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.
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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

Part-A

PROGRAM	:	**B.Tech.,V-Sem., IT – R20** Regulation (A-sec)
ACADEMIC YEAR	:	**2024-2025**
COURSE CODE&NAME	:	**20CS12 - COMPUTER NETWORKS**
L-T-P STRUCTURE	:	**3 -0 -0**
COURSE CREDITS	:	**3**
COURSE INSTRUCTOR	:	**Mr.B.Ravindra chanti babu**
PRE-REQUISITES	:	Communication systems.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this course student will learn:

COURSE OUTCOMES (COs):

The Objective of the course is to provide a foundation to understand computer networks using layered architectures. It also helps the students to understand the various network models, addressing concepts, routing protocols and design aspects of computer networks.

On successful completion of the course, students will be able to:

CO 1	Demonstrate the modern network architectures from a design perspective.
CO 2	Apply various Data Link layer design issues and error detection & correction techniques to solve collisions problems.
CO 3	Demonstrate the network Layer functionalities.
CO 4	Outline the functions of transport layer protocols
CO 5	Examine different application layer protocols.

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	2	-	-	-	-	-	-	-	-	2	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-

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

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

BOS APPROVED TEXT BOOKS:

T1 Behrouz A. Forouzan, "Data Communication and Networking", McGraw-Hill, 4th Edition, 2011.

T2 Andrew S. Tanenbaum, "Computer Networks", Pearson New International Edition, 8th Edition, 2013.

BOS APPROVED REFERENCE BOOKS:

R1 William Stallings, "Data and Computer Communication", Pearson Prentice Hall India, 8 th Edition.

R2 Douglas Comer, Internetworking with TCP/IP, Prentice Hall of India, Volume 1, 6th Edition, 2009.

R3 Richard Stevens, "TCP/IP Illustrated" , Addison-Wesley, Volume 1, 2001.

R4 http://www.cse.iitk.ac.in/users/dheeraj/cs425/.

R5 http://www.tcpipguide.com/free/t_OSIReferenceModelLayers.htm

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Data Communication Components

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of Cos and CEOs of the course	1	01-07-2024		TLM2	
2.	Introduction to Data Communication and Computer Networks	1	3-07-2024		TLM2	
3.	Protocols and Standards	1	4-07-2024		TLM2	
4.	Various Connection Topology s	1	5-07-2024		TLM2	
5.	OSI model	2	8-07-2024 10-07-2024		TLM2	
6.	Transmission Media	2	11-07-2024 12-07-2024		TLM2	
7.	LAN: Wired LAN, Wireless LANs	1	15-07-2024		TLM2	
8.	Connecting LAN and Virtual LAN.	1	18-07-2024		TLM2	
9.	**TUTORIAL-1, Quiz-1 & Assignment-1**	1	*19-07-2024*		**TLM3**	
No. of classes required to complete UNIT-I		11				

UNIT-II: Data Link Layer and Medium Access Sub Layer

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.	Introduction to DLL, Data link layer design issues	1	22-07-2024		TLM2	
11.	Error Detection and Error Correction - Fundamentals	1	24-07-2024		TLM2	
12.	Block coding, Hamming Distance	1	25-07-2024		TLM2	
13.	CRC	1	26-07-2024		TLM2	
14.	Flow Control and Error control protocols -Stop and Wait	1	29-07-2024		TLM2	
15.	Go back – N ARQ, Selective Repeat ARQ	1	31-07-2024		TLM2	
16.	Sliding Window, Piggybacking	2	1-08-2024 2-08-2024		TLM2	
17.	Random Access s, Multiple access protocols -Pure ALOHA	1	5-08-2024		TLM2	

18.	Slotted ALOHA, CSMA	2	7-08-2024 8-08-2024		TLM2	
19.	CSMA/CD,CDMA/CA	1	9-08-2024		TLM2	
20.	**TUTORIAL-2, Quiz-2 ASSIGNMENT-2**	1	12-08-2024		**TLM3**	
No. of classes required to complete UNIT-II		13				

UNIT-III: Network Layer

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.	Network layer design issues	2	14-08-2024 16-08-2024		TLM2	
22.	Switching	2	19-08-2024 21-08-24		TLM2	
23.	Logical addressing – IPV4.	1	22-08-24		TLM2	
24.	IPV6	1	23-08-2024		TLM2	
25.	Address mapping – ARP, RARP	2	28-08-2024 29-08-24		TLM2	
26.	BOOTP	1	30-08-2024		TLM2	
27.	DHCP–Delivery	1	9-09-2024		TLM2	
28.	Forwarding and Unicast Routing protocols	3	11-09-2024 12-09-2024 13-09-2024		TLM2	
29.	**TUTORIAL-3, Quiz-3 ASSIGNMENT-3**	1	18-09-2024		TLM2	
No. of classes required to complete UNIT-III		14				

UNIT-IV: Transport Layer

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Introduction to Transport Layer and Network Layer, Optimality Principle	1	19-09-2024		TLM2	
31.	Process to Process Communication	1	20-09-2024		TLM2	
32.	User Datagram Protocol (UDP)	1	23-09-2024		TLM2	
33.	Transmission Control Protocol (TCP)	1	25-09-2024		TLM2	
34.	SCTP Congestion Contro	1	26-09-2024		TLM2	
35.	Flow and congestion control	1	27-09-2024		TLM2	
36.	Quality of Service	1	30-09-2024		TLM2	

37.	QoS improving techniques: Leaky Bucket	1	3-10-2024		TLM2	
38.	Token Bucket algorithm.	1	4-10-2024		TLM2	
39.	**TUTORIAL4, Quiz-4 ASSIGNMENT-4**	1	7-10-2024		TLM3	
No. of classes required to complete UNIT-IV		10				

UNIT-V: APPLICATION LAYER

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Domain Name Space (DNS)	1	9-10-2024		TLM2	
41.	DDNS	1	10-10-2024		TLM2	
42.	TELNET	2	14-10-2024 16-10-2024		TLM2	
43.	EMAIL	2	17-10-2024 18-10-2024		TLM2	
44.	File Transfer Protocol (FTP), WWW	2	21-10-2024 23-10-2024		TLM2	
45.	HTTP, SNMP	2	24-10-2024 25-10-2024		TLM2	
46.	Bluetooth, Firewalls0	1	28-10-2024		TLM2	
47.	. **TUTORIAL-5, Quiz-5 ASSIGNMENT-5**	1	30-10-2024		**TLM3**	
No. of classes required to complete UNIT-V		12				

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
48.	DNS, N/W Layer Design Issues	1	01-11-2024		TLM2	

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

Part – C

EVALUATION PROCESS:

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1 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.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Signature				
Name of the Faculty	**Mr.B.Ravindra chanti babu**	**Dr.P.Bhagath**	**Mr.G.Rajendra**	**Dr. B. Srinivasa Rao**

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

Part-A

PROGRAM	:	**B.Tech.(IT), V-Semester, Sec-B**
ACADEMIC YEAR	:	**2024-2025**
COURSE CODE&NAME	:	**20CS12 - COMPUTER NETWORKS**
L-T-P STRUCTURE	:	**3 - -**
COURSE CREDITS	:	**3**
COURSE INSTRUCTOR	:	**PAVITRA RAMACHANDRAPURAM**
PRE-REQUISITES	:	Communication systems.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this course student will learn:

COURSE OUTCOMES (COs):

The Objective of the course is to provide a foundation to understand computer networks using layered architectures. It also helps the students to understand the various network models, addressing concepts, routing protocols and design aspects of computer networks.

On successful completion of the course, students will be able to:

CO 1	Demonstrate the modern network architectures from a design perspective.
CO 2	Apply various Data Link layer design issues and error detection & correction techniques to solve collisions problems.
CO 3	Demonstrate the network Layer functionalities.
CO 4	Outline the functions of transport layer protocols
CO 5	Examine different application layer protocols.

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	2	-	-	-	-	-	-	-	-	2	-	2	-
CO2	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	2	-	2	-

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

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

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R3 Richard Stevens, "TCP/IP Illustrated" , Addison-Wesley, Volume 1, 2001.

R4 http://www.cse.iitk.ac.in/users/dheeraj/cs425/.

R5 http://www.tcpipguide.com/free/t_OSIReferenceModelLayers.htm

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: Data Communication Components

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of Cos and CEOs of the course	1	01-07-2024		TLM1	
2.	Introduction to Data Communication and Computer Networks	1	2-07-2024		TLM1	
3.	Protocols and Standards	1	3-07-2024		TLM2	
4.	Various Connection Topology s	1	6-07-2024		TLM2	
5.	OSI model	2	8-07-2024 9-07-2024		TLM6	
6.	Transmission Media	2	10-07-2024 13-07-2024		TLM2	
7.	LAN: Wired LAN, Wireless LANs	1	15-07-2024		TLM2	
8.	Connecting LAN and Virtual LAN.	1	16-07-2024		TLM2	
9.	**TUTORIAL-1, Quiz-1 & Assignment-1**	1	20-07-2024		**TLM3**	
No. of classes required to complete UNIT-I		11				

UNIT-II: Data Link Layer and Medium Access Sub Layer

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.	Introduction to DLL, Data link layer design issues	1	22-07-2021		TLM1	
11.	Error Detection and Error Correction - Fundamentals	1	23-07-2024		TLM2	
12.	Block coding, Hamming Distance	1	24-07-2024		TLM2	
13.	CRC	1	27-07-2024		TLM2	
14.	Flow Control and Error control protocols -Stop and Wait	1	29-07-2024		TLM2	
15.	Go back – N ARQ, Selective Repeat ARQ	1	30-07-2024		TLM2	
16.	Sliding Window, Piggybacking	1	31-07-2024		TLM2	
17.	Random Access s, Multiple access protocols -Pure ALOHA	1	3-08-2024		TLM2	
18.	Slotted ALOHA, CSMA	1	5-08-2024		TLM2	
19.	CSMA/CD,CDMA/CA	1	6-08-2024		TLM2	

20.	**TUTORIAL-2, Quiz-2 ASSIGNMENT-2**	1	12-08-2024		**TLM3**	
No. of classes required to complete UNIT-II		11				

UNIT-III: Network Layer

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.	Network layer design issues	1	13-08-2024		TLM1	
22.	Switching	1	14-08-2024		TLM2	
23.	Logical addressing – IPV4.	1	17-08-2024		TLM2	
24.	IPV6	1	19-08-2024		TLM6	
25.	Address mapping – ARP, RARP	1	20-08-2024		TLM2	
26.	BOOTP	1	21-08-2024		TLM2	
27.	DHCP–Delivery	1	24-08-2024		TLM2	
28.	Forwarding and Unicast Routing protocols	2	27-08-2024 28-08-2024		TLM2	
29.	**TUTORIAL-3, Quiz-3 ASSIGNMENT-3**	1	31-08-2024		**TLM3**	
No. of classes required to complete UNIT-III		10				

UNIT-IV: Transport Layer

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Introduction to Transport Layer and Network Layer, Optimality Principle	1	9-09-2024		TLM1	
31.	Process to Process Communication	1	10-09-2024		TLM2	
32.	User Datagram Protocol (UDP)	1	11-09-2024		TLM2	
33.	Transmission Control Protocol (TCP)	1	14-09-2024		TLM6	
34.	SCTP Congestion Contro	1	17-09-2024		TLM2	
35.	Flow and congestion control	1	18-09-2024		TLM2	
36.	Quality of Service	1	21-09-2024		TLM2	
37.	QoS improving techniques: Leaky Bucket	1	23-09-2024		TLM2	
38.	Token Bucket algorithm.	1	24-09-2024		TLM2	
39.	**TUTORIAL4, Quiz-4 ASSIGNMENT-4**	1	30-09-2024		**TLM3**	
No. of classes required to complete UNIT-IV		10				

UNIT-V: APPLICATION LAYER

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Domain Name Space (DNS)	1	01-10-2024		TLM1	
41.	DDNS	1	5-10-2024		TLM2	
42.	TELNET	1	07-10-2024		TLM2	
43.	EMAIL	1	09-10-2024		TLM2	
44.	File Transfer Protocol (FTP), WWW	1	16-10-2024		TLM2	
45.	HTTP, SNMP	1	19-10-2024		TLM2	
46.	Bluetooth	1	22-10-2024		TLM2	
47.	Firewalls0	1	26-10-2024		TLM2	
48.	. **TUTORIAL-5, Quiz-5 ASSIGNMENT-5**	1	30-10-2024		**TLM3**	
No. of classes required to complete UNIT-V		10				

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
49.	DNS, N/W Layer Design Issues	1	2-11-2024		TLM2	

Teaching Learning Methods			
TLM1	Chalk and Talk -05	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT-35	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial-05	**TLM6**	Group Discussion/Project-03

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	01-07-2024		
I Phase of Instructions	01-07-2024	31-08-2024	9W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	02-11-2024	8W
II Mid Examinations	04-11-2024	09-11-2024	1W
Preparation and Practical's	11-11-2024	16-11-2024	1W
Semester End Examinations	18-11-2024	30-11-2024	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.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Name of the Faculty	**R Pavitra**	**Dr.P.Bhagath**	**Mrs.G.Rajendra**	**Dr. B. Srinivasa Rao**

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, NTR DIST., A.P.-521 230.
http://lbrce.ac.in/it/index.php,hodit@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor :REHANA BEGUM
Course Name & Code :Machine Learning& 20AD04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V Sem/Sec-A **A.Y.:**2024-25
PREREQUISITE : **Probability and Statistics, Data Warehousing and Data Mining**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide the basic concepts andtechniques of Machine Learning and helps to use machine learning algorithms for solving realworld problems. It enables students to gain experience by doing independent study and research.

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

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

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

COs	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	-	3	-	-	-	-	-	-	-	-	2	-	-
1 - Low						**2** –Medium						**3** –High			

TEXTBOOKS:

T1	Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition,2015.
T2	Tom M. Mitchell, "Machine Learning', MGH, 1997.

REFERENCE BOOKS:

R1	Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory toAlgorithms", Cambridge.
R2	Peter Harington, "Machine Learning in Action", Cengage, 1st edition, 2012
R3	Peter Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge university press,2012.
R4	Jason Brownlee, "Machine Learning Mastery with Python Understand Your Data, Create Accurate Models and Work Projects End-To-End", Edition: v1.4, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-1: Introduction to Machine Learning and Preparing to Model

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Introduction to Machine Learning** – Introduction	1	01-07-2024		TLM1,2	CO1	
2.	Types of Human Learning	1	02-07-2024		TLM1,2	CO1	
3.	How Machine Learning works?	2	03-07-2024 06-07-2024		TLM1,2	CO1	
4.	Types of Machine Learning	2	08-07-2024 09-07-2024		TLM1,2	CO1	
5.	Applications and issues in Machine Learning	1	13-07-2024		TLM1,2	CO1	
6.	**Preparing to Model:** Introduction, Machine Learning Activities	1	15-07-2024		TLM1,2	CO1	
7.	Basic Types of Data in Machine Learning	1	16-07-2024		TLM1,2	CO1	
8.	Exploring Structure Of Data	1	20-07-2024		TLM1,2	CO1	
9.	Data Quality and Remediation, Data Pre-Processing	1	22-07-2024		TLM1,2	CO1	
10.	**Assignment on Unit-1**	1	23-07-2024				
No. of classes required to complete UNIT-I: 12					**No. of classes taken:**		

UNIT-2: Modelling & Evaluation, Basics of Feature Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction, selecting a Model	1	24-07-2024		TLM1,2	CO2	
2.	Training a Model (for supervised Learning),	1	27-07-2024		TLM1,2	CO2	
3.	Model Representation and Interpretability,	1	27-07-2024		TLM1,2	CO2	
4.	Evaluating Performance of a Model	2	29-07-2024 30-07-2024		TLM1,2	CO2	
5.	**Basics of Feature Engineering**- Introduction,	1	31-07-2024 03-08-2024		TLM1,2	CO2	
6.	Feature Transformation – Feature Construction, Feature Extraction,	3	05-08-2024 06-08-2024 07-08-2024		TLM1,2	CO2	
7.	Principal Component Analysis (PCA), Singular Value Decomposition (SVD), Linear Discriminant Analysis	2	12-08-2024 13-08-2024		TLM1,2	CO2	
8.	Feature Subset Selection	2	14-08-2024 17-08-2024		TLM1,2	CO2	
9.	**Assignment on Unit-2**	1	19-08-2024				
No. of classes required to complete UNIT-II: 13					**No. of classes taken:**		

UNIT-3: Regression

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction to regression analysis, Simple linear regression	2	20-08-2024 21-08-2024		TLM1,2	CO3	
2.	Multiple linear regression, Assumptions in Regression Analysis, Improving Accuracy of the linear regression model	3	21-08-2024 24-08-2024 27-08-2024		TLM1,2	CO3	
3.	**Revision for Mid-1**	1	28-08-2024		TLM1,2	CO3	
Mid - I Examinations from							
4.	Polynomial Regression Model Logistic Regression	2	09-09-2024 10-09-2024		TLM1,2	CO3	
5.	Regularization Regularized Linear Regression	2	11-09-2024 17-09-2024		TLM1,2	CO3	
6.	Regularized Logistic Regression	1	18-09-2024		TLM1,2	CO3	
7.	**Assignment on Unit-3**	1	21-09-2024				
No. of classes required to complete UNIT-III: 10					**No. of classes taken:**		

UNIT-IV: Supervised Learning: Classification

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Classification-** Introduction, Example of Supervised Learning,	1	23-09-2024		TLM1,2	CO4	
2.	Classification Model	1	24-09-2024		TLM1,2	CO4	
3.	Classification Learning Steps	1	25-09-2024		TLM1,2	CO4	
4.	**Common Classification Algorithms** - k-Nearest Neighbour (kNN),	2	28-09-2024 30-09-2024		TLM1,2	CO4	
5.	Random Forest model	2	01-10-2024 05-10-2024		TLM1,2	CO4	
6.	Support vector Machines (SVM),	2	07-10-2024 08-10-2024		TLM1,2	CO4	
7.	**Assignment on Unit-4**	1	14-10-2024				
No. of classes required to complete UNIT-IV: 10					**No. of classes taken:**		

UNIT-V: Other Types of Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Ensemble Learning**	1	15-10-2024		TLM1,2	CO5	
2.	Bagging, Boosting	1	16-10-2024		TLM1,2	CO5	
3.	Stacking and its impact on bias and variance,	1	19-10-2024		TLM1,2	CO5	
4.	AdaBoost	1	21-10-2024		TLM1,2	CO5	
5.	Gradient Boosting Machines	1	22-10-2024		TLM1,2	CO5	
6.	XGBoost.	1	23-10-2024		TLM1,2	CO5	
7.	**Reinforcement Learning** – Introduction	1	26-10-2024		TLM1,2	CO5	
8.	Q Learning	2	28-10-2024 29-10-2024		TLM1,2	CO5	
9.	**Assignment on Unit-5**	1	30-10-2024				
10.	**Revision for Mid-2**	1	01-11-2024				
No. of classes required to complete UNIT-V: 11					**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
1.	Basics of Neural Network	1			TLM1,2	
2.	Types of Activation Functions	1			TLM1,2	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

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 engineeringand 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):

PSO 1	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	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. Rehana begum**	**Dr. K. Devi Priya**	**Mrs. M. Hema Latha**	**Dr.B.Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : **Mr. Ch. Sambasivarao**
Course Name & Code : Machine Learning & 20AD04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V Sem/Sec-B **A.Y.:** 2024-25
PREREQUISITE : **Probability and Statistics, Data Warehousing and Data Mining**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide the basic concepts and techniques of Machine Learning and helps to use machine learning algorithms for solving real world problems. It enables students to gain experience by doing independent study and research.

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

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

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

COs	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-	-	3	-	-
CO5	3	1	-	3	-	-	-	-	-	-	-	-	2	-	-
1 - Low							**2** –Medium						**3** – High		

TEXTBOOKS:

T1	Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, "Machine Learning", Pearson Education India ,1st edition,2015.
T2	Tom M. Mitchell, "Machine Learning', MGH, 1997.

REFERENCE BOOKS:

R1	Shai Shalev-Shwartz, ShaiBen David, "Understanding Machine Learning: From Theory toAlgorithms", Cambridge.
R2	Peter Harington, "Machine Learning in Action", Cengage, 1st edition, 2012
R3	Peter Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge university press,2012.
R4	Jason Brownlee, "Machine Learning Mastery with Python Understand Your Data, Create Accurate Models and Work Projects End-To-End", Edition: v1.4, 2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-1: Introduction to Machine Learning and Preparing to Model

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Introduction to Machine Learning** – Introduction	1	01-07-2024		TLM1,2	CO1	
2.	Types of Human Learning	1	02-07-2024		TLM1,2,6	CO1	
3.	How Machine Learning works?	2	04-07-2024 06-07-2024		TLM1,2,6	CO1	
4.	Types of Machine Learning	2	08-07-2024 11-07-2024		TLM1,2	CO1	
5.	Applications and issues in Machine Learning	1	15-07-2024		TLM1,2,5	CO1	
6.	**Preparing to Model:** Introduction, Machine Learning Activities	1	16-07-2024		TLM1,2	CO1	
7.	Basic Types of Data in Machine Learning	1	18-07-2024		TLM1,2	CO1	
8.	Exploring Structure Of Data	1	22-07-2024		TLM1,2,4	CO1	
9.	Data Quality and Remediation, Data Pre-Processing	1	23-07-2024		TLM1,2,4	CO1	
10.	**Assignment on Unit-1**	1	25-07-2024		TLM3		
No. of classes required to complete UNIT-I: 12					**No. of classes taken:**		

UNIT-2: Modelling & Evaluation, Basics of Feature Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction, selecting a Model	1	27-07-2024		TLM1,2	CO2	
2.	Training a Model (for supervised Learning),	1	29-07-2024		TLM1,2	CO2	
3.	Model Representation and Interpretability,	1	30-07-2024		TLM1,2	CO2	
4.	Evaluating Performance of a Model	1	01-08-2024		TLM1,2	CO2	
5.	**Basics of Feature Engineering**- Introduction,	1	03-08-2024 05-08-2024		TLM1,2	CO2	
6.	Feature Transformation – Feature Construction, Feature Extraction,	2	06-08-2024 08-08-2024		TLM1,2	CO2	
7.	Principal Component Analysis (PCA), Singular Value Decomposition (SVD), Linear Discriminant Analysis	2	08-08-2024 12-08-2024		TLM1,2 ,4,5	CO2	
8.	Feature Subset Selection	2	13-08-2024 17-08-2024		TLM1,2	CO2	
9.	**Assignment on Unit-2**	1	19-08-2024		TLM3		
No. of classes required to complete UNIT-II: 13					**No. of classes taken:**		

UNIT-3: Regression

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction to regression analysis, Simple linear regression	2	20-08-2024 22-08-2024		TLM1,2,6	CO3	
2.	Multiple linear regression, Assumptions in Regression Analysis, Improving Accuracy of the linear regression model	3	24-08-2024 27-08-2024 29-08-2024		TLM1,2,4,5	CO3	
3.	**Revision for Mid-1**	1	31-08-2024		TLM1,2	CO3	
Mid - I Examinations from							
4.	Polynomial Regression Model Logistic Regression	2	09-09-2024 10-09-2024		TLM1,2,4	CO3	
5.	Regularization Regularized Linear Regression	2	12-09-2024 17-09-2024		TLM1,2,4,5	CO3	
6.	Regularized Logistic Regression	1	19-09-2024		TLM1,2	CO3	
7.	**Assignment on Unit-3**	1	21-09-2024		TLM3		
No. of classes required to complete UNIT-III: 10					**No. of classes taken:**		

UNIT-IV: Supervised Learning: Classification

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Classification-** Introduction, Example of Supervised Learning,	1	23-09-2024		TLM1,2	CO4	
2.	Classification Model	1	24-09-2024		TLM1,2	CO4	
3.	Classification Learning Steps	1	26-09-2024		TLM1,2	CO4	
4.	**Common Classification Algorithms** - k-Nearest Neighbour (kNN),	2	28-09-2024 30-09-2024		TLM1,2,4,5	CO4	
5.	Random Forest model	2	01-10-2024 03-10-2024		TLM1,2,4,5	CO4	
6.	Support vector Machines (SVM),	2	05-10-2024 07-10-2024		TLM1,2,4,5	CO4	
7.	**Assignment on Unit-4**	1	08-10-2024		TLM3		
No. of classes required to complete UNIT-IV: 10					**No. of classes taken:**		

UNIT-V: Other Types of Learning

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	**Ensemble Learning**	1	10-10-2024		TLM1,2	CO5	
2.	Bagging, Boosting	1	14-10-2024		TLM1,2	CO5	
3.	Stacking and its impact on bias and variance,	1	15-10-2024		TLM1,2	CO5	
4.	AdaBoost	1	17-10-2024		TLM1,2	CO5	
5.	Gradient Boosting Machines	1	19-10-2024		TLM1,2 ,4,5	CO5	
6.	XGBoost.	1	21-10-2024		TLM1,2	CO5	
7.	**Reinforcement Learning** – Introduction	1	22-10-2024		TLM1,2	CO5	
8.	Q Learning	2	24-10-2024 28-10-2024		TLM1,2	CO5	
9.	**Assignment on Unit-5**	1	29-10-2024		TLM3		
10.	**Revision for Mid-2**	1	31-10-2024		TLM1,2	CO5, CO4 CO3	
No. of classes required to complete UNIT-V: 11					**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
1.	Basics of Neural Network	1	28-09-2024		TLM1,2	
2.	Types of Activation Functions	1	31-10-2024		TLM1,2 ,6	

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):

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 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):

PSO 1	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	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.Sambasivarao**	**Dr.D.Venkata Subbaiah**	**Mrs. M. Hema Latha**	**Dr.B.Srinivasa Rao**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada

L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: M. VIJAY KUMR

Course Name & Code : Theory of Computation, 20CS13

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

Program/Sem/Sec : B.Tech-IT / V SEM/A-Sec

A.Y. : 2024-25

PRE-REQUISITE: Discrete Mathematical Structures

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to provide a formal connection between algorithmic problem solving and the theory of Automata and languages, and develop them into a mathematical view towards algorithmic design and in general computation itself.

CO1	Construct finite automata for regular languages and prove it's equivalence. (**Apply-L3**)
CO2	Construct regular expression for regular languages and prove the equivalence of regular expression and Finite Automata. (**Apply-L3**)
CO3	Design Pushdown automata for the context-free languages. (**Understand-L2**)
CO4	Design Turing machine to model computational problems. (**Apply-L3**)
CO5	Distinguish decidable and undecidable problems with the help of Turing machine. (**Understand – L2**)

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

CO	Program Outcomes (POs)												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO5	1	2	-	-	-	-	-	-	-	-	-	-	2	3	2

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

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

TEXTBOOKS:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", Pearson Education Asia, 1997.

REFERENCE BOOKS:

1. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", Pearson Education Asia,2000.
2. Dexter C. Kozen, "Automata and Computability", Springer,2011.
3. Michael Sipser, "Introduction to the Theory of Computation", PWS Publishing,2005.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill,2nd Edition,2003.

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Finite Automata

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 Finite Automata,	1	01-07-2024		**TLM2**	CO1	
2	Alphabets,	1	02-07-2024		**TLM2**	CO1	
3	Strings, Languages and Grammars,	1	03-07-2024		**TLM1**	CO1	
4	Classification of Automata,	1	06-07-2024		**TLM2**	CO1	
5	Definitions and its applications.	1	08-07-2024		**TLM2**	CO1	
6	Finite Automata: Deterministic Finite Automata (DFA),	2	09-07-2024 10-07-2024		**TLM1**	CO1	
7	Non-Deterministic Finite Automata(NFA)	1	13-07-2024		**TLM1**	CO1	
8	Equivalence of NFA and DFA,	1	15-07-2024		**TLM1**	CO1	
9	Equivalence of NFA with epsilon and NFA without epsilon,	2	16-07-2024 20-07-2024		**TLM1**	CO1	
10	Minimization of finite automata,	1	22-07-2024		**TLM1**	CO1	
11	Finite automata with output: mealy machine,	1	23-07-2024		**TLM1**	CO1	
12	Moore machines,	1	24-07-2024		**TLM1**	CO1	
13	Equivalence of mealy and moore machines	2	27-07-2024 29-07-2024		**TLM1**	CO1	
No. of classes required to complete UNIT-I		16	No. of classes taken:				

UNIT-II: Regular Expression and Regular Languages

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
19	Regular Expressions: Equivalence of Regular expression and finite automata	2	30-07-2024 31-07-2024		**TLM1**	CO2	
20	Regular Grammar: Definition of grammar,	1	03-08-2024		**TLM1**	CO2	
21	Derivation and parse tree,	2	05-08-2024 06-08-2024		**TLM1**	CO2	
22	Equivalence of regular grammar and finite automata,	2	10-08-2024 12-08-2024		**TLM1**	CO2	
23	Closure properties of regular languages,	1	13-08-2024		**TLM1**	CO2	
24	Pumping lemma for regular languages.	2	14-08-2024 17-08-2024		**TLM1**	CO2	
No. of classes required to complete UNIT-2		11	No. of classes taken:				

UNIT – III: CFL and Pushdown Automata

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
31	Context free languages: context free grammars(CFG),	1	19-08-2024		**TLM1**	CO3	
32	Ambiguity in CFG,	2	20-08-2024 21-08-2024		**TLM1**	CO3	
33	Chomsky and Greibach normal forms.	2	24-08-2024 27-08-2024		**TLM1**	CO3	
34	Pushdown automata (PDA): Definition of PDA,	1	28-08-2024		**TLM1**	CO3	
35	Deterministic and Non deterministic PDA,	2	31-08-2024 09-09-2024		**TLM1**	CO3	
36	Equivalence of PDA and CFG,	2	10-09-2024 11-09-2024		**TLM1**	CO3	
37	Pumping lemma for context free languages,	1	14-09-2024		**TLM1**	CO3	
38	Closure properties of CFLs.	1	17-09-2024		**TLM1**	CO3	
No. of classes required to complete UNIT-3		12	No. of classes taken:				

UNIT-IV: Turing Machine

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
43	Turing machine: The basic model for Turing Machine (TM),	2	18-09-2024 21-09-2024		**TLM1**	CO4	
44	Turing recognizable (recursively enumerable),	2	23-09-2024 24-09-2024		**TLM1**	CO4	
45	Turing-decidable(recursive) languages,	1	25-09-2024		**TLM1**	CO4	
46	Closure properties,	1	28-09-2024		**TLM1**	CO4	
47	Variants of Turing machines,	1	30-09-2024		**TLM1**	CO4	
48	Non deterministic TMs and Equivalence with deterministic TMs,	2	01-10-2024 05-10-2024		**TLM1**	CO4	
49	Unrestricted grammars and equivalence with TMs,	2	07-10-2024 08-10-2024		**TLM1**	CO4	
50	TMs as enumerators.	1	09-10-2024		**TLM1**	CO4	
No. of classes required to complete UNIT-4		12	No. of classes taken:				

UNIT-V: Undecidability

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
55	Undecidability: Church-Turing thesis,	1	14-10-2024		**TLM1**	CO5	
56	Universal turing machine,	2	15-10-2024 16-10-2024		**TLM1**	CO5	
57	the universal and diagnolization languages,	2	19-10-2024 21-10-2024		**TLM1**	CO5	
58	Reduction between languages,	1	22-10-2024		**TLM1**	CO5	
59	Rice's theorem,	1	23-10-2024		**TLM1**	CO5	
60	Post's correspondence problem,	1	26-10-2024		**TLM1**	CO5	
61	Undecidable problems about languages.	1	28-10-2024		**TLM1**	CO5	
No. of classes required to complete UNIT-5		9	No. of classes taken:				

CONTENT BEYOND SYLLABUS

S No	Topics To Be Covered	No Of Classes Required	Tentative Date of Completion	Actual Date	Teaching Learning Method	Learning Outcome	HOD Sign Weakly
1	Concept of Halt	1	29-10-2024		**TLM1**	CO5	
2	Halting Problems	1	30-10-2024		**TLM 1**	CO5	

TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/SWAYAM/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project
TLM7	Flipped class Room	**TLM8**	Blended Learning
TLM9	SOLO-Self Organized Learning Environment		

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+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 modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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	Organize, Analyze and Interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr. M Vijaykumar	Dr. D Veeriah	Mr. G Rajendra	Dr. B Srinivasa Rao
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: M. VIJAY KUMR

Course Name & Code : Theory of Computation, 20CS13

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Program/Sem/Sec : B.Tech-IT / V SEM/B-Sec

A.Y. : 2024-25

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CO2	Construct regular expression for regular languages and prove the equivalence of regular expression and Finite Automata. (**Apply-L3**)
CO3	Design Pushdown automata for the context-free languages. (**Understand-L2**)
CO4	Design Turing machine to model computational problems. (**Apply-L3**)
CO5	Distinguish decidable and undecidable problems with the help of Turing machine. (**Understand – L2**)

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

CO	Program Outcomes (POs)												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	3	2
CO5	1	2	-	-	-	-	-	-	-	-	-	-	2	3	2

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

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

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REFERENCE BOOKS:

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2. Dexter C. Kozen, "Automata and Computability", Springer,2011.
3. Michael Sipser, "Introduction to the Theory of Computation", PWS Publishing,2005.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill,2nd Edition,2003.

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Finite Automata

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 Finite Automata,	1	02-07-2024		**TLM2**	CO1	
2	Alphabets,	1	03-07-2024		**TLM2**	CO1	
3	Strings, Languages and Grammars,	1	04-07-2024		**TLM1**	CO1	
4	Classification of Automata,	1	05-07-2024		**TLM2**	CO1	
5	Definitions and its applications.	1	09-07-2024		**TLM2**	CO1	
6	Finite Automata: Deterministic Finite Automata (DFA),	2	10-07-2024 11-07-2024		**TLM1**	CO1	
7	Non-Deterministic Finite Automata(NFA)	1	12-07-2024		**TLM1**	CO1	
8	Equivalence of NFA and DFA,	1	16-07-2024		**TLM1**	CO1	
9	Equivalence of NFA with epsilon and NFA without epsilon,	2	18-07-2024 19-07-2024		**TLM1**	CO1	
10	Minimization of finite automata,	1	23-07-2024		**TLM1**	CO1	
11	Finite automata with output: mealy machine,	1	24-07-2024		**TLM1**	CO1	
12	Moore machines,	1	25-07-2024		**TLM1**	CO1	
13	Equivalence of mealy and moore machines	2	26-07-2024 30-07-2024		**TLM1**	CO1	
No. of classes required to complete UNIT-I		16	No. of classes taken:				

UNIT-II: Regular Expression and Regular Languages

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
19	Regular Expressions: Equivalence of Regular expression and finite automata	2	31-07-2024 01-08-2024		**TLM1**	CO2	
20	Regular Grammar: Definition of grammar,	1	02-08-2024		**TLM1**	CO2	
21	Derivation and parse tree,	2	06-08-2024 07-08-2024		**TLM1**	CO2	
22	Equivalence of regular grammar and finite automata,	2	08-08-2024 09-08-2024		**TLM1**	CO2	
23	Closure properties of regular languages,	1	13-08-2024		**TLM1**	CO2	
24	Pumping lemma for regular languages.	2	14-08-2024 16-08-2024		**TLM1**	CO2	
No. of classes required to complete UNIT-2		11	No. of classes taken:				

UNIT – III: CFL and Pushdown Automata

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
31	Context free languages: context free grammars(CFG),	1	20-08-2024		**TLM1**	CO3	
32	Ambiguity in CFG,	2	21-08-2024 22-08-2024		**TLM1**	CO3	
33	Chomsky and Greibach normal forms.	2	23-08-2024 27-08-2024		**TLM1**	CO3	
34	Pushdown automata (PDA): Definition of PDA,	1	28-08-2024		**TLM1**	CO3	
35	Deterministic and Non deterministic PDA,	2	29-08-2024 30-08-2024		**TLM1**	CO3	
36	Equivalence of PDA and CFG,	2	10-09-2024 11-09-2024		**TLM1**	CO3	
37	Pumping lemma for context free languages,	1	12-09-2024		**TLM1**	CO3	
38	Closure properties of CFLs.	1	13-09-2024		**TLM1**	CO3	
No. of classes required to complete UNIT-3		12	No. of classes taken:				

UNIT-IV: Turing Machine

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
43	Turing machine: The basic model for Turing Machine (TM),	2	17-09-2024 18-09-2024		**TLM1**	CO4	
44	Turing recognizable (recursively enumerable),	2	19-09-2024 20-09-2024		**TLM1**	CO4	
45	Turing-decidable(recursive) languages,	1	24-09-2024		**TLM1**	CO4	
46	Closure properties,	1	25-09-2024		**TLM1**	CO4	
47	Variants of Turing machines,	1	26-09-2024		**TLM1**	CO4	
48	Non deterministic TMs and Equivalence with deterministic TMs,	2	27-09-2024 01-10-2024		**TLM1**	CO4	
49	Unrestricted grammars and equivalence with TMs,	2	03-10-2024 04-10-2024		**TLM1**	CO4	
50	TMs as enumerators.	1	08-10-2024		**TLM1**	CO4	
No. of classes required to complete UNIT-4		12	No. of classes taken:				

UNIT-V: Undecidability

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
55	Undecidability: Church-Turing thesis,	1	09-10-2024		**TLM1**	CO5	
56	Universal turing machine,	2	10-10-2024 15-10-2024		**TLM1**	CO5	
57	the universal and diagnolization languages,	2	16-10-2024 17-10-2024		**TLM1**	CO5	
58	Reduction between languages,	1	18-10-2024		**TLM1**	CO5	
59	Rice's theorem,	1	22-10-2024		**TLM1**	CO5	
60	Post's correspondence problem,	1	23-10-2024		**TLM1**	CO5	
61	Undecidable problems about languages.	1	24-10-2024		**TLM1**	CO5	
No. of classes required to complete UNIT-5		9	No. of classes taken:				

CONTENT BEYOND SYLLABUS

S No	Topics To Be Covered	No Of Classes Required	Tentative Date of Completion	Actual Date	Teaching Learning Method	Learning Outcome	HOD Sign Weakly
1	Concept of Halt	1	25-10-2024		**TLM1**	CO5	
2	Halting Problems	1	29-10-2024		**TLM 1**	CO5	

TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/SWAYAM/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project
TLM7	Flipped class Room	**TLM8**	Blended Learning
TLM9	SOLO-Self Organized Learning Environment		

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+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 modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
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PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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	Organize, Analyze and Interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr. M Vijaykumar	Dr. D Veeriah	Mr. G Rajendra	Dr. B Srinivasa Rao
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. S. JYOTHI
Course Name & Code : POAI & 20CS16
L-T-P Structure :**3-0-0** **Credits:** 3
Program/Sem/Sec :B.Tech/V/A & B **A.Y.:** 2024-25

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Understand the fundamentals of Artificial Intelligence types of AI agents and their structures to solve engineering problems. (**Understand – L2**)
CO2	Identify different search algorithms to find and optimise the solution for the given problem. (**Understand-L2**)
CO3	Apply different gaming algorithms and identify the importance of knowledge representations in Artificial Intelligence. (**Apply-L3**)
CO4	Make use of predicate logic and rule-based system to represent the knowledge in AI domain. (**Understand-L2**)
CO5	Interpret the forms of learning in the AI domain as well as present efficient technologies to remove uncertainty in knowledge 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	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	1	-	2	-
CO2	2	3	1	1	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	1	1	-	-	-	-	-	-	-	1	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1	Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, third edition, 2009.can also second edition,2003.
T2	Elaine Rich, Kevin Knight Artificial Intelligence, TMH, second edition, 2007.

REFERENCE BOOKS:

R1	Nils J.Nilsson "Artificial Intelligence - A New Synthesis", ,Morgan Kaufmann, 1988
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., Addition-Wesley,2011.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	AI Introduction	1	1/7/24		TLM1	
2.	Applications of AI	1	2/7/24		TLM1	
3.	History of AI	1	5/7/24		TLM1	
4.	Types of AI	1	8/7/24		TLM1	
5.	Agents and rationality	1	9/7/24		TLM2	
6.	Structure of the agents	1	11/7/24		TLM2	
7.	Agent environment and nature of the environment	1	12/7/24		TLM2	
8.	Types of agents-Simple reflex agents and model-based agents	1	15/7/24		TLM2	
9.	Types of agents-Goal based agents and Utility-based agents	1	16/7/24		TLM2	
10.	Types of agents-Learning agents	1	18/7/24		TLM2	
11.	Problems, search spaces	1	19/7/24		TLM2	
12.	Defining the problem as state space search	1	22/7/24		TLM2	
13.	Production system	1	23/7/24		TLM2	
14.	Problem characteristics	1	25/7/24		TLM2	
15.	Issues in the design of search programs.	1	26/7/24		TLM2	
No. of classes required to complete UNIT-I: 15				**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
16.	Problem solving agents and search algorithm terminologies	1	29/7/24		TLM2	
17.	Properties of search algorithms and types of search algorithms	1	30/7/24		TLM2	
18.	Uninformed search algorithms: Breadth-first Search	1	1/8/24		TLM2	
19.	Depth-first Search and Depth-limited Search	1	2/8/24		TLM2	
20.	Iterative deepening depth-first search.	1	5/8/24		TLM2	
21.	Uniform cost search, Bidirectional search.	1	6/8/24		TLM2	
22.	Informed/Heuristic Search algorithms: Greedy best-first search algorithm	1	8/8/24		TLM2	
23.	A* Search algorithm	1	9/8/24		TLM2	
24.	Hill climbing algorithm	1	12/8/24		TLM2	
25.	Constraint satisfaction problem	1	13/8/24		TLM2	
26.	Means-Ends Analysis	1	16/8/24		TLM2	
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
27.	Adversarial search/Game playing: Introduction	1	19/8/24		TLM2	
28.	Minmax Algorithm	1	20/8/24		TLM2	
29.	Alpha-Beta Pruning	1	22/8/24		TLM2	
30.	Knowledge representation: Representations and mappings	1	23/8/24		TLM2	
31.	Approaches of Knowledge representation	2	27/8/24 29/8/24		TLM2	
32.	Issues in Knowledge Representation	1	30/8/24		TLM2	
No. of classes required to complete UNIT-III: 07				**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
33.	Knowledge Representation Using predicate logic: Representing simple facts in logic.	1	9/9/24		TLM2	
34.	Representing instance and Isa relationships	2	10/9/24 12/9/24		TLM2	
35.	Computable functions and predicates	1	13/9/24		TLM2	
36.	Resolution	2	17/9/24 19/9/24		TLM2	
37.	Natural deduction	1	20/9/24		TLM2	
38.	Representing knowledge using Rules: Procedural verses declarative knowledge	1	23/9/24		TLM2	
39.	Logic programming	1	24/9/24		TLM2	
40.	Forward verses backward reasoning	1	26/9/24		TLM2	
41.	Matching	1	27/9/24		TLM2	
42.	Control knowledge	1	30/9/24		TLM2	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Uncertain knowledge and Reasoning: Probability and Bayes theorem	2	1/10/24 3/10/24		TLM2	
44.	Certainty factors and rule-based	2	4/10/24 7/10/24		TLM2	
45.	Bayesian networks	1	8/10/24		TLM2	
46.	Dempster – Shafer Theory	2	10/10/24 14/10/24		TLM2	
47.	Fuzzy logic	1	15/10/24		TLM2	
48.	Learning: Overview of different forms of learning	1	17/10/24		TLM2	
49.	Learning Decision Trees	1	18/10/24		TLM2	
50.	Neural networks	1	21/10/24		TLM2	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

Content Beyond Syllabus :

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	AI Ethics and Societal Impact	2	22/10/24 24/10/24		TLM2	
2.	Machine Learning Basics and Case Studies	3	25/10/24 28/10/24 29/10/24		TLM2	
No. of classes required to complete : 5				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer**ing 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	Organize, Analyze, and interpret the data to extract meaningful conclusions.
PSO2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	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.S.JYOTHI**	**Mr.N.Srikanth**	**Mr.G.Rajendra**	**Dr. B.Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor:	**Dr. PHANEENDRA KANAKAMEDALA**	
Course Name & Code	**INTERNET OF EVERYTHING & 201T02**	
L-T-P Structure	**3-0-0**	**Credits:** 3
Program/Sem/Sec	B.Tech/V/A & B	**A.Y.:** 2024-25

Pre-requisite:

- **Python Programming**

Course Educational Objective (CEO): The objective of this course is to explore the interconnection and integration of the physical world and the cyber space. Understand the design concepts in setting up IOT Devices. Study about the setup, configuration, and installation of equipment for IOT.

Course Outcomes (COs): After the completion of this course, the student will be able to:

CO1	**Summarize the** Device-processor communication models & protocols. **(Remembering-L1)**
CO2	**Identify** the application areas of IOT. **(Understand-L2)**
CO3	**Demonstrate** the effect of internet on Mobile Devices, Cloud & Sensor Networks. **(Apply-L3)**
CO4	**Acquire** programming experience with Raspberry Pi kit to interface various devices. **(Understand – L2)**
CO5	**Implement** Programming models for IoT Cloud Environment. **(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	1	1	-	-	-	-	-	-	-	-	1	1	1	1
CO2	3	1	1	-	-	-	-	-	-	-	-	1	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1	-	2	-
CO4	3	2	3	-	-	-	-	-	-	-	-	1	2	2	2
CO5	3	2	3	-	-	-	-	-	-	-	-	1	2	2	2

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

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

SYLLABUS

UNIT - I: Introduction to Internet of Things: Introduction, Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabled Technologies, IoT Levels and Deployment Templates

UNIT - II: Domain Specific IoTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

UNIT - III: IoT AND M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT IoT System Management: Need for IoT Systems Management, SNMP, NETCONF, YANG, YANG-NETCONF, NETOPEER.

UNIT - IV: IoT Physical Devices & Endpoints: What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces (Serial, SPI, and I2C), Programming Raspberry Pi with Python, Other IoT Devices

UNIT - V: IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework – Django, Designing a RESTful Web API.

TEXTBOOKS:

T1	Arshdeep Bahga and Vijay Madisetti, **— Internet of Things - A Hands-on Approach**, Universities Press, 2015, ISBN: 9788173719547.
T2	Matt Richardson & Shawn Wallace, O'Reilly (SPD), **Getting Started with Raspberry Pi**, 2014, ISBN: 978935023975.

REFERENCE BOOKS:

R1	Pethuru Raj and Anupama C. Raman," **The Internet of Things: Enabling Technologies, Platforms, and Use Cases**", (CRC Press).
R2	Adrian McEwen, **— Designing the Internet of Things**, Wiley Publishers, 2013, ISBN: 978-1- 118-43062-0.
R3	Daniel Kellmereit, **— The Silent Intelligence: The Internet of Things**, 2013, ISBN: 0989973700.
R4	https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf. http://nptel.ac.in/courses/106105166

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Internet of Things

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 Course and Course Outcomes	1	01-07-2024		**TLM2**	CO1	**T1**	
2.	Introduction to Internet of Things, Characteristics	1	02-07-2024		**TLM2**	CO1	**T1**	
3.	Physical Design of IoT: Things in IoT	2	04-07-2024 05-07-2024		**TLM2**	CO1	**T1**	
4.	IoT Protocols	3	08-07-2024 09-07-2024 11-07-2024		**TLM2**	CO1	**T1**	
5.	Logical Design of IoT: IoT Functional Block	2	12-07-2024 15-07-2024		**TLM2**	CO1	**T1**	
6.	IoT Communication Models	2	16-07-2024 18-07-2024		**TLM2**	CO1	**T1**	
7.	IoT Communication API's, IoT Enabling Technologies	2	19-07-2024 22-07-2024		**TLM2**	CO1	**T1**	
8.	IoT Levels and Deployment Templates	2	23-07-2024 25-07-2024		**TLM2**	CO1	**T1**	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II: Domain Specific IoTs

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 Domain Specific IoT, Home Automation	2	26-07-2024 29-07-2024		**TLM2**	CO2	**T1**	
2.	Domain Specific IoT: Cities, Environment	2	30-07-2024 01-08-2024		**TLM2**	CO2	**T1**	
3.	Domain Specific IoT: Energy, Retail	2	02-08-2024 05-08-2024		**TLM2**	CO2	**T1**	
4.	Domain Specific IoT: Logistics	2	06-08-2024 08-08-2024		**TLM2**	CO2	**T1**	
5.	Domain Specific IoT: Agriculture, Industry	2	09-08-2024 12-08-2024		**TLM2**	CO2	**T1**	
6.	Domain Specific IoT: Health and Life Sciences	2	13-08-2024 16-08-2024		**TLM2**	CO2	**T1**	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III: IoT AND M2M

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 M2M, Difference between IoT and M2M	2	20-08-2024 22-08-2024		**TLM2**	CO3	**T1**	
2.	Software defined Networking for IoT	2	23-08-2024 27-08-2024		**TLM2**	CO3	**T1**	
3.	Network Function Virtualization	2	29-08-2024 30-08-2024		**TLM2**	CO3	**T1**	
4.	Need for IoT System Management, Simple Network Management Protocol (SNMP)	2	09-09-2024 10-09-2024		**TLM2**	CO3	**T1**	
5.	Network operator requirements and NETCONF	2	12-09-2024 13-09-2024		**TLM5**	CO3	**T1**	
6.	YANG Data Modeling Language	1	17-09-2024		**TLM5**	CO3	**T1**	
7.	IoT System Management with NETCONF - YANG	2	19-09-2024 20-09-2024		**TLM5**	CO3	**T1**	
No. of classes required to complete UNIT-III		11			No. of classes taken:			

UNIT-IV: IoT Physical Devices & Endpoints

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.	What is an IoT Device, Building Blocks of IoT	1	23-09-2024 24-09-2024		**TLM2**	CO4	**T1**	
2.	Raspberry Pi Board Components	2	26-09-2024 27-09-2024		**TLM2**	CO4	**T2**	
3.	Linux on Raspberry Pi	2	30-09-2024 01-10-2024		**TLM4**	CO4	**T2**	
4.	Raspberry Pi Interfaces and Python Programming on Raspberry Pi	3	03-10-2024 04-10-2024 07-10-2024		**TLM4**	CO4	**T2**	
No. of classes required to complete UNIT- IV		08			No. of classes taken:			

UNIT-V: IoT Physical Servers and Cloud Offerings

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 Cloud Storage Models and Communication API's, WAMP- Web Application Messaging Protocol	2	14-10-2024 15-10-2024		**TLM2**	CO5	**T1**	
2.	Xively Cloud for IoT	2	17-10-2024 18-10-2024		**TLM2**	CO5	**T1**	
3.	Python Web Application Framework- Django	1	21-10-2024		**TLM4**	CO5	**T1**	
4.	Design of RESTful Web API	2	22-10-2024 24-10-2024		**TLM2**	CO5	**T1**	
5.	**Revision**	2	25-10-2024. 28-10-2024		**TLM2**	CO5	**T1**	
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
1.	IoT Security and Privacy	1	29-10-2024	**TLM2**	**TLM2**	
2.	Artificial Intelligence (AI) for IoT	1	1-11-2024	**TLM2**	**TLM2**	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit) - 6
TLM2	PPT(45)	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS) - 5
TLM3	Tutorial	**TLM6**	Group Discussion/Project

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	01-07-2024	31-08-2024	9W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	02-11-2024	8W
II Mid Examinations	04-11-2024	09-11-2024	1W
Preparation and Practical's	11-11-2024	16-11-2024	1W
Semester End Examinations	18-11-2024	30-11-2024	2W

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 teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze, and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools.

Signature of the Faculty				
Name of the Faculty	**Dr. K. Phaneendra**	**Dr. K. Phaneendra**	**Dr. K. Phaneendra**	**Dr. B. Srinivasa Rao**
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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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

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.V.V.Rama Krishna
Course Name & Code : SATELLITE TECHNOLOGY- 20EC81
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., IT., V-Sem., A-Section A.Y : 2024-25
PRE-REQUISITE :Dynamics, Kinematics, Thermo dynamics.

COURSE EDUCATIONAL OBJECTIVES (CEOs): This course provides the knowledge on different laws associated with the motion of a satellite, launching a satellite into orbit with launch vehicles, subsystems, structures, thermal control and applications.

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

CO 1	List out the operational bands, space craft control mechanisms, sensors and navigational aids for satellite applications (Remember-L1)
CO 2	Summarize the functions of satellite space segment, earth segment, multiple access techniques and satellite services. (Understand-L2)
CO 3	Illustrate the operational principles of satellite power system and space craft control mechanism. (Understand-L2)
CO 4	Outline the concepts of orbital mechanics & satellite communication and its 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	1	-	-	-	-	3	2	-	-	-	-	1	1	-	-
CO2	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO3	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO4	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-

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

TEXT BOOKS:

T1 Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite communications", John Wiley & Sons,2"[d] edition,2003.

T2 Dennis Roddy, "Satellite communications", Tata McGraw Hills, 4th Edition, 2009.

REFERENCE BOOKS:

R1 M. Richharia, "Satellite Communications Systems: Design principles", BS Publications,2' [d] Edition, 2005.

R2 D.C Agarwal, "Satellite communications", Khanna Publications, 5*Edition,2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Satellite Systems:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Objectives	1	01-07-2024			
2.	Brief introduction about the course and its importance.	1	04-07-2024			
3.	Need of Space Communication, Common satellite applications and missions.	1	05-07-2024			
4.	General Structure of satellite Communication system.	1	06-07-2024			
5.	Types of Spacecraft Orbits, Launch vehicles.	1	08-07-2024			
6.	Satellite subsystems and their functions – structure.	1	11-07-2024			
7.	Satellite subsystems and their functions – thermal mechanisms.	1	12-07-2024			
8.	Satellite subsystems and their functions – power, propulsion.	1	15-07-2024			
9.	Satellite subsystems and their functions – Guidance and control.	1	18-07-2024			
10.	Satellite subsystems and their functions – bus electronics.	1	19-07-2024			
11.	Revision of Unit -1	1	20-07-2024			
No. of classes required to complete UNIT-I:11				No. of classes taken:		

UNIT-II:Orbital Mechanics:

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 and overview of Orbital Mechanics	1	22-07-2024			
2.	Fundamentals of Orbital Dynamics – Kepler's laws.	1	25-07-2024			
3.	Fundamentals of Orbital Dynamics – Kepler's laws.	1	26-07-2024			
4.	Fundamentals of Orbital Dynamics – Kepler's laws	1	27-07-2024			
5.	Orbital parameters	1	29-07-2024			
6.	Problems	1	01-08-2024			
7.	Orbital parameters	1	02-08-2024			
8.	Orbital Perturbations	1	03-08-2024			
9.	Need for station keeping.	1	05-08-2024			
10.	Need for Co-ordinate systems.	1	08-08-2024			
11.	GPS System – architecture of GPS	1	09-08-2024			
12.	working principle of GPS	1	10-08-2024			
13.	merits, demerits and applications of GPS	1	12-08-2024			
14.	Ground/Earth station network requirements.	1	15-08-2024			
15.	Revision of Unit -2	1	16-08-2024			
No. of classes required to complete UNIT-II: 15				No. of classes taken:		

UNIT-III: Power System and Bus Electronics:

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 Power system	1	17-08-2024			
2.	Bus electronics	1	19-08-2024			
3.	Solar Panels: Silicon and Ga-As Cells.	1	22-08-2024			
4.	Power generation capacity, efficiency.	1	23-08-2024			
5.	Space Battery Systems.	1	24-08-2024			
6.	Battery Types, Characteristics.	1	26-08-2024			
7.	Battery efficiency Parameters,	1	29-08-2024			
8.	power electronics.	1	09-09-2024			
9.	Telemetry of satellite	1	12-09-2024			
10.	Command Control	1	13-09-2024			
11.	monitoring functions.	1	14-09-2024			
12.	Communication bands - and applications.	1	19-09-2024			
13.	Revision of Unit -3	1	20-09-2024			
No. of classes required to complete UNIT-III: 13				No. of classes taken:		

UNIT-IV : Spacecraft Control:

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 Spacecraft Control	1	21-09-2024			
2.	Control Requirements: Attitude Control	1	23-09-2024			
3.	Station keeping functions, type of control maneuvers.	1	26-09-2024			
4.		1	27-09-2024			
5.	Stabilization Schemes: Spin stabilization.	1	28-09-2024			
6.	Stabilization Schemes: gravity gradient method, 3 axis stabilization.	1	30-09-2024			
7.	Control Systems: Mass expulsion systems.	1	03-10-2024			
8.	Control Systems: Momentum exchange systems.	1	04-10-2024			
9.	Gyro and Magnetic Torque - sensors,Star and sun sensor, Earth sensor.	1	05-10-2024			
10.	Magnetometers and Inertial Sensors.	1	07-10-2024			
11.	Revision of Unit -4	1	10-10-2024			
No. of classes required to complete UNIT-IV: 11				No. of classes taken:		

UNIT-V : Satellite services and 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
1.	Introduction to Satellite services and applications	1	11-10-2024			
2.	GPS location and principle.	1	14-10-2024			
3.	GPS location and principle.	1	17-10-2024			
4.	Direct to Home, Home receiver	1	18-10-2024			
5.	Satellite Mobile Services: VSAT.	1	19-10-2024			
6.	Satellite Mobile Services: MSAT,	1	21-10-2024			

7.	RADARSAT.	1	24-10-2024			
8.	IRNSS constellation.	1	25-10-2024			
9.	Satellite structures and materials.	1	26-10-2024			
10.	Revision of Unit -5	1	27-10-2024			
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.	Information about NaviC & some recently launched satellites information.	1	01-11-2024			

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	**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
(V V Ramakrishna)	(M.Siva Sankara Rao)	(Dr.M.V.Sudhakara Reddy)	(Dr.G.Srinivasulu)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.M.Sivasankara Rao
Course Name & Code : SATELLITE TECHNOLOGY- 20EC81
L-T-P Structure : 3-0-0 Credits : 3
Program/Sem/Sec : B.Tech., ASE., V-Sem., A.Y : 2024-25
PRE-REQUISITE :Dynamics, Kinematics, Thermo dynamics.

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

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CO 2	Summarize the functions of satellite space segment, earth segment, multiple access techniques and satellite services. (Understand-L2)
CO 3	Illustrate the operational principles of satellite power system and space craft control mechanism. (Understand-L2)
CO 4	Outline the concepts of orbital mechanics & satellite communication and its 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	1	-	-	-	-	3	2	-	-	-	-	1	1	-	-
CO2	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO3	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO4	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
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R1 M. Richharia, "Satellite Communications Systems: Design principles", BS Publications,2'[d] Edition, 2005.

R2 D.C Agarwal, "Satellite communications", Khanna Publications, 5*Edition,2006.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Satellite Systems:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Objectives	1	02-07-2024			
2.	Brief introduction about the course and its importance.	1	03-07-2024			
3.	Need of Space Communication, Common satellite applications and missions.	1	05-07-2024			
4.	General Structure of satellite Communication system.	1	06-07-2024			
5.	Types of Spacecraft Orbits, Launch vehicles.	1	09-07-2024			
6.	Satellite subsystems and their functions – structure.	1	10-07-2024			
7.	Satellite subsystems and their functions – thermal mechanisms.	1	12-07-2024			
8.	Satellite subsystems and their functions – power supply.	1	13-07-2024			
9.	Satellite subsystems and their functions – propulsion.	1	16-07-2024			
10.	Satellite subsystems and their functions – Guidance and control.	1	19-07-2024			
11.	Satellite subsystems and their functions – Guidance and control.	1	20-07-2024			
12.	Satellite subsystems and their functions – bus electronics.	1	23-07-2024			
13.	Revision of Unit -1	1	24-07-2024			
No. of classes required to complete UNIT-I:13				No. of classes taken:		

UNIT-II:Orbital Mechanics:

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 and overview of Orbital Mechanics	1	26-07-2024			
2.	Fundamentals of Orbital Dynamics – Kepler's laws.	1	27-07-2024			
3.	Fundamentals of Orbital Dynamics – Kepler's laws.	1	30-07-2024			
4.	Fundamentals of Orbital Dynamics – Kepler's laws	1	31-07-2024			
5.	Orbital parameters	1	02-08-2024			
6.	Orbital parameters	1	03-08-2024			
7.	Orbital parameters	1	06-08-2024			
8.	Simple problems on Orbital parameters	1	07-08-2024			
9.	Orbital Perturbations	1	09-08-2024			
10.	Need for station keeping.	1	10-08-2024			
11.	Need for Co-ordinate systems.	1	13-08-2024			
12.	GPS System – architecture of GPS	1	14-08-2024			
13.	working principle of GPS	1	16-08-2024			
14.	merits, demerits and applications of GPS	1	17-08-2024			
15.	Ground/Earth station network requirements.	1	20-08-2024			
16.	Revision of Unit -2	1	21-08-2024			
No. of classes required to complete UNIT-II: 16				No. of classes taken:		

UNIT-III: Power System and Bus Electronics:

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 Power system	1	23-08-2024			
2.	Bus electronics	1	24-08-2024			
3.	Solar Panels: Silicon and Ga-As Cells.	1	27-08-2024			
4.	Power generation capacity, efficiency.	1	28-08-2024			
5.	Space Battery Systems.	1	30-08-2024			
6.	Battery efficiency Parameters,	1	31-08-2024			
7.	power electronics.	1	10-09-2024			
8.	power electronics	1	11-09-2024			
9.	Telemetry of satellite	1	13-09-2024			
10.	Command Control	1	14-09-2024			
11.	monitoring functions.	1	17-09-2024			
12.	Communication bands - and applications.	1	18-09-2024			
13.	Revision of Unit -3	1	20-09-2024			
No. of classes required to complete UNIT-III: 13				No. of classes taken:		

UNIT-IV : Spacecraft Control:

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 Spacecraft Control	1	21-09-2024			
2.	Control Requirements: Attitude Control	1	24-09-2024			
3.	Station keeping functions, type of control maneuvers.	1	25-09-2024			
4.	Station keeping functions, type of control maneuvers.	1	27-09-2024			
5.	Stabilization Schemes: Spin stabilization.	1	28-09-2024			
6.	Stabilization Schemes: gravity gradient method, 3 axis stabilization.	1	01-10-2024			
7.	Control Systems: Mass expulsion systems.	1	04-10-2024			
8.	Control Systems: Momentum exchange systems.	1	05-10-2024			
9.	Gyro and Magnetic Torque -sensors	1	08-10-2024			
10.	Star and sun sensor, Earth sensor.	1	09-10-2024			
11.	Magnetometers and Inertial Sensors.	1	12-10-2024			
12.	Revision of Unit -4	1	15-10-2024			
No. of classes required to complete UNIT-IV: 12				No. of classes taken:		

UNIT-V : Satellite services and 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
1.	Introduction to Satellite services and applications	1	16-10-2024			
2.	GPS location and principle.	1	18-10-2024			
3.	GPS location and principle.	1	19-10-2024			
4.	Direct to Home, Home receiver	1	22-10-2024			
5.	Satellite Mobile Services: VSAT.	1	23-10-2024			
6.	Satellite Mobile Services: MSAT,	1	25-10-2024			
7.	RADARSAT.	1	26-10-2024			

8.	IRNSS constellation.	1	29-10-2024			
9.	Satellite structures and materials.	1	30-10-2024			
10.	Revision of Unit -5	1	01-11-2024			
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.	Information about NaviC & some recently launched satellites information.	1	02-11-2024			

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	**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
(M.Sivasankara Rao)	(M.Sivasankara Rao)	(Dr.M.V.Sudhakara Reddy)	(Dr.G.Srinivasilu)

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.
http://lbrce.ac.in/it/index.php, hodit@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PROGRAM	**:** B.Tech.,V-Sem., IT – R20 Regulation (A-sec)
ACADEMIC YEAR	**:** 2024-25
COURSE NAME & CODE	**:** Computer Networks Lab–20CS60
L-T-P STRUCTURE	**:** 0-0-3
COURSE CREDITS	**:** 1.5
COURSE INSTRUCTOR	**: Mr.B.Ravindra chanti babu**
PRE-REQUISITE	**:** Data Structures, and Operating Systems

COURSE OBJECTIVE: In this course student will learn about how to build and understanding the fundamental concepts of computer networking and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

COURSE OUTCOMES (CO)

CO1: Implement Network layer functionalities using NS3 simulator. (Apply-L3)
CO2: Demonstrate Transport Layer functionalities. (Understand- L2)
CO3: Analyze Application layer protocols using Wireshark. (Analyze – L4)
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	3	3								1	2	2	2
CO2	1	2	3	3								-	2	3	3
CO3	1	2	3	3								1	3	2	2
CO4	-	-	-	-	-	-	-	1	3	2	-	-	-	-	-
1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High).															

BOS APPROVED TEXT BOOKS:

T1 B. A. Frouzan, Data Communication, Tata Mc Graw Hill.

T2 A. S. Tanenbaum —Computer Network: Second Ed. Prentice Hall, India (tan).

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R2 Douglas Comer, Internetworking with TCP/IP, Prentice Hall of India, Volume 1, 6th Edition, 2009.

R3 Richard Stevens, "TCP/IP Illustrated" , Addison-Wesley, Volume 1, 2001.

R4 http://www.cse.iitk.ac.in/users/dheeraj/cs425/.

R5 http://www.tcpipguide.com/free/t_OSIReferenceModelLayers.htm

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Programs to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	To gain familiarity with the basic network commands & utilities available in the Linux OS	3	2-07-2024		**TLM8/TLM5**	
2.	To learn about network layer tools and analyze captures for congestion.	3	9-07-2024		**TLM8/TLM5**	
3.	To learn about queue management techniques, and global routing in ns3.	6	16-07-2024 23-07-2024		**TLM8/TLM5/TLM4**	
4.	To learn about broadcasting, multicasting, and bridging in a Local Area Network using ns3.	6	30-08-2024 6-08-2024		**TLM8/TLM5/TLM4**	
5.	To learn about Wi-Fi and Mobile Adhoc topologies with ns3.	6	13-08-2024 20-08-2024		**TLM8/TLM5/TLM4**	
6.	To introduce Socket Programming in TCP and UDP.	3	27-08-2024		**TLM8/TLM5**	
7.	Observations of Transmission Control Protocol (TCP) Connection states, Flags and Flow Control.	6	10-9-2024 17-9-2024		**TLM8/TLM5**	
8.	To learn Transmission Control Protocol (TCP) Flow Control, Error Control, and Congestion.	6	24-9-2024		**TLM8/TLM5**	

9.	To introduce Wireshark & tcp dump, and observation of packets in a LAN network.	6	1-10-2024 8-10-2024		**TLM8/TLM5**	
10.	To analyze HTTP packets using Wireshark tool, and understand the records returned by a DNS server.	3	15-10-2024 22-10-2024		**TLM8/TLM5**	
11.	**Lab-Internal**	3	29-10-2024			

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
Commencement of Class Work	01-07-2024		
I Phase of Instructions	01-07-2024	31-08-2024	9W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	02-11-2024	8W
II Mid Examinations	04-11-2024	09-11-2024	1W
Preparation and Practical's	11-11-2024	16-11-2024	1W
Semester End Examinations	18-11-2024	30-11-2024	2W

EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Internal Lab Exam-I	1,2,3	A1= 5
Internal Lab Exam-II	1,2,3	A2= 5
Day to Day Evaluation	1,2,3	B= 5
Record	1,2,3	C= 5
Evaluation of Internal Lab Exam Marks: A=(A1+A2)/2	1,2,3	A= 5
Cumulative Internal Examination: A+B+C	**1,2,3**	**A+B+C =15**
Semester End Examinations	**1,2,3**	**E=35**
Total Marks: A+B+C+D	**1,2,3**	**50**

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	Organize, Analyze and Interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Signature				
Name of the Faculty	**Mr.B.Ravindra chanti babu**	**Dr.P.Bhagath**	**Mr.G.Rajendra**	**Dr. B. Srinivasa Rao**

LAKIREDDY BALI REDDY COLLEGE OF NGINEERING

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http://lbrce.ac.in/it/index.php,hodit@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PROGRAM	**:** B.Tech.,V-Sem., IT – R20 Regulation (B-sec)
ACADEMIC YEAR	**:** 2024-25
COURSE NAME & CODE	**:** Computer Networks Lab–20CS60
L-T-P STRUCTURE	**: 0**-0-3
COURSE CREDITS	**:** 1
COURSE INSTRUCTOR	**: R Pavitra**
PRE-REQUISITE	**: Network Simulation -2,Python,C++**

COURSE OBJECTIVE: In this course student will learn about how to build and understanding the fundamental concepts of computer networking and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

COURSE OUTCOMES (CO)

CO1: Implement Network layer functionalities using NS3 simulator. (Apply-L3)

CO2: Demonstrate Transport Layer functionalities. (Understand- L2)

CO3: Analyze Application layer protocols using Wireshark. (Analyze – L4)

CO 4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	3	3								1	2	2	2
CO2	1	2	3	3									2	3	3
CO3	1	2	3	3								1	3	2	2
CO4	-	-	-	-	-	-	-	1	3	2	-	-	-	-	-
1- Slight (Low), **2 -** Moderate (Medium), **3 -** Substantial (High).															

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COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Programs to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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2.	To learn about network layer tools and analyze captures for congestion.	3	10-07-2024		**TLM8/TLM5**	
3.	To learn about queue management techniques, and global routing in ns3.	6	24-07-2024 31-07-2024		**TLM8/TLM5/TLM4**	
4.	To learn about broadcasting, multicasting, and bridging in a Local Area Network using ns3.	6	07-08-2024 14-08-2024		**TLM8/TLM5/TLM4**	
5.	To learn about Wi-Fi and Mobile Adhoc topologies with ns3.	3	21-08-2024		**TLM8/TLM5/TLM4**	
6.	To introduce Socket Programming in TCP and UDP.	3	28-08-2024		**TLM8/TLM5**	
7.	Observations of Transmission Control Protocol (TCP) Connection states, Flags and Flow Control.	3	11-9-2024		**TLM8/TLM5**	
8.	To learn Transmission Control Protocol (TCP) Flow Control, Error	6	18-9-2024 25-9-2024		**TLM8/TLM5**	

	Control, and Congestion.					
9.	To introduce Wireshark & tcpdump, and observation of packets in a LAN network.	6	9-10-2024 16-10-2024		**TLM8/TLM5**	
10.	To analyze HTTP packets using Wireshark tool, and understand the records returned by a DNS server.	3	23-10-2024		**TLM8/TLM5**	
11.	**Lab-Internal-**	3	30-10-2024			

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving-3	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming-10	**TLM8**	Lab Demo-10
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
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Preparation and Practical's	11-11-2024	16-11-2024	1W
Semester End Examinations	18-11-2024	30-11-2024	2W

EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Internal Lab Exam-I	1,2,3	A1= 5
Internal Lab Exam-II	1,2,3	A2= 5
Day to Day Evaluation	1,2,3	B= 5
Record	1,2,3	C= 5
Evaluation of Internal Lab Exam Marks: A=(A1+A2)/2	1,2,3	A= 5
Cumulative Internal Examination: A+B+C	**1,2,3**	**A+B+C =15**
Semester End Examinations	**1,2,3**	**E=35**
Total Marks: A+B+C+D	**1,2,3**	**50**

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze and Interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**HOD**
Signature				
Name of the Faculty	**R Pavitra**	**Dr.P.Bhagath**	**Mrs.G.Rajendra**	**Dr. B. Srinivasa Rao**

06-10-

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: REHANA BEGUM
Course Name & Code : Machine Learning Lab & 20AD53
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/V/A **A.Y.:** 2024-25

PREREQUISITE : **Probability and Statistics, Programming Knowledge**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this lab is to make use of Data sets in implementing the machine learning algorithms in any suitable language of choice.

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

CO 1	Apply the appropriate pre-processing techniques on data set. (Apply – L3)
CO 2	Implement supervised Machine Learning algorithms. (Apply – L3)
CO 3	Implement unsupervised Machine Learning algorithms (Apply – L3)
CO 4	Improve individual / teamwork skills, communication & report writing skills with ethical values.

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PS O3
CO1	-	2	-	2	3	-	-	-	-	-	-	-	3	-	-
CO2	-	2	-	2	3	-	-	-	-	-	-	-	2	-	3
CO3	2	2	-	-	3	-	-	-	-	-	-	-	2	-	3
CO4	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

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

Web Resources:

1. https://www.analyticsvidhya.com/blog/2021/07/basic-statistics-concepts-for-machine-learning-newbies/
2. https://notepub.io/notes/programming-languages/python-for-data-science/python-for-data-science-data-visualization-totoya-dataset/
3. https://www.analyticsvidhya.com/blog/2021/10/handling-missing-value/
4. https://www.almabetter.com/bytes/articles/outlier-detection-methods-and-techniques-in-machine-learning-with-examples
5. https://builtin.com/machine-learning/pca-in-python
6. https://www.statology.org/linear-discriminant-analysis-in-python/
7. https://machinelearningmastery.com/singular-value-decomposition-for-machine-learning/
8. https://intellipaat.com/blog/what-is-linear-regression/
9. https://www.analyticsvidhya.com/blog/2022/02/logistic-regression-using-python-and-excel/
10. https://www.section.io/engineering-education/polynomial-regression-in-python/
11. https://www.analyticsvidhya.com/blog/2016/01/ridge-lasso-regression-python-complete-tutorial/

12. https://www.digitalocean.com/community/tutorials/k-nearest-neighbors-knn-in-python
13. https://www.mltut.com/svm-implementation-in-python-from-scratch/
14. https://www.datacamp.com/tutorial/random-forests-classifier-python
15. https://www.datacamp.com/tutorial/adaboost-classifier-python
16. https://www.javatpoint.com/xgboost-ml-model-in-python

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S NO	Date (Tentative)	Actual Date	Topics to be covered	Teaching Learning Methods	Learning Outcome COs	HOD Signature
1	03-07-2024		Basic statistical functions for Data Exploration	**TLM4**	CO1	
2	10-07-2024		Data Visualization: Box plot, Scatter plot, Histogram	**TLM4**	CO1	
3	24-07-2024		Data Pre-processing: Handling Missing values, Outliers, Normalization, Scaling	**TLM4**	CO1	
4	31-07-2024		Principle Component Analysis (PCA)	**TLM4**	CO1,3	
5	07-08-2024		Singular Value Decomposition (SVD)	**TLM4**	CO1,3	
6	14-08-2024		Linear Discriminant Analysis (LDA)	**TLM4**	CO1,3	
7	21-08-2024		Regression Analysis: Linear Regression, Logistic Regression, Polynomial Regression	**TLM4**	CO2, CO4	
8	28-08-2024		Regularized Regression	**TLM4**	CO2, CO4	
9	04-09-2024		K-Nearest Neighbour (kNN)	**TLM4**	CO2, CO4	
10	11-09-2024		Support Vector Machines (SVMs)	**TLM4**	CO2, CO4	
11	18-09-2024		Random Forest model	**TLM4**	CO2, CO4	
12	25-09-2024		AdaBoost and XGBoost Classifiers	**TLM4**	CO2, CO4	
13	16-10-2024		Exploring Feature Selection Methods a) Filter Methods b) Wrapper Methods	**TLM4**	CO1	
14	23-10-2024		Exploring Model Evaluation Metrics	**TLM4**	CO1, CO2	
15	30-10-2024		Lab Internal Exam			

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
Day-to-day work	**D1=05**
Record	**R1=05**
Internal Test	**IT1=5**
Continuous Internal Evaluation (CIE)=D1+R1+IT1	**15**
Procedure/Algorithm	**P1=5**
Experimentation/Program execution	**E1=10**
Observations/Calculations/Validation	**O1=10**
Result/Inference	**R1=5**
Viva voce	**V1=5**
Semester End Examination (SEE)= P1+ E1+ O1+ V1	**35**
Total Marks = CIE+SEE	**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.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	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. Rehana Begum**		**Mrs. M. Hema Latha**	**Dr.B. Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Sambasivarao ch
Course Name & Code : Machine Learning Lab & 20AD53
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/V/B **A.Y.:** 2024-25

PREREQUISITE : **Probability and Statistics, Programming Knowledge**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this lab is to make use of Data sets in implementing the machine learning algorithms in any suitable language of choice.

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

CO 1	Apply the appropriate pre-processing techniques on data set. (Apply – L3)
CO 2	Implement supervised Machine Learning algorithms. (Apply – L3)
CO 3	Implement unsupervised Machine Learning algorithms (Apply – L3)
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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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PS O3
CO1	-	2	-	2	3	-	-	-	-	-	-	-	3	-	-
CO2	-	2	-	2	3	-	-	-	-	-	-	-	2	-	3
CO3	2	2	-	-	3	-	-	-	-	-	-	-	2	-	3
CO4	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

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4. https://www.almabetter.com/bytes/articles/outlier-detection-methods-and-techniques-in-machine-learning-with-examples
5. https://builtin.com/machine-learning/pca-in-python
6. https://www.statology.org/linear-discriminant-analysis-in-python/
7. https://machinelearningmastery.com/singular-value-decomposition-for-machine-learning/
8. https://intellipaat.com/blog/what-is-linear-regression/
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PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S NO	Date (Tentative)	Actual Date	Topics to be covered	Teaching Learning Methods	Learning Outcome COs	HOD Signature
1	01-07-2024		Basic statistical functions for Data Exploration	**TLM4**	CO1	
2	08-07-2024		Data Visualization: Box plot, Scatter plot, Histogram	**TLM4**	CO1	
3	15-07-2024		Data Pre-processing: Handling Missing values, Outliers, Normalization, Scaling	**TLM4**	CO1	
4	22-07-2024		Principle Component Analysis (PCA)	**TLM4**	CO1, CO3	
5	29-07-2024		Singular Value Decomposition (SVD)	**TLM4**	CO1, CO3	
6	05-08-2024		Linear Discriminant Analysis (LDA)	**TLM4**	CO1, CO3	
7	12-08-2024		Regression Analysis: Linear Regression, Logistic Regression, Polynomial Regression	**TLM4**	CO2, CO4	
8	19-08-2024		Regularized Regression	**TLM4**	CO2, CO4	
9	09-09-2024		K-Nearest Neighbour (kNN)	**TLM4**	CO2, CO4	
10	23-09-2024		Support Vector Machines (SVMs)	**TLM4**	CO2, CO4	
11	18-09-2024		Random Forest model	**TLM4**	CO2, CO4	
12	30-09-2024		AdaBoost and XGBoost Classifiers	**TLM4**	CO2, CO4	
13	07-10-2024		Exploring Feature Selection Methods a) Filter Methods b) Wrapper Methods	**TLM4**	CO1, CO2	
14	14-10-2024		Exploring Model Evaluation Metrics	**TLM4**	CO1, CO2	
15	21-10-2024		Practice All exercises	**TLM4**	CO1, CO2 CO3	
16	28-10-2024		Lab Internal Exam			

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
Day-to-day work	**D1=05**
Record	**R1=05**
Internal Test	**IT1=5**
Continuous Internal Evaluation (CIE)=D1+R1+IT1	**15**
Procedure/Algorithm	**P1=5**
Experimentation/Program execution	**E1=10**
Observations/Calculations/Validation	**O1=10**
Result/Inference	**R1=5**
Viva voce	**V1=5**
Semester End Examination (SEE)= P1+ E1+ O1+ V1	**35**
Total Marks = CIE+SEE	**50**

PART-D

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 modelling 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	**Ethic**s: 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):

PSO 1	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	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.Sambasivarao**	**Dr.D.Venkata Subbaiah**	**Mrs. M. Hema Latha**	**Dr.B. Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PROGRAM	**:** Information Technology, V -Sem
ACADEMIC YEAR	**:** 2024-25
COURSE NAME & CODE	**:** Skill Advanced Course: IoT Application Development using Python
L-T-P STRUCTURE	**:** 1-0-2
COURSE CREDITS	**:** 2
COURSE INSTRUCTOR	**:** Dr. Phaneendra Kanakamedala

Prerequisite: Python programming

Course Educational Objective (CEO): The objective of this course, to give a comprehensive view of the Internet of Things (Applications / Potentials / Challenges). It enables you a design and implement IoT circuits and solutions.

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

CO1: Recognize various devices, sensors, and applications. **(Understand – L2)**
CO2: Apply design concept to IoT solutions **(Apply – L3)**
CO3: Construct IoT based sensor systems. **(Apply – L3)**
CO 4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

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

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Name of the Experiment	Expected Date	Actual Date	Remarks
	Module - I			
1.	Start Raspberry Pi and try various Linux commands in command terminal windows, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.	05-07-2024		
	Module - II			
2.	Run some python programs on Pi like: 1. Read your name and print Hello message with name 2. Read two numbers and print their sum, difference, product, and division. 3. Word and character count of a given string. 4. Area of a given shape (rectangle, triangle, and circle) reading shape and appropriate values from standard input	12-07-2024		
	Module - III			
3.	Run some python programs on Pi like: 1. Print a name 'n' times, where name and n are read from standard input, using for and while loops. 2. Handle Divided by Zero Exception. 3. Print current time for 10 times with an interval of 10 seconds. 4. Read a file line by line and print the word count of each line.	19-07-2024		
	Module - IV			
4.	1. Light an LED through Python program 2. Get input from two switches and switch on corresponding LEDs.	26-07-2024 02-08-2024		

Module - V				
5.	1. Study and Configure Raspberry Pi. 2. Switch on a relay to Light an LED through Python program	09-08-2024 16-08-2024		
I-MID EXAMINATIONS				
Module - VI				
6.	1. Access an image through a Pi web cam. 2. Control a light source using web page.	23-08-2024 30-08-2024		
Module - VII				
7.	1. Motion Detecting Sensor to open the room door and switch on the light. 2. Get an Alarm and Sprinkle water if Fire is detected in the room.	06-09-2024 13-09-2024		
Module - VIII				
8.	1. Set the siren and open the door if smoke is detected in the room. 2. Smart Room Temperature Monitoring System.	20-09-224 27-09-2024		
Module - IX				
9.	**Open Ended Problem:** Students are required to submit an IoT based project using microcontroller or a Raspberry Pi and connecting various sensors and actuators. The data for the same should be displayed via a webpage or a web app.	04-10-2024 18-10-2024		
Additional Experiments				
10.	1. Building Intrusion Detection System with Arduino and Ultrasonic Sensor **2.** Interfacing of the Relay with Arduino.	25-10-2024		
	Internal Practical Examination	01-11-2024		

TEXTBOOKS:

1. Simon Monk, "**Programming the Raspberry Pi: Getting started with python**", Jan 2012, Mcgraw Hill Professional.
2. Alex Bradbury and Ben Everard, "**Learning Python with Raspberry Pi**", Feb 2014, John Wiley & Sons

REFERENCES:

1. Vijay Madisetti and Arshdeep Bahga, "**Internet of Things (A Hands-on Approach)**", 1st Edition, VPT, 2014.
2. **Getting Started with Raspberry Pi**, Matt Richardson & Shawn Wallace, O'Reilly (SPD),

   2014, ISBN: 9789350239759.
3. John Dean, **Web Programming with HTML5, CSS and JavaScript**, 2018, Jones and

   Bartlett Publishers Inc., ISBN-10: 9781284091793.
4. N.Matthew, R.Stones and Wrox, "**Beginning Linux Programming**", Wiley India Edition, 4th Edition

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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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	Organize, Analyze, and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools.

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	01-07-2024	31-08-2024	9W
I Mid Examinations	02-09-2024	07-09-2024	1W
II Phase of Instructions	09-09-2024	02-11-2024	8W
II Mid Examinations	04-11-2024	09-11-2024	1W
Preparation and Practical's	11-11-2024	16-11-2024	1W
Semester End Examinations	18-11-2024	30-11-2024	2W

Signature of the Faculty				
Name of the Faculty	**Dr. K. Phaneendra**	**Dr. K. Phaneendra**	**Dr. K. Phaneendra**	**Dr. B. Srinivasa Rao**
Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. B. Sarath Chandra
Course Name & Code : Mean Stack Technologies & 20CSS3
L-T-P Structure : 1-0-2 Credits : 2
Program/Sem/Sec : B.Tech., IT., III-Sem.,-A A.Y : 2024-25

PRE-REQUISITE: Mathematics.

Course Educational Objective: In this course student will learn about the fundamentals of HTML, JavaScript, Node.js, Express.JS, MongoDB and React.js. Write programs using the Node.js and Express.js with MongoDB as server side and React.js as front-end, by these technologies students gain skills to Web Application Development with Database.

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

CO 1	Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles (Apply-L3)
CO 2	Build a basic web server using Node.js , Exress.js and also working with Node Package Manager (NPM) (Apply-L3)
CO 3	Make use of Typescript to optimize JavaScript code by using the concept of strict type checking. (Apply-L3)
CO4	Improve individual / teamwork skills, communication & report writing skills with ethical values

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								3		
CO2	3				3								3		
CO3		3			3										3
CO4										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).

PART-B (SYLLABUS)

Module 1: HTML5 - The Language

Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes.

Module 2: HTML5 - The Language

Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes , Creating Form Elements, Color and Date Pickers, Select and Datalist Elements, Input Elements – Attributes, Media, Iframe.

Module 3: JavaScript

Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements, Types of Loops

Module 4: JavaScript

Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating Modules, Consuming Modules.

Module 5: JavaScript

Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Method.

Module 6: Node.js

How to use Node.js, Create a web server in Node.js, Modular programming in Node.js, Restarting Node Application, File Operations.

Module 7: Express.js

Defining a route, Handling Routes, Route Parameters, Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models.

Module 8: MongoDB

CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware.

Module 9: Typescript

Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Optional and Default Parameters.

Module 10: Typescript

Rest Parameter, Creating an Interface, Duck Typing, Function Types

Module 11: Typescript

Extending Interfaces, Classes, Constructor, Access Modifiers

Module 12: Typescript

Properties and Methods, Creating and using Namespaces, Creating and using Modules, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints

COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction Course Outcomes and Program Outcomes	4	05-07-2024		TLM8	
2.	Module 1	4	05-07-2024		TLM8	
3.	Module 2	4	12-07-2024		TLM8	
4.	Module 3	4	19-07-2024		TLM8	
5.	Module 4	4+4	02-08-2024 09-08-2024		TLM8	
6.	Module 5	4	16-08-2024		TLM8	
7.	Module 6	4	23-08-2024		TLM8	
8.	Module 7	4	30-08-2024 13-09-2024		TLM8	
9.	Module 8	4+4	20-09-2024 27-09-2024		TLM8	
10.	Module 9	4	13-10-2024		TLM8	
11.	Module 10	4	18-10-2024		TLM8	
12.	Module 11	4	25-10-2024		TLM8	
13.	Module 12	4	01-11-2024		TLM8	
Additional Lab Experiments						
14.	React.js Function and Class Component Creation	4	01-11-2024		TLM8	
15.	React.js State and Forms	4	01-11-2024		TLM8	

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: A.Y 2024-25

Description	From	To	Weeks
I Phase of Instructions	01-07-2024	31-08-2024	8W
I Mid Examinations	**02-09-2024**	**07-09-2024**	**1 W**
II Phase of Instructions	09-09-2024	02-11-2024	8W
II Mid Examinations	**04-11-2024**	**09-11-2024**	**1 W**
Preparation and Practical	11-11-2024	16-11-2024	1 W
Semester End Examinations	18-11-2024	30-11-2024	2 W

PART-C

EVALUATION PROCESS (R20 Regulations):

Evaluation Task	**Marks**
Day-to-day work	A1 = 05
Record	A2 = 05
Internal test	A3 = 05
CIE Total: (A1+A2+A3)	**M1 = 15**
Procedure/Algorithm	B1 = 5
Experimentation/Program execution	B2 = 10
Observations/Calculations/Validation	B3 = 10
Result/Inference	B4 = 5
Viva voce	B5 = 5
SEE Total: (B1+B2+B3+B4+B5)	**M2 = 35**
Total Marks = CIE + SEE = (M1+M2)	**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.
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PSO 1	Organize, Analyze and Interpret the data to extract meaningful conclusions.
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Title	**Course Instructor**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr. B. Sarath Chandra	Dr. S. Naganjaneyulu	Dr. B. Srinivasa Rao
Signature			