



# 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.

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## DEPARTMENT OF INFORMATION TECHNOLOGY

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr.K.RAVITEJA

**Course Name & Code** : PAI & 20CS16

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

**Program/Sem/Sec** :BTECH/V/A&B

**Credits:** 3

**A.Y.:** 2022-23

**PREREQUISITE:** Basic Engineering and Mathematics knowledge

**COURSE EDUCATIONAL OBJECTIVES (CEOs):**

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

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

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

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

**TEXTBOOKS:**

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

**REFERENCE BOOKS:**

<b>R1</b>	Nils J.Nilsson "Artificial Intelligence - A New Synthesis", ,Morgan Kaufmann, 1988
<b>R2</b>	David poole,Alan Mackworth, "Artificial Intelligence: Foundations for computational agents",Cambridge Univ.press,2010.
<b>R3</b>	Ronald Brachman, "Knowledge representation and Reasoning", Morgan Kaufmann,2004.
<b>R4</b>	Frank van Harmelen,Vladimir Lifschitz,Bruce Porter(Eds),"Handbook of Knowledge representation",Elsevier,2008.
<b>R5</b>	Ivan Bratko," Prolog Programming for Artificial Intelligence",4 <sup>th</sup> 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	18/7/22		TLM1	
2.	Applications of AI	1	20/7/22		TLM1	
3.	History of AI	1	21/7/22		TLM1	
4.	Types of AI	1	23/7/22		TLM1	
5.	Agents and rationality	1	25/7/22		TLM2	
6.	Structure of the agents	1	27/7/22		TLM2	
7.	Agent environment and nature of the environment	1	28/7/22		TLM2	
8.	Types of agents-Simple reflex agents and model-based agents	1	30/7/22		TLM2	
9.	Types of agents-Goal based agents and Utility-based agents	1	01/8/22		TLM2	
10.	Types of agents-Learning agents	1	03/8/22		TLM2	
11.	Problems, search spaces	1	04/8/22		TLM2	
12.	Defining the problem as state space search	1	06/8/22		TLM2	
13.	Production system	1	08/8/22		TLM2	
14.	Problem characteristics	1	11/8/22		TLM2	
15.	Issues in the design of search programs.	1	13/8/22		TLM2	
<b>No. of classes required to complete UNIT-I: 15</b>				<b>No. of classes taken:</b>		

#### 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	17/8/22		TLM2	
17.	Properties of search algorithms and types of search algorithms	1	18/8/22		TLM2	
18.	Uninformed search algorithms: Breadth-first Search	1	20/8/22		TLM2	
19.	Depth-first Search and Depth-limited Search	1	22/8/22		TLM2	
20.	Iterative deepening depth-first search.	1	24/8/22		TLM2	
21.	Uniform cost search, Bidirectional search.	1	25/8/22		TLM2	
22.	Informed/Heuristic Search algorithms: Greedy best-first search algorithm	1	27/8/22		TLM2	
23.	A* Search algorithm	1	29/8/22		TLM2	
24.	Hill climbing algorithm	1	01/9/22		TLM2	
25.	Constraint satisfaction problem	1	03/9/22		TLM2	
26.	Means-Ends Analysis	1	05/09/22		TLM2	
<b>No. of classes required to complete UNIT-II: 11</b>				<b>No. of classes taken:</b>		

#### 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
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27.	Adversarial search/Game playing: Introduction	1	07/9/22		TLM2	
28.	Minmax Algorithm	1	08/9/22		TLM2	
29.	Alpha-Beta Pruning	1	10/9/22		TLM2	
30.	Knowledge representation: Representations and mappings	2	03/10/22 06/10/22		TLM2	
31.	Approaches of Knowledge representation	2	08/10/22 10/10/22		TLM2	
32.	Issues in Knowledge Representation	2	12/10/22 13/10/22		TLM2	
<b>No. of classes required to complete UNIT-III: 09</b>					<b>No. of classes taken:</b>	

#### 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	15/10/22		TLM2	
34.	Representing instance and Isa relationships	2	17/10/22 19/10/22		TLM2	
35.	Computable functions and predicates	1	20/10/22		TLM2	
36.	Resolution	2	22/10/22 26/10/22		TLM2	
37.	Natural deduction	1	27/10/22		TLM2	
38.	Representing knowledge using Rules: Procedural verses declarative knowledge	1	29/10/22		TLM2	
39.	Logic programming	1	31/10/22		TLM2	
40.	Forward verses backward reasoning	1	02/11/22		TLM2	
41.	Matching	1	03/11/22		TLM2	
42.	Control knowledge	1	05/11/22		TLM2	
<b>No. of classes required to complete UNIT-IV: 12</b>					<b>No. of classes taken:</b>	

#### 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	07/11/22 09/11/22		TLM2	
44.	Certainty factors and rule-based systems	2	10/11/22 12/11/22		TLM2	
45.	Bayesian networks	2	14/11/22 16/11/22		TLM2	
46.	Dempster – Shafer Theory	2	17/11/22 19/11/22		TLM2	
47.	Fuzzy logic	1	21/11/22		TLM2	
48.	Learning: Overview of different forms of learning	1	23/11/22		TLM2	
49.	Learning Decision Trees	1	24/11/22		TLM2	
50.	Neural networks	1	26/11/22		TLM2	
<b>No. of classes required to complete UNIT-V: 12</b>					<b>No. of classes taken:</b>	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	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))	<b>M=30</b>
Cumulative Internal Examination (CIE): M	<b>30</b>
Semester End Examination (SEE)	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

### PART-D

#### PROGRAMME OUTCOMES (POs):

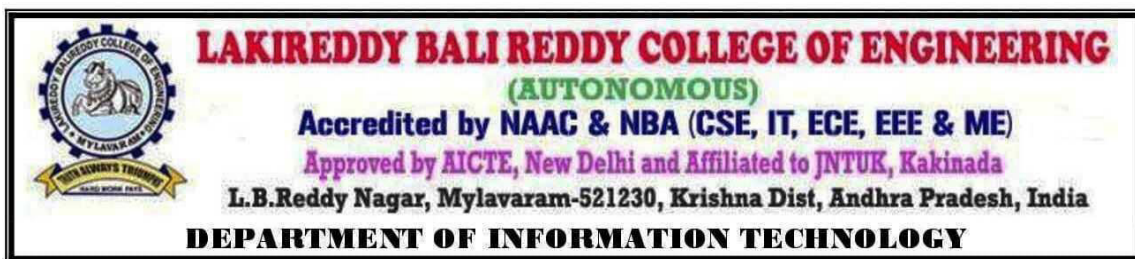
<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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.
<b>PO 6</b>	<b>The engineer and society:</b> 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.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader

	in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):**

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr.K.RAVITEJA</b>	<b>Mr.K.RAVITEJA</b>	<b>Mr G.Rajendra</b>	<b>Dr B.Srinivasa Rao</b>
<b>Signature</b>				



## COURSE HANDOUT

### Part-A

PROGRAM	:	B.Tech.(IT), V-Semester
ACADEMIC YEAR	:	2022-2023
COURSE CODE&NAME	:	20CS12 - COMPUTER NETWORKS
L-T-P STRUCTURE	:	3 - -
COURSE CREDITS	:	3
COURSE INSTRUCTOR	:	<b>Rajasekhar Kommaraju</b>
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:

<b>CO 1</b>	Demonstrate the modern network architectures from a design perspective.
<b>CO 2</b>	Apply various Data Link layer design issues and error detection & correction techniques to solve collisions problems.
<b>CO 3</b>	Demonstrate the network Layer functionalities.
<b>CO 4</b>	Outline the functions of transport layer protocols
<b>CO 5</b>	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	1	-	-	-	-	-	-	-	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](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	19-07-2022		TLM2	
2.	Introduction to Data Communication and Computer Networks	1	21-07-2022		TLM2	
3.	Protocols and Standards	1	22-07-2022		TLM2	
4.	Various Connection Topology s	1	23-07-2022		TLM2	
5.	OSI model	2	26-07-2022 28-07-2022		TLM2	
6.	Transmission Media	2	29-07-2022 30-07-2022		TLM2	
7.	LAN: Wired LAN, Wireless LANs	1	02-08-2022		TLM2	
8.	Connecting LAN and Virtual LAN.	1	04-08-2022		TLM2	
9.	<b>TUTORIAL-1, Quiz-1 &amp; Assignment-1</b>	1	05-08-2022		<b>TLM3</b>	
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	06-08-2022		TLM2	
11.	Error Detection and Error Correction - Fundamentals	1	11-08-2022		TLM2	
12.	Block coding, Hamming Distance	1	12-08-2022		TLM2	
13.	CRC	1	13-08-2022		TLM2	
14.	Flow Control and Error control protocols -Stop and Wait	1	16-08-2022		TLM2	
15.	Go back – N ARQ, Selective Repeat ARQ	1	18-08-2022		TLM2	
16.	Sliding Window, Piggybacking	1	20-08-2022		TLM2	
17.	Random Access s, Multiple access protocols -Pure ALOHA	1	23-08-2022		TLM2	
18.	Slotted ALOHA, CSMA	1	25-08-2022		TLM2	
19.	CSMA/CD,CDMA/CA	1	26-08-2022		TLM2	



20.	<b>TUTORIAL-2, Quiz-2 ASSIGNMENT-2</b>	1	27-08-2022		<b>TLM3</b>	
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	30-08-2022		TLM2	
22.	Switching	1	01-09-2022		TLM2	
23.	Logical addressing – IPV4.	1	02-09-2022		TLM2	
24.	IPV6	1	03-09-2022		TLM2	
25.	Address mapping – ARP, RARP	1	06-09-2022		TLM2	
26.	BOOTP	1	08-09-2022		TLM2	
27.	DHCP–Delivery	1	09-09-2022		TLM2	
28.	Forwarding and Unicast Routing protocols	3	10-09-2022 06-10-2022 07-10-2022		TLM2	
29.	<b>TUTORIAL-3, Quiz-3 ASSIGNMENT-3</b>	1	08-10-2022		TLM2	
No. of classes required to complete UNIT-III		11				

### 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	11-10-2022		TLM2	
31.	Process to Process Communication	1	13-10-2022		TLM2	
32.	User Datagram Protocol (UDP)	1	14-10-2022		TLM2	
33.	Transmission Control Protocol (TCP)	1	15-10-2022		TLM2	
34.	SCTP Congestion Control	1	18-10-2022		TLM2	
35.	Flow and congestion control	1	20-10-2022		TLM2	
36.	Quality of Service	1	21-10-2022		TLM2	
37.	QoS improving techniques: Leaky Bucket	1	22-10-2022		TLM2	
38.	Token Bucket algorithm.	1	25-10-2022		TLM2	
39.	<b>TUTORIAL4, Quiz-4 ASSIGNMENT-4</b>	1	27-10-2022		<b>TLM3</b>	
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	28-10-2022		TLM2	
41.	DDNS	1	29-10-2022		TLM2	
42.	TELNET	1	01-11-2022		TLM2	
43.	EMAIL	1	03-11-2022		TLM2	
44.	File Transfer Protocol (FTP), WWW	1	04-11-2022		TLM2	
45.	HTTP, SNMP	1	05-11-2022		TLM2	
46.	Bluetooth, Firewalls0	1	08-11-2022		TLM2	
47.	<b>. TUTORIAL-5, Quiz-5 ASSIGNMENT-5</b>	1	10-11-2022		<b>TLM3</b>	
No. of classes required to complete UNIT-V		08				

**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	12-11-2022		TLM2	

**Teaching Learning Methods**

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	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

### ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	18-07-2022		
I Phase of Instructions	18-07-2022	10-9-2022	8W
Technical Training/Value Added Courses	12-09-2022	24-09-2022	2W
I Mid Examinations	26-09-2022	01-10-2022	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	28-11-2022	03-12-2022	1W
Preparation and Practical's	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	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 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)**

- 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.

	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HOD</b>
Signature				
Name of the Faculty	<b>Mr. K. Rajasekhar</b>	<b>Dr.K. Naga Prasanthi</b>	<b>Mr. G.Rajendra</b>	<b>Dr. B. Srinivasa Rao</b>



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

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

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

## DEPARTMENT OF INFORMATION TECHNOLOGY

### COURSE HANDOUT

**PROGRAM** : B.Tech.,V-Sem-B, IT – R20 Regulation

**ACADEMIC YEAR** : 2022-23

**COURSE NAME & CODE** : Computer Networks Lab–20CS12

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

**COURSE CREDITS** : 1

**COURSE INSTRUCTOR** : J.Geetha Renuka

**PRE-REQUISITE** : Python,C++

**COURSE OBJECTIVE:** The Objective of the course is to prepare students to write programs to illustrate communication in networks configure different networks (LAN, WAN) and prepare students to differentiate various protocols and their performance.

### **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).

**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).**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\\_OSReferenceModelLayers.htm](http://www.tcpipguide.com/free/t_OSReferenceModelLayers.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	19-07-2022		<b>TLM8/TLM5</b>	
2.	2. To learn about network layer tools and analyze captures for congestion.	3	26-07-2022		<b>TLM8/TLM5</b>	
3.	To learn about queue management techniques, and global routing in ns3.	6	2-07-2022 16-08-2022		<b>TLM8/TLM5/TLM4</b>	
4.	To learn about broadcasting, multicasting, and bridging in a Local Area Network using ns3.	6	23-08-2022 30-08-2022		<b>TLM8/TLM5/TLM4</b>	
5.	To learn about Wi-Fi and Mobile Adhoc topologies with ns3.	3	06-09-2022		<b>TLM8/TLM5/TLM4</b>	
6.	To introduce Socket Programming in TCP and UDP.	3	20-09-2022		<b>TLM8/TLM5</b>	
7.	Observations of Transmission Control Protocol (TCP) Connection states, Flags and Flow Control.	3	11-10-2022		<b>TLM8/TLM5</b>	
8.	To learn Transmission Control Protocol (TCP) Flow Control, Error Control, and Congestion.	3	18-10-2022		<b>TLM8/TLM5</b>	

9.	. To introduce Wireshark & tcpdump, and observation of packets in a LAN network.	3	25-10-2022		<b>TLM8/TLM5</b>	
10.	To analyze HTTP packets using Wireshark tool, and understand the records returned by a DNS server.	3	1-11-2022		<b>TLM8/TLM5</b>	
11.	<b>Lab-Internal-</b>	3	22-11-2022			

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

### **ACADEMIC CALENDAR:**

Description	From	To	Weeks
Commencement of Class Work	20-09-2021		
I Phase of Instructions	18-07-2022	10-9-2022	8W
Technical Training/Value Added Courses	12-09-2022	24-09-2022	2W
I Mid Examinations	26-09-2022	01-10-2022	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	28-11-2022	03-12-2022	1W
Preparation and Practical's	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	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
<b>Cumulative Internal Examination: A+B+C</b>	<b>1,2,3</b>	<b>A+B+C=15</b>
<b>Semester End Examinations</b>	<b>1,2,3</b>	<b>E=35</b>
<b>Total Marks: A+B+C+D</b>	<b>1,2,3</b>	<b>50</b>

### **PROGRAMME OUTCOMES (POs):**



<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

<b>J.Geetha Renuka</b>	<b>Dr.K.NagaPrasanthi</b>	<b>Mr.G.Rajendra</b>	<b>Dr.B. Srinivasa Rao</b>
<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HOD</b>



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## DEPARTMENT OF MECHANICAL ENGINEERING COURSE HANDOUT

### Part-A

**PROGRAM** : B.Tech., V-Sem., IT, A & B-Section  
**ACADEMIC YEAR** : 2022-23  
**COURSE NAME & CODE** : RENEWABLE ENERGY SOURCES- 20ME81  
**L-T-P STRUCTURE** : 4-0-0  
**COURSE CREDITS** : 3  
**COURSE INSTRUCTOR** : KAMALA PRIYA B  
**COURSE COORDINATOR** : K. Lakshmi Prasad  
**PRE-REQUISITES:** Nil

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** To provide the insights on different non-conventional energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and direct energy conversion systems.

### COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

**CO1:** Compute the performance of solar energy harnessing devices and its energy scenario. **(Applying- L3)**

**CO2:** Apply the principles of energy conversion for wind and geothermal power generating plants. **(Applying - L3)**

**CO3:** Compare the power generating capacities of tidal energy, wave energy and ocean thermal energy plants. **(Understanding - L2)**

**CO4:** Illustrate the various biomass power generation system technologies. **(Understanding - L2)**

**CO5:** Comprehend the direct energy power generation systems. **(Understanding - 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	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO3	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO4	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO5	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-

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

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

### BOS APPROVED TEXT BOOKS:

**T1** G.D.Rai, Non-Conventional Energy Sources, 5<sup>th</sup> Edition 2011, Khanna Publishers, New Delhi, India.

**T2** Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.

**BOS APPROVED REFERENCE BOOKS:**

- R1** John Twidell&Tony Weir, Renewable Energy Resources – 2<sup>nd</sup> Edition, Taylor & Francis
- R2** G.N.Tiwari, Solar Energy – Fundamentals, Design, Modelling and Applications –Narosa Publication Ltd.,2000.
- R3** Ashok V Desai, Non-Conventional Energy- Wiley Eastern, 2000.

**Part-B****COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT-I : GLOBAL AND NATIONAL ENERGY SCENARIO & SOLAR ENERGY HARNESSING DEVICES**

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.	Course Outcomes & Blooms Taxonomy Levels	2	19.07.2022		TLM1/ TLM2			
2.	Over view of conventional & renewable energy sources	2	20-07-2022		TLM1/ TLM2	CO1	T1	
3.	Need & Development of renewable energy sources	2	21-07-2022		TLM1/ TLM2	CO1	T1	
4.	Types of renewable energy systems.	2	22-07-2022		TLM1/ TLM2	CO1	T1	
5.	Energy available from Sun, Solar radiation data,	1	26-07-2022		TLM1/ TLM2	CO1	T1	
6.	Flat plate and Concentrating collectors	1	27-07-2022		TLM1/ TLM2	CO1	T1	
7.	Mathematical analysis of Flat plate collectors and collector efficiency	2	28-07-2022 29-07-2022		TLM1/ TLM2	CO1	T1	
8.	Solar water Heating, Space Heating – Active and Passive heating	2	02-08-2022 03-08-2022		TLM1/ TLM2	CO1	T1	
9.	solar stills and ponds	1	04-08-2022		TLM1/ TLM2	CO1	T1	
10.	basic principle of power generation in photovoltaic cell	1	05-08-2022		TLM1/ TLM2	CO1	T1	
11.	Problems	2	09-08-2022 10-08-2022		TLM1/ TLM2	CO1	T1	
12.	<b>Quiz/Assignment</b>							
No. of classes required to complete UNIT-I		14	No. of classes taken:					

### UNIT-II : WIND ENERGY & GEOTHERMAL ENERGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly	
13.	Wind – characteristics – wind energy conversion systems – types	2	11-08-2022 12-08-2022		TLM1/ TLM2	CO2	T1		
14.	Betz model & Interference factor, Power Coefficient Torque Coefficient and thrust coefficient	3	16-08-2022 17-08-2022		TLM1/ TLM2	CO2	T1		
15.	site selection requirements.	1	18-08-2022		TLM1/ TLM2	CO2	T1		
16.	GEOTHERMAL ENERGY: Structure of Earth, Geothermal sources	2	19-08-2022 23-08-2022		TLM1/ TLM2	CO2	T1		
17.	Hot springs, Hot Rocks & Hot Aquifers	1	24-08-2022		TLM1/ TLM2	CO2	T1		
18.	Interconnection of geothermal fossil systems	1	25-08-2022		TLM1/ TLM2	CO2	T1		
19.	Problems	1	26-08-2022		TLM1/ TLM2	CO1	T1		
20.	<b>Quiz/Assignment</b>								
No. of classes required to complete UNIT-II		10			No. of classes taken:				

### UNIT-III : TIDAL ENERGY, WAVE ENERGY and OCEAN THERMAL ENERGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
21.	<b>Tidal Energy-</b> Introduction, Origin of Tides, Tidal Power generation	2	30-08-2022		TLM1/ TLM2	CO3	T1, R8	
22.	Classification of Tidal Power Plant,	1	31-08-2022		TLM1/ TLM2	CO3	T1	
23.	Site requirements	1	01-09-2022		TLM1/ TLM2	CO3	T1	
24.	<b>WAVE ENERGY:</b> Introduction, Wave energy and Power	2	02-09-2022 06-09-2022		TLM1/ TLM2	CO3	T1	

25.	Wave Energy devices – Merits and Demerits	1	07-09-2022		<b>TLM1/ TLM2</b>	CO3	T1	
26.	<b>OCEAN THERMAL ENERGY:</b> Introduction	1	08-09-2022		<b>TLM1/ TLM2</b>	CO3	T1	
27.	Working principle of Ocean Thermal Energy Conversion	2	09-09-2022 05-10-2022		<b>TLM1/ TLM2</b>	CO3	T1	
28.	OTEC Systems, Advantages and Disadvantages of OTEC plants.	2	06-10-2022 07-10-2022		<b>TLM1/ TLM2</b>	CO3	T1	
29.	<b>Quiz/Assignment</b>	11				CO3		
No. of classes required to complete UNIT-III		08			No. of classes taken:			

#### UNIT-IV : BIO – ENERGY

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
30.	<b>BIO – ENERGY:</b> Introduction	2	11-10-2022 13-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
31.	Biomass Energy Sources	1	14-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
32.	Aerobic and Anaerobic bio-conversion processes	2	18-10-2022 19-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
33.	Types of Biogas plants	1	20-10-2022					
34.	Raw Materials and properties of Bio-gas	2	21-10-2022 25-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
35.	Bio-gas plant Technology and Status	2	26-10-2022 27-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
36.	Biomass gasification	1	28-10-2022		<b>TLM1/ TLM2</b>	CO4	T1	
37.	Types and application of gasifier	2	01-11-2022 02-11-2022		<b>TLM1/ TLM2</b>	CO4	T1	
38.	<b>Quiz/Assignment</b>					CO4		
No. of classes required to complete UNIT-IV		13			No. of classes taken:			

### UNIT-V : DIRECT ENERGY CONVERSION SYSTEMS

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
39.	DIRECT ENERGY CONVERSION SYSTEMS: Introduction	2	03-11-2022 04-11-2022		TLM1/ TLM2	CO5	T1	
40.	Peltier effect, seebeck effect, Thomson effect,	2	08-11-2022 09-11-2022		TLM1/ TLM2	CO5	T1	
41.	Fuel Cells-Types.	2	10-11-2022 11-11-2022		TLM1/ TLM2	CO5	T1	
42.	Efficiency of Fuel Cells.	2	15-11-2022 16-11-2022		TLM1/ TLM2	CO5	T1	
43.	Thermoelectric power Generation	2	17-11-2022 18-11-2022		TLM1/ TLM2	CO5	T1	
44.	Thermionic electro power Generation	1	22-11-2022					
45.	MHD Generator	1	23-11-2022		TLM1/ TLM2	CO5	T1	
46.	Open and closed systems	1	24-11-2022		TLM1/ TLM2	CO5	T1	
47.	applications of direct energy energy conversion systems	1	25-11-2022		TLM1/ TLM2	CO5	T1	
48.	<b>Quiz/Assignment</b>					CO5		
No. of classes required to complete UNIT-V		14			No. of classes taken:			

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

#### Academic Calender-A.Y-2020-21

Description	From	To	Weeks
<b>B Tech V Semester</b>			
Commencement of class work	18.07.2022		
I phase of Instructions	18.07.2022	10.09.2022	8
Technical Training/Value added course	12.09.2022	24.09.2022	2
I Mid Examination	<b>26.09.2022</b>	<b>01.10.2022</b>	<b>1</b>
II phase of Instructions	03.10.2022	26.11.2022	8

II Mid Examination	<b>28.11.2022</b>	<b>03.12.2022</b>	<b>1</b>
Preparation and Practical	05.12.2022	10.12.2022	1
Semester End Examination	<b>12.12.2022</b>	<b>24.12.2022</b>	<b>2</b>

### Part - C

#### EVALUATION PROCESS:

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

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

**PEO2:** To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

**PEO3:** To develop inquisitiveness towards good communication and lifelong learning.

#### PROGRAMME OUTCOMES (POs)

**Engineering Graduates will be able to:**

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

**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.

**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.

**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.

**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.

**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.

**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.

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

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

**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.

**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.

**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.

**PSOs**

1. To apply the principles of thermal sciences to design and develop various thermal systems.

2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

3. To apply the basic principles of mechanical engineering design or evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Kamala Priya B	Mr. K. Lakshmi	Dr. P. Vijay Kumar	Dr. S. Pichi Reddy



	Prasad		
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# 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.

**DEPARTMENT OF INFORMATION TECHNOLOGY**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor:** CH. POORNA VENKATA SRINIVASA RAO

**Course Name & Code** : INTERNET OF EVERYTHING & 20IT02

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

**Credits:** 3

**Program/Sem/Sec** : B.Tech/V/A & B

**A.Y.** : 2022-23

**PREREQUISITE:** Python Programming.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

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

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

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

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

#### **TEXTBOOKS:**

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

#### **REFERENCE BOOKS:**

1. Pethuru Raj and Anupama C. Raman," The Internet of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press).
2. Adrian McEwen, —Designing the Internet of Things, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0.
3. Daniel Kellmerit, —The Silent Intelligence: The Internet of Things, 2013, ISBN: 0989973700.
4. Dieter Uckelmann et.al, Architecting the Internet of Things, Springer, 2011.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Introduction

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and Course Outcomes	1	18-07-2022		TLM1	
2.	Introduction to Internet of Things, Characteristics	1	19-07-2022		TLM1	
3.	Physical Design of IoT: Things in IoT	1	20-07-2022		TLM1	
4.	IoT Protocols	1	21-07-2022		TLM1	
5.	Logical Design of IoT: IoT Functional Block	2	25-07-2022 26-07-2022		TLM1	
6.	IoT Communication Models	1	27-07-2022		TLM1	
7.	IoT Communication API's, IoT Enabling Technologies	1	27-07-2022		TLM1	
8.	IoT Levels and Deployment Templates	2	28-07-2022 01-08-2022		TLM1	
9.	<b>Tutorial - I</b>	1	02-08-2022		TLM1	
<b>No. of classes required to complete UNIT-I: 11</b>				<b>No. of classes taken:</b>		

#### UNIT-II: The Greedy Method

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 Domain Specific IoT, Home Automation	2	03-08-2022 04-08-2022		TLM1	
11.	Domain Specific IoT: Cities, Environment	1	08-08-2022		TLM1	
12.	Domain Specific IoT: Energy, Retail	1	10-08-2022		TLM1	
13.	Domain Specific IoT: Logistics	1	11-08-2022		TLM1	
14.	Domain Specific IoT: Agriculture, Industry	1	16-08-2022		TLM1	
15.	Domain Specific IoT: Health and Life Sciences	1	17-08-2022		TLM1	
16.	<b>Tutorial-II</b>	1	18-08-2022			
<b>No. of classes required to complete UNIT-II: 8</b>				<b>No. of classes taken:</b>		

#### UNIT-III: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Introduction to M2M, Difference between IoT and M2M	2	22-08-2022 23-08-2022		TLM1	

18.	Software defined Networking for IoT	1	24-08-2022		TLM1	
19.	Network Function Virtualization	1	25-08-2022		TLM1	
20.	Need for IoT System Management, Simple Network Management Protocol (SNMP)	2	30-08-2022		TLM1	
21.	Network operator requirements and NETCONF	1	01-09-2022		TLM1	
22.	YANG Data Modeling Language	1	05-09-2022		TLM1	
23.	IoT System Management with NETCONF - YANG	1	06-09-2022		TLM1	
24.	<b>Tutorial -III</b>	1	07-09-2022		TLM1	
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-IV: Back tracking

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	What is an IoT Device, Building Blocks of IoT	1	08-09-2022		TLM1	
26.	Raspberry Pi Board Components	2	12-09-2022 13-09-2022		TLM1	
27.	Linux on Raspberry Pi	1	14-09-2022		TLM1	
28.	Raspberry Pi Interfaces and Python Programming on Raspberry Pi	3	15-09-2022 19-09-2022 20-09-2022		TLM1	
29.	<b>Tutorial -IV</b>	1	21-09-2022		TLM1	
<b>No. of classes required to complete UNIT-IV: 08</b>				<b>No. of classes taken:</b>		

#### UNIT-V: Branch and Bound

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 Cloud Storage Models and Communication API's, WAMP- Web Application Messaging Protocol	2	22-09-2022 26-09-2022		TLM1	
31.	Xively Cloud for IoT	2	10-10-2022 11-10-2022		TLM1	
32.	Python Web Application Framework- Django	1	19-10-2022		TLM2	
33.	Design of RESTful Web API	2	09-11-2022 16-11-2022		TLM2	
34.	<b>Tutorial -V</b>	1	24-11-2022		TLM2	
<b>No. of classes required to complete UNIT-V: 8</b>				<b>No. of classes taken:</b>		

**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 network design and Cloud networks	1	22-11-2022		TLM1	
2.	IoT Service integration	1	23-11-2022		TLM1	

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

**ACADEMIC CALENDAR:**

Description	From	To	Weeks
I Phase of Instructions-1	18-07-2022	10-09-2022	8W
I Mid Examinations	26-09-2021	01-10-2022	
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	28-11-2022	03-12-2022	
Preparation and Practical's	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

**PART-C****PEVALUATION 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))	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

**PART-D****PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of
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	complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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.
<b>PO 6</b>	<b>The engineer and society:</b> 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.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of Organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. Ch. Poorna Venkata Srinivasa Rao	Mr. Ch. Poorna Venkata Srinivasa Rao	Dr.S.Naganjaneylulu	Dr.B.Srinivasa Rao
Signature				



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<http://www.lbrce.ac.in>, Phone: 08659 – 222933, Fax: 08659 – 222931 Extn:109

**DEPARTMENT OF INFORMATION TECHNOLOGY**

PROGRAM : B.Tech., V-Sem., IT – R20 Regulation  
 ACADEMIC YEAR : 2022-23  
 COURSE NAME & CODE : Machine learning Lab-20AD53  
 L-T-P STRUCTURE : 0-0-2  
 COURSE CREDITS : 1  
 COURSE INSTRUCTOR : A.Sarvani  
 PRE-REQUISITE : Probability and Statistics, Programming Knowledge

**Course Educational Objective:** 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 (CO):** At the end of this course, the student will be able to:

- CO1:** Apply the appropriate pre-processing techniques on data set. (**Apply – L3**)
- CO2:** Implement supervised Machine Learning algorithms. (**Apply – L3**)
- CO3:** 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	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
<b>CO1</b>	-	2	-	2	3	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	-	2	-	2	3	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	2	2	-	-	3	-	-	-	-	-	-	-	-	-	-
<b>CO4</b>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

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

**COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

S.N O	CYCLE	Date	List Of Programmes	Signature
1	-	19-07-2022	Introduction of lab	
2	1	26-07-2022	Basic statistical functions for data exploration	
3	2	02-08-2022	Data Visualization: Box plot, scatter plot, histogram	
4	3	16-08-2022 23-08-2022	Data Pre-processing: Handling missing values, outliers, normalization, Scaling	
5	4	30-08-2022	Principal Component Analysis (PCA)	
6	5	06-09-2022	Singular Value Decomposition (SVD)	
7	6	13-09-2022	Linear Discriminant Analysis (LDA)	
8	7	20-09-2022	Regression Analysis: Linear regression, Logistic regression, Polynomial regression	
9	8	27-09-2022	Regularized Regression	
10	9	04-10-2022	K-Nearest Neighbour (kNN) Classifier	
11	10	11-10-2022	Support Vector Machines (SVMs)	
12	11	18-10-2022	Random Forest model	
13	12	25-10-2022	AdaBoost Classifier and XGBoost	
	-	01-11-2022	Revision and practice	
	-	15-11-2022	Revision and practice	
14	-	22-11-2022	Internal Exam	

**ACADEMIC CALENDAR:**

Description	From	To	Weeks
Commencement of Class Work	18-07-2022		
I Phase of Instructions	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	<b>26-09-2022</b>	<b>01-10-2022</b>	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	<b>28-11-2022</b>	<b>03-12-2022</b>	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

A.Sarvani	Dr.P.Bhagath	Dr.B.Srinivasa Rao
<b>Course Instructor</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>





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**DEPARTMENT OF INFORMATION TECHNOLOGY**

PROGRAM : B.Tech., V-Sem., IT – R20 Regulation  
 ACADEMIC YEAR : 2022-23  
 COURSE NAME & CODE : Machine learning Lab-20AD53  
 L-T-P STRUCTURE : 0-0-2  
 COURSE CREDITS : 1  
 COURSE INSTRUCTOR : A.Sarvani  
 PRE-REQUISITE : Probability and Statistics, Programming Knowledge

**Course Educational Objective:** 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 (CO):** At the end of this course, the student will be able to:

- CO1:** Apply the appropriate pre-processing techniques on data set. (**Apply – L3**)
- CO2:** Implement supervised Machine Learning algorithms. (**Apply – L3**)
- CO3:** 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	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
<b>CO1</b>	-	2	-	2	3	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	-	2	-	2	3	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	2	2	-	-	3	-	-	-	-	-	-	-	-	-	-
<b>CO4</b>	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

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

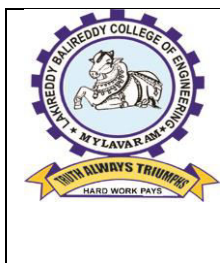
**COURSE DELIVERY PLAN (LESSON PLAN): Section-B**

S.N O	CYCLE	Date	List Of Programmes	Signature
1	-	22-07-2022	Introduction of lab	
2	1	29-07-2022	Basic statistical functions for data exploration	
3	2	05-08-2022	Data Visualization: Box plot, scatter plot, histogram	
4	3	12-08-2022 26-08-2022	Data Pre-processing: Handling missing values, outliers, normalization, Scaling	
5	4	02-09-2022	Principal Component Analysis (PCA)	
6	5	09-09-2022	Singular Value Decomposition (SVD)	
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8	7	23-09-2022	Regression Analysis: Linear regression, Logistic regression, Polynomial regression	
9	8	30-09-2022	Regularized Regression	
10	9	07-10-2022	K-Nearest Neighbour (kNN) Classifier	
11	10	14-10-2022	Support Vector Machines (SVMs)	
12	11	21-10-2022	Random Forest model	
13	12	28-10-2022	AdaBoost Classifier and XGBoost	
14	-	04-11-2022	Revision and practice	
15	-	11-11-2022	Revision and practice	
16	-	18-11-2022	Revision and practice	
17	-	25-11-2022	Internal Exam	

**ACADEMIC CALENDAR:**

Description	From	To	Weeks
Commencement of Class Work	18-07-2022		
I Phase of Instructions	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	<b>26-09-2022</b>	<b>01-10-2022</b>	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	<b>28-11-2022</b>	<b>03-12-2022</b>	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

A.Sarvani	Dr.P.Bhagath	Dr.B.Srinivasa Rao
<b>Course Instructor</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>



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**DEPARTMENT OF INFORMATION TECHNOLOGY**

## COURSE HANDOUT

### PART-A

Name of Course Instructor : A.Sarvani  
Course Name & Code : Machine Learning (20AD04)  
L-T-P Structure : 3-0-0 Credits: 3  
Program/Sem/Sec : B.Tech., IT., V-B A.Y: 2022-23

**PRE-REQUISITE: Probability and Statistics, Data Warehousing and Data Mining**

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course provides the basic concepts and techniques of Machine Learning and helps to use recent machine learning software for solving practical problems. It enables students to gain experience by doing independent study and research.

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

<b>CO 1</b>	Identify the characteristics of machine learning. (Understand- L2)
<b>CO 2</b>	Understand the Model building and evaluation approaches (Understand- L2)
<b>CO 3</b>	Apply regression algorithms for real-world Problems. (Apply- L3)
<b>CO 4</b>	Handle classification problems via supervised learning algorithms. (Apply- L3)
<b>CO 5</b>	Learn advanced learning techniques to deal with complex data (Apply- L3)

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

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

#### **TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section C****UNIT-I : 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	HOD Sign Weekly
1.	Introduction	1	18.07.2022		TLM1	
2.	Types of Machine Learning-supervise Learning	1	20.07.2022		TLM1	
3.	Unsupervised Learning	1	21.07.2022		TLM1	
4.	Reinforcement Learning	1	22.07.2022		TLM1	
5.	Applications of Machine Learning,	1	25.07.2022		TLM1	
6.	Issues in Machine Learning	1	27.07.2022		TLM1	
7.	Introduction, Machine Learning Activities	1	28.07.2022		TLM1	
8.	Basic Types of Data in Machine Learning	1	29.07.2022		TLM1	
9.	Exploring Structure of Data	1	01.08.2022		TLM1	
10.	Exploring Structure of Data	1	03.08.2022		TLM1	
11.	Data Quality and Remediation,	1	04.08.2022		TLM1	
12.	Data PreProcessing	1	05.08.2022		TLM2	
<b>No. of classes required to complete UNIT-I</b>		<b>12</b>		<b>No of classes taken</b>		

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

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13	Introduction,	1	08.08.2022			
14.	selecting a Model, training a Model (for Supervised Learning),	2	10.08.2022 11.08.2022		TLM1	
15.	, Model Representation and Interpretability	1	12.08.2022		TLM1	

16.	Evaluating Performance of a Model.	1	17.08.2022		TLM1	
17.	Feature Transformation	1	18.08.2022		TLM1	
18.	Feature Construction	1	22.08.2022		TLM1	
19.	Feature Extraction	1	24.08.2022		TLM1	
20.	Principal Component Analysis (PCA),	2	25.08.2022 26.08.2022		TLM1	
21.	Singular Value Decomposition	2	29.08.2022 02.09.2022		TLM2	
22	Linear Discriminant Analysis (LDA), Feature Subset Selection	2	05.09.2022 07.09.2022		TLM2	
Revision of Unit-I,II		1	08.09.2022		-	
		1	09.09.2022		-	
		1	12.09.2022		-	
<b>No. of classes required to complete UNIT-II</b>		<b>11</b>		<b>No of classes taken</b>		

### UNIT-III: Regression

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	Introduction to regression analysis, Simple linear regression	2	15.09.2022 16.09.2022		TLM1	
24.	Multiple linear regression	2	19.09.2022 21.09.2022		TLM1	
25.	Assumptions in Regression Analysis, Main Problems in Regression Analysis	1	22.09.2022		TLM1	
26.	Improving Accuracy of the linear regression model,	1	23.09.2022		TLM1	
27.	Polynomial Regression Model	1	06.10.2022		TLM1	
28.	Logistic Regression	1	07.10.2022		TLM1	
29.	Regularization	1	10.10.2022		TLM1	
30.	Regularized Linear Regression	1	12.10.2022		TLM1	
31.	Regularized Logistic Regression.	1	13.10.2022		TLM2	

32.	Revision	1	14.10.2022			
<b>No. of classes required to complete UNIT-III</b>		<b>11</b>		<b>No of classes taken</b>		

#### UNIT-IV: Supervised Learning: Classification

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Supervised Learning Introduction and example	1	17.10.2022		TLM1	
33.	Classification Model	2	19.10.2022 20.10.2022		TLM1	
34.	Classification Learning Steps	1	21.10.2022		TLM1	
35.	k-Nearest Neighbour (kNN)	2	26.10.2022 27.10.2022		TLM1	
36.	Support vector Machines	2	28.10.2022 31.10.2022		TLM1	
37.	Random Forest model	2	02.11.2022 03.11.2022		TLM2	
<b>No. of classes required to complete UNIT-IV</b>		<b>10</b>		<b>No of classes taken</b>		

#### UNIT-V: Other Types of Learning

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Bagging	2	04.11.2022 07.11.2022		TLM1	
39.	Boosting	2	09.11.2022 10.11.2022		TLM2	
40	Stacking and its impact on bias and variance	2	11.11.2022 14.11.2022		TLM2	
41	AdaBoost	2	16.11.2022 17.11.2022		TLM2	
42	,Gradient Boosting Machines	2	18.11.2022 21.11.2022		TLM2	
43	XGBoost	2	23.11.2022 24.11.2022		TLM2	
44	Reinforcement Learning- Q learning	1	25.11.2022		TLM2	
<b>No. of classes required to complete UNIT-V</b>		<b>13</b>		<b>No of classes taken</b>		

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

### PART-C

#### ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	18-07-2022		
I Phase of Instructions	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	<b>26-09-2022</b>	<b>01-10-2022</b>	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	<b>28-11-2022</b>	<b>03-12-2022</b>	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

#### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	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):

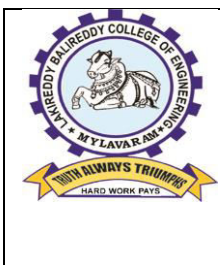
<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

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<b>Course Instructor</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>





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(AUTONOMOUS)**  
L.B. REDDY NAGAR, MYLAVARAM – 521230. A.P. INDIA  
Affiliated to JNTUK Kakinada & Approved by AICTE, New Delhi  
Accredited By NAAC, Accredited By NBA Tier-I & Certified by ISO 9001:2015  
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**DEPARTMENT OF INFORMATION TECHNOLOGY**

## COURSE HANDOUT

### PART-A

Name of Course Instructor : A.Sarvani  
Course Name & Code : Machine Learning (20AD04)  
L-T-P Structure : 3-0-0 Credits: 3  
Program/Sem/Sec : B.Tech., IT., V-B A.Y: 2022-23

**PRE-REQUISITE: Probability and Statistics, Data Warehousing and Data Mining**

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course provides the basic concepts and techniques of Machine Learning and helps to use recent machine learning software for solving practical problems. It enables students to gain experience by doing independent study and research.

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

<b>CO 1</b>	Identify the characteristics of machine learning. (Understand- L2)
<b>CO 2</b>	Understand the Model building and evaluation approaches (Understand- L2)
<b>CO 3</b>	Apply regression algorithms for real-world Problems. (Apply- L3)
<b>CO 4</b>	Handle classification problems via supervised learning algorithms. (Apply- L3)
<b>CO 5</b>	Learn advanced learning techniques to deal with complex data (Apply- L3)

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

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

#### **TEXT BOOKS:**

1. Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das, “Machine Learning”, Pearson Education India ,1st edition,2015.

2. Tom M. Mitchell, "Machine Learning", MGH, 1997.

**REFERENCE BOOKS:**

5. Shai Shalev-Shwartz, Shai Ben David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge
6. Peter Harington, "Machine Learning in Action", Cengage, 1st edition, 2012.
7. Peter Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge university press, 2012.
8. 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): Section C**

**UNIT-I : 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	HOD Sign Weekly
13.	Introduction	1	18.07.2022		TLM1	
14.	Types of Machine Learning-supervise Learning	1	20.07.2022		TLM1	
15.	Unsupervised Learning	1	21.07.2022		TLM1	
16.	Reinforcement Learning	1	23.07.2022		TLM1	
17.	Applications of Machine Learning,	1	25.07.2022		TLM1	
18.	Issues in Machine Learning	1	27.07.2022		TLM1	
19.	Introduction, Machine Learning Activities	1	28.07.2022		TLM1	
20.	Basic Types of Data in Machine Learning	1	30.07.2022		TLM1	
21.	Exploring Structure of Data	1	01.08.2022		TLM1	
22.	Exploring Structure of Data	1	03.08.2022		TLM1	
23.	Data Quality and Remediation,	1	04.08.2022		TLM1	
24.	Data Preprocessing	1	06.08.2022		TLM2	
<b>No. of classes required to complete UNIT-I</b>		<b>12</b>		<b>No of classes taken</b>		

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

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13	Introduction,	1	08.08.2022			
14.	selecting a Model, training a Model (for Supervised Learning),	2	10.08.2022 11.08.2022		TLM1	
15.	, Model Representation and	1	17.08.2022		TLM1	

	Interpretability					
16.	Evaluating Performance of a Model.	1	18.08.2022		TLM1	
17.	Feature Transformation	1	20.08.2022		TLM1	
18.	Feature Construction	1	22.08.2022		TLM1	
19.	Feature Extraction	1	24.08.2022		TLM1	
20.	Principal Component Analysis (PCA),	2	25.08.2022 27.08.2022		TLM1	
21.	Singular Value Decomposition	2	29.08.2022 03.09.2022		TLM2	
22	Linear Discriminant Analysis (LDA), Feature Subset Selection	2	05.09.2022 07.09.2022		TLM2	
Revision of Unit-I,II		1	08.09.2022		-	
		1	10.09.2022		-	
		1	12.09.2022		-	
<b>No. of classes required to complete UNIT-II</b>		<b>11</b>		<b>No of classes taken</b>		

### UNIT-III: Regression

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	Introduction to regression analysis, Simple linear regression	2	15.09.2022 17.09.2022		TLM1	
24.	Multiple linear regression	2	19.09.2022 21.09.2022		TLM1	
33.	Assumptions in Regression Analysis, Main Problems in Regression Analysis	1	22.09.2022		TLM1	
34.	Improving Accuracy of the linear regression model,	1	24.09.2022		TLM1	
35.	Polynomial Regression Model	1	06.10.2022		TLM1	
36.	Logistic Regression	1	08.10.2022		TLM1	
37.	Regularization	1	10.10.2022		TLM1	
38.	Regularized Linear Regression	1	12.10.2022		TLM1	
39.	Regularized Logistic Regression.	1	13.10.2022		TLM2	

40.	Revision	1	15.10.2022		
<b>No. of classes required to complete UNIT-III</b>		<b>11</b>		<b>No of classes taken</b>	

#### UNIT-IV: Supervised Learning: Classification

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Supervised Learning Introduction and example	1	17.10.2022		TLM1	
33.	Classification Model	2	19.10.2022 20.10.2022		TLM1	
38.	Classification Learning Steps	1	22.10.2022		TLM1	
39.	k-Nearest Neighbour (kNN)	2	26.10.2022 27.10.2022		TLM1	
40.	Support vector Machines	2	29.10.2022 31.10.2022		TLM1	
41.	Random Forest model	2	02.11.2022 03.11.2022		TLM2	
<b>No. of classes required to complete UNIT-IV</b>		<b>10</b>		<b>No of classes taken</b>		

#### UNIT-V: Other Types of Learning

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Bagging	2	05.11.2022 07.11.2022		TLM1	
39.	Boosting	2	09.11.2022 10.11.2022		TLM2	
40	Stacking and its impact on bias and variance	2	12.11.2022 14.11.2022		TLM2	
41	AdaBoost	2	16.11.2022 17.11.2022		TLM2	
42	,Gradient Boosting Machines	2	19.11.2022 21.11.2022		TLM2	
43	XGBoost	2	23.11.2022 24.11.2022		TLM2	
44	Reinforcement Learning- Q learning	1	26.11.2022		TLM2	
<b>No. of classes required to complete UNIT-V</b>		<b>13</b>		<b>No of classes taken</b>		

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

### PART-C

#### ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work	18-07-2022		
I Phase of Instructions	18-07-2022	10-09-2022	8W
Technical Training/Value added courses	12-09-2022	24-09-2022	2W
I Mid Examinations	<b>26-09-2022</b>	<b>01-10-2022</b>	1W
II Phase of Instructions	03-10-2022	26-11-2022	8W
II Mid Examinations	<b>28-11-2022</b>	<b>03-12-2022</b>	1W
Preparation and Practicals	05-12-2022	10-12-2022	1W
Semester End Examinations	12-12-2022	24-12-2022	2W

#### EVALUATION PROCESS (R20 Regulations):

Evaluation Task	Marks
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	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):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

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# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)

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

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

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Asha . G  
Course Name & Code : SATELLITE TECHNOLOGY - 20EC81  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech., IT., V-Sem., A.Y : 2022-23  
**PRE-REQUISITE:**Basics related to Dynamics, Kinematics, Thermodynamics and Properties of an Ellipse.

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

**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 ( <b>Remember-L1</b> )
CO 2	Summarize the functions of satellite space segment, earth segment, Multiple access techniques and satellite services. ( <b>Understand-L2</b> )
CO 3	Illustrate the operational principles of satellite power system and space craft Control mechanism. ( <b>Understand-L2</b> )
CO 4	Outline the concepts of orbital mechanics & satellite communication and its application ( <b>Understand-L2</b> )

**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	PS O1	PS O2	PS O3
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<sup>nd</sup> edition, 2003.

#### REFERENCE BOOKS:

R1 M. Richharia, "Satellite Communications Systems: Design principles", BS Publications, 2<sup>nd</sup> Edition, 2005.

R2 D.C Agarwal, "Satellite communications", Khanna Publications, 5<sup>th</sup> Edition, 2006.

R3 Richard, Filipowsky Eugen 1 Muehllorf, 'Space Communication Systems', Prentice Hall 1995.



## 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	19/07/2022		TLM2	
2.	Brief introduction about the course and its importance.	1	20/07/2022		TLM2	
3.	Need for Space Communications, Definition of a satellite and Orbit.	2	21/07/2022 22/07/2022		TLM2	
4.	General Structure of satellite Communication	1	26/07/2022		TLM2	
5.	Types of Spacecraft Orbits	1	27/07/2022		TLM2	
6.	Common satellite applications and missions	1	28/07/2022		TLM2	
7.	Launch Vehicles and Launching of a satellite	1	29/07/2022		TLM2	
8.	Satellite system and their functions- (Structural, thermal, power mechanisms, propulsion, etc)	2	02/08/2022 03/08/2022		TLM2	
9.	Revision	1	04/08/2022			
No. of classes required to complete UNIT-I: 9				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	05/08/2022		TLM1	
2.	Newton's laws of Force, Fundamentals of Orbital Dynamics- Kepler's laws	2	10/08/2022 11/08/2022		TLM2	
3.	Orbital parameters and determination	2	12/08/2022 16/08/2022		TLM2	
4.	Orbital Perturbations-Need for station keeping	2	17/08/2022 18/08/2022		TLM1	
5.	GPS systems-Architecture of GPS, Working Principle of GPS	2	23/08/2022 24/08/2022		TLM2	
6.	Ground station or Earth station Requirements	2	26/08/2022 30/08/2022		TLM1	
7.	Problems and Revision	2	01/09/2022 02/09/2022		TLM1	

8.	Revision	1	06/09/2022			
No. of classes required to complete UNIT-II: 9				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 and Bus electronics	2	07/09/2022 08/09/2022		TLM2	
2.	Solar Panels: Silicon and Ga-As Cells	2	09/09/2022 13/09/2022		TLM2	
3.	Power generation capacity, efficiency	2	14/09/2022 15/09/2022		TLM1	
4.	Space Battery Systems	2	16/09/2022 20/09/2022		TLM2	
5.	Battery Types, Characteristics , Battery efficiency Parameters	2	21/09/2022 22/09/2022		TLM2	
6.	Telemetry, Tracking and Command Control (TT&C) functions	2	04/10/2022 06/10/2022		TLM2	
7.	Telemetry, Tracking and Command Control (TT&C) functions	2	07/10/2022 11/10/2022		TLM2	
8.	Generally Employed Communication Bands	1	12/10/2022		TLM2	
9.	Revision	1	13/10/2022			
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	14/10/2022		TLM2	
2.	Control Requirements: Attitude Control and station keeping functions, type of control maneuvers	2	18/10/2022 19/10/2022		TLM2	
3.	Stabilization Schemes: Spin stabilization	1	20/10/2022		TLM2	
4.	gravity gradient method, 3 axis stabilization	2	21/10/2022 25/10/2022		TLM2	
5.	Commonly Used Control Systems: Mass expulsion systems, Momentum exchange systems.	2	26/10/2022 27/10/2022		TLM2	
6.	Gyro and Magnetic Torque -sensors, Star and sun sensor, Earth sensor.	1	28/10/2022		TLM2	

7.	Magnetometers and Inertial Sensors.	1	01/11/2022		TLM2	
8.	Revision	1	02/11/2022			
No. of classes required to complete UNIT-IV: 10				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, GPS architecture	1	03/11/2022		TLM2	
2.	Location principle	2	04/11/2022 09/11/2022		TLM2	
3.	Direct to home, home receiver	1	10/11/2022		TLM2	
4.	Satellite mobile services, VSAT	2	11/11/2022 15/11/2022		TLM2	
5.	MSAT, RADARSAT	2	16/11/2022 17/11/2022		TLM2	
6.	IRNSS Constellation	2	18/11/2022 22/11/2022		TLM2	
7.	Satellite structures and materials	1	23/11/2022		TLM2	
8.	Revision	1	24/11/2022			
No. of classes required to complete UNIT-V: 8				No. of classes taken:		

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

## PART-C

#### EVALUATION PROCESS (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):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):**

<b>PSO 1</b>	<b>Communication:</b> Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
<b>PSO 2</b>	<b>VLSI and Embedded Systems:</b> 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
<b>PSO 3</b>	<b>Signal Processing:</b> Apply the Signal processing techniques to synthesize and realize the issues related to real time applications

Course Instructor  
Ms. Asha. G

Course Coordinator  
Mr. P. James Vijay

Module Coordinator  
Dr.M.V.Sudhakar

HOD  
Dr. Y. Amar Babu