10-2025		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	1	14-10-2025		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	17-10-2025		TLM1	CO4	T1,T2	
41.	Representation mappings	1	18-10-2025		TLM1	CO4	T1,T2	
42.	Inference Engine: Forward chaining/reasoning	1	20-10-2025		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	24-10-2025		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	1	25-10-2025		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	1	27-10-2025		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	28-10-2025		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 11					**No. of classes taken:**			

UNIT-V: KNOWLEDGE REPRESENTATION TECHNIQUES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
47.	Introduction	1	31-10-2025		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	1	01-11-2025		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	03-11-2025		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	04-11-2025		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	1	07-11-2025		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	08-11-2025		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	10-11-2025		TLM1	CO4	T1,T2	
54.	Types of reasoning	1	10-11-2025		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	1	11-11-2025		TLM2	CO5	T1,T2	

56.	The Internet Shopping World	1	14-11-2025		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	14-11-2025		TLM1	CO5	-	
No. of classes required to complete UNIT-V:11					**No. of classes taken:**			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	15-11-2025		**TLM1**			

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 (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 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 professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, 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	**P. Gandhi Prakash**	**P. Gandhi Prakash**	**Dr.V. Surya Narayana**	**Dr. P. Bhagath**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAACwith'A' Grade& NBA (Under Tier - I)
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF IiNFORMATION AND TCHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: T. Karuna Latha
Course Name & Code :CYBER SECURITY AND DIGITAL FORENSICS&201T84
L-T-P Structure : **3-0-0** **Credits:** 03
Program/Sem/Sec : B.Tech-E.C.E / VII SEM / C
A.Y. : 2025 - 26

PRE-REQUISITE: Understanding of digital logic, operating system concepts, Computer hardware knowledge.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to provide the basic concepts of cybersecurity and digital Forensics which help to protect ourselves from various kinds of cyber-attacks. Digital forensics is a branch of forensics science encompassing the recovery and investigation of material found in digital devices, often in relaxation to computer crime. It enables students to gain experience to do independent study and research

CO1	Understand the implementation of cybercrime. **(Understand - L2)**
CO2	Identify key Tools and Methods used in Cybercrime. **(Remember- L1)**
CO3	Under the Concepts of Cyber Forensics. **(Understand- L2)**
CO4	Apply Cyber Forensics in collection of digital evidence and sources of evidence **(Apply- L3)**
CO5	Analyze the cyber forensics tools for present and future**(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	1	1	-	-	1	1	-	1	-	-	-	1	1	-	-
CO2	-	1	1	-	3	1	-	-	-	-	-	1	1	-	-
CO3	1	-	-	1	3	1	-	-	-	-	-	1	1	-	-
CO4	1	1	-	3	1	-	-	-	-	-	-	1	1	1	-
CO5	-	-	1	-	3	1		1				1	2	1	
1 - Low					**2 –**Medium						**3 -** High				

TEXT BOOKS:

1. Dejey, Dr.Murugan, “cyber Forensics”, Oxford University Press, India, 2018
2. Sunit Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY,2011

REFERENCE BOOKS:

1. Michael Simpson, Kent Blackman and James e. Corley, “Hands on Ethical Hacking and Network Defense”, Cengage, 2019
2. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi
3. Alfred Basta, Nadine Basta, Mary Brown and Ravindra Kumar “Cyber Security and Cyber Laws”, Cengage, 2018

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section A

UNIT-I: Introduction to Cybercrime

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
1	Introduction to CSDF	1	30-06-2025		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	01-072025		**TLM1**	CO1	
3	Cybercrime and Information Security	1	02-07-2025		**TLM2**	CO1	
4	Cybercriminals	1	05-07-2025		**TLM7**	CO1	
5	Classifications of Cybercrime	1	07-07-2025		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	1	08-072025		**TLM2**	CO1	

7	Botnets Security Challenges Posed by Mobile	2	09-07-2025		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	1	14-07-2025		**TLM9**	CO1	
9	Unit-I Assignment Test	1	15-07-2025		**TLM6**	CO1	
No. of classes required to complete UNIT-I		10	No. of classes taken:				

UNIT-II: Tools and Methods

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completio06.072024n	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
10	Proxy Servers and Anonymizers	1	16-07-2025		**TLM2**	CO2	
11	Phishing, Password Cracking	1	19-07-2025		**TLM7**	CO2	
12	Key loggers and Spywares Virus and Worms	1	21-07-2025		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	22-07-2025		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	23-07-2025 28-07-2025		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	2	29-07-2025 30-07-2025		**TLM2**	CO2	
16	Unit-II Assignment Test	1	02-08-2025		**TLM6**	CO2	
No. of classes required to complete UNIT-2		09	No. of classes taken:				

UNIT – III: Cyber Forensics

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

17	Cyber Forensics Definition	1	04-08-2025		**TLM2**	CO3	
18	Disk Forensics	1	05-08-2025		**TLM1**	CO3	
19	Network Forensics	1	06-08-2025		**TLM2**	CO3	
20	Wireless Forensics	1	11-08-2025		**TLM2**	CO3	
21	Database Forensics	1	12-08-2025		**TLM2**	CO3	
22	Malware Forensics	1	13-08-2025		**TLM2**	CO3	
23	Mobile Forensics	1	18-08-2025		**TLM2**	CO3	
24	Email Forensics	1	18-08-2025		**TLM1**	CO3	
25	Unit-III Assignment Test	1	19-08-2025		**TLM6**	CO3	
No. of classes required to complete UNIT-3		9	No. of classes taken:				

UNIT-IV: Digital Evidence

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
26	Introduction to Digital Evidence and Evidence Collection procedure	2	19-08-2025 20-08-2025		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	15-09-2025 16-09-2025		**TLM7**	CO4	
28	File System Windows Registry	2	17-09-2025 20-09-2025		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	22-09-2025 23-09-2025		**TLM2**	CO4	
30	Linux Artifact	2	24-09-2025		**TLM1**	CO4	

			27-09-2025				
31	Digital evidence on the internet	2	04-10-2025 06-10-2025		**TLM3**	CO4	
32	Impediments to collection of Digital Evidence	1	07-10-2025		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	08-10-2025 11-10-2025		**TLM2**	CO4	
34	Unit-III Assignment Test	1	13-10-2025		**TLM6**	CO4	
No. of classes required to complete UNIT-4		16	No. of classes taken:				

UNIT-V: Cyber Forensics

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	HOD Sign Weekly
35	The Present and The Future Forensics Tools	2	14-10-2025 15-10-2025		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	2	18-10-2025 20-10-2025		**TLM2**	CO5	
37	Tools for Integrity Verification and Hashing	2	22-10-2025 25-10-2025		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	2	27-10-2025 28-10-2025		**TLM5**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	29-10-2025 01-11-2025		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	2	03-11-2025 04-11-2025		**TLM2**	CO5	
41	Unit -5 Assignment test.	2	05-11-2025 08-11-2025		**TLM6**	CO5	
No. of classes required to complete UNIT-5		14	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
1.	Cloud security & its types and storages	1	28-10-2025		TLM2	
2.	Using AI/ML to Analyze Cyber Threats	1	29.10.2025		TLM2	

TLM1	Chalk and Talk = 6	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT = 22	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS) =2
TLM3	Tutorial = 02	**TLM6**	Group Discussion/Project = 5

Part – C

EVALUATION PROCESS:

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

ACADEMIC CALENDAR:

Description	**From**	**To**	**Weeks**
Commencement of Class Work	24.06.2024		
I Phase of Instructions	30.06.2025	23.08.2025	8W
I Mid Examinations	08.09.2025	13.09.2025	2W
II Phase of Instructions	15.09.2025	15.11.2025	9W
II Mid Examinations	17.11.2025	22-11-2025	1W
Preparation and Practical's	24.11.2025	29.11.2025	1W
Semester End Examinations	01.12.2025	13.12.2025	2W

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	Pursue a successful career in the area of Information Technology or its allied fields.
PEO 2	Exhibit sound knowledge in the fundamentals of Information Technology and apply practical experience with programming techniques to solve real world problems.
PEO 3	Able to demonstrate self-learning, life-long learning and work in teams on multidisciplinary projects.
PEO 4	Able to understand the professional code of ethics and demonstrate ethical behavior, effective communication and team work and leadership skills in their job.

PROGRAMME OUTCOMES (POs):

PO1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 **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.

PO3 **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 **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.

PO5 **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.

PO6 **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.

PO7 **Environment and sustainability**: Understand the impact of the professional engineering solution sin societal and environmental contexts, and demonstrate the knowledge of, and

need for sustainable development.

PO8 **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **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.

PO11 **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.

PO12 **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 Organize, Analyze and Interpret the data to extract meaningful conclusions.

PSO2 Design, Implement and Evaluate a computer-based system to meet desired needs.

PSO3 Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs T.Karuna latha	Mrs. T.Karuna Latha	Mr. G.Rajendra	Dr. D.Rathna Kishore
Signature				

DEPARTMENT OF ECE
COURSE HANDOUT
PART - A

PROGRAM : B.Tech. - VII-Sem. - ECE – C Section
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : Management Science for Engineers – 20HS02
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Mr. S.Srinivasa reddy, Sr. Assistant Professor
COURSE COORDINATOR : Dr. A.Nageswara Rao, Sr. Assistant Professor
PER-REQUISITE : NIL

COURSE EDUCATIONAL OBJECTIVES:
1. To make students understand management, its principles, contribution to management, organization,
and its basic issues and types.
2. To make students understand the concept of plant location and its factors and plant layout and types,
method of production and work study importance.
3. To understand the purpose and function of statistical quality control. And understand the material management techniques.

COURSE OUTCOMES:
After completion of the course student will be able to:
CO1: Understand management principles to practical situations based on the organization structures. (L2)
CO2: Design Effective plant Layouts by using work study methods. (L2)
CO3: Apply quality control techniques for improvement of quality and materials management. (L3)
CO4: Develop best practices of HRM in corporate Business to raise employee productivity. (L2)
CO5: Identify critical path and project completion time by using CPM and PERT techniques. (L3)

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

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

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

BOS APPROVED TEXT BOOKS:
1. Dr. A.R.Aryasri, Management Science, TMH, 10th edition, 2012

References:

1. Koontz & weihrich – Essentials of management, TMH, 10th edition, 2015
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
3. O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-C

UNIT-I: INTRODUCTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction To Management	1	30-06-25		TLM1	CO1	T1	
2.	Definition, Nature, Importance of management	1	01-07-25		TLM1	CO1	T1	
3.	Functions of Management	1	02-07-25		TLM1	CO1	T1	
4.	Taylor's scientific management theory	1	04-07-25		TLM1	CO1	T1	
CRT Classes 25-08-25 TO 06-09-25								
5.	Fayal's principles of management	1	07-07-25		TLM3	CO1	T1	
6.	Contribution of Elton mayo, Maslow	1	08-07-25		TLM1	CO1	T1	
7.	Herzberg, Douglas MC Gregor principles of management	1	11-07-25		TLM1	CO1	T1	
8.	Basic Concepts of Organization, Authority, Responsibility	1	14-07-25		TLM1	CO1	T1	
9.	Delegation of Authority, Span of control	1	15-07-25		TLM1	CO1	T1, R1	
	Departmentation and Decentralization, Organization structures	1	16-07-25		TLM1	CO1	T1, R1	
	Line and Functional staff organization,	1	18-07-25		TLM1	CO1	T1, R1	
	Committee and Matrix organization	1	21-07-25		TLM1	CO1	T1	
No. of classes required to complete UNIT-I		12	22-07-25		No. of classes taken:			

UNIT-II: OPERATIONS MANAGEMENT

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
	Introduction	1	23-07-25		TLM1	CO2	T1, R3	
	Plant location	1	25-07-25		TLM1	CO2	T1, R3	

10.								
11.	Factors influencing location	1	28-07-25		TLM1	CO2	T1, R3	
12.	Principles of plant layouts	1	29-07-25		TLM1	CO2	T1, R3	
13.	Types of plant layouts	1	30-07-25		TLM1	CO2	T1, R3	
14.	Methods of production	1	01-08-25		TLM3	CO2	T1, R3	
15.	Work study	1	04-08-25		TLM1	CO2	T1	
16.		1	05-08-25		TLM1	CO2	T1	
17.	Basic procedure involved in method study	1	06-08-25		TLM1	CO2	T1	
18.	Work measurement	1	08-08-25		TLM3	CO2	T1	
No. of classes required to complete UNIT-II		10	11-08-25		No. of classes taken:			

UNIT-III: STATISTICAL QUALITY CONTROL & MATERIALS MANAGEMENT

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
	Introduction, Concept of Quality	1	12-08-25		TLM1	CO3	T1	
	Quality Control functions	1	13-08-25		TLM1	CO3	T1, R1	
	Meaning of SQC, Variables and attributes	1	18-08-25		TLM1	CO3	T1, R1	
	X chart, R Chart	1	19-08-25		TLM1	CO3	T1	
	C Chart, P Chart	1	20-08-25		TLM3	CO3	T1, R1	
	Simple problems	1	22-08-25		TLM1	CO3	T1, R1	
	Acceptance sampling	1	22-08-25		TLM1	CO3	T1	
MID-I 08-09-25 TO 19-09-25								
	Sampling plans	1	15-09-25		TLM1	CO3	T1, R1	
	Deming's contribution to quality	1	16-09-25		TLM1	CO3	T1, R1	
	Materials management Meaning and objectives	1	17-09-25		TLM1	CO3	T1	
	Inventory control	1	19-09-25		TLM3	CO3	T1	
	Need for inventory control	1	22-09-25		TLM1	CO3	T2	
	Purchase procedure, Store records	1	23-09-25		TLM1	CO3	T1	
	EOQ, ABC analysis	1	24-09-25		TLM1	CO3	T1, R2	
	Stock levels	1	26-09-25		TLM1	CO3	T1, R2	

19.								
No. of classes required to complete UNIT-III		15	04-10-25		No. of classes taken:			

UNIT-IV: HUMAN RESOURCE MANAGEMENT (HRM)

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
	Introduction	1	06-10-25		TLM1	CO4	T1	
	Concepts of HRM	1	07-10-25		TLM1	CO4	T1	
	Basic functions of HR manager	1	08-10-25		TLM1	CO4	T1, R2	
	Man power planning	1	10-10-25		TLM3	CO4	T1, R2	
	Recruitment	1	13-10-25		TLM1	CO4	T1, R2	
	Selection,	1	14-10-25		TLM1	CO4	T1, R1	
	Training & developmemt	1	15-10-25		TLM1	CO4	T1, R1	
	Placement	1	17-10-25		TLM1	CO4	T1	
	Wage and salary administration	1	20-10-25		TLM3	CO4	T1, R1	
	Promotion, Transfers Separation	1	22-10-25		TLM1	CO4	T1, R1	
	Performance appraisal	1	24-10-25		TLM1	CO4	T1	
	Job evaluation and merit rating	1	27-10-25		TLM3	CO4	T1	
No. of classes required to complete UNIT-IV		12	28-10-25		No. of classes taken:			

UNIT-V: PROJECT MANAGEMENT

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
	Introduction	1	29-10-25		TLM1	CO5	T1,R2	
	Early techniques in project management	1	31-10-25		TLM1	CO5	T1, R2	
	Network analysis	1	03-11-25		TLM1	CO5	T1,R2	
	Programme Evaluation and Review Technique (PERT)	1	04-11-25		TLM1	CO5	T1,R2	
	Problems	1	05-11-25		TLM1	CO5	T1,R2	
	Critical path method (CPM)	1	07-11-25		TLM1	CO5	T1, R2	
	Identifying critical path	1	10-11-25		TLM1	CO5	T1,R2	
	Probability of completing project within given time	1	12-11-25		TLM1	CO5	T1,R2	
	Project cost analysis	1	13-11-25		TLM1	CO5	T1,R2	
	project	1	14-11-25		TLM1	CO5	T1, R2	

20.	crashing							
No. of classes required to complete UNIT-V		10			No. of classes taken:			

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

Part – C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment 1	1	A1=5
Assignment 2	2	A2=5
I-Mid Examination	1,2,3	B1=15
Quiz – 1	1,2,3	Q1=10
Assignment 3	3	A3=5
Assignment 4	4	A4=5
Assignment 5	5	A5=5
II-Mid Examination	3,4,5	B2=15
Quiz – 2	3,4,5	Q2=10
Evaluation of Assignment: A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=15
Evaluation of Quiz Marks: Q=75% of Max(Q1,Q2)+25% of Min(Q1,Q2	1,2,3,4,5	Q=10
Cumulative Internal Examination: A+B+Q	1,2,3,4,5	CIE=30
Semester End Examinations	1,2,3,4,5	SEE=70
Total Marks: CIE+SEE	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Pursue higher education, entrepreneurship and research to compete at global level.
PEO2: Design and develop products innovatively in the area of computer science and engineering ar
in
Other allied fields.
PEO3: Function effectively as individuals and as members of a team in the conduct of interdisciplinary
Projects and even at all the levels with ethics and necessary attitude.
PEO4: Serve ever-changing needs of the society with a pragmatic perception.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - 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.

PO3 - Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - 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.

PO5 - 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.

PO6 - 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.

PO7 - 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.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - 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.

PO11 - Project Management and Finance: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO1: The ability to apply Software Engineering practices and strategies in software project development using open source programming environment for the success of organization.

PSO2: The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.

PSO3: To inculcate an ability to analyze, design and implement database applications.

Mr. S.Srinivasa reddy	Dr. A.Nageswara Rao	Mr. J. Subba Reddy	Dr. M.B.S.Sreekara Reddy
Course Instructor	Course Coordinator	Module Coordinator	HoD

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Name of Course Instructor: Dr.P. Venkat Rao
Course Name & Code : INTERNET OF THINGS, 20EC30
L-T-P Structure :**1-0-2** **Credits:** 2
Program/Sem/Sec : B.Tech/VII/C **A.Y.:** 2025-2026

Pre requisite: EMI, MPMC, Python Programming.

Course Educational Objective: In this course, student will learn about basics of IoT and procedure to develop prototypes for engineering applications.

Course Outcomes: (COs): At the end of the course, students are able to:

CO 1 : Understand the programming concepts of IOT. (**Understand – L2)**

CO 2 : Develop real time applications using Internet of Things. (**Apply – L3**

CO 3 **:** Demonstrate the integration of sensors with IOT. (**Understand – L2)**

CO 4 : Adapt effective Communication, presentation and report writing skills **(Apply – L3)**

UNIT – I: IoT Basics:
IoT, Frame work, Architectural View, Technology, Sources, M2M communication, Sensors, Participatory sensing, RFID, Wireless sensor network elements

UNIT – II: IoT Applications:
Prototyping embedded devices for M2M and IoT, M2M and IoT case studies.

TEXT BOOK:
1. Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hill Publication, 2017.
2. Zach Shelby, Carsten Bormann: "The Wireless Embedded Internet", Wiley, 1st Edition.

REFERENCES:
1. Arshdeep Bahga and Vijay Madisetti, Internet of Things – A Hands-on Approach, University Press, 2015
2. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford Press.

HANDS – ON Laboratory Sessions:
1. Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino
2. Interfacing Ultrasonic sensor and PIR sensor using Arduino
3. Design of Traffic Light Simulator using Arduino
4. Design of Water flow detection using an Arduino board
5. Interfacing of LED, Push button with Raspberry Pi and Python Program
6. Design of Motion Sensor Alarm using PIR Sensor
7. Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi
8. Interfacing DS18B20 Temperature Sensor with Raspberry Pi
9. Implementation of DC Motor and Stepper Motor Control with Raspberry Pi
10. Raspberry Pi based Smart Phone Controlled Home Automation
11. Smart Traffic light Controller
12. Smart Health Monitoring System

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT – I: IoT Basics						
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.	Introducation, COs, POs	1	03-07-2025		TLM2	
2.	IoT Introduction and Frame work	1	10-07-2025		TLM2	
3.	Architectural View of IoT	1	17-07-2025		TLM2	
4.	IoT Technology and Sources,	1	24-07-2025		TLM2	
5.	M2M communication	1	31-07-2025		TLM2	
6.	Sensors for IoT	1	07-08-2025		TLM2	
7.	Participatory sensing	1	14-08-2025		TLM2	
8.	RFID	1	21-08-2025		TLM2	
9.	Wireless sensor network elements	1	28-08-2025		TLM2	

UNIT – II: IoT Applications						
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.	Prototyping embedded devices for M2M	1	04-09-2025		TLM2	
11.	Prototyping embedded devices for IoT	1	18-09-2025		TLM2	
12.	M2M case studies.	2	25-09-2025 09-10-2025		TLM2	
13.	IoT case studies.	2	16-10-2025 23-10-2025		TLM2	

Hands – on Laboratory Session						
S.No.	**Experiments to be conducted**	**No. of Classes Required**	**Tentative Date of Completion**	**Actual Date of Completion**	**Teaching Learning Methods**	**HOD Sign Weekly**
	CYCLE-1					
1.	Introduction to Lab/Demo	3	03-07-2025		TLM4	
2.	Interfacing LED. DHT11-Temperature and, humidity sensor using Arduino	3	10-07-2025		TLM4	
3.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	3	17-07-2025		TLM4	
4.	Design of Traffic Light Simulator using Arduino	3	24-07-2025		TLM4	
5.	Design of Water flow detection using an Arduino board	3	31-07-2025		TLM4	
6.	Discussion of Arduino based Projects and Demo	3	07-08-2025		TLM6	
7.	Discussion of Arduino based Projects and Demo	3	07-08-2025		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	3	14-08-2025			
9.	Design of Motion Sensor Alarm using PIR Sensor	3	21-08-2025		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	3	28-08-2025		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	3	04-09-2025		TLM4	
12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	3	18-09-2025		TLM4	

13.	Raspberry Pi based Smart Phone Controlled Home Automation	3	25-09-2025		TLM4	
14.	Smart Traffic light Controller	3	09-10-2025		TLM4	
15.	Smart Health Monitoring	3	16-10-2025		TLM4	
16.	Implementation of Wireless Sensor Network using Raspberry Pi boards	3	23-10-2025		TLM4	
17.	Discussion of Raspberry Pi based Projects and Demo	4	30-10-2025		TLM4	
18.	Discussion of Raspberry Pi based Projects and Demo	4	06-10-2025		TLM6	
19.	Project Report writing & Verification	4	13-10-2025		TLM6	
No.of classes required to complete:		**75**	**No.of classes conducted:**			

PART-C

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

EVALUATION PROCESS

Evaluation Task	**Marks**
Report	10
Quality of work	10
Presentation	20
Interaction / Queries	10
Total Marks:	**50**

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:	**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:	**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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. P. Venkat Rao	Dr. P. Venkat Rao	Dr. P. Lachi Reddy	Dr. G. Srinivasulu
Signature				

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NIRF-2023 (Positioned in the Band of 101-150 in the Innovation Category)
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L.B.Reddy Nagar, Mylavaram-521230, N.T.R Dist., Andhra Pradesh, India.
Department of Electronics and Communication Engineering

COURSE HANDOUT
PART-A

Name of Course Instructor : Dr. P. Lachi Reddy
Course Name & Code : VLSI Testing and Verification – 20ECH4
L-T-P Structure : 3-1-0 Credits : 4
Program/Sem/Sec : B. Tech., ECE, VII-Sem., Honors A.Y : 2025-26

PRE-REQUISITE: VLSI Design

COURSE EDUCATIONAL OBJECTIVES (CEOs):
In this course student will learn about testable design, test generation algorithms for combinational and sequential circuits, design verification and verification tools, timing and physical design verification.

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

CO 1	Identify the significance of testable design **(Understand – L2)**
CO 2	Implement combinational and sequential circuit test generation algorithms **(Apply – L3)**
CO 3	Understand the importance of Design verification **(Understand – L2)**
CO 4	Learn verification tools **(Apply – L3)**
CO 5	Analyze the static timing verification and physical design verification **(Analyze – L4)**

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

CO	PO1	PO 2	PO3	PO4	PO5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	-	-	-	-	-	--	-	-	1	-	2	-
CO2	1	2	2	1	2	-	-	-	-	-	-	1	-	2	-
CO3	1	2	3	1	2	-	-	-	-	-	-	2	-	3	-
CO4	1	2	3	2	3	-	-	-	-	-	-	2	-	3	-
CO5	3	2	3	2	3	-	-	-	-	-	-	2	-	3	-

Correlation Levels: **1**-Slight (Low), **2**-Moderate (Medium), **3**-Substantial (High) and No correlation: **'-'**

TEXT BOOKS:
1. P. K. Lala, **"Digital Circuit Testing and Testability"**, Academic Press.
2. M.L. Bushnell and V.D. Agrawal, **"Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits"**, Kluwer Academic Publishers.

REFERENCE BOOKS:
1. M. Abramovici, M.A. Breuer and A.D. Friedman, **"Digital Systems and Testable Design"**, Jaico Publishing House, 2002.
2. Janick Bergeron, **"Writing test benches: functional verification of HDL models"**, 2nd edition, Kluwer Academic Publishers, 2003.
3. Jayaram Bhasker, Rakesh Chadha, **"Static Timing Analysis for Nanometer Designs"** A practical approach, Springer publications.
4. Prakash Rashinkar, Peter Paterson, Leena Singh **"System on a Chip Verification"**, Kluwer Publications.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Testing; Test Generation for Combinational Logic Circuits

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	General Interaction & Introduction to the course, Course Objective and Outcomes, POs, PSOs and Mapping with COs	2	04-07-2025		-	
2.	Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends Affecting Testing	2	05-07-2025		-	
3.	Faults in Digital Circuits: Failures and Faults, Modeling of Faults, Temporary Faults	2	11-07-2025		TLM1	
4.	Fault Diagnosis of Digital Circuits, Test Generation Techniques for Combinational Circuits	2	18-07-2025		TLM2	
5.	Test Generation Techniques for Combinational Circuits, Detection of Multiple Fauls in Combinational Logic Circuits	2	19-07-2025		TLM2	
No. of classes required to complete UNIT-I		**10**	**No. of classes taken**			

UNIT-II: Design of Testable Sequential Circuits; Built-In Self-Test

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Controllability and Observability, Ad Hoc Design Rules for Improving Testability, Design of Dignosable Sequential Circuits	2	25-07-2025		TLM2	
2.	The Scan-Path Technique for Testable Sequential Circuit Design, Level-Sensitive Scan Design, Random Access Scan Technique	2	01-08-2025		TLM2	
3.	Partial Scan, Testable Sequential Circuit Design Using Nonscan Techniques, Cross Check, Boundry Scan	2	02-08-2025		TLM2	
4.	Built-In Self-Test: Test Pattern Generation for BIST, Output Response Analysis	2	08-08-2025		TLM2	
5.	Circular BIST, BIST Architectures	2	22-08-2025		TLM2	
No. of classes required to complete UNIT-II		**10**	**No. of classes taken**			

UNIT-III: Testable Memory Design; Importance of Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	RAM Fault Models, Test Algorithms for RAMs, Detection of Pattern Sensitive Faults	2	23-08-2025		TLM2	
2.	BIST Techniques for Ram Chips, Test Generation and BIST for Embedded RAMs	2	05-09-2025		TLM2	
3.	What is verification? What is attest bench? The importance of verification, Reconvergence model	2	06-09-2025		TLM2	
4.	Formal verification, Equivalence checking, Model checking, Functional verification	2	12-09-2025		TLM2	
No. of classes required to complete UNIT-III		**08**	**No. of classes taken**			

UNIT-IV: Verification Tools; The verification plan

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Linting tools: Limitations of linting tools, lintingverilog source code, linting VHDL source code, lintingOpenVera and esource code, code reviews	2	19-09-2025		TLM2	
2.	Simulators: Stimulus and response, Event based simulation, cycle based simulation, Co-simulators, verification intellectual property: hardware modelers, waveform viewers	2	20-09-2025		TLM2	
3.	The role of verification plan: specifying the verification plan, defining the first success, Levels of verification: unit level verification, reusable components verification	2	26-09-2025		TLM2	
4.	ASIC and FPGA verification, system level verification, board level verification, verifying strategies, verifying responses	2	27-09-2025		TLM2	
No. of classes required to complete UNIT-IV		**08**	**No. of classes taken**			

UNIT-V: Static Timing Verification; Physical Design Verification

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Concept of static timing analysis, Cross talk and noise, Limitations of STA, Slew of a wave form, Skew between the signals	2	10-10-2025		TLM2	
2.	Timing arcs and unateness, Min and Max timing paths, clock domains, operating conditions	2	17-10-2025		TLM2	

3.	critical path analysis, false paths, Timing models, Layout rule checks and electrical rule checks	2	18-10-2025		TLM2	
4.	Parasitic extraction, Antenna, Crosstalk and Noise**:** Cross talk glitch analysis	2	24-10-2025		TLM2	
5.	crosstalk delay analysis, timing verification	2	25-10-2025		TLM2	
No. of classes required to complete UNIT-V		**10**	**No. of classes taken**			

Contents beyond the Syllabus

S. No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Hardware/software co-verification	**2**	01-11-2025		TLM4	

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 & 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
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):

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:	**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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. P. Lachi Reddy	Dr. G. Srinivasulu

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. V SOWJANYA
Course Name & Code : Introduction to Deep Learning (20ADM5)
L-T-P Structure : 3-1-0 **Credits:** 3
Program/Sem/Sec :IV B.Tech/ VII Sem/ Minor **A.Y.:** 2025-26

PREREQUISITE: Probability and Statistics, LATT, Statistical reasoning in machine learning

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objectives of this course are to:

1. Provide a strong mathematical foundation for deep learning through linear algebra, probability, and optimization.
2. Introduce the fundamentals of machine learning and its relevance to deep learning.
3. Familiarize students with various architectures of deep neural networks.
4. Enable students to design and implement Convolutional Neural Networks (CNNs).
5. Equip students to build and train Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) networks for sequence modelling tasks.

COURSE OUTCOMES (CO's): After successful completion of the course the students are able to

CO1	Demonstrate the mathematical foundation of Neural network **(Understand -L2)**
CO2	Describe the basics of machine learning **(Understand- L2)**
CO3	Compare the different architectures of Deep Neural Network **(Analyze- L4)**
CO4	Build a convolutional Neural Network **(Apply- L3)**
CO5	Build and train RNN and LSTMs. **(Apply- L3)**

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

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

TEXTBOOKS:

T1 Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courvile, MIT Press, 2016

T2 Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

REFERENCE BOOKS:

R1 Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019

R2 Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Linear Algebra & Probability and information Theory

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**UNIT-1 Linear Algebra:** Introduction about CO's & PO's related to Course,	1	04.7.2025		TLM 1, 2	
2.	Scalars, Vectors, Matrices and Tensors, Matrix Operations, Types of Matrices, Norms	1	04.7.2025		TLM 1, 2	
3.	Eigen Decomposition, Singular Value Decomposition, Principal Component Analysis	2	05.7.2025		TLM 1, 2	
4.	**Probability and Information Theory:** Random Variables, Probability Distributions, Marginal Probability, Conditional Probability	2	11.7.2025		TLM 1, 2	
5.	Expectation, Variance and Covariance, Bayes' Rule,	2	12.7.2025		TLM 1, 2	
6.	**Information Theory.** Numerical Computation: Overflow and Underflow.	2	18.7.2025		TLM 1, 2	
7.	Gradient-Based Optimization, Constrained Optimization, Linear Least Squares	2	19.7.2025		TLM 1, 2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Machine Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	**Machine Learning:** Basics and Underfitting, Hyper parameters and Validation Sets, Estimators	2	25.7.2025		TLM 1, 2	
9.	Bias and Variance, Maximum Likelihood, Bayesian Statistics,	2	01.8.2025		TLM 1, 2	
10.	Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning.	2	02.8.2025		TLM 1, 2	
11.	**Deep Feed forward Networks:** Learning XOR,	1	08.8.2025		TLM 1, 2	
12.	Gradient-Based Learning, Hidden Units	1	09.8.2025		TLM 1, 2	
13.	Architecture Design, Back-Propagation and other Differentiation Algorithms	2	22.8.2025		TLM 1, 2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Regularization for Deep Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization	2	23.8.2025		TLM 1, 2	
15.	Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness	2	19.9.2025		TLM 1, 2	
16.	Semi-Supervised Learning, Multi-Task Learning, Early Stopping	2	20.9.2025		TLM 1, 2	
17.	Parameter Tying and Parameter Sharing, Sparse Representations,	2	26.9.2025		TLM 1, 2	
18.	Bagging and Other Ensemble Methods, Dropout, Adversarial Training,	2	27.9.2025		TLM 1, 2	
19.	Tangent Distance, Tangent Prop and Manifold Tangent Classifier.	2	10.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Convolutional networks

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.	**Convolutional Networks**: The Convolution Operation, Pooling.	2	11.10.2025		TLM 1, 2	
21.	Convolution, Basic Convolution Functions, Structured Outputs, Data Types	2	17.10.2025		TLM 1, 2	
22.	Efficient Convolution Algorithms, Random Unsupervised Features	2	18.10.2025		TLM 1, 2	
23.	Basis for Convolutional Networks	2	24.10.2025		TLM 1, 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Sequence Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	**Sequence Modeling: Recurrent and Recursive Nets:** Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs	2	25.10.2025		TLM 1, 2	
25.	Encoder-Decoder Sequence-to-Sequence Architectures	2	31.10.2025		TLM 1, 2	
26.	Deep Recurrent Networks, Recursive Neural Networks	2	01.11.2025		TLM 1, 2	
27.	Echo State Networks Models, LSTM, Gated RNNs	2	07.11.2025		TLM 1, 2	
28.	Optimization for Long-Term Dependencies	2	08.11.2025		TLM 1, 2	
29.	Auto encoders, Deep Generative	2	14.11.2025		TLM 1, 2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Transformers and Attention Mechanism (used in models like BERT, GPT).	1	15.11.2025		TLM 1, 2	
31.	Graph Neural Networks (GNNs)	1	15.11.2025		TLM 1, 2	

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

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 projects development using open-source programming environment for the success of Organization.
PSO 2	The ability to design and develop computer programs in networking and 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	**Ms V Sowjanya**	**Ms V Sowjanya**	**Dr V Surya Narayana**	**Dr. P. Bhagath**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Ch. Srinivasa Rao
CourseName&Code **Introduction to Software Engineering** &20CSM6
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem : B.Tech,VII-Sem(Minors) **A.Y.:**2025-26

PREREQUISITE: Object Oriented Programming.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

Theobjectiveofthecourseistoprovideanunderstandingofdifferents/wprocessmodelsand how to choose one among them by gathering the requirements from a client and specifying them. Usingthoserequirementsinthedesignofthesoftwarearchitecturebasedonthechoiceswiththehelp ofmodulesandinterfaces.Toenables/wdevelopment,byusingdifferenttestingtechniqueslikeunit, integrationandfunctionaltesting,qualityassurancecanbeachieved.

CO1	Understand the fundamentals of software engineering concepts and software Process models. **(Understand-L2)**
CO2	Apply the requirement elicitation techniques for preparing SRS and design engineering. **(Apply-L3)**
CO3	Understanding the basic building blocks of UML, Class, and object diagrams. **(Understand-L2)**
CO4	Apply behavioral models for real world applications. **(Apply-L3)**
CO5	Demonstrate different software testing approaches for testing real time applications. **(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
CO1	3												3		
CO2		2											2	1	
CO3	3												3	2	
CO4		2												3	1
CO5	2	2													3
1- Low						**2**–Medium							**3** -High		

TEXTBOOKS:

T1 Roger S. Pressman, "Software engineering- A practitioner 's Approach", TMH InternationalEdition, 6th edition, 2005.

T2 Grady Booch, James Rum baugh, Ivar Jacobson, "The Unified Modeling Language User Guide", PEARSON,4thImpression,2012.

REFERENCE BOOKS:

R1 Software Engineering- Concepts and practices: Ugrasen Suman, Cengage learning

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

R3 Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI **R4**

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Software and software Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs discussion	1	04/07/2025		TLM2	
2.	The evolving role of Software	1	04/07/2025		TLM2	
3.	Characteristics of Software	1	05/07/2025		TLM2	
4.	Importance of software Engineering	1	05/07/2025		TLM2	
5.	Changing nature of software	1	11/07/2025		TLM2	
6.	Legacy Software	1	11/07/2025		TLM2	
7.	Software Myths	1	12/07/2025		TLM2	
8.	Software process model: layered. technology	1	12/07/2025		TLM2	
9.	Process framework The process and product	1	18/07/2025		TLM2	
10.	Waterfall model	1	18/07/2025		TLM2	
11.	Incremental model	1	19/07/2025		TLM2	
12.	Spiral and V model	1	19/07/2025		TLM2	
13.	Component based s/w development	1	25/07/2025		TLM2	
14.	Unified Process model	1	25/07/2025		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Requirements Analysis and Software design

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.	Requirements gathering	1	01/08/2025		TLM2	
16.	Requirement analysis	1	01/08/2025		TLM2	
17.	Software requirement specification	1	02/08/2025		TLM2	
18.	SRS document case study	1	02/08/2025		TLM2	
19.	Overview of design process	1	08/08/2025		TLM2	
20.	Design concepts	1	08/08/2025		TLM2	
21.	Architectural concepts	1	09/08/2025		TLM2	
22.	Examples	1	09/08/2025		TLM2	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Design using UML

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Building Blocks of UML	1	22/08/2025		TLM2	
25.	Defining things	1	22/08/2025		TLM2	
26.	Defining relationships and diagrams	1	23/08/2025		TLM2	
27.	Common Mechanism in UML	1	23/08/2025		TLM2	
28.	Class diagrams	1	19/09/2025		TLM2	
29.	Examples	1	19/09/2025		TLM2	
30.	Object diagrams and examples	1	20/09/2025		TLM2	
31.	Revision	1	20/09/2025		TLM2	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: Behavioral Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Interactions	1	26/09/2025		TLM2	
33.	Interaction diagrams	1	26/09/2025		TLM2	
34.	Use-cases	1	27/09/2025		TLM2	
35.	Use-case diagrams	1	27/09/2025		TLM2	
36.	Activity diagrams	1	03/10/2025		TLM2	
37.	Events and signals, state machines	1	03/10/2025		TLM2	
38.	processes and Threads, time, and space	1	04/10/2025		TLM2	
39.	State chart diagrams	1	04/10/2025		TLM2	
40.	Component diagrams	1	10/10/2025		TLM2	
41.	Deployment diagrams	1	10/10/2025		TLM2	
42.	Examples	1	11/10/2025		TLM2	
43.	Revision	1	11/10/2025		TLM2	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Testing 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
44.	Software testing fundamentals	1	17/10/2025		TLM2	
45.	Unit testing	1	17/10/2025		TLM2	
46.	Integration testing	2	18/10/2025		TLM2	
47.	Blackbox testing	1	24/10/2025		TLM2	
48.	Whitebox testing	1	24/10/2025		TLM2	
49.	Debugging	2	25/10/2025		TLM2	
50.	System testing	2	31/10/2025		TLM2	
51.	Examples	2	01/11/2025		TLM2	
52.	Revision	2	07/11/2025		TLM2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

Content Beyond the Syllabus:

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50	Case study version control	2	08/11/2025		TLM6	
51	Case study test case preparation	2	14/11/2025		TLM6	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial/Assignment	**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
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	**Ch. Srinivasa Rao**	**Ch. Srinivasa Rao**	**Dr.D.V.Subbaiah**	**Dr. Nagarjuna Reddy**
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 INFORMATION TECHNOLOGY

COURSE HANDOUT

Course Instructor : Mrs.K.Lakshmi Devi

Course Name & Code : OBJECT ORIENTED ANALYSIS AND DESIGN USING UML-**20ITM5**

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

Program/Sem/Sec **:** B.Tech, VII SEM **A.Y.:** 2025-26

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

CO1: Understand the basic concepts of object and Elements of object model (Understand -L2)
CO2: Identify the design patterns to solve object oriented design problems (Understand -L2)
CO3: Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)
CO4: Design Interaction diagrams for a given application. (Analyze –L3)
CO5: Design use case, activity, Implementation diagrams for any application (Analyze –L3)

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	-	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	1	3	-	-	-	-	-	-	-	-	-	-	1	-

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

BOS APPROVED TEXT BOOKS:

1. Grady Booch, ―Object Oriented Analysis & Design with Applications‖,
2 Edition, Pearson Education 1999. 2. Ali Bahrami, ―Object Oriented Systems Development – Using the Unified Modeling Language‖. TGH International Editions, Computer Science Series, 1999.

BOS APPROVED REFERENCE BOOKS:

1. James Rumbaugh, Ivan Jacobson and Grady Booch, ―Unified Modeling Language Reference Manual‖, PHI, 1999.

2. Jacobson et al., the ―Unified Software Development Process‖. AW, 1999.

3. Tom Pender, ―UML Bible‖, John Wiley & Sons. 2003.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

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.	The Object Model – Overview of Object Oriented system Development	1	04.07.25		TLM2	
2.	Object Basic – Object – Oriented Systems Development Life Cycle	2	04.07.25 05.07.25		TLM2	
3.	Object Oriented Analysis Process	1	05.07.25		TLM1	
4.	Identifying use cases: Introduction.	1	11.07.25		TLM2	
5.	Why Analysis is a Difficult Activity	1	11.07.25		TLM7	
6.	Business Object Analysis: Understanding the Business Layer	1	18.07.25		TLM2	
7.	Use-Case Driven Object-Oriented Analysis: The Unified Approach	1	18.07.25		TLM2	
8.	Business Process Modeling	1	19.07.25		TLM1	
9.	Use-Case Model, Developing Effective Documentation	1	19.07.25		TLM2	
10.	Use-Case Model, Developing Effective Documentation	1	25.07.25		TLM2	
11.	Assignment	1	25.07.24		TLM6	
No. of classes required to complete UNIT-I		12	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
1.	Unified Modeling Language (UML): Introduction	1	26.07.25		TLM2	
2.	Static and Dynamic Models	1	26.07.25		TLM2	
3.	Why Modeling?	1	27.07.25		TLM2	
4.	Introduction to the Unified Modeling Language, UML Diagrams.	2	27.07.25 01.08.25		TLM2	
5.	UML Use Case Diagram- Use case descriptions	1	01.08.25		TLM2	
6.	Actors and actor descriptions	1	02.08.25		TLM2	
7.	Use case relationships: communication association, include	1	02.08.25		TLM1	
8.	Extend and Generalization, System Boundary,	1	08.08.25		TLM2	
9.	Case study Via Net Bank ATM.	1	08.08.25		TLM1	
10.	Tutorial	1	16.08.25		TLM3	
No. of classes required to complete UNIT-II		11	No. of classes taken:			

UNIT-III

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Identifying Object Relationships, Attributes and Methods: Introduction, Associations, Super Sub Class Relationships	1	16.08.25		TLM2	
2.	A-Part-of Relationships-Aggregation, Class Responsibility, Identifying Attributes and Methods	1	17.08.25		TLM2	
3.	Class Responsibility, Defining Attributes by Analyzing Use Cases and Other UML Diagrams	2	17.08.25 23.08.25		TLM2	
4.	Object Responsibility: Methods and Messages	1	23.08.25		TLM1	
5.	Static Modeling: UML Class Diagram: Class, interface	2	19.09.25 19.09.25		TLM9	
6.	Package, Relationships between classes and other Notations of Class Diagram	1	20.09.25		TLM9	
7.	Package, Relationships between classes and other Notations of Class Diagram	2	20.09.25 26.09.25		TLM9	
8.	Case study ViaNet Bank ATM.	1	26.09.25		TLM9	
9.	Assignment	1	27.09.25		TLM6	
No. of classes required to complete UNIT-III		12	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
10.	UML Interaction Diagrams – UML Sequence Diagram: object, life line,	1	27.09.25		TLM2	
11.	Activation Bar, Types of Messages.	2	10.10.25 10.10.25		TLM2	
12.	UML Collaboration Diagram: object, object Connection	1	11.10.25		TLM9	
13.	Message with sequence numbers, case study ViaNet Bank ATM	1	11.10.25		TLM9	
14.	UML State-Chart Diagram: object State, Initial/Final State	2	17.10.25 17.10.25		TLM2	
15.	Simple/Complex Transitions	1	18.10.25		TLM1	
16.	UML Activity Diagram: Activity State, Transition	1	18.10.25		TLM2	
17.	Swim Lane, Initial state, Final State	1	24.10.25		TLM2	
18.	Synchronization Bar, Branching, case study Via Net Bank ATM	1	24.10.25		TLM9	
19.	TUTORIALS	1	25.10.25		TLM3	
No. of classes required to complete UNIT-IV		12	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
20.	Implementation Diagrams – Component Diagram: Component, Dependency and Interface,	1	25.10.25		TLM2	
21.	Deployment Diagram: Node, Communication Association, case study Via Net Bank ATM.	1	31.10.25		TLM2	
22.	Model Management: Packages and Model Organization	1	31.10.25		TLM2	
23.	UML Extensibility, UML Meta Model.	2	01.11.25 01.11.25		TLM2	
24.	Designing Classes: Introduction, The Object-Oriented Design Philosophy, UML Object Constraint Language	1	07.11.25		TLM7	
25.	Designing Classes: The Process, Class Visibility: Designing Well-Defined Public, Private, and Protected Protocols	2	07.11.25 08.11.25		TLM2	
26.	Designing Classes: Refining Attributes, Designing Methods and Protocols	1	08.11.25		TLM2	
27.	Packages and Managing Classes, case study Via Net Bank ATM.	1	15.11.25		TLM9	
28.	Assignment		15.11.25		TLM6	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

Teaching Learning Methods			
TLM1	Chalk and Talk-6	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT-27	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial-2	**TLM6**	Group Discussion/Project-2

PART-C

EVALUATION PROCESS (R20 Regulations):

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

PSO1: Organize, Analyze, and interpret the data to extract meaningful conclusions.

PSO2: Design, Implement and Evaluate a computer-based system to meet desired needs

PSO3: Develop IT application services with the help of different current engineering tools.

Course Name	CO s	CO Name	PI s
OOAD	CO1	Understand the basic concepts of object and Elements of object model (Understand -L2)	2.1, 3.1
	CO2	Identify the design patterns to solve object oriented design problems (Understand -L2)	2.2
	CO3	Understanding the basic building blocks of UML, Class and object diagrams. (Understand-L2)	2.1
	CO4	Design Interaction diagrams for a given application. (Analyze –L3)	1.3
	CO5	Design use case, activity, Implementation diagrams for any application (Analyze –L3)	2.1

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs. K.Lakshmi Devi			Dr D.Ratna Kishore
Signature				