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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.M.V.Sudhakar

Course Name & Code : Optical Communications – 20EC23

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

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section- A A.Y : 2024-25

PRE-REQUISITE: EMWTL, Analog Communications, and Digital Communications.

COURSE OBJECTIVE: This course gives knowledge on optical communication fundamentals, fiber types, and fiber materials. This course also describes about transmission losses in the fiber, optical sources, source to fiber coupling scheme, and optical receivers. This course also provides understanding of digital optical link, analog optical systems, wavelength division multiplexing and optical networks.

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

CO1	**Describe** the fundamental concepts of optical communication systems, WDM systems, and optical networks. (L2)
CO2	**Apply** knowledge of signal transmission characteristics on fibers, optical sources and detectors in the optical communication system parameters calculations. (L3)
CO3	I**nterpret** the operations of optical sources, detectors in the presence of channel degradation mechanisms in analog and digital optical systems. (L2)
CO4	**Examine** the parameters of source to fiber launching, Power-Coupling Calculations, attenuation and dispersion measurement. (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	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	3	-	-

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

TEXT BOOKS:

T1	Gerd Keiser, Optical Fiber Communications, Mc Graw-Hill International edition,4th Edition, 2008.
T2	John M. Senior, Optical Fiber Communications, PHI, 2nd Edition, 2002.

REFERENCE BOOKS:

R1	Joseph C. Palais, Fiber Optic Communications, Pearson Education, 4th Edition, 2004.
R3	Govind P. Agarwal, Fiber Optic Communication Systems, John Wiley, 3rd Edition, 2004

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Overview of Optical Fiber Communications

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course, COs,POs	1	24.06.2024		TLM1	
2.	The General System	1	26.06.2024		TLM1	
3.	Elements of Optical Fiber Link, Merits and Demerits of Optical Fiber Communications	1	27.06.2024		TLM1	
4.	Applications of Optical Fiber Communications	1	28.06.2024		TLM1	
5.	Refractive Index, Refraction, Reflection	1	01.07.2024		TLM1	
6.	CriticalAngle, Total Internal Reflection	1	03.07.2024		TLM1	
7.	Optical Fiber Structures, Step Index Fiber Structure, Graded Index Fiber Structure	1	04.07.2024		TLM2	
8.	Acceptance Angle, NumericalAperture	1	05.07.2024		TLM2	
9.	Meridional and Skew Rays,	1	08.07.2024		TLM2	
10.	Overview of Modes, Summary of key model concepts.	1	10.07.2024		TLM1	
11.	Single mode fiber, Cut-off Wavelength, Mode Field Diameter	1	11.07.2024		TLM1	
12.	Assignment	1	12.07.2024		TLM1	
No. of classes required to complete UNIT-I		12	No. of classes taken			

UNIT-II: Fiber Materials and Signal Degradation in Optical Fibers

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.	Fiber Materials: Glass Fibers	1	15.07.2024		TLM1	
2.	Active Glass Fibers, PlasticGlass Fibers	1	18.07.2024		TLM1	
3.	Attenuation: Attenuation Units,Absorption	1	19.07.2024		TLM1	
4.	Scattering Losses	1	22.07.2024		TLM1	
5.	BendingLosses, Core-Cladding Losses	1	24.07.2024		TLM2	
6.	Signal Distortion in	1	25.07.2024		TLM2	

	OpticalWaveguides, Information Capacity Determination					
7.	Group delay, Material Dispersion	1	26.07.2024		TLM1	
8.	Polarization-Mode Dispersion,	1	29.07.2024		TLM2	
9.	Intermodal Dispersion, Mode coupling	1	31.07.2024		TLM1	
10.	Design Optimization of Single-Mode Fibers	1	01.08.2024		TLM1	
11.	Refractive Index Profiles	1	02.08.2024		TLM1	
12.	Assignment	1	05.08.2024		TLM1	
No. of classes required to complete UNIT-I		12	No. of classes taken			

UNIT-III: Optical Sources, Power Launching and Coupling

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.	Requirements of OpticalSources, LED Structures	1	07.08.2024		TLM1	
2.	Light Source Materials	1	08.08.2024		TLM1	
3.	Quantum Efficiency and LEDPower, Modulation of LED	1	09.08.2024		TLM1	
4.	LASER Diodes, Laser Diode Modes andThreshold Conditions	1	12.08.2024		TLM2	
5.	Semiconductor Laser Diodes: Fabry Perot Lasers	1	14.08.2024		TLM1	
6.	Distributed Feedback (DFB)Lasers, Laser diode rate equations	1	16.08.2024		TLM1	
7.	External quantum efficiency, resonant frequencies	1	09.09.2024		TLM1	
8.	Source to fiber power launching, Source output pattern	1	11.09.2024		TLM2	
9.	power coupling calculation	1	12.09.2024		TLM1	
10.	Lensing Schemes for coupling improvement	1	13.09.2024		TLM1	
11.	Laser Diode-to-Fiber Coupling	1	18.09.2024		TLM1	
12.	Assignment	1	19.09.2024		TLM1	
No. of classes required to complete UNIT-III		12	No. of classes taken			

UNIT-IV: Optical detectors and receivers

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.	Photo detectors, Physical Principles of Photodiodes	1	20.09.2024		TLM1	
2.	PIN Photo Detector	1	23.09.2024		TLM2	
3.	Avalanche Photo Diodes	1	25.09.2024		TLM1	
4.	Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors.	1	26.09.2024		TLM1	
5.	Fundamental ReceiverOperation , Digital Signal Transmission	1	27.09.2024		TLM2	
6.	Error Sources	1	30.09.2024		TLM2	
7.	Receiver Configuration,	1	03.10.2024		TLM1	
8.	Digital Receiver Performance	1	04.10.2024		TLM1	
9.	Probability of Error, The Quantum Limit	1	14.10.2024		TLM1	
10.	Analog Receivers	1	16.10.2024		TLM1	
11.	Assignment	1	17.10.2024		TLM1	
No. of classes required to complete UNIT-IV		11	No. of classes taken			

UNIT-V: Digital Transmission Systems and Measurements:

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.	Point to Point Links, SystemConsiderations	1	18.10.2024		TLM1	
2.	Link Power Budget	1	21.10.2024		TLM2	
3.	Rise Time Budget	1	23.10.2024		TLM1	
4.	Line Coding- NRZ codes, RZCodes	1	24.10.2024		TLM1	
5.	WDM Features, Operation Principles of WDM	1	25.10.2024		TLM2	
6.	Types of WDM	1	28.10.2024		TLM1	
7.	SONET/SDH Networks	1	30.10.2024		TLM2	

8.	Measurement of Attenuation	1	01.11.2024		TLM1	
9.	Measurement of Dispersion	1	04.11.2024		TLM1	
10.	Assignment	1	06.11.2024		TLM1	
No. of classes required to complete UNIT-V		10	No. of classes taken			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Visible light communication system	1	07.11.2024		TLM1	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1 W
II Phase of Instructions	09-09-2024	09-11-2024	9 W
II Mid Examinations	11-11-2024	16-11-2024	1 W
Preparation and Practical's	18-11-2024	23-11-2024	1 W
Semester End Examinations	25-11-2024	07-12-2024	2 W

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 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

Date:22.06.2024

Course Instructor	Course Coordinator	Module Coordinator	HOD
Dr. M.V.Sudhakar	Dr. M.V.Sudhakar	Dr. M.V.Sudhakar	Dr. G. Srinivasulu

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Electronics & Communication Engineering

COURSE HANDOUT

PART-A

Name of Course Instructor: M.Ramya Harika
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.:** 2024-2025

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	24-06-24			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	25-06-24			
3.	Wireless sensor networks- classification, advantages, limitations	1	26-06-24			
4.	Applications of WSNs	1	29-06-24			
5.	Application examples and types of applications	1	01-07-24			
6.	Unique constraints and Challenges	1	02-07-24			
7.	Characteristic Requirements and mechanisms	1	03-07-24			
8.	Advantages of Sensor Networks	1	06-07-24			
9.	Collaborative processing and Key definitions	1	08-07-24			
10.	Difference between Mobile Ad-hoc and Sensor Networks	1	09-07-24			
11.	Enabling technologies	1	10-07-24			
12.	Application case study	1	13-07-24			
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	15-07-24			
14.	Hardware components of sensor nodes- description	1	16-07-24			
15.	Energy Consumption of Sensor Nodes	1	20-07-24			
16.	Operating states with different Power Consumption	1	22-07-24			
17.	Energy consumption of Transceiver	1	23-07-24			
18.	Energy consumption of Micro controller; Memory	1	24-07-24			
19.	Dynamic Voltage Scaling	1	27-07-24			
20.	Relation between Computation and Communication	1	29-07-24			
21.	commercially available sensor nodes	1	30-07-24			
22.	Sensor Network architecture	1	03-08-24			
23.	Sensor Network Scenarios	1	05-08-24			
24.	Optimization Goals of sensor networks	1	06-08-24			
25.	Figures of Merit	1	07-08-24			
26.	Gateway Concepts.	1	10-08-24			
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	12-08-24			
28.	Fundamental concepts of protocol architectures- cross layer architecture	1	13-08-24			
29.	Physical Layer and Transceiver design considerations in WSNs	1	14-08-24			
30.	MAC Protocols for Wireless Sensor Networks	1	17-08-24			
31.	Low Duty Cycle protocols	1	19-08-24			
32.	Wakeup radio concepts	1	20-08-24			
33.	S-MAC	1	21-08-24			
34.	The IEEE 802.15.4 MAC protocol	1	24-08-24			
35.	Routing Protocols for WSN	1	27-08-24			
36.	Energy efficient	1	28-08-24			
37.	Geographic routing	1	31-08-24			
38.	Position based routing	1	09-09-24			
39.	Routing Challenges and Design Issues in wireless sensor networks.	1	10-09-24			
40.	Simulation of one of the routing protocol for WSN using MATLAB/NS-2	1	11-09-24			
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 wireless sensor networks	1	14-09-24			
42.	Possible options for topology control	1	17-09-24			
43.	Examples and types for topology control- LMST	1	18-09-24			
44.	Clustering	1	21-09-24			
45.	Different types of clustering-methods	1	23-09-24			
46.	Time synchronization	1	24-09-24			
47.	Clocks and communication delays	1	25-09-24			
48.	Interval methods and reference broadcast methods	1	28-09-24			
49.	Localization and positioning	1	30-09-24			
50.	Sensor Tasking & Control	1	01-10-24			
51.	Task driven sensing,	1	05-10-24			
52.	Role of sensor nodes & utilities,	1	07-10-24			
53.	Information based sensor tasking.	1	08-10-24			
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	14-10-24			

55.	Types of Sensor Node Hardware	1	15-10-24			
56.	Berkeley Motes	1	16-10-24			
57.	Programming Challenges	1	19-10-24			
58.	Node-level software platforms	1	21-10-24			
59.	TinyOS	1	22-10-24			
60.	TinyOS application example	1	23-10-24			
61.	nesC	1	26-10-24			
62.	Components of node level simulator	1	28-10-24			
63.	Network simulator-NS-2	1	29-10-24			
64.	Installation and example programs in NS-2	1	30-10-24			
65.	Different types of Node-level Simulators	1	02-11-24			
66.	State-centric programming	1	04-11-24			
67.	WSN application case study with software tools	1	05-11-24			
No. of classes required to complete UNIT-V: 14				**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 and attacks in WSN	1	06-11-24			
69.	Research trends to improve energy efficiency of WSN, Simulation tools-NS-3	1	09-11-24			

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	**M.Ramya Harika**	**Dr. P. Venkat rao**	**Dr. M.V Sudhakar**	**Dr. G. Srinivasulu**
Signature				

COURSE HANDOUT

PART-A

Name of Course Instructor :Dr E V Krishna Rao

Course Name & Code :Cellular & Mobile Communications - 20EC29

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

Program/Sem/Sec :B.Tech.,ECE.,VII-Sem.,Section-A A.Y: 2024-25

Pre-Requisites: Analog and Digital Communications, Fundamentals of antennas.

Course Objectives: This course provides the knowledge on operation of cellular systems, techniques to improve the capacity of a cellular system, types of fading and its effects on the radio signal, methods to reduce channel interference, hand-off mechanisms, multiple access techniques, and digital cellular systems.

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

CO1	Outline the concepts and operational principles of cellular systems (UnderstandL2).
CO2	Summarize the multiple access techniques and evolution of cellular technologies. (Understand-L2).
CO3	Examine interferences, performance parameters, cell site & mobile antennas and methodologies to improve the cellular capacity. (Apply-L3)
CO4	Analyze the effects of radio propagation models, Frequency Management, Channel Assignment, handoff, and call drops in cellular communications (Analyze-L4).

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	2	1	-	-	-	2	2	-	-	-	-	1	2	-	-
CO2	1	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO3	3	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO4	2	1	1	-	-	2	1	-	-	-	-	1	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).

TEXTBOOK(S):

T1 William C.Y. Lee,"Mobile Cellular Telecommunications", Tata McGraw Hill, 2nd Edition,2006.

T2 Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education,1st Edition, 2013.

REFERENCEBOOK(S):

R1 Theodore S. Rappaport, "Wireless Communications", Pearson Education, 2nd Edition, 2002.

R2 R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)-Section-A

UNIT-I:Introduction to Cellular Systems

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to COs,Pos and Unit-I	1	24-06-2024		TLM1	
2.	Basic cellular system	1	27-06-2024		TLM1	
3.	Operation of cellular systems	1	28-06-2024		TLM1	
4.	Call establishment	1	29-06-2024		TLM1	
5.	Operational channels	1	01-07-2024		TLM1	
6.	Performance criteria	1	04-07-2024		TLM1	
7.	Concept of Digital cellular system	1	05-07-2024		TLM1	
8.	Hexagonal shaped cells	1	06-07-2024		TLM1	
9.	Frequency Reuse	1	08-07-2024		TLM1	
10.	Cell splitting	1	11-07-2024		TLM1	
11.	Sectoring	1	12-07-2024		TLM1	
12.	Microcell zone concept	1	15-07-2024		TLM1	
No. of classes required to complete UNIT-I		12	No.of classes taken			

UNIT-II:Mobile Radio Propagation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to Unit-II	1	18-07-2024		TLM1	
14.	Basics of mobile radio propagation mechanisms	1	19-07-2024		TLM1	
15.	Free space propagation	1	20-07-2024		TLM1	
16.	Link budget design	1	22-07-2024		TLM1	
17.	Propagation models	1	25-07-2024		TLM1	
18.	small-scale multipath propagation	1	26-07-2024		TLM1	
19.	Factors influencing the fading	1	27-07-2024		TLM1	
20.	Types of small-scale fading	1	29-07-2024		TLM1	
21.	Cell Site Antennas and Mobile Antennas: Types - Omni directional antennas	1	01-08-2024		TLM1	
22.	Directional antennas	1	02-08-2024		TLM1	
23.	Sectoring	1	03-08-2024		TLM1	
24.	Mobile antenna types	1	05-08-2024		TLM1	
No.of classes required to complete UNIT-II		12	No. of classes taken			

UNIT-III:Interference in Cellular Mobile System

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to Unit-III	1	08-08-2024		TLM1	
26.	Introduction to Co-Channel Interference	1	09-08-2024		TLM1	
27.	Procedure to find nearest neighbors of a particular cell	1	12-08-2024		TLM1	
28.	Procedure to find nearest neighbors of a particular cell	1	16-08-2024		TLM1	
29.	Co-channel Interference Reduction Factor	1	17-08-2024		TLM1	
30.	Co-channel Interference Reduction Factor	1	17-08-2024		TLM1	
31.	Desired C/I from a normal and worst case in an omni-directional and directional Antenna system	1	19-08-2024		TLM1	
32.	Desired C/I from a normal and worst case in an omni-directional and directional Antenna system	1	22-08-2024		TLM1	
33.	impact on co-channel interference by lowering the antenna height	1	23-08-2024		TLM1	
34.	impact on co-channel interference by lowering the antenna height	1	24-08-2024		TLM1	
35.	Non co-channel interference	1	29-08-2024		TLM1	
36.	Non co-channel interference	1	12-09-2024		TLM1	
No.of classes required to complete UNIT-III (First Half-50%)		12	No.of classes taken			

UNIT-IV:Frequency Management and Channel Assignment

S.No.	Topic/s	No.of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction to Unit-IV	1	13-09-2024		TLM1	
38.	Numbering and grouping	1	19-09-2024		TLM1	
39.	Setup channels	1	20-09-2024		TLM1	
40.	Access channels and paging channels	1	21-09-2024		TLM1	
41.	Access channels and paging channels	1	23-09-2024		TLM1	
42.	Channel assignments to cell sites and mobile units	1	26-09-2024		TLM1	
43.	Overlaid cells	1	27-09-2024		TLM1	
44.	Channel sharing and borrowing	1	28-09-2024		TLM1	
45.	Handoffs and Dropped Calls: Types of handoff	1	28-09-2024		TLM1	
46.	Initiation, delaying handoff, forced handoff, mobile assigned handoff	1	30-09-2024		TLM1	
47.	Initiation, delaying handoff, forced handoff, mobile assigned handoff	1	03-10-2024		TLM1	
48.	Intersystem handoff, dropped call rate	1	04-10-2024		TLM1	
No.of classes required to complete UNIT-IV		12	No.of classes taken			

UNIT-V:Digital Cellular Systems: multiple access schemes:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	FDMA	1	05-10-2024		TLM1	
50.	FDMA	1	07-10-2024		TLM1	
51.	TDMA	1	14-10-2024		TLM1	
52.	TDMA	1	17-10-2024		TLM1	
53.	CDMA	1	18-10-2024		TLM1	
54.	CDMA	1	19-10-2024		TLM1	
55.	2G Systems- GSM system architecture	1	21-10-2024		TLM1	
56.	3G Systems- architecture of WCDMA	1	24-10-2024		TLM1	
57.	4G system- 4G network standards	1	25-10-2024		TLM1	
58.	4G system- 4G network standards	1	26-10-2024		TLM1	
59.	LTE architecture	1	28-10-2024		TLM1	
60.	OFDMA	1	01-11-2024		TLM1	
61.	OFDMA	1	02-11-2024		TLM1	
62.	Introduction to 5G technologies, Comparison of cellular technologies.	1	04-11-2024		TLM1	
No.of classes required to complete UNIT-V		**13**	No.of classes taken			

Content 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
63.	Introduction to GSM Protocols	1	07-11-2024			
64.	Introduction to 6G Technology	1	08-11-2024			

Teaching Learning Methods

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

EVALUATIONPROCESS PART-C

EvaluationTask	**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

PROGRAMMEOUTCOMES(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 E V Krishna Rao	Dr E V Krishna Rao	Dr. G L N Murthy	Dr G Srinivasulu

Date:

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms.G.DIVYA
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.: 2024-25**

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 Harmelen, 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	25-06-2024		-	CO1	-	
2.	Introduction: What Is AI?,	1	26-06-2024		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	27-06-2024		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	28-06-2024		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	02-07-2024		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	03-07-2024		TLM1	CO1	T1,T2	
7.	Types of agents	1	04-07-2024		TLM2	CO1	T1,T2	
8.	Types of agents	1	05-07-2024		TLM2	CO1	T1,T2	
9.	Types of agents	1	09-07-2024		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	10-07-2024		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	11-07-2024		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	12-07-2024		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	16-07-2024		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	18-07-2024		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	19-07-2024 23-07-2024		TLM1	CO2	T1,T2	
16.	searching for Solutions, Uninformed Search Strategies	2	24-07-2024 25-07-2024		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	26-07-2024		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	30-07-2024		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	31-07-2024		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	01-08-2024		TLM2	CO2	T1,T2	
21.	A* Algorithm	2	02-08-2024 06-08-2024		TLM2	CO2	T1,T2	
22.	AO* Algorithm	2	07-08-2024 08-08-2024		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	09-08-2024		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	13-08-2024		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	14-08-2024		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	16-08-2024		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	20-08-2024		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	2	21-08-2024 22-08-2024		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	23-08-2024		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	27-08-2024		TLM2	CO3	T1,T2	
31.	Depth limited search	1	28-08-2024		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	29-08-2024		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	30-08-2024		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	10-09-2024		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	11-09-2024		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	12-09-2024		TLM1	CO4	T1,T2	
37.	Minimax algorithm	2	13-09-2024 17-09-2024		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	2	18-09-2024 19-09-2024		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	2	20-09-2024		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	24-09-2024		TLM1	CO4	T1,T2	
41.	Representation mappings	1	25-09-2024		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	26-09-2024		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	27-09-2024		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	2	01-10-2024 03-10-2024		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	2	04-10-2024 08-10-2024		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	09-10-2024		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 16					**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	10-10-2024		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	2	15-10-2024 16-10-2024		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	17-10-2024		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	18-10-2024		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	2	22-10-2024 23-10-2024		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	24-10-2024		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	25-10-2024		TLM1	CO4	T1,T2	
54.	Types of reasoning	2	29-10-2024 30-10-2024		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	2	01-11-2024 05-11-2024		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	06-11-2024		TLM1	CO5	T1,T2	

57.	Assignment/Quiz-5	1	07-10-2024		TLM1	CO5	-	
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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	08-11-2024		**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 the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**G.Divya**			**Dr. O. Rama Devi**
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
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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. : 2024-25

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	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	25-06-2024		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	27-06-2024		**TLM2**	CO1	
3	Cybercrime and Information Security	1	28-06-2024		**TLM2**	CO1	
4	Cybercriminals	1	28-06-2024		**TLM2**	CO1	
5	Classifications of Cybercrime	1	02-07-2024		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	04-07-2024 05-07-2024		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	06-07-2024 09-07-2024		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	11-07-2024 12-07-2024		**TLM2**	CO1	
9	Unit-I Assignment Test	1	16-07-2024		**TLM2**	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	18-07-2024		**TLM2**	CO2	
11	Phishing, Password Cracking	2	19-07-2024 20-07-2024		**TLM2**	CO2	
12	Key loggers and Spywares Virus and Worms	1	23-07-2024		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	25-07-2024		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	26-07-2024 27-07-2024		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	30-07-2024		**TLM2**	CO2	
16	Unit-II Assignment Test	1	01-08-2024		**TLM2**	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	02-08-2024		**TLM2**	CO3	
18	Disk Forensics	2	03-08-2024 06-08-2024		**TLM**	CO3	
19	Network Forensics	1	08-08-2024		**TLM2**	CO3	
20	Wireless Forensics	1	09-08-2024		**TLM2**	CO3	
21	Database Forensics	2	13-08-2024		**TLM2**	CO3	
22	Malware Forensics	1	16-08-2024		**TLM2**	CO3	

23	Mobile Forensics	1	17-08-2024		**TLM2**	CO3	
24	Email Forensics	1	20-08-2024		**TLM1**	CO3	
25	Unit-III Assignment Test	1	22-08-2024		**TLM2**	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	23-08-2024 24-08-2024		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	27-08-2024 29-08-2024		**TLM2**	CO4	
28	File System Windows Registry	2	30-08-2024 31-08-2024		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	10-09-2024 12-09-2024		**TLM2**	CO4	
30	Linux Artifact	2	13-09-2024 14-09-2024		**TLM1**	CO4	
31	Digital evidence on the internet	2	17-09-2024 19-09-2024		**TLM2**	CO4	
32	Impediments to collection of Digital Evidence	1	20-09-2024		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	21-09-2024 24-09-2024		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	26-09-2024		**TLM2**	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	01-10-2024		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	05-10-2024		**TLM2**	CO5	
37	Tools for Integrity Verification and Hashing	1	08-10-2024		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	15-10-2024		**TLM2**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	17-10-2024 22-10-2024		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	25-10-2024		**TLM2**	CO5	
41	Unit -5 Assignment test.	1	29-10-2024		**TLM2**	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	05-11-2024		TLM2	
2.	Cloud Security	1	08-11-2024		TLM2	

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
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	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	09-11-2024	9W
II Mid Examinations	11-11-2024	16-11-2024	1W
Preparation and Practical's	18-11-2024	13-04-2024	1W
Semester End Examinations	25-11-2024	07-12-2024	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**	**Dr. K. Phaneendra**	**Dr. G. Srinivasulu**
Signature				

DEPARTMENTOFELECTRONICS&COMMUNICATIONSENGINEERINGC
OURSE HANDOUT
PART-A

PROGRAM :B.Tech.-VII-Sem.-**ECE–A**
ACADEMICYEAR :2024-25
COURSE NAME &CODE :ManagementScienceforEngineers–20HS02
L-T-PSTRUCTURE : **3**-0-0-3
COURSECREDITS 3
COURSE INSTRUCTOR : **B.Kalyan Kumar Asst.Prof**
COURSE COORDINATOR :**Dr.U.Rambabu**
PER-REQUISITE : NIL

COURSEEDUCATIONALOBJECTIVES:

1. To makestudentsunderstand management,itsprinciples,contributiontomanagement,organization, and its basic issues and types.
2. Tomakestudentsunderstandtheconceptofplant locationanditsfactorsandplant layout andtypes, method of production and work study importance.
3. To understandthepurposeandfunctionofstatisticalqualitycontrol. Andunderstandthe material management techniques.

COURSEOUTCOMES:

Aftercompletionofthecoursestudentwillbeableto:
CO1:Understandmanagementprinciplestopracticalsituationsbasedontheorganizationstructures. **(L2)**
CO2:DesignEffectiveplantLayoutsbyusingworkstudymethods.**(L2)**
CO3:Applyqualitycontroltechniques forimprovement ofqualityand 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)**

COURSEARTICULATIONMATRIX (CorrelationbetweenCOs &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: EnterCorrelationLevels **1**or**2**or**3.**Ifthereisno correlation, **put'-' 1-** Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High).

BOSAPPROVEDTEXTBOOKS:

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

References:

1. Koontz&weihrich–Essentialsofmanagement,TMH,10th edition, 2015
2. Stoner,Freeman,Gilbert,Management, 6th editionPearsoneducation,NewDelhi,2004
3. O.P.Khana,IndustrialengineeringandManagementL.S.Srinath,PERT&CPM

Part-B

COURSEDELIVERYPLAN(LESSONPLAN):Section-B

UNIT-I: INTRODUCTION

S.No.	Topicstobecovered	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.	IntroductionTo Management	1	23-06-2024		TLM1	CO1	T1	
2.	Definition,Nature, Importanceof management	1	24-06-2024		TLM1	CO1	T1	
3.	Functionsof Management	1	25-06-2024		TLM2	CO1	T1	
4.	Taylor'sscientific managementtheory	1	27-06-2024		TLM1	CO1	T1	
5.	Fayal'sprinciplesof management	1	29-06-2024		TLM3	CO1	T1	
6.	ContributionofElton mayo,Maslow	1	02-07-2024		TLM2	CO1	T1	
7.	Herzberg, Douglas MCGregorprinciples of management	1	03-07-2024		TLM2	CO1	T1	
8.	BasicConcepts of Organization	1	04-07-2024		TLM1	CO1	T1	
9.	Authority, Responsibility	1	06-07-2024		TLM1	CO1	T1,R1	
10.	Delegationof Authority	1	09-07-2024		TLM1	CO1	T1,R1	
11.	Spanofcontrol	1	10-07-2024		TLM1	CO1	T1,R1	
12.	Departmentationand Decentralization	1	11-07-2024		TLM2	CO1	T1	
13.	Organization structures(Line organization)Lineand Functional stafforganizatio n,	1	13-07-2024		TLM3	CO1	T1	
14.	Committeeand Matrix organization	1	16-07-2024		TLM1	CO1	T1	
No.ofclassesrequiredto completeUNIT-I		**14**			No.ofclassestaken:			

UNIT-II:OPERATIONSMANAGEMENT

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Introduction	1	17-07-2024		TLM1	CO2	T1,R3	
16.	Plantlocation	1	18-07-2024		TLM2	CO2	T1,R3	
17.	Factorsinfluencing location	1	20-07-2024		TLM1	CO2	T1,R3	
18.	Principlesof plantlayouts	1	23-07-2024		TLM2	CO2	T1,R3	
19.	Types of plantlayouts	1	24-07-2024		TLM1	CO2	T1,R3	
20.		1	25-07-2024		TLM3	CO2	T1,R3	
21.	Methodsofproduction	1	27-07-2024		TLM1	CO2	T1	
22.		1	30-07-2024		TLM1	CO2	T1	

23.	Workstudy	1	31-07-2024		TLM1	CO2	T1	
24.	Basic procedure involved in method study	1	01-08-2024		TLM3	CO2	T1	
25.	Work measurement	1	03-08-2024		TLM1	CO2	T1	
26.		1	06-08-2024		TLM1	CO2	T1	
No.ofclassesrequiredto complete UNIT-II		**12**			No.ofclassestaken:			

UNIT-III:STATISTICALQUALITYCONTROL&MATERIALS MANAGEMENT

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	Introduction	1	07-08-2024		TLM1	CO3	T1	
28.	ConceptofQuality	1	08-08-2024		TLM1	CO3	T1,R1	
29.	QualityControl functions	1	10-08-2024		TLM1	CO3	T1,R1	
30.	MeaningofSQC, Variables and attributes	1	13-08-2024		TLM1	CO3	T1	
31.	X chart,RChart	1	14-08-2024		TLM3	CO3	T1,R1	
32.	CChart,PChart	1	17-08-2024		TLM1	CO3	T1,R1	
33.	Simpleproblems	1	20-08-2024		TLM1	CO3	T1	
34.	Simpleproblems	1	21-08-2024		TLM1	CO3	T1,R1	
35.	Acceptancesampling	1	22-08-2024		TLM1	CO3	T1,R1	
36.	Samplingplans	1	24-08-2024		TLM1	CO3	T1	
37.	Deming'scontribution toquality	1	27-08-2024		TLM3	CO3	T1	
38.	Materialsmanagement Meaning and objectives	1	28-08-2024		TLM1	CO3	T2	
39.	Inventorycontrol	1	29-08-2024		TLM1	CO3	T1	
40.	Needforinventory control	1	31-08-2024		TLM1	CO3	T1,R2	
41.	Purchaseprocedure, Store records	1	03-09-2024		TLM1	CO3	T1,R2	
42.	EOQ	1	04-09-2024		TLM1	CO3	T1,R2	
43.	ABCanalysis, Stocklevels	1	05-09-2024		**TLM1**	CO3	**T1, R1**	
No.ofclassesrequiredto complete UNIT-III		**17**			No.ofclassestaken:			

UNIT-IV:HUMANRESOURCEMANAGEMENT(HRM)

S.No.	Topicstobecovered	No. of Classes Required	Tentative Date of Completion	ActualDate of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
44.	Introduction	1	4-09-2024		**TLM1**	CO4	**T1**	
45.	ConceptsofHRM	1	05-09-2024		**TLM1**	CO4	**T1**	

46.	Basicfunctionsof HR manager	1	07-09-2024		**TLM1**	CO4	**T1, R2**	
47.	Manpower planning	1	10-09-2024		**TLM3**	CO4	**T1, R2**	
48.	Recruitment	1	11-09-2024		**TLM2**	CO4	**T1, R2**	
49.	Selection,	1	12-09-2024		**TLM1**	CO4	**T1, R1**	
50.	Training& Development, Placement	1	14-09-2024		**TLM1**	CO4	**T1, R1**	
51.	Wageandsalary administration	1	17-09-2024		**TLM3**	CO4	**T1, R1**	
52.	Promotion,Transfers Separation	1	18-09-2024		**TLM2**	CO4	**T1, R1**	
53.	Performance appraisal	1	19-09-2024		**TLM2**	CO4	**T1**	
54.	Jobevaluationand meritrating	1	21-09-2024		**TLM3**	CO4	**T1**	
No.ofclassesrequiredto completeUNIT-IV		12			No.ofclassestaken:			

UNIT-V:PROJECTMANAGEMENT

S.No.	**Topicstobecovered**	**No. of Classes Required**	**Tentative Date of Completion**	**ActualDate of Completion**	**Teaching Learning Methods**	**Learning Outcome COs**	**Text Book followed**	**HOD Sign Weekly**
55.	Introduction	1	24-09-2024		TLM1	CO5	T1,R2	
56.	Earlytechniquesin projectmanagement	1	25-09-2024		TLM1	CO5	T1,R2	
57.	Networkanalysis	1	26-09-2024		TLM1	CO5	T1,R2	
58.	Programme Evaluation and ReviewTechnique (PERT)	1	28-09-2024		TLM1	CO5	T1,R2	
59.	Problems	1	01-10-2024		TLM1	CO5	T1,R2	
60.	Problems	1	03-10-2024		TLM1	CO5	T1,R2	
61.	Criticalpathmethod (CPM)	1	05-10-2024		TLM1	CO5	T1,R2	
62.	Identifying criticalpath&Probl ems	1	08-10-2024		TLM1	CO5	T1,R2	
63.	Problems	1	09-10-2024		TLM1	CO5	T1,R2	
64.	Probability of completingproject withingiventime	1	10-10-2024		TLM1	CO5	T1,R2	
65.	Projectcostanalysis	1	12-10-2024		TLM1	CO5	T1,R2	
66.	Problems	1	15-10-2024		TLM1	CO5	T1,R2	
67.	Problems	1	16-10-2024		TLM1	CO5	T1,R2	
	project crashing	1	17-10-2024					
68.	Importance & need	1	19-10-2024		TLM1	CO5	T1,R2	
69.	Simple problems	1	22-10-2024		TLM1	CO5	T1,R2	
70.	Simpleproblems	1	23-10-2024		TLM1	CO5	T1,R2	
71.	Simpleproblems	1	24-10-2024		TLM1	CO5	T1	
No.ofclassesrequiredto complete UNIT-V		**18**			No.ofclassestaken:			

TeachingLearningMethods					
TLM1	ChalkandTalk	**TLM4**	ProblemSolving	**TLM7**	SeminarsorGD
TLM2	PPT	**TLM5**	Programming	**TLM8**	LabDemo
TLM3	Tutorial	**TLM6**	AssignmentorQuiz	**TLM9**	CaseStudy

ACADEMICCALENDAR:

Description	From	To	Weeks
IPhase ofInstructions-1	24-06-2024	31-08-2024	10W
IMid Examinations	02-09-2024	07-09-2024	1W
IIPhase ofInstructions	09-09-2024	09-11-2024	9W
IIMidExaminations	11-11-2024	16-11-2024	1W
PreparationandPractical's	18-11-2024	23-11-2024	1W
SemesterEndExaminations	25-11-2024	07-12-2024	2W

Part– C

EVALUATIONPROCESS:

EvaluationTask	**COs**	**Marks**
Assignment1	1	A1=5
Assignment2	2	A2=5
I-MidExamination	1,2,3	B1=15
Quiz–1	1,2,3	Q1=10
Assignment3	3	A3=5
Assignment4	4	A4=5
Assignment5	5	A5=5
II-MidExamination	3,4,5	B2=15
Quiz–2	3,4,5	Q2=10
EvaluationofAssignment:A=(A1+A2+A3+A4+A5)/5	1,2,3,4,5	A=5
EvaluationofMidMarks:B=75%ofMax(B1,B2)+25%ofMin(B1,B2)	1,2,3,4,5	B=15
EvaluationofQuizMarks:Q=75%ofMax(Q1,Q2)+25%ofMin(Q1,Q2)	1,2,3,4,5	Q=10
CumulativeInternalExamination:A+B+Q	**1,2,3,4,5**	**CIE=30**
SemesterEndExaminations	**1,2,3,4,5**	**SEE=70**
TotalMarks: CIE+SEE	**1,2,3,4,5**	**100**

PROGRAMMEEDUCATIONALOBJECTIVES(PEOs):

PEO1: To Attainasolid foundationinElectronics&CommunicationEngineering fundamentalswith an attitude to pursue continuing education.

PEO2: ToFunctionprofessionallyintherapidlychangingworldwithadvances intechnology.

PEO3: To ContributetotheneedsofthesocietyinsolvingtechnicalproblemsusingElectronics & Communication Engineering principles, tools and practices.

PEO4: ToExerciseleadershipqualities,atlevelsappropriatetotheirexperience,whichaddressesissues in a responsive, ethical, and innovative manner.

PROGRAMMEOUTCOMES(POs):

EngineeringGraduateswillbeableto:

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 engineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesofmathematics,natural sciences, and engineering sciences.

PO3 - Design / Development of Solutions: Design solutions for complex engineering problems and designsystemcomponentsorprocessesthat meet thespecified needswithappropriateconsiderationfor the public health and safety, and the cultural, societal, and environmental considerations.

PO4-ConductInvestigationsofComplexProblems: Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 -Modern ToolUsage: Create, select, and applyappropriatetechniques, resources, and modern engineeringandITtoolsincludingpredictionand modelingto complexengineeringactivitieswithan understanding of the limitations.

PO6- TheEngineerandSociety: Applyreasoninginformedbythecontextualknowledgetoassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and Sustainability: Understand the impact ofthe professionalengineering solutionsinsocietalandenvironmentalcontexts,anddemonstratetheknowledgeof, andneed for sustainable development.

PO8-Ethics: Applyethicalprinciplesandcommitto professionalethicsandresponsibilitiesand norms of the engineering practice.

PO9-IndividualandTeamWork: Functioneffectivelyasanindividual,andasa memberorleader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineeringcommunityandwithsocietyat large,suchas,beingabletocomprehendandwriteeffective reportsanddesigndocumentation, makeeffectivepresentations,andgiveandreceiveclear instructions. **PO11 - Project Management and Finance:** Demonstrate knowledge and understanding of the ring and management principles and applythese to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12-Life-longLearning: Recognizetheneed for,andhavethepreparationandabilitytoengage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFICOUTCOMES (PSOS):

PSO1: Designanddevelopmoderncommunicationtechnologiesforbuildingtheinterdisciplinary skills to meet current and future needs of industry.

PSO2: DesignandAnalyzeAnalogandDigitalElectronicCircuitsorsystemsandimplement real time applications in the field of VLSI and Embedded Systems using relevant tools.

PSO3: ApplytheSignalprocessingtechniquestosynthesizeandrealizethe issuesrelatedtorealtime applications.

B.Kalyan Kumar	Dr.U.Rambabu	Dr.U.Rambabu	Dr.A.Adisesha Reddy
CourseInstructor	CourseCoordinator	ModuleCoordinator	HoD

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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/A **A.Y.:** 2024-2025

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	24-06-2024		TLM2	
2.	IoT Introduction and Frame work	1	01-07-2024		TLM2	
3.	Architectural View of IoT	1	08-07-2024		TLM2	
4.	IoT Technology and Sources,	1	15-07-2024		TLM2	
5.	M2M communication	1	22-07-2024		TLM2	
6.	Sensors for IoT	1	29-07-2024		TLM2	
7.	Participatory sensing	1	05-08-2024		TLM2	
8.	RFID	1	12-08-2024		TLM2	
9.	Wireless sensor network elements	1	19-08-2024		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	09-09-2024		TLM2	
11.	Prototyping embedded devices for IoT	1	23-09-2024		TLM2	
12.	M2M case studies.	1	30-09-2024		TLM2	
13.	IoT case studies.	1	07-10-2024		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	2	24-06-2024		TLM4	
2.	Interfacing LED. DHT11-Temperature and, humidity sensor using Arduino	2	01-07-2024		TLM4	
3.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	2	08-07-2024		TLM4	
4.	Design of Traffic Light Simulator using Arduino	2	15-07-2024		TLM4	
5.	Design of Water flow detection using an Arduino board	2	22-07-2024		TLM4	
6.	Discussion of Arduino based Projects and Demo	2	29-07-2024		TLM6	
7.	Discussion of Arduino based Projects and Demo	2	05-08-2024		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	2	12-08-2024		TLM4	
9.	Design of Motion Sensor Alarm using PIR Sensor	2	19-08-2024		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	2	09-09-2024		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	2	23-09-2024		TLM4	
12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	2	30-09-2024		TLM4	

13.	Raspberry Pi based Smart Phone Controlled Home Automation	2	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]	[Mr. K.Sasi Bhushan]	[Dr.P.Lachi Reddy]	[Dr.G.Srinivasulu]

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DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

Name of Course Instructors : Mr. P. James Vijay/Ms. B. Lakshmi Thirupathamma
Course Name : Association
Program/Sem/Sec : B.Tech./ECE VII-Sem, A-Section A.Y : 2024-2025

COURSE DELIVERY PLAN (LESSON PLAN):

S.No	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Discussion about Association Activities by course instructors and Self-Introduction.	25-06-2024		
2.	Group Discussion on Will Reliance Jio be a sustainable business model in a country like INDIA?	02-07-2024		
3.	JAM on Mission GAGANYAAN.	09-07-2024		
4.	Seminar related to 5G Technology (or) ZWMT(Zigbee Wireless Mesh Technology).	16-07-2024		
5.	Debate on BOON (or) BANE in AI.	23-07-2024		
6.	Exchange of views on World Happiness Report -2024	30-07-2024		
7.	PPT on Block Chain Technology with Applications.	06-08-2024		
8.	Group Discussion on India's Energy Evolution : A Shift Towards Renewables.	13-08-2024		
9.	Presentation on career opportunities in government sector at central and state levels.	20-08-2024		
10.	Exploring National Green Hydrogen Machine.	27-08-2024		
11.	Exploring Block chain technology	10-09-2024		
12.	Presentation on Cyber Spying.	17-09-2024		
13.	Group Discussion on Ethical Dilemmas in Modern Society.	24-09-2024		
14.	Negotiation on Kesavananda Bharati Vs State of Kerala Case.	01-10-2024		
15.	Group Discussion on The Trillion-dollar future : A Deep Dive into the Semiconductor Industry's Growth Prospects.	08-10-2024		
16.	Seminar on Agni-V Missile	15-10-2024		
17.	Testing knowledge on verbal/quantitative/reasoning/problem solving/logical/etc. skills.	22-10-2024		
18	Debate-Role of AI on Man Kind (or) Machine Learning & Deep Learning.	29-10-2024		
19	QUIZ on Current Affairs.	05-11-2024		

Mr. P. James Vijay
Ms. B. Lakshmi Thirupathamma

HOD
Dr. G. Srinivasulu

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

COURSE HANDOUT

PART-A

Name of Course Instructor :Dr E V Krishna Rao

Course Name & Code :Cellular & Mobile Communications - 20EC29

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

Program/Sem/Sec :B.Tech.,ECE.,VII-Sem.,Section-B A.Y: 2024-25

Pre-Requisites: Analog and Digital Communications, Fundamentals of antennas.

Course Objectives: This course provides the knowledge on operation of cellular systems, techniques to improve the capacity of a cellular system, types of fading and its effects on the radio signal, methods to reduce channel interference, hand-off mechanisms, multiple access techniques, and digital cellular systems.

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

CO1	Outline the concepts and operational principles of cellular systems (UnderstandL2).
CO2	Summarize the multiple access techniques and evolution of cellular technologies. (Understand-L2).
CO3	Examine interferences, performance parameters, cell site & mobile antennas and methodologies to improve the cellular capacity. (Apply-L3)
CO4	Analyze the effects of radio propagation models, Frequency Management, Channel Assignment, handoff, and call drops in cellular communications (Analyze-L4).

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	2	1	-	-	-	2	2	-	-	-	-	1	2	-	-
CO2	1	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO3	3	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO4	2	1	1	-	-	2	1	-	-	-	-	1	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).

TEXTBOOK(S):

T1 William C.Y. Lee,"Mobile Cellular Telecommunications", Tata McGraw Hill, 2nd Edition,2006.

T2 Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education,1st Edition, 2013.

REFERENCEBOOK(S):

R1 Theodore S. Rappaport, "Wireless Communications", Pearson Education, 2nd Edition, 2002.

R2 R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)-Section-B

UNIT-I:Introduction to Cellular Systems

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to COs,Pos and Unit-I	1	24-06-2024		TLM1	
2.	Basic cellular system	1	25-06-2024		TLM1	
3.	Operation of cellular systems	1	26-06-2024		TLM1	
4.	Call establishment	1	27-06-2024		TLM1	
5.	Operational channels	1	01-07-2024		TLM1	
6.	Performance criteria	1	02-07-2024		TLM1	
7.	Concept of Digital cellular system	1	03-07-2024		TLM1	
8.	Hexagonal shaped cells	1	04-07-2024		TLM1	
9.	Frequency Reuse	1	08-07-2024		TLM1	
10.	Cell splitting	1	09-07-2024		TLM1	
11.	Sectoring	1	10-07-2024		TLM1	
12.	Microcell zone concept	1	11-07-2024		TLM1	
No. of classes required to complete UNIT-I		12	No.of classes taken			

UNIT-II:Mobile Radio Propagation

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Introduction to Unit-II	1	15-07-2024		TLM1	
14.	Basics of mobile radio propagation mechanisms	1	16-07-2024		TLM1	
15.	Free space propagation	1	18-07-2024		TLM1	
16.	Link budget design	1	22-07-2024		TLM1	
17.	Propagation models	1	23-07-2024		TLM1	
18.	small-scale multipath propagation	1	24-07-2024		TLM1	
19.	Factors influencing the fading	1	25-07-2024		TLM1	
20.	Types of small-scale fading	1	29-07-2024		TLM1	
21.	Cell Site Antennas and Mobile Antennas: Types - Omni directional antennas	1	30-07-2024		TLM1	
22.	Directional antennas	1	31-07-2024		TLM1	
23.	Sectoring	1	01-08-2024		TLM1	
24.	Mobile antenna types	1	05-08-2024		TLM1	
No.of classes required to complete UNIT-II		12	No. of classes taken			

UNIT-III:Interference in Cellular Mobile System

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Introduction to Unit-III	1	06-08-2024		TLM1	
26.	Introduction to Co-Channel Interference	1	07-08-2024		TLM1	
27.	Procedure to find nearest neighbors of a particular cell	1	08-08-2024		TLM1	
28.	Procedure to find nearest neighbors of a particular cell	1	12-08-2024		TLM1	
29.	Co-channel Interference Reduction Factor	1	13-08-2024		TLM1	
30.	Co-channel Interference Reduction Factor	1	14-08-2024		TLM1	
31.	Desired C/I from a normal and worst case in an omni-directional and directional Antenna system	1	19-08-2024		TLM1	
32.	Desired C/I from a normal and worst case in an omni-directional and directional Antenna system	1	20-08-2024		TLM1	
33.	impact on co-channel interference by lowering the antenna height	1	21-08-2024		TLM1	
34.	impact on co-channel interference by lowering the antenna height	1	22-08-2024		TLM1	
35.	Non co-channel interference	1	27-08-2024		TLM1	
36.	Non co-channel interference	1	28-08-2024		TLM1	
No.of classes required to complete UNIT-III (First Half-50%)		12	No.of classes taken			

UNIT-IV:Frequency Management and Channel Assignment

S.No.	Topic/s	No.of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Introduction to Unit-IV	1	29-08-2024		TLM1	
38.	Numbering and grouping	1	10-09-2024		TLM1	
39.	Setup channels	1	11-09-2024		TLM1	
40.	Access channels and paging channels	1	12-09-2024		TLM1	
41.	Access channels and paging channels	1	17-09-2024		TLM1	
42.	Channel assignments to cell sites and mobile units	1	18-09-2024		TLM1	
43.	Overlaid cells	1	19-09-2024		TLM1	
44.	Channel sharing and borrowing	1	23-09-2024		TLM1	
45.	Handoffs and Dropped Calls: Types of handoff	1	24-09-2024		TLM1	
46.	Initiation, delaying handoff, forced handoff, mobile assigned handoff	1	25-09-2024		TLM1	
47.	Initiation, delaying handoff, forced handoff, mobile assigned handoff	1	26-09-2024		TLM1	
48.	Intersystem handoff, dropped call rate	1	30-09-2024		TLM1	
No.of classes required to complete UNIT-IV		12	No.of classes taken			

UNIT-V:Digital Cellular Systems: multiple access schemes:

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	FDMA	1	01-10-2024		TLM1	
50.	FDMA	1	03-10-2024		TLM1	
51.	TDMA	1	07-10-2024		TLM1	
52.	TDMA	1	08-10-2024		TLM1	
53.	CDMA	1	14-10-2024		TLM1	
54.	CDMA	1	15-10-2024		TLM1	
55.	2G Systems- GSM system architecture	1	16-10-2024		TLM1	
56.	3G Systems- architecture of WCDMA	1	17-10-2024		TLM1	
57.	4G system- 4G network standards	1	21-10-2024		TLM1	
58.	4G system- 4G network standards	1	22-10-2024		TLM1	
59.	LTE architecture	1	23-10-2024		TLM1	
60.	OFDMA	1	24-10-2024		TLM1	
61.	OFDMA	1	28-10-2024		TLM1	
62.	Introduction to 5G technologies, Comparison of cellular technologies.	1	29-10-2024		TLM1	
No.of classes required to complete UNIT-V		**13**	No.of classes taken			

Content 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
63.	Introduction to GSM Protocols	1	30-10-2024			
64.	Introduction to 6G Technology	1	04-11-2024			
65.	Discussion	3	05,06, 07-11-2024			

Teaching Learning Methods

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

EVALUATIONPROCESS PART-C

EvaluationTask	**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

PROGRAMMEOUTCOMES(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 E V Krishna Rao	Dr E V Krishna Rao	Dr. G L N Murthy	Dr G Srinivasulu

Date:

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs. K. Pavani

Course Name & Code : Optical Communications – 20EC23

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

Program/Sem/Sec : B.Tech., ECE., VII-Sem., Section- B A.Y : 2024-25

PRE-REQUISITE: EMWTL, Analog Communications, and Digital Communications.

COURSE OBJECTIVE: This course gives knowledge on optical communication fundamentals, fiber types, and fiber materials. This course also describes about transmission losses in the fiber, optical sources, source to fiber coupling scheme, and optical receivers. This course also provides understanding of digital optical link, analog optical systems, wavelength division multiplexing and optical networks.

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

CO1	**Describe** the fundamental concepts of optical communication systems, WDM systems, and optical networks. (L2)
CO2	**Apply** knowledge of signal transmission characteristics on fibers, optical sources and detectors in the optical communication system parameters calculations. (L3)
CO3	I**nterpret** the operations of optical sources, detectors in the presence of channel degradation mechanisms in analog and digital optical systems. (L2)
CO4	**Examine** the parameters of source to fiber launching, Power-Coupling Calculations, attenuation and dispersion measurement. (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	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	3	-	-

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

TEXT BOOKS:

T1	Gerd Keiser, Optical Fiber Communications, Mc Graw-Hill International edition,4th Edition, 2008.
T2	John M. Senior, Optical Fiber Communications, PHI, 2nd Edition, 2002.

REFERENCE BOOKS:

R1	Joseph C. Palais, Fiber Optic Communications, Pearson Education, 4th Edition, 2004.
R3	Govind P. Agarwal, Fiber Optic Communication Systems, John Wiley, 3rd Edition, 2004

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Overview of Optical Fiber Communications

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course, COs,POs	1	24.06.2024		TLM1	
2.	The General System	1	25.06.2024		TLM1	
3.	Elements of Optical Fiber Link, Merits and Demerits of Optical Fiber Communications	1	27.06.2024		TLM1	
4.	Applications of Optical Fiber Communications	1	28.06.2024		TLM1	
5.	Refractive Index, Refraction, Reflection	1	01.07.2024		TLM1	
6.	CriticalAngle, Total Internal Reflection	1	02.07.2024		TLM1	
7.	Optical Fiber Structures, Step Index Fiber Structure, Graded Index Fiber Structure	1	04.07.2024		TLM2	
8.	Acceptance Angle, NumericalAperture	1	05.07.2024		TLM2	
9.	Meridional and Skew Rays,	1	08.07.2024		TLM2	
10.	Overview of Modes, Summary of key model concepts.	1	09.07.2024		TLM1	
11.	Single mode fiber, Cut-off Wavelength, Mode Field Diameter	1	11.07.2024		TLM1	
12.	Assignment	1	12.07.2024		TLM1	
No. of classes required to complete UNIT-I		12	No. of classes taken			

UNIT-II: Fiber Materials and Signal Degradation in Optical Fibers

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.	Fiber Materials: Glass Fibers	1	15.07.2024		TLM1	
2.	Active Glass Fibers, PlasticGlass Fibers	1	16.07.2024		TLM1	
3.	Attenuation: Attenuation Units,Absorption	1	18.07.2024		TLM1	
4.	Scattering Losses	1	19.07.2024		TLM1	
5.	BendingLosses, Core-Cladding Losses	1	22.07.2024		TLM2	
6.	Signal Distortion in	1	23.07.2024		TLM2	

	OpticalWaveguides, Information Capacity Determination					
7.	Group delay, Material Dispersion	1	25.07.2024		TLM1	
8.	Polarization-Mode Dispersion,	1	26.07.2024		TLM2	
9.	Intermodal Dispersion, Mode coupling	1	29.07.2024		TLM1	
10.	Design Optimization of Single-Mode Fibers	1	30.07.2024		TLM1	
11.	Refractive Index Profiles	1	01.08.2024		TLM1	
12.	Assignment	1	02.08.2024		TLM1	
No. of classes required to complete UNIT-I		12	No. of classes taken			

UNIT-III: Optical Sources, Power Launching and Coupling

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.	Requirements of OpticalSources, LED Structures	1	05.08.2024		TLM1	
2.	Light Source Materials	1	06.08.2024		TLM1	
3.	Quantum Efficiency and LEDPower, Modulation of LED	1	08.08.2024		TLM1	
4.	LASER Diodes, Laser Diode Modes andThreshold Conditions	1	09.08.2024		TLM2	
5.	Semiconductor Laser Diodes: Fabry Perot Lasers	1	12.08.2024		TLM1	
6.	Distributed Feedback (DFB)Lasers, Laser diode rate equations	1	13.08.2024		TLM1	
7.	External quantum efficiency, resonant frequencies	1	09.09.2024		TLM1	
8.	Source to fiber power launching, Source output pattern	1	10.09.2024		TLM2	
9.	power coupling calculation	1	12.09.2024		TLM1	
10.	Lensing Schemes for coupling improvement	1	13.09.2024		TLM1	
11.	Laser Diode-to-Fiber Coupling	1	17.09.2024		TLM1	
12.	Assignment	1	19.09.2024		TLM1	
No. of classes required to complete UNIT-III		12	No. of classes taken			

UNIT-IV: Optical detectors and receivers

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.	Photo detectors, Physical Principles of Photodiodes	1	20.09.2024		TLM1	
2.	PIN Photo Detector	1	23.09.2024		TLM2	
3.	Avalanche Photo Diodes	1	24.09.2024		TLM1	
4.	Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors.	1	26.09.2024		TLM1	
5.	Fundamental ReceiverOperation , Digital Signal Transmission	1	27.09.2024		TLM2	
6.	Error Sources	1	30.09.2024		TLM2	
7.	Receiver Configuration,	1	01.10.2024		TLM1	
8.	Digital Receiver Performance	1	03.10.2024		TLM1	
9.	Probability of Error, The Quantum Limit	1	04.10.2024		TLM1	
10.	Analog Receivers	1	14.10.2024		TLM1	
11.	Assignment	1	15.10.2024		TLM1	
No. of classes required to complete UNIT-IV		11	No. of classes taken			

UNIT-V: Digital Transmission Systems and Measurements:

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.	Point to Point Links, SystemConsiderations	1	17.10.2024		TLM1	
2.	Link Power Budget	1	18.10.2024		TLM2	
3.	Rise Time Budget	1	21.10.2024		TLM1	
4.	Line Coding- NRZ codes, RZCodes	1	22.10.2024		TLM1	
5.	WDM Features, Operation Principles of WDM	1	24.10.2024		TLM2	
6.	Types of WDM	1	25.10.2024		TLM1	
7.	SONET/SDH Networks	1	28.10.2024		TLM2	

8.	Measurement of Attenuation	1	29.10.2024		TLM1	
9.	Measurement of Dispersion	1	01.11.2024		TLM1	
10.	Assignment	1	04.11.2024		TLM1	
No. of classes required to complete UNIT-V		10	No. of classes taken			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Visible light communication system	1	05.11.2024		TLM1	

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1 W
II Phase of Instructions	09-09-2024	09-11-2024	9 W
II Mid Examinations	11-11-2024	16-11-2024	1 W
Preparation and Practical's	18-11-2024	23-11-2024	1 W
Semester End Examinations	25-11-2024	07-12-2024	2 W

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 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

Date:18.06.2024

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mrs. K. Pavani	Dr. M. V. Sudhakar	Dr. M.V.Sudhakar	Dr. G. Srinivasulu

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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/B **A.Y.:** 2024-2025

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	24-06-24			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	26-06-24			
3.	Wireless sensor networks- classification, advantages, limitations	1	27-06-24			
4.	Applications of WSNs	1	28-06-24			
5.	Application examples and types of applications	1	01-07-24			
6.	Unique constraints and Challenges	1	03-07-24			
7.	Characteristic Requirements and mechanisms	1	04-07-24			
8.	Advantages of Sensor Networks	1	05-07-24			
9.	Collaborative processing and Key definitions	1	08-07-24			
10.	Difference between Mobile Ad-hoc and Sensor Networks	1	10-07-24			
11.	Enabling technologies	1	11-07-24			
12.	Application case study	1	12-07-24			
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	15-07-24			
14.	Hardware components of sensor nodes- description	1	18-07-24			
15.	Energy Consumption of Sensor Nodes	1	19-07-24			
16.	Operating states with different Power Consumption	1	22-07-24			
17.	Energy consumption of Transceiver,	1	24-07-24			
18.	Energy consumption of Micro controller; Memory	1	25-07-24			
19.	Dynamic Voltage Scaling	1	26-07-24			
20.	Relation between Computation and Communication	1	29-07-24			
21.	commercially available sensor nodes	1	31-07-24			
22.	Sensor Network architecture	1	01-08-24			
23.	Sensor Network Scenarios	1	02-08-24			
24.	Optimization Goals of sensor networks	1	05-08-24			
25.	Figures of Merit	1	07-08-24			
26.	Gateway Concepts.	1	08-08-24			
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	09-08-24			
28.	Fundamental concepts of protocol architectures- cross layer architecture	1	12-08-24			
29.	Physical Layer and Transceiver design considerations in WSNs	1	14-08-24			
30.	MAC Protocols for Wireless Sensor Networks	1	16-08-24			
31.	Low Duty Cycle protocols	1	19-08-24			
32.	Wakeup radio concepts	1	21-08-24			
33.	S-MAC	1	22-08-24			
34.	The IEEE 802.15.4 MAC protocol	1	23-08-24			
35.	Routing Protocols for WSN	1	28-08-24			
36.	Energy efficient	1	29-08-24			
37.	Geographic routing	1	30-08-24			
38.	Position based routing	1	09-09-24			
39.	Routing Challenges and Design Issues in wireless sensor networks.	1	11-09-24			
40.	Simulation of one of the routing protocol for WSN using MATLAB/NS-2	1	12-09-24			
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 wireless sensor networks	1	13-09-24			
42.	Possible options for topology control	1	16-09-24			
43.	Examples and types for topology control- LMST	1	18-09-24			
44.	Clustering	1	19-09-24			
45.	Different types of clustering-methods	1	20-09-24			
46.	Time synchronization	1	23-09-24			
47.	Clocks and communication delays	1	25-09-24			
48.	Interval methods and reference broadcast methods	1	26-09-24			
49.	Localization and positioning	1	27-09-24			
50.	Sensor Tasking & Control	1	30-09-24			
51.	Task driven sensing,	1	03-10-24			
52.	Role of sensor nodes & utilities,	1	04-10-24			
53.	Information based sensor tasking.	1	07-10-24			
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	09-10-24			

55.	Types of Sensor Node Hardware	1	14-10-24			
56.	Berkeley Motes	1	16-10-24			
57.	Programming Challenges	1	17-10-24			
58.	Node-level software platforms	1	18-10-24			
59.	TinyOS	1	21-10-24			
60.	TinyOS application example	1	23-10-24			
61.	nesC	1	24-10-24			
62.	Components of node level simulator	1	25-10-24			
63.	Network simulator-NS-2	1	28-10-24			
64.	Installation and example programs in NS-2	1	30-10-24			
65.	Different types of Node-level Simulators	1	01-11-24			
66.	State-centric programming	1	04-11-24			
67.	WSN application case study with software tools	1	06-11-24			
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 and attacks in WSN	1	07-11-24			
69.	Research trends to improve energy efficiency of WSN, Simulation tools-NS-3	1	08-11-24			

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. 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. NARENDRA BABU P
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.: 2024-25**

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 Harmelen, 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	24-06-2024		-	CO1	-	
2.	Introduction: What Is AI?,	1	25-06-2024		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	26-06-2024		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	28-06-2024		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	01-07-2024		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	02-07-2024		TLM1	CO1	T1,T2	
7.	Types of agents	1	03-07-2024		TLM2	CO1	T1,T2	
8.	Types of agents	1	05-07-2024		TLM2	CO1	T1,T2	
9.	Types of agents	1	08-07-2024		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	09-07-2024		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	10-07-2024		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	12-07-2024		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	15-07-2024		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	16-07-2024		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	19-07-2024 22-07-2024		TLM1	CO2	T1,T2	
16.	searching for Solutions, Uninformed Search Strategies	1	23-07-2024		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	24-07-2024		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	26-07-2024		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	29-07-2024		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	30-07-2024		TLM2	CO2	T1,T2	
21.	A* Algorithm	2	31-07-2024 01-08-2024		TLM2	CO2	T1,T2	
22.	AO* Algorithm	2	02-08-2024 05-08-2024		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	07-08-2024		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	09-08-2024		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	12-08-2024		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	13-08-2024		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	14-08-2024		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	2	16-08-2024 19-08-2024		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	20-08-2024		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	21-08-2024		TLM2	CO3	T1,T2	
31.	Depth limited search	1	23-08-2024		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	27-08-2024		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	28-08-2024		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	30-08-2024		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	09-09-2024		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	10-09-2024		TLM1	CO4	T1,T2	
37.	Minimax algorithm	2	11-09-2024 13-09-2024		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	2	16-09-2024 17-09-2024		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	2	18-09-2024 20-09-2024		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	23-09-2024		TLM1	CO4	T1,T2	
41.	Representation mappings	1	24-09-2024		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	25-09-2024		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	27-09-2024		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	2	30-09-2024 01-10-2024		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	2	02-10-2024 03-10-2024		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	07-10-2024		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 16					**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	14-10-2024		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	2	15-10-2024 17-10-2024		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	19-10-2024		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	21-10-2024		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	2	22-10-2024 24-10-2024		TLM2	CO5	T1,T2	
52.	Mental Events and Mental Objects	1	26-10-2024		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	28-10-2024		TLM1	CO4	T1,T2	

54.	Types of reasoning	2	29-10-2024 02-11-2024		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	2	04-11-2024 05-11-2024		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	07-11-2024		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	09-11-2024		TLM1	CO5	-	
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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1			**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 the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**NARENDRA BABU P**	**NARENDRA BABU P**		**Dr. O. Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
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An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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. : 2024-25

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	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 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	24-06-2024		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	25-06-2024		**TLM2**	CO1	
3	Cybercrime and Information Security	1	27-06-2024		**TLM2**	CO1	
4	Cybercriminals	1	29-06-2024		**TLM2**	CO1	
5	Classifications of Cybercrime	1	01-07-2024		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	2	02-07-2024 04-07-2024		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	06-07-2024 08-07-2024		**TLM2**	CO1	
8	Attacks on Mobile/Cell Phones Network and Computer Attacks	2	09-07-2024 11-07-2024		**TLM2**	CO1	
9	Unit-I Assignment Test	1	15-07-2024		**TLM2**	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	16-07-2024		**TLM2**	CO2	
11	Phishing, Password Cracking	2	18-07-2024 20-07-2024		**TLM2**	CO2	
12	Key loggers and Spywares Virus and Worms	1	22-07-2024		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	23-07-2024		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	25-07-2024 27-07-2024		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	1	29-07-2024		**TLM2**	CO2	
16	Unit-II Assignment Test	1	30-07-2024		**TLM2**	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	01-08-2024		**TLM2**	CO3	
18	Disk Forensics	2	03-08-2024 05-08-2024		**TLM**	CO3	
19	Network Forensics	1	06-08-2024		**TLM2**	CO3	
20	Wireless Forensics	1	08-08-2024		**TLM2**	CO3	
21	Database Forensics	2	12-08-2024		**TLM2**	CO3	
22	Malware Forensics	1	13-08-2024		**TLM2**	CO3	

23	Mobile Forensics	1	17-08-2024		**TLM2**	CO3	
24	Email Forensics	1	20-08-2024		**TLM1**	CO3	
25	Unit-III Assignment Test	1	22-08-2024		**TLM2**	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	24-08-2024 27-08-2024		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	29-08-2024 31-08-2024		**TLM2**	CO4	
28	File System Windows Registry	2	09-09-2024 10-09-2024		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	12-09-2024 14-09-2024		**TLM2**	CO4	
30	Linux Artifact	2	17-09-2024 19-09-2024		**TLM1**	CO4	
31	Digital evidence on the internet	2	21-09-2024 23-09-2024		**TLM2**	CO4	
32	Impediments to collection of Digital Evidence	1	24-09-2024		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	26-09-2024 28-09-2024		**TLM2**	CO4	
34	Unit-IV Assignment Test	1	30-09-2024		**TLM2**	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	01-10-2024		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	1	05-10-2024		**TLM2**	CO5	
37	Tools for Integrity Verification and Hashing	1	07-10-2024		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	1	14-10-2024		**TLM2**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	19-10-2024 22-10-2024		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	1	26-10-2024		**TLM2**	CO5	
41	Unit -5 Assignment test.	1	29-10-2024		**TLM2**	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	04-11-2024		TLM2	
2.	Cloud Security	1	09-11-2024		TLM2	

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
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	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	09-11-2024	9W
II Mid Examinations	11-11-2024	16-11-2024	1W
Preparation and Practical's	18-11-2024	13-04-2024	1W
Semester End Examinations	25-11-2024	07-12-2024	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	Dr. K. Phaneendra	Dr. G. Srinivasulu
Signature				

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

PART - A

PROGRAM : B.Tech. - VII-Sem. - **ECE – B&C Section**
ACADEMIC YEAR : 2024-25
COURSE NAME & CODE : Management Science for Engineers – 20HS02
L-T-P STRUCTURE : **3**-0-0-3
COURSE CREDITS 3
COURSE INSTRUCTOR : **Mrs. Y NAGAMANI Assistant Professor**
COURSE COORDINATOR : **Mrs. Y NAGAMANI 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	24-06-2024		TLM1	CO1	T1	
2.	Definition, Nature, Importance of management	1	26-06-2024		TLM1	CO1	T1	
3.	Functions of Management	1	27-06-2024		TLM2	CO1	T1	
4.	Taylor's scientific management theory	1	28-06-2024		TLM1	CO1	T1	
5.	Fayal's principles of management	1	29-06-2024		TLM3	CO1	T1	
6.	Contribution of Elton mayo, Maslow	1	01-07-2024		TLM2	CO1	T1	
7.	Herzberg, Douglas MC Gregor principles of management	1	03-07-2024		TLM2	CO1	T1	
8.	Basic Concepts of Organization	1	04-07-2024		TLM1	CO1	T1	
9.	Authority, Responsibility	1	05-07-2024		TLM1	CO1	T1, R1	
10.	Delegation of Authority	1	06-07-2024		TLM1	CO1	T1, R1	
11.	Span of control	1	08-07-2024		TLM1	CO1	T1, R1	
12.	Departmentation and Decentralization	1	10-07-2024		TLM2	CO1	T1	
13.	Organization structures (Line organization) Line and Functional staff organization,	1	11-07-2024		TLM3	CO1	T1	
14.	Committee and Matrix organization	1	13-07-2024		TLM1	CO1	T1	
No. of classes required to complete UNIT-I		**14**	15-07-2024		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
15.	Introduction	1	16-07-2024		TLM1	CO2	T1, R3	
16.	Plant location	1	18-07-2024		TLM2	CO2	T1, R3	
17.	Factors influencing location	1	19-07-2024		TLM1	CO2	T1, R3	
18.	Principles of plant layouts	1	22-07-2024		TLM2	CO2	T1, R3	
19.	Types of plant layouts	1	24-07-2024		TLM1	CO2	T1, R3	
20.		1	25-07-2024		TLM3	CO2	T1, R3	
21.	Methods of production	1	26-07-2024		TLM1	CO2	T1	
22.		1	27-07-2024		TLM1	CO2	T1	

23.	Work study	1	29-07-2024		TLM1	CO2	T1	
24.	Basic procedure involved in method study	1	31-07-2024		TLM3	CO2	T1	
25.	Work measurement	1	01-08-2024		TLM1	CO2	T1	
26.		1	02-08-2024		TLM1	CO2	T1	
No. of classes required to complete UNIT-II		**12**			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
27.	Introduction	1	03-08-2024		TLM1	CO3	T1	
28.	Concept of Quality	1	5-08-2024		TLM1	CO3	T1, R1	
29.	Quality Control functions	1	7-08-2024		TLM1	CO3	T1, R1	
30.	Meaning of SQC, Variables and attributes	1	8-08-2024		TLM1	CO3	T1	
31.	X chart, R Chart	1	9-08-2024		TLM3	CO3	T1, R1	
32.	C Chart, P Chart	1	10-08-2024		TLM1	CO3	T1, R1	
33.	Simple problems	1	12-8-2024		TLM1	CO3	T1	
34.	Simple problems	1	14-08-2024		TLM1	CO3	T1, R1	
35.	Acceptance sampling	1	16-08-2024		TLM1	CO3	T1, R1	
36.	Sampling plans	1	17-08-2024		TLM1	CO3	T1	
37.	Deming's contribution to quality	1	27-08-2024		TLM3	CO3	T1	
38.	Materials management Meaning and objectives	1	28-08-2024		TLM1	CO3	T2	
39.	Inventory control	1	29-08-2024		TLM1	CO3	T1	
40.	Need for inventory control	1	29-08-2024		TLM1	CO3	T1, R2	
41.	Purchase procedure, Store records	1	30-8-2024		TLM1	CO3	T1, R2	
42.	EOQ	1	31-08-2024		TLM1	CO3	T1, R2	
43.	ABC analysis, Stock levels	1	31-08-2024		**TLM1**	CO3	**T1, R1**	
No. of classes required to complete UNIT-III		**17**			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
44.	Introduction	1	4-09-2024		**TLM1**	CO4	**T1**	
45.	Concepts of HRM	1	05-09-2024		**TLM1**	CO4	**T1**	

46.	Basic functions of HR manager	1	06-09-2024		**TLM1**	CO4	**T1, R2**	
47.	Man power planning	1	09-09-2024		**TLM3**	CO4	**T1, R2**	
48.	Recruitment	1	11-09-2024		**TLM2**	CO4	**T1, R2**	
49.	Selection,	1	12-09-2024		**TLM1**	CO4	**T1, R1**	
50.	Training & Development, Placement	1	13-09-2024		**TLM1**	CO4	**T1, R1**	
51.	Wage and salary administration	1	14-09-2024		**TLM3**	CO4	**T1, R1**	
52.	Promotion, Transfers Separation	1	14-09-2024		**TLM2**	CO4	**T1, R1**	
53.	Performance appraisal	1	18-09-2024		**TLM2**	CO4	**T1**	
54.	Job evaluation and merit rating	1	18-09-2024		**TLM3**	CO4	**T1**	
No. of classes required to complete UNIT-IV		12			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
55.	Introduction	1	19-09-2024		TLM1	CO5	T1,R2	
56.	Early techniques in project management	1	20-09-2024		TLM1	CO5	T1, R2	
57.	Network analysis	1	25-09-2024		TLM1	CO5	T1,R2	
58.	Programme Evaluation and Review Technique (PERT)	1	26-09-2024		TLM1	CO5	T1,R2	
59.	Problems	1	27-09-2024		TLM1	CO5	T1,R2	
60.	Problems	1	3-10-2024		TLM1	CO5	T1, R2	
61.	Critical path method (CPM)	1	04-10-2024		TLM1	CO5	T1,R2	
62.	Identifying critical path& Problems	1	09-10-2024		TLM1	CO5	T1,R2	
63.	Problems	1	16-10-2024		TLM1	CO5	T1,R2	
64.	Probability of completing project within given time	1	17-10-2024		TLM1	CO5	T1, R2	
65.	Project cost analysis	1	21-10-2024		TLM1	CO5	T1,R2	
66.	Problems	1	24-10-2024		TLM1	CO5	T1,R2	
67.	Problems	1	25-10-2024		TLM1	CO5	T1,R2	
	project crashing	1	1-11-2024					
68.	Importance & need	1	02-11-2024		TLM1	CO5	T1, R2	
69.	Simple problems	1	07-11-2024		TLM1	CO5	T1,R2	
70.	Simple problems	1	08-11-2024		TLM1	CO5	T1,R2	
71.	Simple problems	1	09-11-2024		TLM1	CO5	T1	
No. of classes required to complete UNIT-V		**18**			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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	09-11-2024	9W
II Mid Examinations	11-11-2024	16-11-2024	1W
Preparation and Practical's	18-11-2024	23-11-2024	1W
Semester End Examinations	25-11-2024	07-12-2024	2W

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: To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.

PEO2: To Function professionally in the rapidly changing world with advances in technology.

PEO3: To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.

PEO4: To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

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: Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

PSO2: 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.

PSO3: Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Mrs. Y NAGAMANI	Mrs. Y NAGAMANI	Dr. U Rambabu	Dr. A Adisesha Reddy
Course Instructor	Course Coordinator	Module Coordinator	HoD

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. Y AMAR BABU
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., Section-Honor A.Y : 2024-25

PRE-REQUISITES: Digital Circuits.

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

CO1	Identify the significance of testable design
CO2	Implement combinational and sequential circuit test generation algorithms
CO3	Understand the importance of Design verification.
CO4	Analyze the static timing verification and physical design verification.

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

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

TEXT BOOKS:

T1 P. K. Lala, "Digital Circuit Testing and Testability", Academic Press

T2 M.L. Bushnell and V.D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwar Academic Publishers.

REFERENCE BOOKS:

R1 M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design", Jaico Publishing House, 2002.

R2 Janick Bergeron, "Writing test benches: functional verification of HDL models", 2nd edition ,Kluwer Academic Publishers,2003

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section - Honor

UNIT-I: Introduction to Testing

S. No.	Topics	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Testing Philosophy, Role of Testing	1	28-06-2024			
2.	Digital and Analog VLSI Testing	1	28-06-2024			
3.	VLSI Technology Trends Affecting Testing	1	29-06-2024			
4.	Faults in Digital Circuits: Failures and Faults	1	29-06-2024			
5.	Modelling of Faults, Temporary Faults	1	05-07-2024			
6.	Test Generation for Combinational Logic Circuits: Fault Diagnosis of Digital Circuits	1	05-07-2024			
7.	Test Generation Techniques for Combinational Circuits	1	06-07-2024			
8.	Detection of Multiple Fauls in Combinational Logic Circuits.	1	06-07-2024			
9.	Innovative Teaching- Tutorial	1	12-07-2024			
No. of classes required to complete UNIT-I:		**9**	No. of classes taken:			

UNIT-II: Design of Testable Sequential Circuits

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Controllability and Observability, Ad Hoc Design Rules for Improving Testability	1	12-07-2024			
2.	Design of Diagnosable Sequential Circuits	1	19-07-2024			
3.	The Scan-Path Technique for Testable Sequential Circuit Design	1	19-07-2024			
4.	Level-Sensitive Scan Design, Random Access Scan Technique	1	20-07-2024			
5.	Partial Scan, Testable Sequential Circuit Design Using Non-scan Techniques	1	20-07-2024			
6.	Cross Check, Boundary Scan	1	26-07-2024			
7.	Built-In Self Test: Test Pattern Generation for BIST, Output Response Analysis, Circular BIST	1	26-07-2024			
8.	BIST Architectures	1	27-07-2024			
9.	Innovative Teaching- Tutorial	1	27-07-2024			
No. of classes required to complete UNIT-II:		**09**	No. of classes taken:			

UNIT-III: Testable Memory 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
1.	RAM Fault Models, Test Algorithms for RAMs	1	02-08-2024			
2.	Detection of Pattern Sensitive Faults	1	02-08-2024			
3.	BIST Techniques for Ram Chips, Test Generation and BIST for Embedded RAMs	1	03-08-2024			
4.	Importance of Design Verification: What is verification? What is attest bench? The importance of verification	1	03-08-2024			
5.	Reconvergence model	1	09-08-2024			
6.	Formal verification	1	09-08-2024			
7.	Equivalence checking	1	23-08-2024			
8.	Model checking, Functional verification	1	23-08-2024			
9.	Innovative Teaching- Tutorial	1	24-08-2024			
No. of classes required to complete UNIT-III:		**09**	No. of classes taken:			

UNIT-IV: Verification 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
1.	Linting tools: Limitations of linting tools, Co-simulators, verification intellectual property: hardware modelers, waveformviewers	1	24-08-2024			
2.	linting verilog source code, linting VHDL source code, linting OpenVera and esource code	1	30-08-2024			
3.	code reviews, Simulators: Stimulus and response, Event based simulation, cycle based simulation	1	30-08-2024			
4.	The verification plan: The role of verification plan: specifying the verification plan, defining the first success	1	31-08-2024			
5.	Levels of verification: unit level verification, reusable components verification	1	31-08-2024			
6.	ASIC and FPGA verification	1	06-09-2024			
7.	system level verification, board level verification	1	06-09-2024			
8.	verifying strategies, verifying responses	1	13-09-2024			
9.	Innovative Teaching- Tutorial	1	13-09-2024			
No. of classes required to complete UNIT-IV:		**09**	No. of classes taken:			

UNIT-V: Static Timing Verification

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.	Concept of static timing analysis. Cross talk and noise. Limitations of STA	1	20-09-2024			
2.	slew of a wave form, Skew between the signals, Timing arcs and unateness	1	20-09-2024			
3.	Min and Max timing paths, clock domains, operating conditions	1	21-09-2024			
4.	critical path analysis, false paths, Timing models	1	21-09-2024			
5.	Physical Design Verification: Layout rule checks and electrical rule checks	1	27-09-2024			
6.	Parasitic extraction. Antenna	1	27-09-2024			
7.	Crosstalk and Noise: Cross talk glitch analysis	1	29-09-2024			
8.	crosstalk delay analysis, timing Verification	1	4-10-2024			
9.	Innovative Teaching- Tutorial	1	5-10-2024			
No. of classes required to complete UNIT-V:		**09**	No. of classes taken:			

Contents beyond the Syllabus

S. No.	Topics	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Universal Verification Methodology	1	12-10-2024			

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
Assignment-I (Units-2 1/2)	A1=5
I-Mid Examination (Units-2 1/2)	M1=15
I-Quiz Examination (Units-2 1/2)	Q1=10
Assignment-II (Units-2 1/2)	A2=5
II-Mid Examination (Units-2 1/2)	M2=15
II-Quiz Examination (Units-2 1/2)	Q2=10
Mid Marks =80% of Max(M1, M2)+20% of Min(M1, M2)	M=15
Quiz Marks =80% of Max(Q1, Q2)+20% of Min(Q1, Q2)	Q=10
Assignment Marks = Average of Best two of A1, A2	A=5
Cumulative Internal Examination (CIE) : M+Q+A	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for 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

Date: 18-06-2024

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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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.V.Sowjanya
Course Name & Code : Deep Learning & 20ADM5
L-T-P Structure : **3-1-0** **Credits:** 4
Program/Sem/Sec : B.Tech/VII **A.Y.:** 2024-25
PREREQUISITES : **Probability and Statistics, LATT, Machine Learning**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to make students learn the frameworks of deep learning and their application

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

CO1	**Demonstrate** the mathematical foundation of Neural network **(Understand-L2)**
CO2	**Describe** the machine learning basics **(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	2	2	1	-	-	-	-	-	-	-	-	1	1	-	3
CO2	3	2	-	2	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	2	2	-	-	-	-	-	-	-	2	-	2	2
CO4	2	2	-	2	-	-	-	-	-	-	-	-	2	-	-
CO5	2	2	2	2	-	-	-	-	-	-	-	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.	Introduction about CO's & PO's related to Course	2	27.6.24		TLM1,2	
2.	**UNIT-1 Linear Algebra:** Scalars, Vectors, Matrices and Tensors, Matrix Operations, Types of Matrices, Norms	2	29.6.24		TLM1,2	
3.	Eigen Decomposition, Singular Value Decomposition, Principal Component Analysis	2	4.7.24		TLM1,2	
4.	**Probability and Information Theory:** Random Variables, Probability Distributions, Marginal Probability, Conditional Probability	2	6.7.24		TLM1,2	
5.	Expectation, Variance and Covariance, Bayes' Rule,	2	11.7.24		TLM1,2	
6.	**Information Theory.** Numerical Computation: Overflow and Underflow.	2	18.7.24		TLM1,2	
7	Gradient-Based Optimization	2	20.7.24		TLM1,2	
8	Constrained Optimization, Linear Least Squares	2	25.7.24		TLM1,2	
No. of classes required to complete UNIT-I: 16				**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
9	Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators	2	1.8.24			
10	Bias and Variance, Maximum Likelihood, Bayesian Statistics,	2	3.8.24		TLM1,2	
11	Supervised and Unsupervised Learning, Stochastic Gradient	2	8.8.24		TLM1,2	

	Descent, Challenges Motivating Deep Learning.					
12	**Deep Feed forward Networks:** Learning XOR,	2	17.8.24		TLM1,2	
13	Gradient-Based Learning, Hidden Units	2	22.8.24		TLM1,2	
14	Architecture Design, Back-Propagation and other Differentiation Algorithms	2	24.8.24		TLM1,2	
No. of classes required to complete UNIT-II: 12				**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
15	**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization	2	29.8.24		TLM1,2	
16	Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness	2	31.8.24		TLM1,2	
17	Semi-Supervised Learning, Multi-Task Learning, Early Stopping	2	12.9.24		TLM1,2	
18	Parameter Tying and Parameter Sharing, Sparse Representations,	2	19.9.24		TLM1,2	
19	Bagging and Other Ensemble Methods, Dropout, Adversarial Training,	2	21.9.24		TLM1,2	
20	Tangent Distance, Tangent Prop and Manifold Tangent Classifier.	2	26.9.24		TLM1,2	
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
21	**Convolutional Networks**: The Convolution Operation, Pooling.	2	28.9.24		TLM1,2	
22	Convolution, Basic Convolution Functions, Structured Outputs, Data Types	2	3.10.24		TLM1,2	
23	Efficient Convolution Algorithms, Random Unsupervised Features	2	5.10.24		TLM1,2	

24	Basis for Convolutional Networks	2	17.10.24		TLM1,2	
No. of classes required to complete UNIT-IV: 7				**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
25	**Sequence Modeling: Recurrent and Recursive Nets:** Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs	2	19.10.24		TLM1,2	
26	Encoder-Decoder Sequence-to-Sequence Architectures	2	24.10.24		TLM1,2	
27	Deep Recurrent Networks, Recursive Neural Networks	2	26.10.24		TLM1,2	
28	Echo State Networks Models, LSTM, Gated RNNs	2	2.11.24		TLM1,2	
29	Optimization for Long-Term Dependencies	2	7.11.24		TLM1,2	
30	Auto encoders, Deep Generative	2	9.11.24		TLM1,2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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	V Sowjanya	V Sowjanya	Dr.V. Surya Narayana	Dr. O. Rama Devi
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. :** 2024-25

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	28/06/2024		TLM2	
2.	The evolving role of Software	1	28/06/2024		TLM2	
3.	Characteristics of Software	1	29/06/2024		TLM2	
4.	Importance of software Engineering,	1	29/06/2024		TLM2	
5.	Changing nature of software	1	05/07/2024		TLM2	
6.	Legacy Software	1	05/07/2024		TLM2	
7.	Software Myths	1	06/07/2024		TLM2	
8.	Software process model: layered. technology	1	06/07/2024		TLM2	
9.	Process framework The process and product	2	12/07/2024		TLM2	
10.	Waterfall model	1	19/07/2024		TLM2	
11.	Incremental model	1	19/07/2024		TLM2	
12.	Spiral and V model	1	20/07/2024		TLM2	
13.	Component based s/w development	1	20/07/2024		TLM2	
14.	Unified Process model	1	26/07/2024		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	26/07/2024		TLM2	
16.	Requirement analysis	1	27/07/2024		TLM2	
17.	Software requirement specification	1	27/07/2024		TLM2	
18.	SRS document case study	2	02/08/2024		TLM2	
19.	Overview of design process	1	03/08/2024		TLM2	
20.	Design concepts	1	03/08/2024		TLM2	
21.	Architectural concepts	2	09/08/2024		TLM2	
22.	Examples	2	16/08/2024		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	17/08/2024		TLM2	
25.	Defining things	1	17/08/2024		TLM2	
26.	Defining relationships and diagrams	2	23/08/2024		TLM2	
27.	Common Mechanism in UML	1	23/08/2024		TLM2	
28.	Class diagrams	1	24/08/2024		TLM2	
29.	Examples	1	30/08/2024		TLM2	
30.	Object diagrams and examples	1	31/08/2024		TLM2	
31.	Revision	1	13/09/2024		TLM2	
No. of classes required to complete UNIT-III: 09				**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	13/09/2024		TLM2	
33.	Interaction diagrams	1	20/09/2024		TLM2	
34.	Use-cases	1	20/09/2024		TLM2	
35.	Use-case diagrams	1	21/09/2024		TLM2	
36.	Activity diagrams	1	21/09/2024		TLM2	
37.	Events and signals, state machines	1	27/09/2024		TLM2	
38.	processes and Threads, time, and space	1	27/09/2024		TLM2	
39.	State chart diagrams	2	28/09/2024		TLM2	
40.	Component diagrams	1	04/10/2024		TLM2	
41.	Deployment diagrams	1	05/10/2024		TLM2	
42.	Examples	1	05/10/2024		TLM2	
43.	Revision	1	18/10/2024		TLM2	
No. of classes required to complete UNIT-IV: 15				**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	18/10/2024		TLM2	
45.	Unit testing	1	19/10/2024		TLM2	
46.	Integration testing	1	19/10/2024		TLM2	
47.	Blackbox testing	2	25/10/2024		TLM2	
48.	Whitebox testing	2	26/10/2024		TLM2	
49.	Debugging	1	18/10/2024		TLM2	
50.	System testing	2	19/10/2024		TLM2	
51.	Examples	2	25/10/2024		TLM2	
52.	Revision	2	26/10/2024		TLM2	
No. of classes required to complete UNIT-V: 09				**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	01/11/2024		TLM6	
51	Case study test case preparation	2	02/11/2024		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.S.Jayaprada**	**Dr. D. Veeraiah**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
L.B. REDDY NAGAR, MYLAVARAM – 524230. A.P. INDIA
Affiliated to JNTUK Kakinada & Approved by AICTE, New Delhi
Accredited By NAAC, Accredited By NBA Tier-I & Certified by ISO 9001:2015
http://www.lbrce.ac.in, Phone: 08659 – 222933, Fax: 08659 – 222931 Extn:109
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PROGRAM : B.Tech., VII-Sem., IT, R20 Regulations-**Minor**

ACADEMIC YEAR : 2024-25

COURSE NAME & CODE: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML-20ITM5

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

COURSE CREDITS : 3

COURSE INSTRUCTOR : Mrs.K.Lakshmi Devi

COURSE COORDINATOR:

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
CO1	2	1	2	-	-	-	-	-	-	-	-	-
CO2	1	1	2	-	-	-	-	-	-	-	-	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	2	1	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. 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	28.06.24		TLM2	
2.	Object Basic – Object – Oriented Systems Development Life Cycle	2	28.06.24 29.06.24		TLM2	
3.	Object Oriented Analysis Process	1	29.06.24		TLM1	
4.	Identifying use cases: Introduction.	1	19.07.24		TLM2	
5.	Why Analysis is a Difficult Activity	1	19.04.24		TLM2	
6.	Business Object Analysis: Understanding the Business Layer	1	20.07.24		TLM2	
7.	Use-Case Driven Object-Oriented Analysis: The Unified Approach	1	20.07.24		TLM2	
8.	Business Process Modeling	1	26.07.24		TLM1	
9.	Use-Case Model, Developing Effective Documentation	1	26.07.24		TLM2	
10.	Use-Case Model, Developing Effective Documentation	2	27.07.24 27.07.24		TLM2	
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	02.08.24		TLM2	
2.	Static and Dynamic Models	1	02.08.24		TLM2	
3.	Why Modeling?	1	03.08.24		TLM2	
4.	Introduction to the Unified Modeling Language, UML Diagrams.	2	03.08.24 09.08.24		TLM2	
5.	UML Use Case Diagram- Use case descriptions	1	09.08.24		TLM2	
6.	Actors and actor descriptions	1	16.08.24		TLM2	
7.	Use case relationships: communication association, include	2	16.08.24 17.08.24		TLM1	
8.	Extend and Generalization, System Boundary,	1	17.08.24		TLM2	
9.	Case study Via Net Bank ATM.	1	23.08.24		TLM1	
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	1	23.08.24		TLM2	

	Relationships					
2.	A-Part-of Relationships-Aggregation, Class Responsibility, Identifying Attributes and Methods	1	24.08.24		TLM2	
3.	Class Responsibility, Defining Attributes by Analyzing Use Cases and Other UML Diagrams	2	24.08.24 30.08.24		TLM2	
4.	Object Responsibility: Methods and Messages	1	30.08.24		TLM1	
5.	Static Modeling: UML Class Diagram: Class, interface	2	31.08.24 31.08.24		TLM2	
6.	Package, Relationships between classes and other Notations of Class Diagram	1	13.09.24		TLM2	
7.	Package, Relationships between classes and other Notations of Class Diagram	2	13.09.24 20.09.24		TLM2	
8.	Case study ViaNet Bank ATM.	2	20.09.24 21.09.24		TLM1	
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
9.	UML Interaction Diagrams – UML Sequence Diagram: object, life line,	1	21.09.24		TLM2	
10.	Activation Bar, Types of Messages.	2	27.09.24 27.09.24		TLM2	
11.	UML Collaboration Diagram: object, object Connection	1	28.09.24		TLM2	
12.	Message with sequence numbers, case study ViaNet Bank ATM	1	28.09.24		TLM2	
13.	UML State-Chart Diagram: object State, Initial/Final State	2	04.10.24 04.10.24		TLM2	
14.	Simple/Complex Transitions	1	05.10.24		TLM1	
15.	UML Activity Diagram: Activity State, Transition	1	05.10.24		TLM2	
16.	Swim Lane, Initial state, Final State	2	18.10.24 18.10.24		TLM2	
17.	Synchronization Bar, Branching, case study Via Net Bank ATM	1	19.10.24		TLM1	
No. of classes required to complete UNIT-IV		13	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
18.	Implementation Diagrams – Component Diagram: Component, Dependency and Interface,	1	19.10.24		TLM2	
19.	Deployment Diagram: Node, Communication Association, case study Via Net Bank ATM.	1	25.10.24		TLM2	

20.	Model Management: Packages and Model Organization	1	25.10.24		TLM2	
21.	UML Extensibility, UML Meta Model.	2	26.10.24 26.10.24		TLM2	
22.	Designing Classes: Introduction, The Object-Oriented Design Philosophy, UML Object Constraint Language	1	01.11.24		TLM2	
23.	Designing Classes: The Process, Class Visibility: Designing Well-Defined Public, Private, and Protected Protocols	2	01.11.24 02.11.24		TLM2	
24.	Designing Classes: Refining Attributes, Designing Methods and Protocols	1	02.11.24		TLM2	
25.	Packages and Managing Classes, case study Via Net Bank ATM.	2	08.11.24 08.11.24		TLM2	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

Teaching Learning Methods					
TLM2	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 (R17 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):	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.
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Mrs.K.Lakshmi Devi		Dr.B.Srinivasa Rao
Course Instructor	Module Coordinator	Head of the Department

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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/B **A.Y.:** 2024-2025

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	25-06-2024		TLM2	
2.	IoT Introduction and Frame work	1	02-07-2024		TLM2	
3.	Architectural View of IoT	1	09-07-2024		TLM2	
4.	IoT Technology and Sources,	1	16-07-2024		TLM2	
5.	M2M communication	1	23-07-2024		TLM2	
6.	Sensors for IoT	1	30-07-2024		TLM2	
7.	Participatory sensing	1	06-08-2024		TLM2	
8.	RFID	1	13-08-2024		TLM2	
9.	Wireless sensor network elements	1	20-08-2024		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	27-08-2024		TLM2	
11.	Prototyping embedded devices for IoT	1	10-09-2024		TLM2	
12.	M2M case studies.	1	17-09-2024		TLM2	
13.	IoT case studies.	1	24-09-2024		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	2	25-06-2024		TLM4	
2.	Interfacing LED. DHT11-Temperature and, humidity sensor using Arduino	2	02-07-2024		TLM4	
3.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	2	09-07-2024		TLM4	
4.	Design of Traffic Light Simulator using Arduino	2	16-07-2024		TLM4	
5.	Design of Water flow detection using an Arduino board	2	23-07-2024		TLM4	
6.	Discussion of Arduino based Projects and Demo	2	30-07-2024		TLM6	
7.	Discussion of Arduino based Projects and Demo	2	06-08-2024		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	2	13-08-2024		TLM4	
9.	Design of Motion Sensor Alarm using PIR Sensor	2	20-08-2024		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	2	27-08-2024		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	2	10-09-2024		TLM4	
12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	2	17-09-2024		TLM4	
13.	Raspberry Pi based Smart Phone	2	24-09-2024		TLM4	

	Controlled Home Automation					
14.	Smart Traffic light Controller	2	01-10-2024		TLM4	
15.	Smart Health Monitoring	2	08-10-2024		TLM4	
16.	Implementation of Wireless Sensor Network using Raspberry Pi boards	3	15-10-2024		TLM4	
17.	Discussion of Raspberry Pi based Projects and Demo	3	22-10-2024		TLM6	
18.	Discussion of Raspberry Pi based Projects and Demo	3	29-10-2024		TLM6	
19.	Project Report writing & Verification	3	05-10-2024		TLM6	
No.of classes required to complete:		**55**	**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.
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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	Mr. K. Sasi Bhushan	Dr. P. Lachi Reddy	Dr. G. Srinivasulu
Signature				

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DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

Name of Course Instructors : Ms. B. Lakshmi Thirupathamma/Mr. P. James Vijay
Course Name : Association
Program/Sem/Sec : B.Tech./ECE VII-Sem, B-Section A.Y : 2024-2025

COURSE DELIVERY PLAN (LESSON PLAN):

S.No	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Discussion about Association Activities by course instructors and Self-Introduction.	26-06-2024		
2.	JAM on Mission GAGANYAAN.	03-07-2024		
3.	Group Discussion on Will Reliance Jio be a sustainable business model in a country like INDIA?	10-07-2024		
4.	Seminar related to 5G Technology (or) ZWMT(Zigbee Wireless Mesh Technology).	24-07-2024		
5.	Debate on BOON (or) BANE in AI.	31-07-2024		
6.	Extempore on Do we really need smart cities?	08-08-2024		
7.	PPT on Block Chain Technology with Applications.	21-08-2024		
8.	Group Discussion on India's Energy Evolution : A Shift Towards Renewables.	28-08-2024		
9.	Technical Quiz on competitive exam topics.	11-09-2024		
10.	Exploring National Green Hydrogen Machine.	18-09-2024		
11.	Debate-Role of AI on Man Kind (or) Machine Learning & Deep Learning.	25-09-2024		
12.	Presentation on Cyber Spying(Hacking).	16-10-2024		
13.	Group Discussion on Ethical Dilemmas in Modern Society.	23-10-2024		
14.	Negotiation on Kesavananda Bharati Vs State of Kerala Case.	30-10-2024		
15.	Group Discussion on The Trillion-dollar future : A Deep Dive into the Semiconductor Industry's Growth Prospects.	30-10-2024		
16.	QUIZ on Current Affairs.	06-11-2024		
17.	Testing knowledge on verbal/quantitative/reasoning/problem solving/logical/etc. skills.	06-11-2024		

Ms. B. Lakshmi Thirupathamma
Mr. P. James Vijay

HOD
Dr. G. Srinivasulu

COURSEHANDOUT

PART-A

NameofCourseInstructor :V.V.Rama Krishna

CourseName&Code : Cellular& Mobile Communications - 20EC10

L-T-P-CrStructure :3-0-0-3

Program/Sem/Sec :B.Tech.,ECE.,VII-Sem.,Section-C A.Y: 2024-25

Pre-Requisites: Analog and digital communications, Fundamentals of antennas.

Course Objectives: This course provides the knowledge on operation of cellular systems, techniques to improve the capacity of a cellular system, types of fading and its effects on the radio signal, methods to reduce channel interference, hand-off mechanisms, multiple access techniques, and digital cellular systems.

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

CO1	Outline the concepts and operational principles of cellular systems (UnderstandL2).
CO2	Summarize the multiple access techniques and evolution of cellular technologies. (Understand-L2).
CO3	Examine interferences, performance parameters, cell site & mobile antennas and methodologies to improve the cellular capacity. (Apply-L3)
CO4	Analyze the effects of radio propagation models, Frequency Management, Channel Assignment, handoff, and call drops in cellular communications (Analyze-L4).

CourseArticulationMatrix (CorrelationbetweenCOs&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	2	1	-	-	-	2	2	-	-	-	-	1	2	-	-
CO2	1	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO3	3	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO4	2	1	1	-	-	2	1	-	-	-	-	1	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).

TEXTBOOK(S):

T1 William C.Y. Lee,"Mobile Cellular Telecommunications", Tata McGraw Hill, 2 nd Edition,2006.

T2 GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson Education,1 stEdition, 2013.

REFERENCEBOOK(S):

R1 Theodore S. Rappaport, "Wireless Communications", Pearson Education, 2 nd Edition, 2002.

R2 R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements

PART-B

COURSEDELIVERYPLAN (LESSONPLAN)-Section-A

UNIT-I: Introduction to Cellular Systems

S.No.	Topic/s	No. of ClassesRequired	Tentative Date ofCompletion	Actual Date ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Objective and Course Outcomes	1	24-06-2024			
2.	Introduction	1	25-06-2024			
3.	Basic cellular system	1	26-06-2024			
4.	Operation of cellular systems	1	28-06-2024			
5.	Call establishment	1	01-07-2024			
6.	Operational channels	1	02-07-2024			
7.	Performance criteria	1	03-07-2024			
8.	concept of Digital cellular system	1	05-07-2024			
9.	Hexagonal shaped cells	1	08-07-2024			
10.	Frequency Reuse	1	09-07-2024			
11.	Frequency Reuse		10-07-2024			
12.	Cell splitting	1	12-07-2024			
13.	Sectoring	1	15-07-2024			
14.	Microcell zone concept	1	16-07-2024			
15.	Revision of I unit	1	19-07-2024			
No.ofclassesrequiredtocompleteUNIT-I		15	No.of classes taken			

UNIT-II:Mobile Radio Propagation

S.No.	Topic/s	No. ofClasses Required	Tentative Dateof Completion	Actual Dateof Completion	TeachingLearning Methods	HOD Sign Weekly
16.	Introduction to Unit-II	1	22-07-2024			
17.	Basics of mobile radio propagation mechanisms	1	23-07-2024			
18.	Free space propagation	1	24-07-2024			
19.	Link budget design	1	26-07-2024			
20.	Link budget design	1	26-07-2024			
21.	Propagation models	1	30-07-2024			
22.	small-scale multipath propagation	1	31-07-2024			
23.	small-scale multipath propagation	1	02-08-2024			
24.	factors influencing the fading	1	02-08-2024			
25.	Types of small-scale fading	1	05-08-2024			
26.	Cell Site Antennas, Mobile antennas Types - Omni directional antennas	1	06-08-2024			
27.	directional antennas, sectoring	1	07-08-2024			
28.	Revision of Unit-2	1	09-08-2024			
No.ofclassesrequiredtocompleteUNIT-II		13	No. of classes taken			

UNIT-III:Interference in cellular mobile system

S.No.	Topic/s	No. ofClasses Required	Tentative Dateof Completion	Actual Dateof Completion	TeachingLearning Methods	HOD Sign Weekly
29.	Introduction to Unit-III	1	12-08-2024			
30.	Introduction to Co-Channel Interference	1	13-08-2024			
31.	procedure to find nearest neighbors of a particular cell	1	14-08-2024			
32.	Co-channel Interference Reduction Factor	1	16-08-2024			
33.	Desired C/I from a normal case in an omni-directional and directional Antenna system	1	19-08-2024			
34.	Desired C/I from a worst case in an omni-directional and directional Antenna system	1	20-08-2024			
35.	impact on co-channel interference by lowering the antenna height	1	21-08-2024			
36.	non co-channel interference	1	23-08-2024			
37.	Problems	1	28-08-2024			
38.	Problems	1	30-08-2024			
No.ofclassesrequiredto complete UNIT-III(First Half-50%)		10	No.ofclassestaken			

UNIT-IV:Frequency Management and Channel Assignment

S.No.	Topic/s	No. ofClasses Required	Tentative Date ofCompletion	ActualDate ofCompletion	Teaching Learning Methods	HOD Sign Weekly
39.	Introduction to Unit-IV	1	09-09-2024			
40.	Numbering and grouping	1	10-09-2024			
41.	setup channels	1	11-09-2024			
42.	access channels	1	13-09-2024			
43.	paging channels	1	17-09-2024			
44.	channel assignments to cell sites and mobile units	1	18-09-2024			
45.	overlaid cells	1	20-09-2024			
46.	channel sharing and borrowing	1	23-09-2024			
47.	Handoffs and Dropped Calls: Types of handoff	1	24-09-2024			
48.	initiation, delaying handoff,	1	25-09-2024			
49.	forced handoff, mobile assigned handoff	1	27-09-2024			
50.	Intersystem handoff,	1	30-09-2024			
51.	dropped call rate	1	01-10-2024			
No.ofclasses requiredto completeUNIT-IV		13	No.ofclassestaken			

UNIT-V:Digital Cellular Systems: multiple access schemes:

S.No.	Topic/s	No. ofClasses Required	TentativeDateofCompletion	ActualDateofCompletion	Teaching Learning Methods	HOD Sign Weekly
52.	Frequency Division Multiple Access	1	01-10-2024			
53.	Frequency Division Multiple Access	1	02-10-2024			
54.	Time Division Multiple Access	1	04-10-2024			
55.	Time Division Multiple Access	1	07-10-2024			
56.	CDMA	1	08-10-2024			
57.	2G Systems- GSM system architecture	1	09-10-2024			
58.	3G Systems- architecture of WCDMA	1	14-10-2024			
59.	4G system- 4G network standards	1	15-10-2024			
60.	4G system- 4G network standards	1	16-10-2024			
61.	LTE architecture	1	18-10-2024			
62.	OFDMA	1	21-10-2024			
63.	Introduction to 5G technologies, Comparison of cellular technologies.	1	22-10-2024			
64.	Introduction to 5G technologies, Comparison of cellular technologies.	1	23-10-2024			
65.	Revision of unit-1& 2	1	25-10-2024			
66.	Revision of unit-3	1	28-10-2024			
67.	Revision of unit-4	1	29-10-2024			
68.	Revision of unit-5	1	30-10-2024			
No.ofclassesrequiredtocompleteUNIT-V		**17**	No.ofclassestaken			

Contentsbeyond theSyllabus

S.No.	Topic/s	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
69.	Introduction to GSM Protocols	1	01-11-2024			
70.	Introduction to 6G Technology	1	04-11-2024			

TeachingLearningMethods

TLM1	ChalkandTalk	**TLM4**	Demonstration (Lab/FieldVisit)
TLM2	PPT	**TLM5**	ICT(NPTEL/SwayamPrabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

EVALUATIONPROCESS:

PART-C

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%ofMax((M1+Q1+A1),(M2+Q2+A2)) + 20%ofMin((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**

PROGRAMME OUTCOMES (POs):

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

Date: 18-06-2024

Date:

CourseInstructor	**CourseCoordinator**	**ModuleCoordinator**	**HOD**
V.V.Rama Krishna	Dr.E.V.Krishna Rao	Dr.M.V.Sudhakar	Dr.G.Srinivasulu

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF CIVIL ENGINEERING

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. **:** 2024 - 25

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	24.06.2024		**TLM2**	CO1	
2	Cybercrime definition and origins of the word	1	25.06.2024		**TLM2**	CO1	
3	Cybercrime and Information Security	1	26.06.2024		**TLM2**	CO1	
4	Cybercriminals	1	29.06.2024		**TLM2**	CO1	
5	Classifications of Cybercrime	1	01.07.2024		**TLM2**	CO1	
6	Cyberstalking Cybercafé and Cybercrime	1	02.07.204		**TLM2**	CO1	
7	Botnets Security Challenges Posed by Mobile	2	03.07.2024		**TLM2**	CO1	

8	Attacks on Mobile/Cell Phones Network and Computer Attacks	1	06.07.2024		**TLM2**	CO1	
9	Unit-I Assignment Test	1	08.07.2024		**TLM2**	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	09.07.2024		**TLM2**	CO2	
11	Phishing, Password Cracking	1	10.07.2024		**TLM2**	CO2	
12	Key loggers and Spywares Virus and Worms	1	15.07.2024		**TLM2**	CO2	
13	Trojan Horses and Backdoors Steganography	1	16.072024		**TLM2**	CO2	
14	Sniffers, Spoofing, session Hijacking Buffer Overflow Identity Theft	2	20.072024 22.07.2024		**TLM1**	CO2	
15	Dos and DDos Attacks SQL Injection Port Scanning	2	23.07.2024 24.072024		**TLM2**	CO2	
16	Unit-II Assignment Test	1	27.07.2024		**TLM2**	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	29.07.2024		**TLM2**	CO3	
18	Disk Forensics	1	30.07.2024		**TLM**	CO3	

19	Network Forensics	1	31.07.2024		**TLM2**	CO3	
20	Wireless Forensics	1	03.08.2024		**TLM2**	CO3	
21	Database Forensics	1	05.08.2024		**TLM2**	CO3	
22	Malware Forensics	1	06.08.2024		**TLM2**	CO3	
23	Mobile Forensics	1	07.08.2024		**TLM2**	CO3	
24	Email Forensics	1	12.08.2024		**TLM1**	CO3	
25	Unit-III Assignment Test	1	13.08.2024		**TLM2**	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	14.08.2024 17.08.2024		**TLM2**	CO4	
27	Source of Evidence Operating systems and their Boot Processes	2	19.08.2024 20.08.2024		**TLM2**	CO4	
28	File System Windows Registry	2	21.08.2024 24.08.2024		**TLM1**	CO4	
29	Windows Artifacts Browser Artifact	2	27.08.2024 28.08.2024		**TLM2**	CO4	
30	Linux Artifact	2	31.082024 09.09.2024		**TLM1**	CO4	

31	Digital evidence on the internet	2	11.09.2024 17.09.2024		**TLM2**	CO4	
32	Impediments to collection of Digital Evidence	1	18.09.2024 21.09.2024		**TLM1**	CO4	
33	Challenges with Digital Evidence	2	23.09.2024 24.09.2024		**TLM2**	CO4	
34	Unit-III Assignment Test	1	25.09.2024 28.09.2024		**TLM2**	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	30.092024 01.10.2024		**TLM2**	CO5	
36	Cyber Forensics suite Imaging and Validation Tools	2	05.10.2024 07.102024		**TLM2**	CO5	
37	Tools for Integrity Verification and Hashing	2	08.10.2024 09.10.2024		**TLM2**	CO5	
38	Forensics Tools for Data Recovery Encryption/decryption	2	14.10.2024 15.10.2024		**TLM2**	CO5	
39	Forensics tools for Password Recovery Analyzing network	2	16.10.2024 19.10.2024		**TLM1**	CO5	
40	Forensics Tools for Email Analysis	2	21.10.2024 22.10.2024		**TLM2**	CO5	
41	Unit -5 Assignment test.	2	23.10.2024 26.10.2024		**TLM2**	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	28.10.2024		TLM2	

2.	Using AI/ML to Analyze Cyber Threats	1	29.10.2024		TLM2	

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
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	24.06.2024	31.08.2024	10W
I Mid Examinations	02.09.2024	07.09.2024	1W

II Phase of Instructions	09.09.2024	09.11.2024	9W
II Mid Examinations	11.11.2024	06-04-2024	1W
Preparation and Practical's	18.11.2024	23.11.2024	1W
Semester End Examinations	25.11.2024	07.12.2024	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. B.Srinivas Rao
Signature				

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

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. :** 2024-25

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	28/06/2024		TLM2	
2.	The evolving role of Software	1	28/06/2024		TLM2	
3.	Characteristics of Software	1	29/06/2024		TLM2	
4.	Importance of software Engineering,	1	29/06/2024		TLM2	
5.	Changing nature of software	1	05/07/2024		TLM2	
6.	Legacy Software	1	05/07/2024		TLM2	
7.	Software Myths	1	06/07/2024		TLM2	
8.	Software process model: layered. technology	1	06/07/2024		TLM2	
9.	Process framework The process and product	2	12/07/2024		TLM2	
10.	Waterfall model	1	19/07/2024		TLM2	
11.	Incremental model	1	19/07/2024		TLM2	
12.	Spiral and V model	1	20/07/2024		TLM2	
13.	Component based s/w development	1	20/07/2024		TLM2	
14.	Unified Process model	1	26/07/2024		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	26/07/2024		TLM2	
16.	Requirement analysis	1	27/07/2024		TLM2	
17.	Software requirement specification	1	27/07/2024		TLM2	
18.	SRS document case study	2	02/08/2024		TLM2	
19.	Overview of design process	1	03/08/2024		TLM2	
20.	Design concepts	1	03/08/2024		TLM2	
21.	Architectural concepts	2	09/08/2024		TLM2	
22.	Examples	2	16/08/2024		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	17/08/2024		TLM2	
25.	Defining things	1	17/08/2024		TLM2	
26.	Defining relationships and diagrams	2	23/08/2024		TLM2	
27.	Common Mechanism in UML	1	23/08/2024		TLM2	
28.	Class diagrams	1	24/08/2024		TLM2	
29.	Examples	1	30/08/2024		TLM2	
30.	Object diagrams and examples	1	31/08/2024		TLM2	
31.	Revision	1	13/09/2024		TLM2	
No. of classes required to complete UNIT-III: 09				**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	13/09/2024		TLM2	
33.	Interaction diagrams	1	20/09/2024		TLM2	
34.	Use-cases	1	20/09/2024		TLM2	
35.	Use-case diagrams	1	21/09/2024		TLM2	
36.	Activity diagrams	1	21/09/2024		TLM2	
37.	Events and signals, state machines	1	27/09/2024		TLM2	
38.	processes and Threads, time, and space	1	27/09/2024		TLM2	
39.	State chart diagrams	2	28/09/2024		TLM2	
40.	Component diagrams	1	04/10/2024		TLM2	
41.	Deployment diagrams	1	05/10/2024		TLM2	
42.	Examples	1	05/10/2024		TLM2	
43.	Revision	1	18/10/2024		TLM2	
No. of classes required to complete UNIT-IV: 15				**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	18/10/2024		TLM2	
45.	Unit testing	1	19/10/2024		TLM2	
46.	Integration testing	1	19/10/2024		TLM2	
47.	Blackbox testing	2	25/10/2024		TLM2	
48.	Whitebox testing	2	26/10/2024		TLM2	
49.	Debugging	1	18/10/2024		TLM2	
50.	System testing	2	19/10/2024		TLM2	
51.	Examples	2	25/10/2024		TLM2	
52.	Revision	2	26/10/2024		TLM2	
No. of classes required to complete UNIT-V: 09				**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	01/11/2024		TLM6	
51	Case study test case preparation	2	02/11/2024		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.S.Jayaprada**	**Dr. D. Veeraiah**
Signature				

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Name & Code	:	INTERNET OF THINGS – 20EC30
L-T-P Structure	:	1-0-2
Credits	:	3
Program	:	B.Tech., ECE – C Section
A.Y	:	2024 - 25

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	26-06-2024		TLM2	
2.	IoT Introduction and Frame work	1	03-07-2024		TLM2	
3.	Architectural View of IoT	1	10-07-2024		TLM2	
4.	IoT Technology and Sources,	1	17-07-2024		TLM2	
5.	M2M communication	1	24-07-2024		TLM2	
6.	Sensors for IoT	1	31-07-2024		TLM2	
7.	Participatory sensing	1	07-08-2024		TLM2	
8.	RFID	1	14-08-2024		TLM2	
9.	Wireless sensor network elements	1	21-08-2024		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	28-08-2024		TLM2	
11.	Prototyping embedded devices for IoT	1	11-09-2024		TLM2	
12.	M2M case studies.	1	18-09-2024		TLM2	
13.	IoT case studies.	1	25-09-2024		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.	Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino	3	26-06-2024		TLM4	
2.	Interfacing Ultrasonic sensor and PIR sensor using Arduino System	3	03-07-2024		TLM4	
3.	Design of Traffic Light Simulator using Arduino	3	10-07-2024		TLM4	
4.	Design of Water flow detection using an Arduino board	3	17-07-2024		TLM4	
5.	Interfacing of LED, Push button with Raspberry Pi and Python Program	3	24-07-2024		TLM4	
6.	Design of Motion Sensor Alarm using PIR Sensor	3	31-07-2024		TLM6	
7.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	3	07-08-2024		TLM6	
	CYCLE-2					
8.	Interfacing of LED, Push button with Raspberry Pi and Python Program	2	14-08-2024		TLM4	
9.	Design of Motion Sensor Alarm using PIR Sensor	2	21-08-2024		TLM4	
10.	Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi	2	28-08-2024		TLM4	
11.	Interfacing DS18B20 Temperature Sensor with Raspberry Pi	2	11-09-2024		TLM4	
12.	Implementation of DC Motor and Stepper Motor Control with Raspberry Pi	2	18-09-2024		TLM4	
13.	Raspberry Pi based Smart Phone Controlled Home Automation	2	25-09-2024		TLM4	
14.	Smart Traffic light Controller	2	02-10-2024		TLM4	

15.	Smart Health Monitoring	2	09-10-2024		TLM4	
16.	Implementation of Wireless Sensor Network using Raspberry Pi boards	3	16-10-2024		TLM4	
17.	Discussion of Raspberry Pi based Projects and Demo	3	23-10-2024		TLM6	
18.	Discussion of Raspberry Pi based Projects and Demo	3	30-10-2024		TLM6	
19.	Project Report writing & Verification	3	06-10-2024		TLM6	
No.of classes required to complete:		**51**	**No.of classes conducted:**			

PART-C

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

Academic Calendar : B.Tech., VII-Sem., 2024-25			
Description	**From**	**To**	**Weeks**
Commencement of Class work: 24-06-2024			
I Phase of Instructions	24-06-2024	31-08-2024	10W
I MID Examinations	**02-09-2024**	**07-09-2024**	**1W**
II Phase of Instructions	09-09-2024	09-11-2024	9W
II MID Examinations	**11-11-2024**	**16-11-2024**	**1W**
Preparation and Practicals	18-11-2024	23-11-2024	1W
Semester End Examinations	**25-11-2024**	**07-12-2024**	**2W**

Evaluation Process		
Evaluation Task	**COs**	**Marks**
Day to Day work	1,2,3,4	A1=10
Internal Lab Examination	1,2,3,4	B=5
Total Internal Marks: [A+B]		**C=15**
Semester End Examinations	1,2,3,4	**D=35**
Total Marks: [C+D]	1,2,3,4	**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
[Mr. K. Sasi Bhushan]	[Mr. K. Sasi Bhushan]	[Dr. P.Lachi Reddy]	[Dr. G. Srinivasulu]

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

PART - A

PROGRAM : B.Tech. - VII-Sem. - **ECE – B&C Section**
ACADEMIC YEAR : 2024-25
COURSE NAME & CODE : Management Science for Engineers – 20HS02
L-T-P STRUCTURE : **3**-0-0-3
COURSE CREDITS 3
COURSE INSTRUCTOR : **Mrs. Y NAGAMANI Assistant Professor**
COURSE COORDINATOR : **Mrs. Y NAGAMANI 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	24-06-2024		TLM1	CO1	T1	
2.	Definition, Nature, Importance of management	1	26-06-2024		TLM1	CO1	T1	
3.	Functions of Management	1	27-06-2024		TLM2	CO1	T1	
4.	Taylor's scientific management theory	1	28-06-2024		TLM1	CO1	T1	
5.	Fayal's principles of management	1	29-06-2024		TLM3	CO1	T1	
6.	Contribution of Elton mayo, Maslow	1	01-07-2024		TLM2	CO1	T1	
7.	Herzberg, Douglas MC Gregor principles of management	1	03-07-2024		TLM2	CO1	T1	
8.	Basic Concepts of Organization	1	04-07-2024		TLM1	CO1	T1	
9.	Authority, Responsibility	1	05-07-2024		TLM1	CO1	T1, R1	
10.	Delegation of Authority	1	06-07-2024		TLM1	CO1	T1, R1	
11.	Span of control	1	08-07-2024		TLM1	CO1	T1, R1	
12.	Departmentation and Decentralization	1	10-07-2024		TLM2	CO1	T1	
13.	Organization structures (Line organization) Line and Functional staff organization,	1	11-07-2024		TLM3	CO1	T1	
14.	Committee and Matrix organization	1	13-07-2024		TLM1	CO1	T1	
No. of classes required to complete UNIT-I		**14**	15-07-2024		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
15.	Introduction	1	16-07-2024		TLM1	CO2	T1, R3	
16.	Plant location	1	18-07-2024		TLM2	CO2	T1, R3	
17.	Factors influencing location	1	19-07-2024		TLM1	CO2	T1, R3	
18.	Principles of plant layouts	1	22-07-2024		TLM2	CO2	T1, R3	
19.	Types of plant layouts	1	24-07-2024		TLM1	CO2	T1, R3	
20.		1	25-07-2024		TLM3	CO2	T1, R3	
21.	Methods of production	1	26-07-2024		TLM1	CO2	T1	
22.		1	27-07-2024		TLM1	CO2	T1	

23.	Work study	1	29-07-2024		TLM1	CO2	T1	
24.	Basic procedure involved in method study	1	31-07-2024		TLM3	CO2	T1	
25.	Work measurement	1	01-08-2024		TLM1	CO2	T1	
26.		1	02-08-2024		TLM1	CO2	T1	
No. of classes required to complete UNIT-II		**12**			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
27.	Introduction	1	03-08-2024		TLM1	CO3	T1	
28.	Concept of Quality	1	5-08-2024		TLM1	CO3	T1, R1	
29.	Quality Control functions	1	7-08-2024		TLM1	CO3	T1, R1	
30.	Meaning of SQC, Variables and attributes	1	8-08-2024		TLM1	CO3	T1	
31.	X chart, R Chart	1	9-08-2024		TLM3	CO3	T1, R1	
32.	C Chart, P Chart	1	10-08-2024		TLM1	CO3	T1, R1	
33.	Simple problems	1	12-8-2024		TLM1	CO3	T1	
34.	Simple problems	1	14-08-2024		TLM1	CO3	T1, R1	
35.	Acceptance sampling	1	16-08-2024		TLM1	CO3	T1, R1	
36.	Sampling plans	1	17-08-2024		TLM1	CO3	T1	
37.	Deming's contribution to quality	1	27-08-2024		TLM3	CO3	T1	
38.	Materials management Meaning and objectives	1	28-08-2024		TLM1	CO3	T2	
39.	Inventory control	1	29-08-2024		TLM1	CO3	T1	
40.	Need for inventory control	1	29-08-2024		TLM1	CO3	T1, R2	
41.	Purchase procedure, Store records	1	30-8-2024		TLM1	CO3	T1, R2	
42.	EOQ	1	31-08-2024		TLM1	CO3	T1, R2	
43.	ABC analysis, Stock levels	1	31-08-2024		**TLM1**	CO3	**T1, R1**	
No. of classes required to complete UNIT-III		**17**			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
44.	Introduction	1	4-09-2024		**TLM1**	CO4	**T1**	
45.	Concepts of HRM	1	05-09-2024		**TLM1**	CO4	**T1**	

46.	Basic functions of HR manager	1	06-09-2024		**TLM1**	CO4	**T1, R2**	
47.	Man power planning	1	09-09-2024		**TLM3**	CO4	**T1, R2**	
48.	Recruitment	1	11-09-2024		**TLM2**	CO4	**T1, R2**	
49.	Selection,	1	12-09-2024		**TLM1**	CO4	**T1, R1**	
50.	Training & Development, Placement	1	13-09-2024		**TLM1**	CO4	**T1, R1**	
51.	Wage and salary administration	1	14-09-2024		**TLM3**	CO4	**T1, R1**	
52.	Promotion, Transfers Separation	1	14-09-2024		**TLM2**	CO4	**T1, R1**	
53.	Performance appraisal	1	18-09-2024		**TLM2**	CO4	**T1**	
54.	Job evaluation and merit rating	1	18-09-2024		**TLM3**	CO4	**T1**	
No. of classes required to complete UNIT-IV		12			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
55.	Introduction	1	19-09-2024		TLM1	CO5	T1,R2	
56.	Early techniques in project management	1	20-09-2024		TLM1	CO5	T1, R2	
57.	Network analysis	1	25-09-2024		TLM1	CO5	T1,R2	
58.	Programme Evaluation and Review Technique (PERT)	1	26-09-2024		TLM1	CO5	T1,R2	
59.	Problems	1	27-09-2024		TLM1	CO5	T1,R2	
60.	Problems	1	3-10-2024		TLM1	CO5	T1, R2	
61.	Critical path method (CPM)	1	04-10-2024		TLM1	CO5	T1,R2	
62.	Identifying critical path& Problems	1	09-10-2024		TLM1	CO5	T1,R2	
63.	Problems	1	16-10-2024		TLM1	CO5	T1,R2	
64.	Probability of completing project within given time	1	17-10-2024		TLM1	CO5	T1, R2	
65.	Project cost analysis	1	21-10-2024		TLM1	CO5	T1,R2	
66.	Problems	1	24-10-2024		TLM1	CO5	T1,R2	
67.	Problems	1	25-10-2024		TLM1	CO5	T1,R2	
	project crashing	1	1-11-2024					
68.	Importance & need	1	02-11-2024		TLM1	CO5	T1, R2	
69.	Simple problems	1	07-11-2024		TLM1	CO5	T1,R2	
70.	Simple problems	1	08-11-2024		TLM1	CO5	T1,R2	
71.	Simple problems	1	09-11-2024		TLM1	CO5	T1	
No. of classes required to complete UNIT-V		**18**			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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	24-06-2024	31-08-2024	10W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	09-11-2024	9W
II Mid Examinations	11-11-2024	16-11-2024	1W
Preparation and Practical's	18-11-2024	23-11-2024	1W
Semester End Examinations	25-11-2024	07-12-2024	2W

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: To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.

PEO2: To Function professionally in the rapidly changing world with advances in technology.

PEO3: To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.

PEO4: To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

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: Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.

PSO2: 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.

PSO3: Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Mrs. Y NAGAMANI	Mrs. Y NAGAMANI	Dr. U Rambabu	Dr. A Adisesha Reddy
Course Instructor	Course Coordinator	Module Coordinator	HoD

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

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING

COURSE HANDOUT

Name of Course Instructors : Ms. Asha. G/ Ms. B. Lakshmi Thirupathamma
Course Name : Association
Program/Sem/Sec : B.Tech./ECE VII-Sem, C-Section A.Y : 2024-2025

COURSE DELIVERY PLAN (LESSON PLAN):

S.No	Topics to be covered	Tentative Date of Completion	Actual Date of Completion	HOD Sign Weekly
1.	Discussion about Association Activities by course instructors and Self-Introduction.	24-06-2024		
2.	JAM on Mission GAGANYAAN.	01-07-2024		
3.	Group Discussion on Will Reliance Jio be a sustainable business model in a country like INDIA?	08-07-2024		
4.	Seminar related to 5G Technology (or) ZWMT(Zigbee Wireless Mesh Technology).	15-07-2024		
5.	Debate on BOON (or) BANE in AI.	22-07-2024		
6.	Extempore on Do we really need smart cities?	29-07-2024		
7.	PPT on Block Chain Technology with Applications.	05-08-2024		
8.	Group Discussion on India's Energy Evolution : A Shift Towards Renewables.	12-08-2024		
9.	Technical Quiz on competitive exam topics.	19-08-2024		
10.	Exploring National Green Hydrogen Machine.	09-09-2024		
11.	Debate-Role of AI on Man Kind (or) Machine Learning & Deep Learning.	23-09-2024		
12.	Presentation on Cyber Spying(Hacking).	30-09-2024		
13.	Group Discussion on Ethical Dilemmas in Modern Society.	07-10-2024		
14.	Negotiation on Kesavananda Bharati Vs State of Kerala Case.	14-10-2024		
15.	Group Discussion on The Trillion-dollar future : A Deep Dive into the Semiconductor Industry's Growth Prospects.	21-10-2024		
16.	QUIZ on Current Affairs.	28-10-2024		
17.	Testing knowledge on verbal/quantitative/reasoning/problem solving/logical/etc. skills.	04-11-2024		

Ms. Asha. G
Ms. B. Lakshmi Thirupathamma

HOD
Dr. G. Srinivasulu

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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.:** 2024-2025

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	25-06-24			
2.	Wireless Communication, concept of Wireless Sensor Networks (WSNs)	1	27-06-24			
3.	Wireless sensor networks- classification, advantages, limitations	1	28-06-24			
4.	Applications of WSNs	1	29-06-24			
5.	Application examples and types of applications	1	02-07-24			
6.	Unique constraints and Challenges	1	04-07-24			
7.	Characteristic Requirements and mechanisms	1	05-07-24			
8.	Advantages of Sensor Networks	1	06-07-24			
9.	Collaborative processing and Key definitions	1	09-07-24			
10.	Difference between Mobile Ad-hoc and Sensor Networks	1	11-07-24			
11.	Enabling technologies	1	12-07-24			
12.	Application case study	1	16-07-24			
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	18-07-24			
14.	Hardware components of sensor nodes- description	1	19-07-24			
15.	Energy Consumption of Sensor Nodes	1	20-07-24			
16.	Operating states with different Power Consumption	1	23-07-24			
17.	Energy consumption of Transceiver,	1	25-07-24			
18.	Energy consumption of Micro controller; Memory	1	26-07-24			
19.	Dynamic Voltage Scaling	1	27-07-24			
20.	Relation between Computation and Communication	1	30-07-24			
21.	commercially available sensor nodes	1	01-08-24			
22.	Sensor Network architecture	1	02-08-24			
23.	Sensor Network Scenarios	1	03-08-24			
24.	Optimization Goals of sensor networks	1	06-08-24			
25.	Figures of Merit	1	08-08-24			
26.	Gateway Concepts.	1	09-08-24			
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	13-08-24			
28.	Fundamental concepts of protocol architectures- cross layer architecture	1	16-08-24			
29.	Physical Layer and Transceiver design considerations in WSNs	1	17-08-24			
30.	MAC Protocols for Wireless Sensor Networks	1	20-08-24			
31.	Low Duty Cycle protocols	1	22-08-24			
32.	Wakeup radio concepts	1	23-08-24			
33.	S-MAC	1	24-08-24			
34.	The IEEE 802.15.4 MAC protocol	1	27-08-24			
35.	Routing Protocols for WSN	1	29-08-24			
36.	Energy efficient	1	30-08-24			
37.	Geographic routing	1	31-08-24			
38.	Position based routing	1	10-09-24			
39.	Routing Challenges and Design Issues in wireless sensor networks.	1	12-09-24			
40.	Simulation of one of the routing protocol for WSN using MATLAB/NS-2	1	13-09-24			
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 wireless sensor networks	1	17-09-24			
42.	Possible options for topology control	1	19-09-24			
43.	Examples and types for topology control- LMST	1	20-09-24			
44.	Clustering	1	21-09-24			
45.	Different types of clustering-methods	1	24-09-24			
46.	Time synchronization	1	26-09-24			
47.	Clocks and communication delays	1	27-09-24			
48.	Interval methods and reference broadcast methods	1	28-09-24			
49.	Localization and positioning	1	01-10-24			
50.	Sensor Tasking & Control	1	03-10-24			
51.	Task driven sensing,	1	04-10-24			
52.	Role of sensor nodes & utilities,	1	05-10-24			
53.	Information based sensor tasking.	1	08-10-24			
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	15-10-24			

55.	Types of Sensor Node Hardware	1	17-10-24			
56.	Berkeley Motes	1	18-10-24			
57.	Programming Challenges	1	19-10-24			
58.	Node-level software platforms	1	22-10-24			
59.	TinyOS	1	24-10-24			
60.	TinyOS application example	1	25-10-24			
61.	nesC	1	26-10-24			
62.	Components of node level simulator	1	29-10-24			
63.	Network simulator-NS-2	1	01-11-24			
64.	Installation and example programs in NS-2	1	02-11-24			
65.	Different types of Node-level Simulators	1	01-11-24			
66.	State-centric programming	1	05-11-24			
67.	WSN application case study with software tools	1	07-11-24			
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 and attacks in WSN	1	08-11-24			
69.	Research trends to improve energy efficiency of WSN, Simulation tools-NS-3	1	09-11-24			

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. 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. NARENDRA BABU P
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.: 2024-25**

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 Harmelen, 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	24-06-2024		-	CO1	-	
2.	Introduction: What Is AI?,	1	25-06-2024		TLM1	CO1	T1,T2	
3.	The Foundations of Artificial Intelligence	1	27-06-2024		TLM1	CO1	T1,T2	
4.	The History of Artificial Intelligence,	1	28-06-2024		TLM1	CO1	T1,T2	
5.	The State of the Art.	1	01-07-2024		TLM1	CO1	T1,T2	
6.	Agents and Environments	1	02-07-2024		TLM1	CO1	T1,T2	
7.	Types of agents	1	04-07-2024		TLM2	CO1	T1,T2	
8.	Types of agents	1	05-07-2024		TLM2	CO1	T1,T2	
9.	Types of agents	1	08-07-2024		TLM2	CO1	T1,T2	
10.	Good Behavior: The Concept of Rationality	1	09-07-2024		TLM1	CO1	T1,T2	
11.	Omniscience vs Rational agent	1	11-07-2024		TLM1	CO1	T1,T2	
12.	The Nature of Environments	1	12-07-2024		TLM1	CO1	T1,T2	
13.	The Structure of Agents	1	15-07-2024		TLM1	CO1	T1,T2	
14.	Assignment/Quiz-2	1	16-07-2024		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	18-07-2024 22-07-2024		TLM1	CO2	T1,T2	
16.	searching for Solutions, Uninformed Search Strategies	1	23-07-2024		TLM1	CO2	T1,T2	
17.	Search algorithms terminologies	1	25-07-2024		TLM1	CO2	T1,T2	
18.	Properties of search algorithms	1	26-07-2024		TLM1	CO2	T1,T2	
19.	Types of search algorithms.	1	29-07-2024		TLM1	CO2	T1,T2	
20.	Best first search algorithm	1	30-07-2024		TLM2	CO2	T1,T2	
21.	A* Algorithm	2	03-08-2024 01-08-2024		TLM2	CO2	T1,T2	
22.	AO* Algorithm	2	05-08-2024 06-08-2024		TLM2	CO2	T1,T2	
23.	Local Search Algorithms	1	08-08-2024		TLM2	CO2	T1,T2	
24.	Local Search Algorithms	1	10-08-2024		TLM2	CO2	T1,T2	
25.	Searching with Nondeterministic Actions.	1	12-08-2024		TLM2	CO2	T1,T2	
26.	Assignment/Quiz-2	1	13-08-2024		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	17-08-2024		TLM1	CO3	T1,T2	
28.	Uniformed/Blind Search Algorithms:	2	20-08-2024 19-08-2024		TLM1	CO3	T1,T2	
29.	Breadth-first Search	1	22-08-2024		TLM2	CO3	T1,T2	
30.	Depth-first Search,	1	24-08-2024		TLM2	CO3	T1,T2	
31.	Depth limited search	1	27-08-2024		TLM2	CO3	T1,T2	
32.	Iterative deepening depth-first search	1	29-08-2024		TLM2	CO3	T1,T2	
33.	Uniform cost search	1	31-08-2024		TLM2	CO3	T1,T2	
34.	Bidirectional Search.	1	09-09-2024		TLM2	CO3	T1,T2	
35.	Assignment/Quiz-3	1	10-09-2024		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	12-09-2024		TLM1	CO4	T1,T2	
37.	Minimax algorithm	2	14-09-2024 16-09-2024		TLM2	CO4	T1,T2	
38.	Alpha-Beta pruning	2	17-09-2024 19-09-2024		TLM2	CO4	T1,T2	
39.	Knowledge Based Agent, Architecture	2	21-09-2024 23-09-2024		TLM1	CO4	T1,T2	
40.	Knowledge base Levels and types	1	24-09-2024		TLM1	CO4	T1,T2	
41.	Representation mappings	1	26-09-2024		TLM1	CO4	T1,T2	
42.	Inference Engine:Forward chaining/reasoning	1	28-09-2024		TLM1	CO4	T1,T2	
43.	Backward chaining/reasoning	1	30-09-2024		TLM1	CO4	T1,T2	
44.	Approaches of knowledge representation,	2	01-10-2024		TLM1	CO4	T1,T2	
45.	issues in knowledge representation	1	04-10-2024		TLM1	CO4	T1,T2	
46.	Assignment/Quiz-4	1	07-10-2024		TLM1	CO4	-	
No. of classes required to complete UNIT-IV: 16					**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	14-10-2024		TLM1	CO5	T1,T2	
48.	Logic, Propositional Logic:	2	15-10-2024 17-10-2024		TLM1	CO5	T1,T2	
49.	A Very Simple Logic,	1	19-10-2024		TLM1	CO4	T1,T2	
50.	Ontological Engineering	1	21-10-2024		TLM2	CO4	T1,T2	
51.	Categories, Objects and Events	2	22-10-2024 24-10-2024		TLM2	CO5	T1,T2	

52.	Mental Events and Mental Objects	1	26-10-2024		TLM1	CO5	T1,T2	
53.	What is reasoning and Types	1	28-10-2024		TLM1	CO4	T1,T2	
54.	Types of reasoning	2	29-10-2024 02-11-2024		TLM1	CO4	T1,T2	
55.	Reasoning Systems for Categories	2	04-11-2024 05-11-2024		TLM2	CO5	T1,T2	
56.	The Internet Shopping World	1	07-11-2024		TLM1	CO5	T1,T2	
57.	Assignment/Quiz-5	1	09-11-2024		TLM1	CO5	-	
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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Turing test, Interview Questions	1	24-10-2023		**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 the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary

	environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**NARENDRA BABU P**	**NARENDRA BABU P**		**Dr. O. Rama Devi**
Signature				