LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING(AUTONOMOUS)
Accredited by NAAC with 'A' Grade
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.Rajendra Prasad
Course Name & Code : **23FE11-DISCRETE MATHEMATICS & GRAPH THEORY**
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III /A **A.Y.:** 2025-26

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

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

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

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

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

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Mathematical Logic:

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 CO'S and PO'S	1	30-06-2025			
2.	Introduction of DMGT	1	01-07-2025			
3.	Propositional Calculus: Statements and Notations, Connectives	1	03-07-2025		TLM1	
4.	Well Formed Formulas, Truth Tables	1	05-07-2025		TLM1	
5.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	07-07-2025		TLM3	
6.	Tautologies, Equivalence of Formulas, Duality Law	1	08-07-2025		TLM1	
7.	Tautological Implications, Normal Forms,	1	10-07-2025		TLM1	
8.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	12-07-2025		TLM1	
9.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	14-07-2025		TLM3	
10.	Indirect Method of Proof, Predicate Calculus: Predicates	1	15-07-2025		TLM1	
11.	Predicative Logic, Statement Functions	1	17-07-2025		TLM1	
12.	Variables and Quantifiers	1	19-07-2025		TLM1	
13.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	21-07-2025 22-07-2025		TLM3	
14.	Free and Bound Variables	1	24-07-2025		TLM1	
15.	Inference Theory for Predicate Calculus	2	26-07-2025		TLM1	
16.	Tutorial on Unit 1	1	28-07-2025		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Set Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Introductions to Sets and It's Relation		29-07-2025			
18.	Sets: Operations on Sets	1	31-07-2025		TLM1	
19.	Principle of Inclusion-Exclusion	1	02-08-2025		TLM1	
20.	Relations: Properties, Operations	1	04-08-2025		TLM1	
21.	Tutorial on Practice the sets and Relations Problems	1	05-08-2025		TLM3	
22.	Partition and Covering,	1	07-08-2025		TLM1	
23.	Transitive Closure, Equivalence,	1	09-08-2025		TLM1	
24.	Compatibility and Partial Ordering,	1	11-08-2025		TLM1	

	Hasse Diagrams					
25.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	12-08-2025		TLM3	
26.	Functions: Bijective, Composition, Inverse,	1	14-08-2025		TLM1	
27.	Permutation, and Recursive Functions,	1	16-08-2025		TLM1	
28.	Tutorial on Functions& Recursive Functions	1	18-08-2025		TLM3	
29.	Lattice and its Properties	15	19-08-2025 21-08-2025 23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Combinatorics and Recurrence Relations:

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 Permutations and Combinations	1	01-09-2025			
31.	Basis of Counting, Permutations, Permutations with Repetitions	1	02-09-2025		TLM1	
32.	Circular and Restricted Permutations, Combinations,	1	04-09-2025		TLM1	
33.	Tutorial on Permutations, Combinations,	1	06-09-2025		TLM3	
34.	Restricted Combinations	1	08-09-2025		TLM1	
35.	Binomial and Multinomial Coefficients and Theorems.	1	09-09-2025		TLM1	
36.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	11-09-2025		TLM3	
37.	Recurrence Relations: Generating Functions, Function of Sequences,	1	13-09-2025		TLM1	
38.	Partial Fractions, Calculating Coefficient of Generating Functions	1	15-09-2025		TLM1	
39.	Recurrence Relations, Formulation as Recurrence Relations	1	16-09-2025		TLM1	
40.	Tutorial on Partial Fractions, Recurrence Relations	1	18-09-2025		TLM3	
41.	Solving Recurrence Relations by Substitution and Generating Functions	1	20-09-2025		TLM1	
42.	Method of Characteristic Roots, Solving non homogeneous Recurrence Relations	2	22-09-2025 23-09-2025		TLM1	
43.	Tutorial on UNIT III	1	25-09-2025		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
44.	Basic Concepts, Graph Theory and its Applications	1	27-09-2025		TLM1	
45.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	2	29-09-2025 30-09-2025		TLM1	
46.	Isomorphic Graphs,	1	04-10-2025		TLM1	
47.	Paths and Circuits	1	06-10-2025		TLM1	
48.	Tutorial on Graphs	1	07-10-2025		TLM3	
49.	Eulerian and Hamiltonian Graphs,	1	09-10-2025		TLM1	

No. of classes required to complete UNIT-IV: 6	No. of classes taken:

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Multigraphs,	1	11-10-2025		TLM1	
51.	Bipartite and Planar Graphs	1	13-10-2025		TLM1	
52.	Tutorial on Bipartite and Planar Graphs	1	14-10-2025		TLM3	
53.	Euler's Theorem	1	16-10-2025		TLM1	
54.	Graph Colouring	1	18-10-2025		TLM1	
55.	Covering	1	20-10-2025		TLM1	
56.	Tutorial on Graph Colouring, Euler Theorem	1	21-10-2025		TLM3	
57.	Chromatic Number	1	23-10-2025		TLM1	
58.	Spanning Trees, Prim's and Kruskal's Algorithms	1	25-10-2025		TLM1	
59.	BFS Spanning Trees.	1	27-10-2025 28-10-2025		TLM1	
60.	Tutorial on UNIT V	1	30-10-2025		TLM3	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pigeon Hole Principle	1	01-10-2025		**TLM1**			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.B.Rajendra Prasad	Mr. .T.N.V.S.Praveen	Dr. D. Venkata Subbaiah	Dr.S.Jayaprada
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr B.SRINIVASARAO
Course Name & Code : Universal Human Values - II: Understanding Harmony (20HS01)
L-T-P Structure : 3-0-0 **Credits :** 3
Program/Sem/Sec : B.Tech/ IV /A/R **A.Y. :** 2025-26

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity **(L2)**
CO2	Identify one's self, and one's surroundings (family, society nature) **(L2)**
CO3	Relate human values with human relationship and human society. **(L2)**
CO4	Illustrate the need for universal human values and harmonious existence **(L2)**
CO5	Develop as socially and ecologically responsible engineers **(L3)**

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

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

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999

R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004

R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Value Education

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	30-06-2025		TLM2	
2.	Process for self exploration: Natural Acceptance	1	01-07-2025		TLM2	
3.	Right Understanding, Relationship and Physical Facility	1	04-07-2025		TLM2	
4.	Revision	1	05-07-2025		TLM2	
5.	Understanding Value Education	1	07-07-2025		TLM2	
6.	self-exploration as the Process for Value Education	1	08-07-2025		TLM2	
7.	Continuous Happiness	1	11-07-2025		TLM2	
8.	Tutorial	1	12-07-2025		TLM2	
9.	Prosperity	1	14-07-2025		TLM2	
10.	Happiness and Prosperity	1	15-07-2025		TLM2	
11.	Revision	1	18-07-2025		TLM2	
12.	Method to Fulfill the Basic Human Aspirations	1	19-07-2025		TLM2	
13.	Tutorial	1	21-07-2025		TLM2	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: Harmony in the Human Being

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Understanding Human being as the Co-existence of the self and the body	1	22-07-2025		TLM2	

15.	Understanding Human being as the Co-existence of the body	1	25-07-2025		TLM2	
16.	Distinguishing between the Needs of the self and the body	1	28-07-2025		TLM2	
17.	Distinguishing between the Needs of the body	1	29-07-2025		TLM2	
18.	The body as an Instrument of the self	1	01-08-2025			
19.	Understanding Harmony in the self	1	02-08-2025		TLM2	
20.	Harmony of the self with the body	1	04-08-2025		TLM2	
21.	Programme to ensure self-regulation and Health	1	05-08-2025		TLM2	
22.	Tutorial - 1	1	08-08-2025		TLM2	
23.	Tutorial -2	1	09-08-2025		TLM1	
I MID EXAMINATIONS(22-07-2025 TO 09-08-2025)						
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT III: Harmony in the Family and Society

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Harmony in the Family	1	11-08-2025		TLM2	
25.	'Trust' – the Foundational Value in Relationship	1	12-08-2025		TLM2	
26.	Practice Session PS7 Exploring the Feeling of Trust	1	18-08-2025		TLM2	
27.	'Respect' – as the Right Evaluation	1	19-08-2025		TLM1	
28.	Practice Session PS8 Exploring the Feeling of Respect	1	22-08-2025		TLM2	
29.	Other Feelings, Justice in Human-to-Human Relationship	1	23-08-2025		TLM2	
30.	Understanding Harmony in the Society, Vision for the Universal Human Order	1	25-08-2025		TLM2	
No. of classes required to complete UNIT-III: 07				**No. of classes taken:**		

UNIT-IV: Harmony in the Nature/Existence

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Understanding Harmony in the Nature	1	01-09-2025		TLM2	
32.	Interconnectedness	1	02-09-2025		TLM2	
33.	Revision	1	05-09-2025		TLM2	
34.	self-regulation	1	06-09-2025		TLM2	
35.	Mutual Fulfilment among the Four Orders of Nature	1	08-09-2025		TLM2	
36.	Tutorial-1	1	09-09-2025		TLM2	
37.	Realizing Existence as Co-existence at All Levels	1	12-09-2025		TLM2	

38.	The Holistic Perception of Harmony in Existence	1	13-09-2025		TLM2	
39.	Revision	1	15-09-2025		TLM2	
40.	Tutorial -2	1	16-09-2025		TLM1	
41.	Tutorial -3	1	19-09-2025		TLM2	
42.	Existence as Co-existence	1	20-09-2025		TLM2	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Implications of the Holistic Understanding

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.	Natural acceptance of human values	2	22-09-2025 - 23-09-2025		TLM2	
44.	Definitiveness of ethical human conduct	1	26-09-2025		TLM2	
45.	Basis for humanistic education	1	27-09-2025		TLM2	
46.	A Basis for Humanistic Education, Humanistic Constitution and Universal Human	2	03-10-2025 04-19-2025		TLM2	
47.	Competence in professional ethics	1	06-10-2025		TLM2	
48.	Strategy for transition from the present state to universal human order	2	07-10-2025 - 10-10-2025		TLM2	
49.	Holistic Technologies, Production Systems and Management Models-Typical Case	1	11-10-2025		TLM2	
50.	**MID –II EXAMINATIONS (22-09-2025 TO 11-10-2025)**					
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. B. SRINIVASA RAO**			**Dr. S.JAYAPRADA**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. L.Narendra
Course Name & Code : Artificial Intelligence & 23AD02
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./CSE(AI&ML)/III/B-SEC **A.Y.:** 2025-26

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

Course Objectives: The main objectives of the course is to

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

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

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

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

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

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

Reference Books:
1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical

approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	What Is AI?	1	30-06-2025		TLM2	
2.	The Foundations of Artificial Intelligence	1	02-07-2025		TLM2	
3.	The Foundations of Artificial Intelligence	1	03-07-2025		TLM2	
4.	The History of Artificial Intelligence	1	05-07-2025		TLM2	
5.	The History of Artificial Intelligence	1	07-07-2025		TLM2	
6.	The State of the Art	1	09-07-2025		TLM2	
7.	Agents and Environments	1	10-07-2025		TLM2	
8.	Agents and Environments	1	14-07-2025		TLM2	
9.	Good Behavior: The Concept of Rationality	1	16-07-2025		TLM2	
10.	The Nature of Environments	1	17-07-2025		TLM2	
11.	The Structure of Agents.	1	18-07-2025		TLM2	
12.	The Structure of Agents.	1	19-07-2025		TLM2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Searching.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Searching for solutions	1	21-07-2025		TLM1	
14.	Informed Search Strategies	1	23-07-2025		TLM1	
15.	BFS,DFS,UCS,BDS	1	24-07-2025		TLM1	
16.	uniformed search strategies Breadth first search	1	26-07-2025		TLM1	
17.	Depth first Search.	1	28-07-2025		TLM1	
18.	Search with partial information (Heuristic search) Hill climbing	1	30-07-2025		TLM1	
19.	A* Algorithm	1	31-07-2025		TLM1	

20.	AO* Algorithm	1	02-08-2025		TLM1	
21.	Problem reduction	1	04-08-2025		TLM1	
22.	Game Playing-Adversial search	1	06-08-2025		TLM1	
23.	Games, mini-max algorithm	1	07-08-2025		TLM1	
24.	Mini-Max Search Algorithms	1	11-08-2025		TLM1	
25.	optimal decisions in multiplayer games	1	13-08-2025		TLM1	
26.	Problem in Game playing	1	18-08-2025		TLM1	
27.	Alpha-Beta Algorithms	1	20-08-2025		TLM1	
28.	Alpha-Beta Pruning	1	21-08-2025		TLM1	
29.	Evaluation functions	1	23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		

UNIT-III: Representation of Knowledge

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Knowledge representation issues	1	01-09-2025		TLM2	
31.	predicate logic- logic programming	1	03-09-2025		TLM2	
32.	semantic nets- frames and inheritance	1	04-09-2025		TLM2	
33.	constraint propagation	1	06-09-2025		TLM2	
34.	representing knowledge using rules	1	08-09-2025		TLM2	
35.	rules based deduction systems	1	10-09-2025		TLM2	
36.	Reasoning under uncertainty	1	11-09-2025		TLM2	
37.	Review of probability	1	15-09-2025		TLM2	
38.	Bayes' probabilistic interferences	1	17-09-2025		TLM2	
39.	Bayes' probabilistic interferences	1	18-09-2025		TLM2	
40.	Dempstershafer theory	1	20-09-2025		TLM2	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Logic concepts

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	First order logic	1	22-09-2025		TLM2	
42.	First order logic	1	24-09-2025		TLM2	

43.	Inference in first order logic	1	25-09-2025		TLM2	
44.	propositional vs. first order inference	1	27-09-2025		TLM2	
45.	unification & lifts forward chaining	1	29-09-2025		TLM2	
46.	Backward chaining	1	01-10-2025		TLM2	
47.	Resolution	1	04-10-2025		TLM2	
48.	Learning from observation Inductive learning	1	06-10-2025		TLM2	
49.	Decision trees	1	08-10-2025		TLM2	
50.	Explanation based learning, Statistical Learning methods	1	09-10-2025		TLM2	
51.	Reinforcement Learning	1	13-10-2025		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Expert Systems.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Architecture of expert systems	1	15-10-2025		TLM2	
53.	Architecture of expert systems	1	16-10-2025		TLM2	
54.	Roles of expert systems	1	18-10-2025		TLM2	
55.	Roles of expert systems	1	20-10-2025		TLM2	
56.	Knowledge Acquisition	1	22-10-2025		TLM2	
57.	Meta knowledge Heuristics	1	23-10-2025		TLM2	
58.	Typical expert systems-MYCIN	1	25-10-2025		TLM2	
59.	DART	1	27-10-2025		TLM2	
60.	XCON: Expert systems shells.	1	29-10-2025		TLM2	
61.	XCON: Expert systems shells.	1	30-10-2025		TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Generative AI	1	01-11-2025		TLM2	
No. of classes:01						
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025) **II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)**						

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. L.Narendra**	**Mr. L.Narendra**	**Dr. K.Devi Priya**	**Dr. S Jayaprada**
Signature				

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DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. JAGADEESWARA RAO P
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS, 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III/A **A.Y.:** 2025-26

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

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

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

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

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

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995

Algorithms + Data Structures & Programs: N.Wirth, PHI
R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

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 CO discussion	1	30/06/2025		TLM1	
2.	Introduction to Algorithm- Characteristics	1	01/07/2025		TLM1	
3.	Pseudo code specifications- Sample Algorithms	2	03/07/2025 04/07/2025		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	05/07/2025		TLM3	
5.	Algorithm Analysis- Time and Space Complexity - Examples	2	07/07/2025 08/07/2025		TLM1	
6.	Asymptotic Notations	2	10/07/2025 11/07/2025		TLM1	
7.	Tutorial on finding space & time complexity of algorithms	1	14/07/2025		TLM3	
8.	AVL Tree Operations	2	15/07/2025 17/07/2025		TLM1	
9.	B-Tree operations	2	18/07/2025 19/07/2025		TLM1	
10.	Tutorial on AVL & B Tree operations	1	21/07/2025		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	22/07/2025		TLM1	
12.	Max Heap, Min Heap Construction- operations	1	24/07/2025		TLM1	
13.	Implementation of Heap Tree	1	25/07/2025		TLM1	
14.	Graph Terminology, Representations of Graphs	2	28/07/2025 29/07/2025		TLM1	
15.	Tutorial on Heap Tree Construction	1	31/07/2025		TLM3	
16.	Basic Search and Traversal Techniques – DFS	2	01/08/2025 02/08/2025		TLM1	
17.	BFS – Example, Implementation	1	04/08/2025		TLM1	
18.	Tutorial on BFS & DFS traversals	1	05/08/2025		TLM3	
19.	Connected Components, Bi-connected Components	2	07/08/2025 08/08/2025		TLM1	
20.	Divide and Conquer General Method, Finding Max and Min	1	11/08/2025		TLM1	
21.	Merge Sort	1	12/08/2025		TLM1	
22.	Tutorial on Merge Sort Analysis	1	14/08/2025		TLM3	
23.	Quick sort	1	18/08/2025		TLM1	
24.	Strassen' Matrix Multiplication	1	19/08/2025		TLM1	
25.	Tutorial on Divide & Conquer Technique problems	1	21/08/2025		TLM3	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: 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
26.	Introduction to Greedy Method	1	22/08/2025		TLM1	
27.	Job Sequencing with dead Lines	1	23/08/2025		TLM1	
28.	Knapsack Problem	1	01/09/2025		TLM1	
29.	Minimum Cost Spanning Tree-Kruskal Algorithm	2	02/09/2025 04/09/2025		TLM1	
30.	Tutorial on different knapsack problem instances	1	05/09/2025		TLM3	
31.	Prims Algorithm	2	06/09/2025 08/09/2025		TLM1	
32.	Single Source Shortest Path	2	09/09/2025 11/09/2025		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	12/09/2025 13/09/2025		TLM3	
34.	Optimal Storage on tapes	2	15/09/2025 16/09/2025		TLM1	
35.	Huffman Coding	1	18/09/2025		TLM1	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: 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
36.	Introduction to Dynamic Programming	1	19/09/2025		TLM1	
37.	All pairs shortest path	1	20/09/2025		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programming	1	22/09/2025		TLM3	
39.	Bellman Ford Algorithm	1	23/09/2025		TLM1	
40.	0/1 knapsack problem	2	25/09/2025 26/09/2025		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	27/09/2025		TLM3	
42.	Optimal binary search tree	2	06/10/2025 07/10/2025		TLM1	
43.	String editing	2	09/10/2025 10/10/2025		TLM1	
44.	Travelling salesperson problem	2	13/10/2025 14/10/2025		TLM1	
45.	Tutorial on Analysis of OBST	1	16/10/2025		TLM3	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: Back tracking & 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
46.	Backtracking Introduction	1	17/10/2025		TLM1	

47.	N-queens Problem	1	18/10/2025		TLM1	
48.	Graph Coloring	1	20/10/2025		TLM1	
49.	Tutorial on Analysis of N-Queens	1	23/10/2025			
50.	Sum of subsets problem	1	24/10/2025		TLM1	
51.	Introduction to Branch and Bound	1	25/10/2025		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	1	27/10/2025		TLM1	
53.	Tutorial on 0/1 Knapsack	1	28/10/2025			
54.	Travelling Salesperson Problem -LC Search	1	30/10/2025		TLM1	
55.	Introduction to P and NP	1	31/10/2025		TLM1	
56.	NP-Complete Problems & Revision	1	01/11/2025		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	31-10-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Jagadeeswara Rao P**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr. S.Jayaprada**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Y.KRANTHI KUMAR
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./CSE(AI&ML)/III/A-SEC **A.Y.:** 2025-26

PREREQUISITE: Programming for Problem Solving using C

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to learn the constructs of the Java programming language along with built-in facilities to create different applications such as console & graphical user interfaces. In the process of learning the language, they will be applying knowledge of object-oriented programming; they will get the fundamental knowledge reason collection framework.

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

CO1	Identify the syntax and semantics of java programming language and basic concepts of java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented Programming. **(Understand-L2)**
CO3	Develop array-based problems, reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling, and I/O streams to develop secure, error free, and efficient applications. **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(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
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	-

Text Books:

T1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
T2. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
T3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

R1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
R2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Variables, Introduction to Operators, Control Statements.

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 Objective & Outcomes	1	30-06-2025		TLM2	
2.	Basic concepts, Principles, Program Structure in Java: Introduction , **Tutorial**	2	01-07-2025 02-07-2025		TLM1	
3.	Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements.	2	03-07-2025 05-07-2025		TLM4	
4.	Command Line Arguments, User Input to Programs.	2	07-07-2025 08-07-2025		TLM4	
5.	Escape Sequences Comments, Programming Style.	1	09-07-2025		TLM1	
6.	Introduction, Data Types in Java, Declaration of Variables, Data Types.	2	10-07-2025 12-07-2025		TLM2	
7.	Type Casting, Scope of Variable Identifier.	1	14-07-2025		TLM2	
8.	Literal Constants, Symbolic Constants, Formatted Output with printf() Method, **Tutorial**	2	15-07-2025 16-07-2025		TLM1	
9.	Static Variables and Methods, Attribute Final.	1	17-07-2025		TLM1	
10.	Precedence and Associativity of Operators	1	19-07-2025		TLM2	
11.	Control Statements: Introduction, if Expression, Nested if Expressions.	2	21-07-2025 22-07-2025		TLM4	
12.	if–else Expressions, Ternary Operator?:	1	23-07-2025		TLM4	
13.	Switch Statement, Iteration Statements, while Expression, do–while	2	24-07-2025 26-07-2025		TLM1	
14.	Loop, for Loop, Nested for Loop	2	28-07-2025 29-07-2025		TLM4	
15.	For–Each for Loop, Break Statement, Continue Statement, **Tutorial**	2	30-07-2025 31-07-2025		TLM4	
No. of classes required to complete UNIT-I: 24				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java.

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.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	2	02-08-2025 04-08-2025		TLM1	
17.	Access Control for Class Members, Accessing Private Members of Class	2	05-08-2025 06-08-2025		TLM4	

18.	Constructor Methods for Class, Overloaded Constructor Methods	2	07-08-2025 09-08-2025		TLM4	
19.	Nested Classes, Final Class and Methods	2	11-08-2025 12-08-2025		TLM2	
20.	Passing Arguments by Value and by Reference, Keyword this. **Tutorial**	2	13-08-2025 14-08-2025		TLM4	
21.	Defining Methods, Overloaded Methods, Overloaded Constructor Methods	2	16-08-2025 18-08-2025		TLM4	
22.	Class Objects as Parameters in Methods, Access Control, Recursive Methods	2	19-08-2025 20-08-2025		TLM4	
23.	Nesting of Methods, Overriding Methods,	1	21-08-2025		TLM4	
24.	Attributes Final and Static.	1	23-08-2025		TLM2	
No. of classes required to complete UNIT-II: 16				**No. of classes taken:**		

UNIT-III: Arrays, Inheritance, Interfaces.

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.	Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	2	01-09-2025 02-09-2025		TLM1	
26.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size.	2	03-09-2025 04-09-2025		TLM2	
27.	Sorting of Arrays, Search for Values in Arrays,	2	06-09-2025 08-09-2025		TLM4	
28.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths	1	09-09-2025		TLM1	
29.	Three dimensional Arrays, Arrays as Vectors.	1	10-09-2025		TLM1	
30.	Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class	1	11-09-2025		TLM1	
31.	Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance	2	13-09-2025 15-09-2025		TLM2	
32.	Application of Keyword Super, Constructor Method and Inheritance	1	16-09-2025		TLM4	
33.	Method Overriding, Dynamic Method Dispatch	1	17-09-2025		TLM1	
34.	Abstract Classes, Interfaces and Inheritance.	1	18-09-2025		TLM4	
35.	Declaration of Interface, Implementation of Interface	1	20-09-2025		TLM4	
36.	Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces	2	22-09-2025 23-09-2025		TLM1	

37.	Static Methods in Interface, Functional Interfaces, Annotations	1	24-09-2025		TLM1	
No. of classes required to complete UNIT-III: 18				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File.

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.	Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE	1	25-09-2025		TLM4	
39.	Java.lang Package and its Classes, Class Object, Enumeration, class Math	2	27-09-2025 29-09-2025		TLM1	
40.	Wrapper Classes, Auto-boxing and Auto-unboxing	1	06-10-2025		TLM1	
41.	Java util Classes and Interfaces, Formatter Class, Random Class,	1	07-10-2025		TLM4	
42.	Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class	1	08-10-2025		TLM2	
43.	Hierarchy of Standard Exception Classes, Keywords throws and throw	1	09-10-2025		TLM1	
44.	try, catch, and finally Blocks, Multiple Catch Clauses	1	11-10-2025		TLM1	
45.	Class Throwable, Unchecked Exceptions, Checked Exceptions.	1	13-10-2025		TLM1	
46.	Java I/O API, standard I/O streams, types	1	14-10-2025		TLM1	
47.	Byte streams, Character streams, Scanner class, Files in Java	1	15-10-2025		TLM4	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Need for Multiple Threads., Multithreaded Programming for Multi-core Processor	1	16-10-2025		TLM1	
49.	Thread Class, Main Thread - Creation of New Threads, Thread States,	1	18-10-2025		TLM4	
50.	Thread Priorities, Synchronization, Inter-thread Communication- producer consumer problem.	1	20-10-2025		TLM2	
51.	Purpose of Collection Framework, Hierarchy of collection Interfaces / classes	1	22-10-2025		TLM1	

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Methods defined in Collection Interface, Interface Iterator	1	23-10-2025		TLM2	
53.	Collection classes/Interfaces – List, Set, Map.	1	25-10-2025		TLM1	
54.	Overview of AWT & Swings API, limitations	1	27-10-2025		TLM4	
55.	Java FX Scene Builder, Java FX App Window Structure	1	28-10-2025		TLM2	
56.	displaying text and image, event handling	1	29-10-2025		TLM1	
57.	laying out nodes in scene graph, mouse events	1	30-10-2025		TLM4	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign
1.	Applets	1	01-11-2025		TLM4	CO5	T1	
No. of classes		01			No. of classes taken:			
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025) **II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)**								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. Y.Kranthi Kumar**	**Dr. K.Devi Priya**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S Jayaprada**
Signature				

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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., AI&ML-A
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. V. Bhagya Lakshmi
COURSE COORDINATOR : Dr. ShahedaNiloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	L2

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

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

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

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.

T2. Palaniswamy,EnvironmentalStudies,2/e,Pearsoneducation,2014.

T3.S.AzeemUnnisa,EnvironmentalStudies,AcademicPublishingCompany,2021.

T4.K.RaghavanNambiar,"TextbookofEnvironmentalStudiesforUndergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

ReferenceBooks:

R1.KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
R2. DeekshaDaveandE.SaiBabaReddy,TextbookofEnvironmentalScience,2/e, Cengage Publications, 2012.
R3.M.AnjiReddy,"TextbookofEnvironmentalSciencesandTechnology",BSPublication, 2014.
R4.J.P.Sharma,ComprehensiveEnvironmentalstudies,Laxmipublications,2006.
R5.J.GlynnHenryandGaryW.Heinke,EnvironmentalSciencesandEngineering, Prentice Hall of India Private limited, 1988.
R6.G.R.Chatwal,ATextBookofEnvironmentalStudies,HimalayaPublishingHouse, 2018.
R7. GilbertM.MastersandWendellP.Ela,IntroductiontoEnvironmentalEngineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	01-07-2025		TLM2			
2.	Multidisciplinary Nature ofEnvironmental Studies	1	07-07-2025		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

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
3.	Natural Resources – Forest resources	1	08-07-2025		TLM1	CO1	T1,T2	
4.	Water resources	1	14-07-2025		TLM1	CO1	T1,T2	
5.	Mineral resources	1	15-07-2025		TLM1	CO1	T1,T2	
6.	Food resources	1	21-07-2025		TLM1	CO1	T1,T2	
7.	Energy resources		22-07-2025					
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

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
8.	Ecosystems – Structure & Functions	1	28-07-2025		TLM1	CO2	T1,T2	
9.	Ecological succession &	1	29-07-2025		TLM1	CO2	T1,T2	
10.	Food chains, Food webs & Ecological Pyramids	1	04-08-2025		TLM1	CO2	T1,T2	
11.	Types of ecosystems	1	05-08-2025		TLM1	CO2	T1,T2	
12.	Biodiversity – introduction, levels, bio geographic classification	1	11-08-2025		TLM1	CO2	T1,T2	

13.	Values of Biodiversity, India as mega diversity nation	1	12-08-2025		TLM1	CO2	T1,T2	
14.	Threats to biodiversity and Conservation of biodiversity	1	18-08-2025		TLM1	CO2	T1,T2	
15.	Revision	1	19-08-2025		TLM3	CO2	T1,T2	
No. of classes required to complete UNIT-II		08			No. of classes taken:			

I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)

UNIT-III: Environmental Pollution

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
16.	Environmental pollution -Air pollution	1	01-09-2025		TLM1	CO3	T1,T2	
17.	Water pollution, Marine pollution, Thermal pollution	1	02-09-2025		TLM1	CO3	T1,T2	
18.	Soil pollution	1	08-09-2025		TLM1	CO3	T1,T2	
19.	Noise pollution & Nuclear Hazards	1	09-09-2025		TLM1	CO3	T1,T2	
20.	Solid waste management	1	15-09-2025		TLM1	CO3	T1,T2	
21.	Disaster management	1	16-09-2025		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

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
22.	From Unsustainable to Sustainable development	1	22-09-2025		TLM1	CO4	T1,T2	
23.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	23-09-2025		TLM1	CO4	T1,T2	
24.	Environmental ethics, Climate change	1	29-09-2025		TLM1	CO4	T1,T2	
25.	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	30-09-2025		TLM1	CO4	T1,T2	
26.	Environmental Acts	1	06-10-2025		TLM1	CO4	T1,T2	
27.	Environmental Acts	1	07-10-2025		TLM1	CO4	T1,T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

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
28.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	13-10-2025		TLM1	CO5	T1,T2	
29.	Environment and human health –Human Rights – Value Education	1	14-11-2025		TLM1	CO5	T1,T2	
30.	HIV/AIDS – Women and Child Welfare	1	20-11-2025		TLM1	CO5	T1,T2	
31.	Role of information Technology in Environment and human health	1	27-11-2025		TLM1	CO5	T1,T2	
32.	Revision	1	28-11-2025		TLM3	CO5	T1,T2	
No. of classes required to complete UNIT-V		05			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
33.	Case studies	2	19-08-2025 07-10-2025		TLM2	CO2	T1,T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (11-11-2024 TO 16-11-2024)								

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

PART-C EVALUATION PROCESS (R23 Regulation):

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

PART-D PROGRAMME OUTCOMES (POs):

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

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

Dr. V. Bhagya Lakshmi	**Dr. ShahedaNiloufer**	**Dr. ShahedaNiloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. JAGADEESWARA RAO P
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/A **A.Y.:** 2025-26

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

COURSE OUTCOMES (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

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

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	AVL tree	03	03/07/2025		
2.	B-Tree	03	10/07/2025		
3.	Heap Construction	03	17/07/2025		
4.	BFT	03	24/07/2025		
5.	DFT	03	31/07/2025		
6.	Finding Biconnected Components	03	07/08/2025		
7.	Finding Max and Min	03	14/08/2025		
8.	Merge sort, Quick sort	03	21/08/2025		
9.	Single source shortest path	03	04/09/2025		
10.	Job sequencing with dead lines	03	11/09/2025		
11.	0/1 knapsack -Dynamic Programming	06	18/09/2025 25/09/2025		
12.	N-queens Problem	03	09/10/2025		
13.	Travelling Sales person Problem-Branch and bound	03	16/10/2025		
14.	Revision & Practice	03	23/10/2025		
15.	Internal Exam	03	30/10/2025		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Jagadeeswara Rao P**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr. S.Jayaprada**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Y.KRANTHI KUMAR
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III/A **A.Y.:** 2025-26

PREREQUISITES: Programming for problem solving in C Lab

COURSE OBJECTIVES: The aim of this course is to

- Practice object-oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

COURSE OUTCOMES (CO):

After successful completion of the course the students are able to

CO1: Implement basic concepts of the java programming language. **(Apply)**

CO2: Implement object-oriented programming and exception handling. **(Apply)**

CO3: Design multithreaded, database and GUI based applications. **(Apply)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

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

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction to lab.	3	02-07-2025		
2.	Java Basic Programs like primitive data types, quadratic equation.	3	09-07-2025		
3.	Java Basic Programs using control statements	3	16-07-2025		
4.	Binary search, Bubble sort, String Buffer.	3	23-07-2025		
5.	Classes and Objects, Constructors & Parameter Passing.	3	30-07-2025		
6.	Inheritance & Polymorphism	3	06-08-2025		
7.	Super, Static Keywords, Inheritance & Polymorphism	3	13-08-2025		
8.	Dynamic Method Dispatch & Interfaces	3	20-08-2025		
9.	Packages & Exception Handling	3	03-09-2025		
10.	Multithreading Programs-1	3	10-09-2025		
11.	Multithreading Programs-2	3	17-09-2025		
12.	Java FX GUI, AWT Controls, Event Handling	3	24-09-2025		
13.	List, Set interface programs	3	08-10-2025		
14.	Map Interface and its implemented classes	3	15-10-2025		
15.	Lab Internal Exam	3	22-10-2025		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day-to-Day Work	A1 = 10
Record & Observation	B1 = 5
Internal Exam	C1 = 15
Cumulative Internal Examination (CIE): (A1+B1+C1)	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Y.Kranthi Kumar**	**Dr.K.Devi Priya**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S Jayaprada**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.Rajendra Prasad
Course Name & Code : **23FE11-DISCRETE MATHEMATICS & GRAPH THEORY**
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III /A **A.Y.:** 2025-26

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

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

CO1	Construct mathematical arguments using logical connectives and quantifiers and verify them. **(Apply- L3)**
CO2	Demonstrate the basic terminology of functions, relations, lattices and their operations. **(Understand -L2)**
CO3	Illustrate the basic principles/techniques to solve different combinatorial problems and linear recurrence relations**.(Apply- L3)**
CO4	Demonstrate the different types of graphs.**(Understand -L2)**
CO5	Apply the properties of graphs to solve the graph theory problems in computer science**.(Apply- L3)**

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

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

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Mathematical Logic:

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 CO'S and PO'S	1	30-06-2025			
2.	Introduction of DMGT	1	01-07-2025			
3.	Propositional Calculus: Statements and Notations, Connectives	1	03-07-2025		TLM1	
4.	Well Formed Formulas, Truth Tables	1	05-07-2025		TLM1	
5.	Tutorial on : Statements and Notations, Connectives,TruthTables	1	07-07-2025		TLM3	
6.	Tautologies, Equivalence of Formulas, Duality Law	1	08-07-2025		TLM1	
7.	Tautological Implications, Normal Forms,	1	10-07-2025		TLM1	
8.	Theory of Inference for Statement Calculus, Consistency of Premises,	1	12-07-2025		TLM1	
9.	Tutorial on : Theory of Inference for Statement Calculus, Consistency of Premises	1	14-07-2025		TLM3	
10.	Indirect Method of Proof, Predicate Calculus: Predicates	1	15-07-2025		TLM1	
11.	Predicative Logic, Statement Functions	1	17-07-2025		TLM1	
12.	Variables and Quantifiers	1	19-07-2025		TLM1	
13.	Tutorial on : Predicates, Predicative Logic, Statement Functions,	1	21-07-2025 22-07-2025		TLM3	
14.	Free and Bound Variables	1	24-07-2025		TLM1	
15.	Inference Theory for Predicate Calculus	2	26-07-2025		TLM1	
16.	Tutorial on Unit 1	1	28-07-2025		TLM3	
No. of classes required to complete UNIT-I: 16				**No. of classes taken:**		

UNIT-II: Set Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Introductions to Sets and It's Relation		29-07-2025			
18.	Sets: Operations on Sets	1	31-07-2025		TLM1	
19.	Principle of Inclusion-Exclusion	1	02-08-2025		TLM1	
20.	Relations: Properties, Operations	1	04-08-2025		TLM1	
21.	Tutorial on Practice the sets and Relations Problems	1	05-08-2025		TLM3	
22.	Partition and Covering,	1	07-08-2025		TLM1	
23.	Transitive Closure, Equivalence,	1	09-08-2025		TLM1	
24.	Compatibility and Partial Ordering,	1	11-08-2025		TLM1	

	Hasse Diagrams					
25.	Tutorial on Transitive Closure, Equivalence,Hasse Diagrams	1	12-08-2025		TLM3	
26.	Functions: Bijective, Composition, Inverse,	1	14-08-2025		TLM1	
27.	Permutation, and Recursive Functions,	1	16-08-2025		TLM1	
28.	Tutorial on Functions& Recursive Functions	1	18-08-2025		TLM3	
29.	Lattice and its Properties	15	19-08-2025 21-08-2025 23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Combinatorics and Recurrence Relations:

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 Permutations and Combinations	1	01-09-2025			
31.	Basis of Counting, Permutations, Permutations with Repetitions	1	02-09-2025		TLM1	
32.	Circular and Restricted Permutations, Combinations,	1	04-09-2025		TLM1	
33.	Tutorial on Permutations, Combinations,	1	06-09-2025		TLM3	
34.	Restricted Combinations	1	08-09-2025		TLM1	
35.	Binomial and Multinomial Coefficients and Theorems.	1	09-09-2025		TLM1	
36.	Tutorial on Binomial and Multinomial Coefficients and Theorems.	1	11-09-2025		TLM3	
37.	Recurrence Relations: Generating Functions, Function of Sequences,	1	13-09-2025		TLM1	
38.	Partial Fractions, Calculating Coefficient of Generating Functions	1	15-09-2025		TLM1	
39.	Recurrence Relations, Formulation as Recurrence Relations	1	16-09-2025		TLM1	
40.	Tutorial on Partial Fractions, Recurrence Relations	1	18-09-2025		TLM3	
41.	Solving Recurrence Relations by Substitution and Generating Functions	1	20-09-2025		TLM1	
42.	Method of Characteristic Roots, Solving non homogeneous Recurrence Relations	2	22-09-2025 23-09-2025		TLM1	
43.	Tutorial on UNIT III	1	25-09-2025		TLM3	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: Graph Theory:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
44.	Basic Concepts, Graph Theory and its Applications	1	27-09-2025		TLM1	
45.	Subgraphs, Graph Representations: Adjacency and Incidence Matrices	2	29-09-2025 30-09-2025		TLM1	
46.	Isomorphic Graphs,	1	04-10-2025		TLM1	
47.	Paths and Circuits	1	06-10-2025		TLM1	
48.	Tutorial on Graphs	1	07-10-2025		TLM3	
49.	Eulerian and Hamiltonian Graphs,	1	09-10-2025		TLM1	

No. of classes required to complete UNIT-IV: 6	No. of classes taken:

UNIT-V: Multi Graphs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Multigraphs,	1	11-10-2025		TLM1	
51.	Bipartite and Planar Graphs	1	13-10-2025		TLM1	
52.	Tutorial on Bipartite and Planar Graphs	1	14-10-2025		TLM3	
53.	Euler's Theorem	1	16-10-2025		TLM1	
54.	Graph Colouring	1	18-10-2025		TLM1	
55.	Covering	1	20-10-2025		TLM1	
56.	Tutorial on Graph Colouring, Euler Theorem	1	21-10-2025		TLM3	
57.	Chromatic Number	1	23-10-2025		TLM1	
58.	Spanning Trees, Prim's and Kruskal's Algorithms	1	25-10-2025		TLM1	
59.	BFS Spanning Trees.	1	27-10-2025 28-10-2025		TLM1	
60.	Tutorial on UNIT V	1	30-10-2025		TLM3	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Pigeon Hole Principle	1	01-10-2025		**TLM1**			
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.B.Rajendra Prasad	Mr. .T.N.V.S.Praveen	Dr. D. Venkata Subbaiah	Dr.S.Jayaprada
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. R.Chiranjeevi
Course Name & Code : Universal Human Values - II: Understanding Harmony (23HS01)
L-T-P Structure : 3-0-0 **Credits :** 3
Program/Sem/Sec : B.Tech/ IV /B **A.Y. :** 2025-26

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1	Describe the terms like Natural Acceptance, Happiness and Prosperity **(L2)**
CO2	Identify one's self, and one's surroundings (family, society nature) **(L2)**
CO3	Relate human values with human relationship and human society. **(L2)**
CO4	Illustrate the need for universal human values and harmonious existence **(L2)**
CO5	Develop as socially and ecologically responsible engineers **(L3)**

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

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

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999

R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004

R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Value Education

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	30.06.2025		TLM2	
2.	Process for self exploration: Natural Acceptance	1	01.07.2025		TLM2	
3.	Right Understanding, Relationship and Physical Facility	1	04.07.2025		TLM2	
4.	Introduction	1	05.07.2025		TLM2	
5.	Understanding Value Education	1	07.07.2025		TLM2	
6.	self-exploration as the Process for Value Education	1	08.07.2025		TLM2	
7.	Continuous Happiness	1	11.07.2025		TLM2	
8.	Tutorial	1	14.07.2025		TLM2	
9.	Prosperity	1	15.07.2025		TLM2	
10.	Happiness and Prosperity	1	18.07.2025		TLM2	
11.	Method to Fulfill the Basic Human Aspirations	1	19.07.2025		TLM2	
12.	Revision	1	21.07.2025		TLM2	
13.	Tutorial	1	22.07.2025		TLM3	
No. of classes required to complete UNIT-I: 13				**No. of classes taken:**		

UNIT-II: Harmony in the Human Being

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Introduction	1	25.07.2025		TLM2	
15.	Understanding Human being as the Co-existence of the self and the body	1	28.07.2025		TLM2	
16.	Understanding Human being as the Co-existence of the body	1	29.07.2025		TLM2	

17.	Distinguishing between the Needs of the self and the body	1	01.08.2025		TLM2	
18.	Distinguishing between the Needs of the body	1	02.08.2025		TLM2	
19.	The body as an Instrument of the self	1	04.08.2025		TLM2	
20.	Understanding Harmony in the self	1	05.08.2025		TLM2	
21.	Harmony of the self with the body	1	08.08.2025		TLM2	
22.	Programme to ensure self-regulation and Health	1	11.08.2025		TLM2	
23.	Tutorial - 1	1	12.08.2025		TLM3	
24.	Tutorial -2	1	18.08.2025		TLM3	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT III: Harmony in the Family and Society

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.	Introduction	1	19.08.2025			
26.	Harmony in the Family	1	22.08.2025		TLM2	
27.	'Trust' – the Foundational Value in Relationship	1	23.08.2025		TLM2	
MID –I EXAMINATIONS (25-08-2025 TO 30-08-2025)						
28.	Practice Session PS7 Exploring the Feeling of Trust	1	01.09.2025		TLM2	
29.	Revision	1	02.09.2025		TLM2	
30.	'Respect' – as the Right Evaluation	1	05.09.2025		TLM1	
31.	Practice Session PS8 Exploring the Feeling of Respect	1	06.09.2025		TLM2	
32.	Other Feelings, Justice in Human-to-Human Relationship	1	08.09.2025		TLM2	
33.	Understanding Harmony in the Society, Vision for the Universal Human Order	1	09.09.2025		TLM2	
34.	Revision	1	12.09.2025		TLM2	
No. of classes required to complete UNIT-III: 10				**No. of classes taken:**		

UNIT-IV: Harmony in the Nature/Existence

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Introduction	1	15.09.2025			
36.	Understanding Harmony in the Nature	1	16.09.2025		TLM2	
37.	Interconnectedness	1	19.09.2025		TLM2	
38.	Revision	1	20.09.2025		TLM2	
39.	self-regulation	1	22.09.2025		TLM2	

40.	Mutual Fulfilment among the Four Orders of Nature	1	23.09.2025		TLM2	
41.	Tutorial-1	1	26.09.2025		TLM3	
42.	Realizing Existence as Co-existence at All Levels	1	27.09.2025		TLM2	
43.	The Holistic Perception of Harmony in Existence	1	29.09.2025		TLM2	
44.	Revision	1	30.09.2025		TLM2	
45.	Revision	1	03.10.2025		TLM2	
46.	Tutorial -2	1	04.10.2025		TLM3	
47.	Tutorial -3	1	06.10.2025		TLM3	
48.	Existence as Co-existence	1	07.10.2025		TLM2	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: Implications of the Holistic Understanding

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49	Introduction	1	10.10.2025		TLM2	
50	Natural acceptance of human values	2	13.10.2025 14.10.2025		TLM2	
51	Definitiveness of ethical human conduct	1	17.10.2025		TLM2	
52	Basis for humanistic education	1	18.10.2025		TLM2	
53	A Basis for Humanistic Education, Humanistic Constitution and Universal Human	2	20.10.2025 21.10.2025		TLM2	
54	Competence in professional ethics	1	24.10.2025		TLM2	
55	Strategy for transition from the present state to universal human order	2	25.10.2025 27.10.2025		TLM2	
56	Holistic Technologies, Production Systems and Management Models-Typical Case	1	28.10.2025		TLM2	
57	Revision	3	31.10.2025 01.11.2025 02.11.2025		TLM2	
	MID –II EXAMINATIONS (03-11-2025 TO 08-11-2025)					
No. of classes required to complete UNIT-V: 14				No. of classes taken:		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr.R.CHIRANJEEVI**	**Dr.B.SRINIVASA RAO**	**Dr.B.SRINIVASA RAO**	**Dr. S.JAYAPRADA**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. L.Narendra
Course Name & Code : Artificial Intelligence & 23AD02
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./CSE(AI&ML)/III/B-SEC **A.Y.:** 2025-26

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

Course Objectives: The main objectives of the course is to

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

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

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

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

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

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

Reference Books:
1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical

approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	What Is AI?	1	30-06-2025		TLM2	
2.	The Foundations of Artificial Intelligence	1	02-07-2025		TLM2	
3.	The Foundations of Artificial Intelligence	1	03-07-2025		TLM2	
4.	The History of Artificial Intelligence	1	05-07-2025		TLM2	
5.	The History of Artificial Intelligence	1	07-07-2025		TLM2	
6.	The State of the Art	1	09-07-2025		TLM2	
7.	Agents and Environments	1	10-07-2025		TLM2	
8.	Agents and Environments	1	14-07-2025		TLM2	
9.	Good Behavior: The Concept of Rationality	1	16-07-2025		TLM2	
10.	The Nature of Environments	1	17-07-2025		TLM2	
11.	The Structure of Agents.	1	18-07-2025		TLM2	
12.	The Structure of Agents.	1	19-07-2025		TLM2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Searching.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Searching for solutions	1	21-07-2025		TLM1	
14.	Informed Search Strategies	1	23-07-2025		TLM1	
15.	BFS,DFS,UCS,BDS	1	24-07-2025		TLM1	
16.	uniformed search strategies Breadth first search	1	26-07-2025		TLM1	
17.	Depth first Search.	1	28-07-2025		TLM1	
18.	Search with partial information (Heuristic search) Hill climbing	1	30-07-2025		TLM1	
19.	A* Algorithm	1	31-07-2025		TLM1	

20.	AO* Algorithm	1	02-08-2025		TLM1	
21.	Problem reduction	1	04-08-2025		TLM1	
22.	Game Playing-Adversial search	1	06-08-2025		TLM1	
23.	Games, mini-max algorithm	1	07-08-2025		TLM1	
24.	Mini-Max Search Algorithms	1	11-08-2025		TLM1	
25.	optimal decisions in multiplayer games	1	13-08-2025		TLM1	
26.	Problem in Game playing	1	18-08-2025		TLM1	
27.	Alpha-Beta Algorithms	1	20-08-2025		TLM1	
28.	Alpha-Beta Pruning	1	21-08-2025		TLM1	
29.	Evaluation functions	1	23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		

UNIT-III: Representation of Knowledge

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Knowledge representation issues	1	01-09-2025		TLM2	
31.	predicate logic- logic programming	1	03-09-2025		TLM2	
32.	semantic nets- frames and inheritance	1	04-09-2025		TLM2	
33.	constraint propagation	1	06-09-2025		TLM2	
34.	representing knowledge using rules	1	08-09-2025		TLM2	
35.	rules based deduction systems	1	10-09-2025		TLM2	
36.	Reasoning under uncertainty	1	11-09-2025		TLM2	
37.	Review of probability	1	15-09-2025		TLM2	
38.	Bayes' probabilistic interferences	1	17-09-2025		TLM2	
39.	Bayes' probabilistic interferences	1	18-09-2025		TLM2	
40.	Dempstershafer theory	1	20-09-2025		TLM2	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Logic concepts

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	First order logic	1	22-09-2025		TLM2	
42.	First order logic	1	24-09-2025		TLM2	

43.	Inference in first order logic	1	25-09-2025		TLM2	
44.	propositional vs. first order inference	1	27-09-2025		TLM2	
45.	unification & lifts forward chaining	1	29-09-2025		TLM2	
46.	Backward chaining	1	01-10-2025		TLM2	
47.	Resolution	1	04-10-2025		TLM2	
48.	Learning from observation Inductive learning	1	06-10-2025		TLM2	
49.	Decision trees	1	08-10-2025		TLM2	
50.	Explanation based learning, Statistical Learning methods	1	09-10-2025		TLM2	
51.	Reinforcement Learning	1	13-10-2025		TLM2	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Expert Systems.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Architecture of expert systems	1	15-10-2025		TLM2	
53.	Architecture of expert systems	1	16-10-2025		TLM2	
54.	Roles of expert systems	1	18-10-2025		TLM2	
55.	Roles of expert systems	1	20-10-2025		TLM2	
56.	Knowledge Acquisition	1	22-10-2025		TLM2	
57.	Meta knowledge Heuristics	1	23-10-2025		TLM2	
58.	Typical expert systems-MYCIN	1	25-10-2025		TLM2	
59.	DART	1	27-10-2025		TLM2	
60.	XCON: Expert systems shells.	1	29-10-2025		TLM2	
61.	XCON: Expert systems shells.	1	30-10-2025		TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign
1.	Generative AI	1	01-11-2025		TLM2	
No. of classes:01						
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025) **II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)**						

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. L.Narendra**	**Mr. L.Narendra**	**Dr. K.Devi Priya**	**Dr. S Jayaprada**
Signature				

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DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. JAGADEESWARA RAO P
Course Name & Code : ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS, 23CS04
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III/B **A.Y.:** 2025-26

PREREQUISITE: Data Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

1. Provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

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

CO1	Identify the characteristics of an algorithm, analyze its time and space complexity and construct balanced binary trees. **(Apply-L3)**
CO2	Understand Heap structures and graph terminology to perform various operations on non-linear data structures. **(Understand-L2)**
CO3	Apply Divide and Conquer, Greedy algorithm and dynamic programming for solving problems**. (Apply - L3)**
CO4	Analyze the backtracking and branch-and-bound search methods on optimization problems **(Apply - L3)**
CO5	Summarize the importance of NP-Hard and its applications. **(Understand-L2)**

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

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

TEXTBOOKS:

T1 Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2ndEdition Universities Press

T2 Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

REFERENCE BOOKS:

R1 Data Structures and program design in C, Robert Kruse, Pearson Education Asia

R2 An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

R3 The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

R4 Data Structures using C & C++: Langsam, Augenstein &Tanenbaum, Pearson, 1995

Algorithms + Data Structures & Programs: N.Wirth, PHI
R5 Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
R6 Data structures in Java: Thomas Standish, Pearson Education Asia

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction, AVL Tree, B-Tree

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 CO discussion	1	30/06/2025		TLM1	
2.	Introduction to Algorithm- Characteristics	1	01/07/2025		TLM1	
3.	Pseudo code specifications- Sample Algorithms	2	02/07/2025 04/07/2025		TLM1	
4.	Tutorial on writing algorithms using Pseudo Code	1	05/07/2025		TLM3	
5.	Algorithm Analysis- Time and Space Complexity - Examples	2	07/07/2025 08/07/2025		TLM1	
6.	Asymptotic Notations	2	09/07/2025 11/07/2025		TLM1	
7.	Tutorial on finding space & time complexity of algorithms	1	14/07/2025		TLM3	
8.	AVL Tree Operations	2	15/07/2025 16/07/2025		TLM1	
9.	B-Tree operations	2	18/07/2025 19/07/2025		TLM1	
10.	Tutorial on AVL & B Tree operations	1	21/07/2025		TLM3	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Heap Tress, Graphs, Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Heap Trees (Priority Queue) - Introduction	1	22/07/2025		TLM1	
12.	Max Heap, Min Heap Construction- operations	1	23/07/2025		TLM1	
13.	Implementation of Heap Tree	1	25/07/2025		TLM1	
14.	Graph Terminology, Representations of Graphs	2	28/07/2025 29/07/2025		TLM1	
15.	Tutorial on Heap Tree Construction	1	30/07/2025		TLM3	
16.	Basic Search and Traversal Techniques – DFS	2	01/08/2025 02/08/2025		TLM1	
17.	BFS – Example, Implementation	1	04/08/2025		TLM1	
18.	Tutorial on BFS & DFS traversals	1	05/08/2025		TLM3	
19.	Connected Components, Bi-connected Components	2	06/08/2025 08/08/2025		TLM1	
20.	Divide and Conquer General Method, Finding Max and Min	1	11/08/2025		TLM1	
21.	Merge Sort	1	12/08/2025		TLM1	
22.	Tutorial on Merge Sort Analysis	1	13/08/2025		TLM3	
23.	Quick sort	1	18/08/2025		TLM1	
24.	Strassen' Matrix Multiplication	1	19/08/2025		TLM1	
25.	Tutorial on Divide & Conquer Technique problems	1	20/08/2025		TLM3	
No. of classes required to complete UNIT-II: 18				**No. of classes taken:**		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: 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
26.	Introduction to Greedy Method	1	22/08/2025		TLM1	
27.	Job Sequencing with dead Lines	1	23/08/2025		TLM1	
28.	Knapsack Problem	1	01/09/2025		TLM1	
29.	Minimum Cost Spanning Tree-Kruskal Algorithm	2	02/09/2025 03/09/2025		TLM1	
30.	Tutorial on different knapsack problem instances	1	05/09/2025		TLM3	
31.	Prims Algorithm	2	06/09/2025 08/09/2025		TLM1	
32.	Single Source Shortest Path	2	09/09/2025 10/09/2025		TLM1	
33.	Tutorial on analysis of prims & kruskal's algorithm	1	12/09/2025 13/09/2025		TLM3	
34.	Optimal Storage on tapes	2	15/09/2025 16/09/2025		TLM1	
35.	Huffman Coding	1	17/09/2025		TLM1	
No. of classes required to complete UNIT-III: 14				**No. of classes taken:**		

UNIT-IV: 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
36.	Introduction to Dynamic Programming	1	19/09/2025		TLM1	
37.	All pairs shortest path	1	20/09/2025		TLM1	
38.	Tutorial on Tabular & Memorization methods in Dynamic Programming	1	22/09/2025		TLM3	
39.	Bellman Ford Algorithm	1	23/09/2025		TLM1	
40.	0/1 knapsack problem	2	24/09/2025 26/09/2025		TLM1	
41.	Tutorial on Analysis of Bellman Ford & Floyd Warshall Algorithms	1	27/09/2025		TLM3	
42.	Optimal binary search tree	2	06/10/2025 07/10/2025		TLM1	
43.	String editing	2	08/10/2025 10/10/2025		TLM1	
44.	Travelling salesperson problem	2	13/10/2025 14/10/2025		TLM1	
45.	Tutorial on Analysis of OBST	1	15/10/2025		TLM3	
No. of classes required to complete UNIT-IV: 14				**No. of classes taken:**		

UNIT-V: Back tracking & 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
46.	Backtracking Introduction	1	17/10/2025		TLM1	

47.	N-queens Problem	1	18/10/2025		TLM1	
48.	Graph Coloring	1	20/10/2025		TLM1	
49.	Tutorial on Analysis of N-Queens	1	22/10/2025			
50.	Sum of subsets problem	1	24/10/2025		TLM1	
51.	Introduction to Branch and Bound	1	25/10/2025		TLM1	
52.	0/1 Knapsack-LCBB, FIFOBB	1	27/10/2025		TLM1	
53.	Tutorial on 0/1 Knapsack	1	28/10/2025			
54.	Travelling Salesperson Problem -LC Search	1	29/10/2025		TLM1	
55.	Introduction to P and NP	1	31/10/2025		TLM1	
56.	NP-Complete Problems & Revision	1	01/11/2025		TLM1	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Np-Hard Problems	1	31-10-2025					
No. of classes		1			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Jagadeeswara Rao P**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr. S.Jayaprada**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. Y.KRANTHI KUMAR
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA & 23CS05
L-T-P Structure : 3-0-0 **Credits:** 03
Program/Sem/Sec : B.Tech./CSE(AI&ML)/III/B-SEC **A.Y.:** 2025-26

PREREQUISITE: Programming for Problem Solving using C

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to learn the constructs of the Java programming language along with built-in facilities to create different applications such as console & graphical user interfaces. In the process of learning the language, they will be applying knowledge of object-oriented programming; they will get the fundamental knowledge reason collection framework.

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

CO1	Identify the syntax and semantics of java programming language and basic concepts of java. **(Understand-L2)**
CO2	Understand the basic concepts of object-oriented Programming. **(Understand-L2)**
CO3	Develop array-based problems, reusable programs using the concepts of inheritance, polymorphism, and interfaces. **(Apply-L3)**
CO4	Apply the concepts of packages, exception handling, and I/O streams to develop secure, error free, and efficient applications. **(Apply-L3)**
CO5	Design multithreaded and GUI based applications which mimic the real word scenarios. **(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
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	2	-

Text Books:

T1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
T2. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
T3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

R1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
R2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Object Oriented Programming, Data Types, Variables, Introduction to Operators, Control Statements.

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 Objective & Outcomes	1	30-06-2025		TLM2	
2.	Basic concepts, Principles, Program Structure in Java: Introduction	2	01-07-2025 03-07-2025		TLM1	
3.	Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements.	2	05-07-2025 06-07-2025		TLM4	
4.	Command Line Arguments, User Input to Programs.	2	07-07-2025 08-07-2025		TLM4	
5.	Escape Sequences Comments, Programming Style.	1	10-07-2025		TLM1	
6.	Introduction, Data Types in Java, Declaration of Variables, Data Types.	2	11-07-2025 12-07-2025		TLM2	
7.	Type Casting, Scope of Variable Identifier.	1	14-07-2025		TLM2	
8.	Literal Constants, Symbolic Constants, Formatted Output with printf() Method	2	15-07-2025 17-07-2025		TLM1	
9.	Static Variables and Methods, Attribute Final.	1	18-07-2025		TLM1	
10.	Precedence and Associativity of Operators	1	19-07-2025		TLM2	
11.	Control Statements: Introduction, if Expression, Nested if Expressions.	2	21-07-2025 22-07-2025		TLM4	
12.	if–else Expressions, Ternary Operator?:	1	24-07-2025		TLM4	
13.	Switch Statement, Iteration Statements, while Expression, do–while	2	25-07-2025 26-07-2025		TLM1	
14.	Loop, for Loop, Nested for Loop	2	28-07-2025 29-07-2025		TLM4	
15.	For–Each for Loop, Break Statement, Continue Statement, **Tutorial**	2	31-07-2025 01-08-2025		TLM4	
No. of classes required to complete UNIT-I: 24				**No. of classes taken:**		

UNIT-II: Classes and Objects, Constructors and Methods, String Handling in Java.

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.	Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another	2	02-08-2025 04-08-2025		TLM1	
17.	Access Control for Class Members, Accessing Private Members of Class	2	05-08-2025 07-08-2025		TLM4	

18.	Constructor Methods for Class, Overloaded Constructor Methods	2	08-08-2025 09-08-2025		TLM4	
19.	Nested Classes, Final Class and Methods	2	11-08-2025 12-08-2025		TLM2	
20.	Passing Arguments by Value and by Reference, Keyword this. **Tutorial**	2	14-08-2025 16-08-2025		TLM4	
21.	Defining Methods, Overloaded Methods, Overloaded Constructor Methods	2	18-08-2025 19-08-2025		TLM4	
22.	Class Objects as Parameters in Methods, Access Control, Recursive Methods	2	19-08-2025 21-08-2025		TLM4	
23.	Nesting of Methods, Overriding Methods,	1	22-08-2025		TLM4	
24.	Attributes Final and Static.	1	23-08-2025		TLM2	
No. of classes required to complete UNIT-II: 16				**No. of classes taken:**		

UNIT-III: Arrays, Inheritance, Interfaces.

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.	Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays	2	01-09-2025 02-09-2025		TLM1	
26.	Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size.	2	04-09-2025 05-09-2025		TLM2	
27.	Sorting of Arrays, Search for Values in Arrays,	2	06-09-2025 08-09-2025		TLM4	
28.	Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths	1	09-09-2025		TLM1	
29.	Three dimensional Arrays, Arrays as Vectors.	1	11-09-2025		TLM1	
30.	Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class	1	12-09-2025		TLM1	
31.	Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance	2	13-09-2025 15-09-2025		TLM2	
32.	Application of Keyword Super, Constructor Method and Inheritance	1	16-09-2025		TLM4	
33.	Method Overriding, Dynamic Method Dispatch	1	18-09-2025		TLM1	
34.	Abstract Classes, Interfaces and Inheritance.	1	19-09-2025		TLM4	
35.	Declaration of Interface, Implementation of Interface	1	20-09-2025		TLM4	
36.	Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces	2	22-09-2025 23-09-2025		TLM1	

37.	Static Methods in Interface, Functional Interfaces, Annotations	1	25-09-2025		TLM1	
No. of classes required to complete UNIT-III: 18				**No. of classes taken:**		

UNIT-IV: Packages and Java Library, Exception Handling, Java I/O and File.

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.	Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE	1	26-09-2025		TLM4	
39.	Java.lang Package and its Classes, Class Object, Enumeration, class Math	2	27-09-2025 29-09-2025		TLM1	
40.	Wrapper Classes, Auto-boxing and Auto-unboxing	1	06-10-2025		TLM1	
41.	Java util Classes and Interfaces, Formatter Class, Random Class,	1	07-10-2025		TLM4	
42.	Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class	1	09-10-2025		TLM2	
43.	Hierarchy of Standard Exception Classes, Keywords throws and throw	1	10-10-2025		TLM1	
44.	try, catch, and finally Blocks, Multiple Catch Clauses	1	11-10-2025		TLM1	
45.	Class Throwable, Unchecked Exceptions, Checked Exceptions.	1	13-10-2025		TLM1	
46.	Java I/O API, standard I/O streams, types	1	14-10-2025		TLM1	
47.	Byte streams, Character streams, Scanner class, Files in Java	1	16-10-2025		TLM4	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Multithreaded Programming, Java Collections, Java FX GUI.

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Need for Multiple Threads., Multithreaded Programming for Multi-core Processor	1	17-10-2025		TLM1	
49.	Thread Class, Main Thread - Creation of New Threads, Thread States,	1	18-10-2025		TLM4	
50.	Thread Priorities, Synchronization, Inter-thread Communication- producer consumer problem.	1	20-10-2025		TLM2	
51.	Purpose of Collection Framework, Hierarchy of collection Interfaces / classes	1	23-10-2025		TLM1	

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
52.	Methods defined in Collection Interface, Interface Iterator	1	24-10-2025		TLM2	
53.	Collection classes/Interfaces – List, Set, Map.	1	25-10-2025		TLM1	
54.	Overview of AWT & Swings API, limitations	1	27-10-2025		TLM4	
55.	Java FX Scene Builder, Java FX App Window Structure	1	28-10-2025		TLM2	
56.	displaying text and image, event handling	1	30-10-2025		TLM1	
57.	laying out nodes in scene graph, mouse events	1	31-10-2025		TLM4	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign
1.	Applets	1	01-11-2025		TLM4	CO5	T1	
No. of classes		01			No. of classes taken:			
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025) **II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)**								

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

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. Y.Kranthi Kumar**	**Dr. K.Devi Priya**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S Jayaprada**
Signature				

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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., III-Sem., AI&ML-B
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : **Environmental Science**
L-T-P STRUCTURE : 2-0-0
COURSE CREDITS : 0
COURSE INSTRUCTOR : Dr. V. Bhagya Lakshmi
COURSE COORDINATOR : Dr. Shaheda Niloufer
PRE-REQUISITES : Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

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

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	L2

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

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

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

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.

T2. Palaniswamy,EnvironmentalStudies,2/e,Pearsoneducation,2014.

T3.S.AzeemUnnisa,EnvironmentalStudies,AcademicPublishingCompany,2021.

T4.K.RaghavanNambiar,"TextbookofEnvironmentalStudiesforUndergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

ReferenceBooks:

R1.KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
R2. DeekshaDaveandE.SaiBabaReddy,TextbookofEnvironmentalScience,2/e, Cengage Publications, 2012.
R3.M.AnjiReddy,"TextbookofEnvironmentalSciencesandTechnology",BSPublication, 2014.
R4.J.P.Sharma,ComprehensiveEnvironmentalstudies,Laxmipublications,2006.
R5.J.GlynnHenryandGaryW.Heinke,EnvironmentalSciencesandEngineering, Prentice Hall of India Private limited, 1988.
R6.G.R.Chatwal,ATextBookofEnvironmentalStudies,HimalayaPublishingHouse, 2018.
R7. GilbertM.MastersandWendellP.Ela,IntroductiontoEnvironmentalEngineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	05-07-2025		TLM2			
2.	Multidisciplinary Nature of Environmental Studies	1	07-07-2025		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

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
3.	Natural Resources – Forest resources	1	14-07-2025		TLM1	CO1	T1,T2	
4.	Water resources	1	19-07-2025		TLM1	CO1	T1,T2	
5.	Mineral resources & Food resources	1	21-07-2025		TLM1	CO1	T1,T2	
6.	Energy resources	1	28-07-2025		TLM1	CO1	T1,T2	
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

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
7.	Ecosystems – Structure & Functions	1	02-08-2025		TLM1	CO2	T1,T2	
8.	Ecological succession & Food chains, Food webs & Ecological Pyramids	1	04-08-2025		TLM1	CO2	T1,T2	
9.	Biodiversity – introduction, levels, bio geographic classification	1	11-08-2025		TLM1	CO2	T1,T2	
10	Values of Biodiversity, India as mega diversity nation	1	18-08-2025		TLM1	CO2	T1,T2	

11	Threats to biodiversity and Conservation of biodiversity	1	23-08-2025		TLM1	CO2	T1,T2	
No. of classes required to complete UNIT-II		05			No. of classes taken:			

I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)

UNIT-III: Environmental Pollution

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
12	Environmental pollution -Air pollution	1	01-09-2025		TLM1	CO3	T1,T2	
13	Water pollution, Marine pollution, Thermal pollution	1	06-09-2025		TLM1	CO3	T1,T2	
14	Soil pollution	1	08-09-2025		TLM1	CO3	T1,T2	
15	Noise pollution & Nuclear Hazards	1	15-09-2025		TLM1	CO3	T1,T2	
16	Solid waste management	1	20-09-2025		TLM1	CO3	T1,T2	
17	Disaster management	1	22-09-2025		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

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
18	From Unsustainable to Sustainable development	1	27-09-2025		TLM1	CO4	T1,T2	
19	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	29-09-2025		TLM1	CO4	T1,T2	
20	Environmental ethics, Climate change	1	04-10-2025		TLM1	CO4	T1,T2	
21	Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	06-10-2025		TLM1	CO4	T1,T2	
22	Environmental Acts	1	13-10-2025		TLM1	CO4	T1,T2	
23	Environmental Acts	1	18-10-2025		TLM1	CO4	T1,T2	
No. of classes required to complete UNIT-IV		06			No. of classes taken:			

UNIT-V: Human Population & Environment

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

24	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	20-10-2025		TLM1	CO5	T1,T2	
25	Environment and human health –Human Rights – Value Education	1	25-10-2025		TLM1	CO5	T1,T2	
26	HIV/AIDS – Women and Child Welfare	1	27-10-2025		TLM1	CO5	T1,T2	
27	Role of information Technology in Environment and human health	1	01-11-2025		TLM1	CO5	T1,T2	
No. of classes required to complete UNIT-V		04			No. of classes taken:			

Content beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
28.	Case studies	2	11-08-2025 07-10-2025		TLM2	CO2	T1,T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (03-11-2025 TO 08-11-2025)								

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

PART-C EVALUATION PROCESS (R23 Regulation):

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

PART-D PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
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PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research

	methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
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PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
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Dr. V. Bhagya Lakshmi	**Dr. ShahedaNiloufer**	**Dr. ShahedaNiloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. JAGADEESWARA RAO P
Course Name & Code **:** ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB & 23CS53
L-T-P Structure **: 0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2025-26

PREREQUISITE: DATA STRUCTURES LAB

COURSE EDUCATIONAL OBJECTIVE:
The objectives of the course is to

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

COURSE OUTCOMES (CO):
CO1: Implement balanced binary trees, heaps and graph traversals using arrays and linked list. **(Apply-L3)**
CO2: Implement Various Sorting Techniques. **(Apply - L3)**
CO3: : Implement optimization problems using greedy, dynamic programming, backtracking and branch-and-bound techniques. **(Apply - L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

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

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	AVL tree	03	02/07/2025		
2.	B-Tree	03	09/07/2025		
3.	Heap Construction	03	16/07/2025		
4.	BFT	03	23/07/2025		
5.	DFT	03	30/07/2025		
6.	Finding Biconnected Components	03	06/08/2025		
7.	Finding Max and Min	03	13/08/2025		
8.	Merge sort, Quick sort	03	20/08/2025		
9.	Single source shortest path	03	03/09/2025		
10.	Job sequencing with dead lines	03	10/09/2025		
11.	0/1 knapsack -Dynamic Programming	06	17/09/2025 24/09/2025		
12.	N-queens Problem	03	08/10/2025		
13.	Travelling Sales person Problem-Branch and bound	03	15/10/2025		
14.	Revision & Practice	03	22/10/2025		
15.	Internal Exam	03	29/10/2025		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Jagadeeswara Rao P**	**Dr. S. Nagarjuna Reddy**	**Dr. Y.Vijaya Bhaskar Reddy**	**Dr. S.Jayaprada**
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (AI&ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Y.KRANTHI KUMAR
Course Name & Code : OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB & 23CS54
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : B.Tech/CSE(AI&ML)/III/B **A.Y.:** 2025-26

PREREQUISITES: Programming for problem solving in C Lab

COURSE OBJECTIVES: The aim of this course is to

- Practice object-oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

COURSE OUTCOMES (CO):

After successful completion of the course the students are able to

CO1: Implement basic concepts of the java programming language. **(Apply)**

CO2: Implement object-oriented programming and exception handling. **(Apply)**

CO3: Design multithreaded, database and GUI based applications. **(Apply)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

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

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	Introduction to lab.	3	04-07-2025		
2.	Java Basic Programs like primitive data types, quadratic equation.	3	11-07-2025		
3.	Java Basic Programs using control statements	3	18-07-2025		
4.	Binary search, Bubble sort, String Buffer.	3	25-07-2025		
5.	Classes and Objects, Constructors & Parameter Passing.	3	01-08-2025		
6.	Inheritance & Polymorphism	3	08-08-2025		
7.	Super, Static Keywords, Inheritance & Polymorphism	3	22-08-2025		
8.	Dynamic Method Dispatch & Interfaces	3	20-08-2025		
9.	Packages & Exception Handling	3	12-09-2025		
10.	Multithreading Programs-1	3	19-09-2025		
11.	Multithreading Programs-2	3	26-09-2025		
12.	Java FX GUI, AWT Controls, Event Handling	3	10-10-2025		
13.	List, Set interface programs	3	17-10-2025		
14.	Map Interface and its implemented classes	3	24-10-2025		
15.	Lab Internal Exam	3	31-10-2025		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day-to-Day Work	A1 = 10
Record & Observation	B1 = 5
Internal Exam	C1 = 15
Cumulative Internal Examination (CIE): (A1+B1+C1)	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop sophisticated software systems, leveraging expertise in data structures, algorithm analysis, web design, and proficiency in machine learning techniques.
PSO 2	Possess the strong data analysis and interpretation skills, enabling them to extract meaningful insights and patterns from large datasets using AI & ML methodologies.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. Y.Kranthi Kumar**	**Dr.K.Devi Priya**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S Jayaprada**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018,14001:2015,50001:2018 Certified Institution
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING(AI & ML)

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. SHAIK.JAMEER
Course Name & Code : PYTHON PROGRAMMING **(SOC)** & 23CSS1
L-T-P Structure : **0-1-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/B **A.Y.:** 2025-26

PREREQUISITE: INTRODUCTION TO PROGRAMMING

COURSE EDUCATIONAL OBJECTIVE:
The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES (CO):
CO1: Implement the core programming concepts of Python programming language**. (Apply-L3)**
CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries **(Apply-L3)**
CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications**. (Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

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

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

PART-B:

COURSE DELIVERY PLAN (LESSON PLAN):

S.NO	Topic to be covered	Number of Hours	Tentative Date of Completion	Actual Date of Completion	HOD Signature
1.	**UNIT-1:** Introduction, Course Outcomes, Introduction to Python, Reading Input, Print output, Comments	1	1-07-2025		
2.	Installation, Variables, Data types.	3	3-07-2025		
3.	Control statements – if, else, nestedif, elif	1	8-07-2025		
4.	Types of operators, Working on operators, Sample Programs, Type Conversion	3	10-07-2025		
5.	pass, continue and break	1	15-07-2025		
6.	Loop statements, Programs on Loop statements	3	17-07-2025		
7.	Programs on exception handling.	1	22-07-2025		
8.	Exception Handling	3	24-07-2025		
9.	Scope and Lifetime of Variables,	1	29-07-2025		
10.	**UNIT-2:** Function Definition and Calling the function, return Statement and void Function	3	31-07-2025		
11.	Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, sample programs.Strings Introduction, Basic String Operations	1	05-08-2025		
12.	Creating Lists, Basic List Operations,	3	07-08-2025		
13.	Index Number, String Slicing and Joining, Accessing Characters in String-by-String Methods, Formatting Strings., Sample Programs on strings	1	12-08-2025		
14.	Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Sample programs on dictionaries.	3	14-08-2025		
15.	Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement., Programs on	1	19-08-2025		

	Lists **Unit-3:** Introduction to Dictionaries, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries				
16.	Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function	3	21-08-2025		
17.	Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Sample Programs on tuples.	1	02-09-2025		
18.	**Unit-4**: Introduction to files	3	04-09-2025		
19.	Sets, Set Methods, Frozenset., Sample Programs on sets, tuples.	1	09-09-2025		
20.	Pickle Module	3	11-09-2025		
21.	Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, sample programs on files.	1	16-09-2025		
22.	**Object-Oriented Programming**: Classes and Objects, Creating Classes in Python	3	18-09-2025		
23.	Reading and Writing CSV Files, Python os and os.path Modules. Sample programs	1	23-09-2025		
24.	Encapsulation, Inheritance, Polymorphism	3	25-09-2025	,	
25.	Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, sample programs.	1	07-10-2025		
26.	**Unit 5: Introduction to Data Science**: Functional Programming	3	09-10-2025		
27.	Sample Python programs on object-oriented programming.	1	14-10-2025		
28.	JSON and XML in Python, NumPy with Python, Pandas.	3	16-10-2025		
29.	Example Programs on Numpy and pandas	3	23-10-2025		
30.	Internal exam preparation	1	28-10-2025		

31.	**Internal Exam**		30-10-2025		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
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PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. Shaik Jameer	Dr. Y. Vijaya Bhaskar Reddy	Dr. Y. Vijaya Bhaskar Reddy	Dr. S Jayaprada
Signature				