ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

AU24 REGULATIONS COURSE STRUCTURE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Semester I (Second Year)

Sl. No.	Category	Course Code	Course Title	Hours per Week			Credits
				L	T	P	C
1	BS	24AMAT33T	Discrete Mathematics	3	0	0	3
2	HSM	24AUHV31T	Universal Human values-II	3	0	0	3
3	PC	24ACSE31T	Advanced Data structures and algorithm analysis	3	0	0	3
4	PC	24ACSE32T	Object Oriented Programming Using Java	3	0	0	3
5	PC	24ACSE33T	Digital Logic Design and Computer Organization	3	0	0	3
6	PC	24ACSE31L	Advanced Data structures and algorithm analysis Lab	0	0	3	1.5
7	PC	24ACSE32L	Object Oriented Programming Using Java Lab	0	0	3	1.5
8	PC	24ACSE33L	Digital Logic Design and Computer Organization Lab	0	0	3	1.5
9	SC	24ACSE34L	Full Stack Development	1	0	2	2
						Total Credits	21.5

Category	Credits
Basic Science course	3
Professional core Courses	13.5
Humanities Sciences	3
Skill oriented course	2
Total Credits	21.5

Semester II (Second Year)

Sl. No.	Category	Course Code	Course Title	Hours per Week			Credits
				L	T	P	C
1	PC	24ACSE41T	Database Management Systems	3	0	0	3
2	PC	24ACSE42T	Software Engineering	3	0	0	3
3	PC	24AAIM41T	Principles of Artificial Intelligence	3	0	0	3
4	BS	24AMAT41T	Probability and Statistics	3	0	0	3
5	HSM	24AMBA42T	Management Science	3	0	0	3
6	PC	24ACSE41L	Database Management Systems Lab	0	0	3	1.5
7	PC	24ACSE42L	Software Engineering Lab	0	0	3	1.5
8	PC	24AAIM41L	Principles of Artificial Intelligence Lab	0	0	3	1.5
9	SC	24ACSE44L	Advanced Java Programming	1	0	2	2
10	MC	24AENS41T	Environmental Science	2	0	0	0
Total Credits							**21.5**
Internship 2 Months (Mandatory) during summer vacation							

Category	Credits
Basic Science Courses	3
Professional core Courses	9
Engineering Science Courses	4.5
Humanities Sciences	3
Skill oriented course	2
Total Credits	21.5

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Title of the Course:	**Discrete Mathematics**
Category:	BS
Semester:	I Semester
Course Code:	24AMAT33T
Branch/es:	CSE, AIDS,AIML,CSE(DS),CSE(AI),CSE(AIML),CSE(ICB)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: The course aims to build a strong foundation in discrete mathematics with emphasis on logical reasoning and problem-solving. It covers mathematical logic, recurrence relations, relations, functions, algebraic structures, graph theory, and trees. Students will learn techniques for analyzing algorithms, switching circuits, coding theory, and traversal methods. Overall, the course equips learners with essential mathematical tools for applications in computer science and engineering.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand and apply the logic statements and express logical sentences in terms of logical connectives
2. Analyze the various types of recurrence relations and apply the methods to find out their solutions
3. Understand sets, relations, functions, and discrete structures.
4. Apply graph theory concepts in core subjects such as data structures and network theory effectively
5. Apply the properties of Trees in Engineering applications.

Unit 1 Mathematical logic 12

Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus. Applications to switching circuits

Unit 2 Recurrence relations 9

Generating functions of sequences, calculating coefficients of generating functions, Recurrence relations - Solving homogeneous and non-homogeneous recurrence relations of first and second order by substitution and generating functions, method of characteristic roots. Applications of recurrence relation.

Unit 3 Relations and functions 10

Relations and functions: Properties of binary relations in a set, relation matrix and the graph of a relation, partition and covering of a set, equivalence relations, compatibility relations, partial ordering, Hasse diagram, functions - composition of functions, inverse functions.

Algebraic structures: algebraic systems, simple algebraic systems and general properties, semi group and monoid, group (Simple problems only).Applications to coding theory.

Unit 4 Graph theory 9

Definitions, finite and infinite graphs, incidence and degree, isolated and pendant vertices, Graph Representations- Adjacency and Incidence Matrices, isomorphism, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Multi graphs, Bipartite and Planar Graphs, Euler's

formula, Euler graphs, , Hamiltonian paths and circuits, Graph Traversal technique-travelling salesman problem.

Unit 5 Trees **8**

Some properties of trees, distance and centers, rooted and binary trees, Spanning Trees: DFS, BFS, Minimal Spanning Trees, Tree traversal technique-Kruskal's Algorithm.

Prescribed Textbooks:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997. (Units 1 & 3)
2. J.L. Mott, A. Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012. (Unit 2)
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006. (Units 4 and 5).

Reference Books:

1. K. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.
2. R. Johnsonbaugh, Discrete mathematics, 7/e, Pearson Education, 2008.
3. A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, Data Structures using C, PHI/Pearson
4. Education,2005.

Web Resources:

1. https://www.slideshare.net/slideshow/formal-logic-switching-circuits/231907871
2. https://www.geeksforgeeks.org/recurrence-relations-a-complete-guide/
3.https://www.geeksforgeeks.org/maths/real-life-applications-of-abstract-algebra/

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AMAT33T.1	2	2	1	1	-	-	-	-	-	-	1
24AMAT33T.2	3	3	2	2	-	-	-	-	-	-	1
24AMAT33T.3	2	2	1	1	-	-	-	-	-	-	1
24AMAT33T.4	3	2	1	2	-	-	-	-	-	-	1
24AMAT33T.5	3	2	1	2	-	-	-	-	-	-	1

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course:	**Universal Human Values-II**	
Category:	HSM	
Semester:	I Semester	II Semester
Course Code:	24AUHV31T	24AUHV41T
Branch/es:	AIDS, AIML, CSE(AI), CSE(AIML), CSE(DS), ECE, CE, EEE	CSE, CSE(ICB), ME

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: The course aims to help students recognize the vital interplay between values and skills, promoting sustained happiness and prosperity. It seeks to foster a holistic perspective on life and profession, encouraging value-based living through a clear understanding of human reality and existence. Additionally, the course emphasizes the ethical implications of such an understanding, fostering trustful behaviour, fulfilling human interactions, and a harmonious relationship with nature.

Course Outcomes:
At the end of the course, the student will be able to
1. Comprehend the terms like Natural Acceptance, Happiness and Prosperity
2. Analyze one's self, and one's surroundings (family, society, nature)
3. Apply human values in enriching human relationships and human society.
4. Analyze the need for universal human values and harmonious existence.
5. Evaluate themselves as socially and ecologically responsible engineers.

Unit 1 Introduction to Value Education 12

Lecture1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture2: Understanding Value Education
Tutorial 1: Practice Session1: Sharing about oneself
Lecture 3: Self-Exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – The Basic Human Aspirations
Tutorial 2: Practice Session2: Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session3: Exploring Natural Acceptance

Unit 2 Harmony in the Human Being 8

Lecture 7: Understanding Human being as the co-existence of the self and the body.
Lecture 8: Distinguishing between the needs of the self and the body
Tutorial 4: Practice Session4: Exploring the difference of needs of self and body.
Lecture 9: The body as an instrument of the self
Lecture 10: Understanding harmony in the self
Tutorial 5: Practice Session5: Exploring sources of imagination in the self
Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and health
Tutorial 6: Practice Session 6: Exploring harmony of self with the body

Unit 3 Harmony in the Family and Society 8
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session7: Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session 8: Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session9: Exploring systems to fulfil human goal
Unit 4 Harmony in the Nature/Existence 10
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, Self-Regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session 10: Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session11: Exploring Co-existence in Existence

Unit 5 Implications of the Holistic Understanding – A Look at Professional Ethics 10
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session 12: Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session13: Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session14: Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance
Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the Difference of Needs of Self and Body
PS5 Exploring Sources of Imagination in the Self
PS6 Exploring Harmony of Self with the Body
Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

Prescribed Textbooks:

1. The Textbook - R R Gaur, R Asthana, G P Bagaria. A Foundation Course in Human Values and Professional Ethics. 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.
2. The Teacher's Manual - R R Gaur, R Asthana, G P Bagaria. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics. 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. A. Nagaraj. Jeevan Vidya: Ek Parichaya. Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A.N. Tripathi. Human Values. New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi. The Story of My Experiments with Truth
5. E. F Schumacher. Small is Beautiful

Web Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-
3. II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-
6. Harmony%20in%20the%20Nature%20and%20Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202325%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
9. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24AUHV31T/41T.1	-	-	-	-	-	-	3	-	1	-	2
24AUHV31T/41T.2	-	-	-	-	-	-	3	-	1	-	2
24AUHV31T/41T.3	-	-	-	-	-	-	3	-	1	-	2

24AUHV31T/41T.4	-	-	-	-	-	-	3	-	1	-	3
24AUHV31T/41T.5	-	-	-	-	-	2	3	-	1	-	2

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Title of the Course: **Advanced Data Structures and Algorithm Analysis**
Category: Professional Core
Semester: I Semester
Course Code: 24ACSE31T
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS) , CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able
1. To understand and analyse the time and space complexity of algorithms using asymptotic notations.
2. To study advanced data structures like AVL trees, B-trees, heaps, and graphs, and apply them in real-world problems.
3. To explore algorithmic design paradigms including divide-and-conquer, greedy, and dynamic programming techniques.
4. To solve complex computational problems using backtracking and branch-and-bound strategies.
5. To introduce the concept of NP-completeness and understand the complexity of intractable problems.

Course Outcomes:
At the end of the course, the student will be able to
1. Analyze algorithm performance using time and space complexity and apply asymptotic notations.
2. Implement AVL trees, B-trees, heap trees, and graph traversals for efficient data handling.
3. Solve problems using divide-and-conquer, greedy, and dynamic programming techniques.
4. Apply backtracking and branch-and-bound algorithms to solve combinatorial and optimization problems.
5. Understand NP-hard and NP-complete problems and evaluate the computational complexity of algorithms.

Unit 1 **Introduction to Algorithms and advanced Data Structures** **10**

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees – Creation, Insertion, Deletion operations and Applications
B-Trees – Creation, Insertion, Deletion operations and Applications

Unit 2 **Advanced Data Structures and Divide and Conquer** **10**

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen‟s matrix multiplication, Convex Hull

Unit 3 **Greedy Method and Dynamic Programming** **10**

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

Unit 4 Backtracking & Branch and Bound **10**

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

Unit 5 NP Hard and NP Complete Problems **10**

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem.

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Prescribed Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE31T-1	3	2	1	2	-	-	-	-	-	-	-
24ACSE31T-2	3	3	3	2	3	-	-	2	-	-	3

24ACSE31T-3	3	2	1	2	-	-	-	-	-	-	-
24ACSE31T-4	2	1	1	1	-	-	-	-	-	-	-
24ACSE31T-5	3	2	1	2	-	-	-	3	-	-	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Object Oriented Programming using Java**
Category: Professional Core
Semester: I Semester
Course Code: 24ACSE32T
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able
1. To understand the history, evolution, and core principles of Java and object-oriented programming.
2. To learn the use of data types, control structures, classes, objects, methods, and constructors.
3. To implement inheritance, access control, interfaces, and exception handling in Java applications.
4. To explore multithreading, generics, and synchronization for developing concurrent applications.
5. To apply lambda expressions and utilize the Java Collections Framework for efficient data handling.

Course Outcomes:
At the end of the course, the student will be able to
1. Use Java data types, operators, control structures, and arrays to write structured programs.
2. Design and implement classes, methods, constructors, and object-oriented features in Java.
3. Apply inheritance, access control, and exception handling to build robust Java applications.
4. Develop multithreaded programs and use generics for type-safe and reusable code.
5. Implement lambda expressions and work with the Java Collections Framework to manage data efficiently.

Unit 1 Introduction to Java Programming **10**

The History and Evolution of Java, Magic: The Byte code, The Java Buzzwords, The Evolution of Java, Java SE 8. Object-Oriented Programming -Two Paradigms, Abstraction, The three OOP Principles, A First Simple Program-Entering the Program, Compiling the Program, Running the Program, Overview of Java, Data Types, Variables, Arrays, operators and control statements. Classes and Objects: Class Fundamentals, Declaration of Objects, Assigning Object Reference Variables, Introducing Methods, Adding a Method to the Class, Returning a Value, Adding a Method That Takes Parameters, Constructors, Parameterized Constructors, The this Keyword, Instance Variable Hiding, Garbage Collection, The finalize() Method, Overloading Methods, Overloading Constructors, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion.

Unit 2 Access Controls and Inheritance **10**

Introducing Access Control: Understanding static, Introducing final, Arrays Revisited, Introducing Nested and Inner Classes, Exploring the String Class.
Inheritance: Inheritance Basics, Member Access and Inheritance, A Practical Example, Accessing super class members, Usage super key word, Creating a Multilevel Hierarchy, Accessing Constructors in inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance. Object Class.

Unit 3 Packages, Interfaces and Exception Handling 10

Packages and Interfaces: Packages, Defining a Package, Finding Packages and CLASSPATH, A Short Package Example, Access Protection, an Access Example, Importing Packages.

Interfaces: Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces Can Be Extended, Default Interface Methods, Default Method Fundamentals, A More Practical Example, Multiple Inheritance Issues, Use static Methods in an Interface, Final Thoughts on Packages and Interfaces.

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Displaying a Description of an Exception, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Built-in Exceptions, Creating Your Own Exception Subclasses.

Unit 4 Multithreaded Programming and Generics 10

Multithreaded Programming: The Java Thread Model, Thread Priorities, Synchronization, Messaging, The Thread Class and the Runnable Interface, The Main Thread, Creating a Thread, Implementing Runnable, Extending Thread, Choosing an Approach, Creating Multiple Threads, Using isAlive( ) and join( ), Thread Priorities, Synchronization Using Synchronized Methods, The synchronized Statement, Inter thread Communication.

Generics: What Are Generics, Generics Work Only with Reference Types, A Generic Class with Two Type Parameters, The General Form of a Generic Class, Bounded Types, Using Wildcard Arguments, Bounded Wildcards Creating a Generic Method, Generic Constructors, Generic Interfaces, Raw, Generic Class Hierarchies, Using a Generic super class, A Generic Subclass, Run-Time Type Comparisons Within a Generic Hierarchy, Casting, Overriding Methods in a Generic Class, Type Inference with Generics.

Unit 5 Lambda Expressions and The Collection of Framework 10

Lambda Expressions: Introducing Lambda Expressions, Lambda Expression Fundamentals, Functional Interfaces, Some Lambda Expression Examples, Block Lambda Expressions, Generic Functional Interfaces, Passing Lambda Expressions as Arguments, Lambda Expressions and Variable Capture.

java.util Package: The Collections Framework: Collections Overview, The Collection Interfaces: The Collection Interface, The List Interface; The Collection Classes: The ArrayList Class, The LinkedList Class, Accessing a Collection via an Iterator, Using an Iterator, The For-Each Alternative to Iterators, Storing User-Defined Classes in Collections, Working with Maps, The Map Interfaces, The Map Classes, The Collection Algorithms. Arrays, StringTokenizer.

Prescribed Textbooks:

1. Herbert Schildt. Java. The complete reference, 11th Edition, Tata McGraw Hill

Reference Books:

1. J.Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley&sons.
2. Y. Daniel Liang, Introduction to Java programming, Pearson Education. 6th Edition
3. R.A. Johnson- Thomson, An introduction to Java programming and object oriented application development,
4. Cay.S.Horstmann and Gary,Cornell, Core Java 2, Vol. 1, Fundamentals, Pearson Education. 7th Edition,
5. P. Radha Krishna, Object Oriented Programming through Java, University Press.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE32T -1	3	3	-	-	-	3	-	-	3	2	-
24ACSE32T -2	3	3	3	3	-	3	2	-	3	-	-
24ACSE32T -3	3	3	3	3	-	3	-	-	3	2	-
24ACSE32T -4	3	3	3	3	1	3	2	-	3	-	-
24ACSE32T -5	3	3	3	3	-	3	-	-	3	-	-

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Digital Logic Design and Computer Organization**
Category: Professional Core
Semester: I Semester
Course Code: 24ACSE33T
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able to

1. Introduce data representation techniques and the basic structure of computers.
2. Develop understanding of digital logic circuits, simplification techniques, and their applications.
3. To understand computer arithmetic operations and how they are implemented using hardware algorithms
4. To provide insights into memory hierarchy, storage devices, and performance considerations.
5. Introduce input/output systems, interrupt mechanisms, and standard I/O interfaces

Course Outcomes:

At the end of the course, the student will be able to

1. Represent data using different number systems and understand basic computer architecture.
2. Design, simplify, and analyse both combinational and sequential digital logic circuits.
3. Perform fixed and floating-point arithmetic operations and understand processor execution cycles.
4. Analyse memory systems, including cache and virtual memory, and evaluate their performance.
5. Explain I/O operations, manage hardware interrupts, and describe standard interface mechanisms

Unit 1 Data Representation and Basic Structure of Computer 10

Data Representation: Number base conversions, Octal and Hexadecimal Numbers, Signed binary numbers, Binary Numbers, Fixed Point Representation. Floating Point Representation, Binary codes

Basic Structure of Computers: Computer Types, Computer Generations, Functional units, Basic operational concepts, Bus structures.

Unit 2 Digital Logic Circuits 10

DIGITAL LOGIC CIRCUITS - I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions, K-Map Simplification, Combinational Circuits.

DIGITAL LOGIC CIRCUITS - II: Flip-Flops, Registers, Shift Registers, Binary counters, Decoders, Multiplexers.

Unit 3 Computer Arithmetic and Process Organization 10

Computer Arithmetic: Algorithms for fixed point and floating point addition, subtraction, multiplication and division operations.

Processor Organization: Introduction to CPU, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control.

Unit 4 The Memory Organization 10

The Memory Organization: Basic Concepts, RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Unit 5 Input/ Output Organization 10

Input /Output Organization: Introduction to I/O, Interrupts- Hardware, Enabling and disabling Interrupts, Device Control, Direct memory access, buses, Interface Circuits, Standard I/O Interfaces.

Prescribed Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education

Reference Books:

1. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.
2. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson
3. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
4. Fundamentals of Logic Design, Roth, 5thEdition, Thomson
5. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE33T-1	3	2	1	2	-	-	-	-	-	-	-
24ACSE33T-2	3	3	3	2	3	-	-	-	2	-	-
24ACSE33T-3	3	2	1	2	-	-	-	-	-	-	-
24ACSE33T-4	2	1	1	1	-	-	-	-	-	-	-
24ACSE33T-5	-	3	3	2	-	-	-	-	3	-	2

ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course:	**Advanced Data Structures and Algorithm Analysis Lab**
Category:	Professional Core Lab
Semester:	I Semester
Course Code:	24ACSE31L
Branch/es:	AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML), CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
-	-	3	1.5

Course Objectives: This course will be able to
1. Acquire practical skills in constructing and managing Data structures.
2. Use the Java SDK environment to create, debug and run simple Java Programs**.**

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

1. Design and develop programs to solve real world problems with the popular algorithm design methods.
2. Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs.
3. Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.
4. Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems.
5. Compare the performance of different of algorithm design strategies

Exercise 1 3

Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.

Exercise 2 3

Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.

Exercise 3 3

Construct Min and Max Heap using arrays, delete any element and display the content of the Heap

Exercise 4 3

Implement BFT and DFT for given graph, when graph is represented by

a) Adjacency Matrix b) Adjacency Lists

Exercise 5 3

Write a program for finding the bi-connected components in a given graph..

Exercise 6 3

Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).

Exercise 7 3

Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.

Exercise 8 3

Implement Job Sequencing with deadlines using Greedy strategy.

Exercise 9 3

Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.

Exercise 10 3

Implement N-Queens Problem Using Backtracking.

Exercise 11 3

Use Backtracking strategy to solve 0/1 Knapsack problem

Exercise 12 3

Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Online Learning Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE31L-1	1	-	3	-	3	3	1	3	-	3	-
24ACSE31L -2	-	-	3	3	3	-	-	-	-	3	-
24ACSE31L-3	-	-	3	3	3	3	-	3	-	3	-
24ACSE31L-4	-	-	3	-	3	3	1	3	-	3	-
24ACSE31L-5	-	-	3	-	3	3	1	3	-	3	-

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course:	**Object Oriented Programming using Java Lab**
Category:	Professional Core Lab
Semester:	I Semester
Course Code:	24ACSE32L
Branch/es:	AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
-	-	3	1.5

Course Objectives: This course will be able to

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods.
2. Understand fundamentals of Object-Oriented Programming in Java, Including defining classes, Invoking methods, using libraries.
3. Aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Use the Java SDK environment to create, debug and run simple Java Programs.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods.
2. Understand fundamentals of Object-Oriented Programming in Java, Including defining classes, Invoking methods, using libraries.
3. Aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Use the Java SDK environment to create, debug and run simple Java Programs.

Exercise 1 3

a) Write a program using classes and objects in java?

b) Write a Java program to calculate sum of 5 subjects and find percentage.

c) Write a Java program to convert temperature from Centigrade to Fahrenheit and Fahrenheit to Centigrade

d) Write a Java program to perform the arithmetic operations using switch case statement

Exercise 2 3

a) Write a Java program to display all strong numbers between 1 to n.

b) Write a Java program to display Fibonacci series between 1 to n.

c) Write a Java program to find the factorial of a given number using recursion.

d) Write a Java program to find multiplication of two matrices.

e) Write a program to accept contents into an Integer Array and print the frequency of each number in the order of their number of occurrences.

Exercise 3 3

a) Write a Java program to implement the access control.
b) Write a Java program to implement the method overloading.
c) Write a program to call default constructor first and then any other constructor in the class?
d) Create a class Box that uses a parameterized constructor to initialize the dimensions of a box. The dimensions of the Box are width, height, depth. The class should have a method that can return the volume of the box. Create an object of the Box class and test the functionalities.
e) Create a new class called Calculator with the following methods:
A static method called powerInt(int num1,int num2) This method should return num1 to the power num2. A static method called powerDouble(double num1,double num2). This method should return num1 to the power num2. Invoke both the methods and test the functionality. Also count the number of objects created

Exercise 4 3

a) Write a Java program to implement the method overriding.
b) Create a multilevel inheritance for classes vehicle, brand and cost. The vehicle class determines the type of vehicle which is inherited by the class brand which determines the brand of the vehicle. Brand class is inherited by cost class, which tells about the cost of the vehicle. Create another class which calls the constructor of cost class and method that displays the total vehicle information from the attributes available in the super classes.
c) Create an inheritance hierarchy of Figure_3D, Cylinder, Cone, Sphere etc. In the base class provides methods that are common to all Figure_3Ds and override these in the derived classes to perform different behaviors, depending on the specific type of Figure_3D. Create an array of Figure_3D, fill it with different specific types of Figure_3Ds and call your base class methods

Exercise 5 3

a) Design a package to contain the class Student that contains data members such as name, roll number and another package contains the interface Sports which contains some sports information. Import these two packages in a package called Report which process both Student and Sport and give the report.
b) Write a Java program to implement the multiple inheritance using interfaces.

Exercise 6 3

a) Write a Java program to find whether the given string is palindrome or not.
b) Accept two strings from the user and determine if the strings are anagrams or not.
c) Accept an array of strings and display the number of vowels and consonants occurred in each string.
d) Accept a String and a number n from user. Divide the given string into substrings each of size n and sort them lexicographically

Exercise 7 3

a) Write a program using classes and objects in java?
b) Write a Java program to calculate sum of 5 subjects and find percentage.
c) Write a Java program to convert temperature from Centigrade to Fahrenheit and Fahrenheit to Centigrade
d) Write a Java program to perform the arithmetic operations using switch case statement

Exercise 8 3

a) Write a Java program for multi-thread implementation.

Note: First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
b) Write a Java program to use the isAlive() and join() methods.
c) Write a program to illustrate Thread synchronization.
d) Write a Java program to implement producer consumer problem using inter-thread communication mechanism.

Exercise 9 3

a) Create a generic Stack class that can hold any type of object. Implement the following methods: i) void push(T obj): pushes an object onto the top of the stack, ii) T pop(): removes and returns the object at the top of the stack iii) boolean isEmpty(): returns true if the stack is empty, false otherwise
b) Create a generic class for sorting the elements of different data types.
c) Any two programs on Lambda expressions.

Exercise 10 3

a) Write a Java program to display the sum of all the integers of given line of integers using StringTokenizer class.
b) Write a Java program to demonstrate the working of LinkedList collection class.
c) Write a Java program to create a PriorityQueue and add some elements to it. Then remove the highest priority element from the PriorityQueue and print the remaining elements

Prescribed Text Books:

1. H.M.Dietel and P.J.Dietel, Java How to Program 6thEdition, Pearson Education/PHI
2. Y.DanielLiang,Introduction to Java programming, Pearson Education, 6thEdition.
3. Cay Horstmann,Big Java, 2ndedition, Wiley Student Edition, Wiley India Private Limited.
4. Herbert Schildt.Java. The complete reference, TMH. 9thEdition.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE32L-1	1	-	3	-	3	3	1	3	-	3	-
24ACSE32L -2	-	-	3	3	3	-	-	-	-	3	-
24ACSE32L-3	-	-	3	3	3	3	-	3	-	3	-
24ACSE32L-4	-	-	3	-	3	3	1	3	-	3	-

24ACSE32L-5	-	-	3	-	3	3	1	3	-	3	-

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(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)
RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Digital Logic Design and Computer Organization Lab**
Category: Professional Core Lab
Semester: I Semester
Course Code: 24ACSE33L
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
-	-	3	1.5

Course Objectives: This course will be able to
1. Understand the basics of logic gates.
2. Know basic combinational circuits and verify their functionalities
3. Apply the design procedures to design basic sequential circuits
4. Learn about counters and Shift Registers
5. Understand the basic digital circuits and to verify their operation

Course Outcomes:
At the end of the course, the student will be able to
1. Develop Boolean equations and truth tables for synthesis using different logic gates
2. Design combinational and sequential logic circuits.
3. Develop various shift registers and Counters
4. Design and construct synchronous, asynchronous counters and special type of counters
5. Design and construct ALU, CPU and Memory

Exercise 1 3

To verify the truth table of basic logic gates AND, OR, NOT, NAND, NOR, XOR, XNOR and their realization using universal logic gates.

Exercise 2 3

a) To realize Half adder, Full adder, Half Subtractor and Full Subtractor using logic gates.
b) To realize Half Adder, Full adder, Half subtractor and Full subtractor using NAND gate

Exercise 3		3
a) To implement 2-to-4 Decoder and 3-to-8 Decoder using logic gates. b) To implement Full adder using 3-to-8 Decoder.		

Exercise 4 3

a) To implement 2-to-1, 4 to 1, 8 to 1 multiplexer using logic gates.
b) To implement Full adder using 4 to 1 multiplexer

Exercise 5 3

To Realize and verify the truth table of SR, JK, D and T flip flop.

Exercise 6 3

Create a 4-bit ripple carry adder circuit using half adders and full adders and test it by giving proper input.

Exercise 7 3

Design a 5-bit Shift Registers using the flip-flops and check the output

Exercise 8 3

Create a combinational multiplier circuit to multiply two 4-bit binary numbers. Use half adders, full adders and logic gates and test it by giving proper input

Exercise 9 3

a) Design a 4-bit Booth's multiplier circuit
b) Design a 4-bit ALU comprising only the AND, OR, XOR and Add operations.

Exercise 10 3

Design a 4X3 RAM memory which will have 4 words each of 3 bits using binary RAM cells, decoder with enable, OR gates and test it by giving proper input.

Exercise 11 3

a) Design a CPU with single instruction.
b) Design a CPU with more instructions.

Exercise 12 3

To understand the Karnaugh Maps.

Prescribed Textbooks:

1. Stephen Brown, ZvonkoVranesic, —Fundamentals of Digital Logic with Verilog Design‖, Tata McGraw Hill Publishing Company Limited, Second Edition.
2. M Morris Mano, Micheal D Ciletti —Digital Design with an introduction to the verilog HDL‖, Pearson Education, Fifth Edition, 2013

Reference Books:

1. Donald D Givone, —Digital Principles and Design‖, Tata McGraw Hill Publishing Company Limited, 2003.
2. http://vlabs.iitkgp.ac.in/coa

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE33L-1	3	3	3	-	-	-	-	-	-	3	3
24ACSE33L-2	3	3	3	2	3	-	-	2	-	3	3
24ACSE33L-3	3	3	-	-	-	1	-	-	-	3	3
24ACSE33L-4	-	3	-	3	3	-	-	3	-	3	-
24ACSE33L-5	-	3	3	2	-	-	-	3	-	3	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Full Stack Development**
Category: Skill Course
Semester: I Semester
Course Code: 24ACSE34L
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	0	2	2

Course Objectives: This course will be able to
1. Interpret and use HTML concepts in developing the web pages
2. Use the tables and forms controls to design web pages.
3. Use the CSS to design web pages.
4. Interpret the JavaScript programming language
5. Use JavaScript DOM concepts to create dynamic webpages.

Course Outcomes:
At the end of the course, the student will be able to
1. Interpret and apply the fundamental HTML mark-ups when designing web pages
2. Apply and design the web pages with Tables and forms controls.
3. Implement cascading style sheets to design web pages
4. Interpret and use JavaScript concepts in designing web pages
5. Implement JavaScript DOM concepts to create dynamic webpages.

Unit 1 Introduction to HTML **10**

Structuring Documents for the Web-A Web of Structured Documents, Introducing HTML, Tags and **Elements, Attribute Groups:** Core Attributes, Internationalization, Core Elements, Basic Text Formatting, Understanding Block and Inline Elements, Grouping Content, Text Processing tags, **working with lists:** ordered, unordered, Nested lists. **Links and Navigation:** Basic Links, Creating In-Page Links with the Element.

Unit 2 Design of Webpages **10**

Images: adding images, using images as links. Audio and video: adding audio and video to your webpages. **Tables:** Introducing Tables, Basic Table Elements and Attributes, adding a Caption to a Table, Grouping Sections of a Table, Nested Tables. **Forms:** Introducing Forms, creating a Form with the Top of Form

Element, Form Controls, and Creating Labels for Controls and the Element, Structuring Your Forms with field set and legend Elements, Focus, Disabled and Read-Only Controls.

Unit 3 Design of Webpages using CSS 10

Working with Frames: frame and frameset elements. Cascading Style Sheets: Introducing CSS, CSS Properties: Controlling Text, Text Formatting, and Text Pseudo-Classes. **Styling Text:** Selectors-universal, ID, class, Child, Descendant, Adjacent sibling, general sibling. Lengths, **Introducing the Box Model:** An Example Illustrating the Box Model. More CSS: Backgrounds, Lists, Tables.

Unit 4 Introduction to Java Script 10

JavaScript: Introduction to JavaScript, How to Add a Script to Your Pages, comments in JavaScript, Create an External JavaScript, Input and Output in javas cript. JavaScript Programming console, General Programming Concepts: Variables, Operators, String Operators (Using + with Strings), Functions, Conditional Statements, Loops.

Unit 5 Java Script DOM 10

JavaScript pre-defined object properties and methods: Document, Window, Array, Math, String, Regex**.** **Document object model:** DOM tree, **Accessing elements**: Class, id, Tagname. Update Text content Using text Content, Inner Text and Inner HTML property. Adding an Element to the DOM Tree, Removing an element from the DOM Tree.

Prescribed Textbooks:

1. Beginning HTML and CSS Rob Larsen, Wrox Programmer to Programmer.
2. Jon Duckett, “javascript & jQuery: Interactive Front-End Web Development”, Wiley, 2014.

Reference Books:

1. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications
2. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, Wiley Publications
3. jQuery in Action, Bear Bibeault, Yehuda Katz, and Aurelio De Rosa, Third Edition, Manning Publications

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACSE34L-1	3	2	3	1	3	-	-	-	1	-	2
24ACSE34L-2	3	2	3	1	3	-	-	-	1	-	2

24ACSE34L-3	3	2	3	1	3	-	-	-	1	-	2
24ACSE34L-4	3	3	3	2	3	-	-	-	2	-	2
24ACSE34L-5	3	3	3	2	3	-	-	-	2	-	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Database Management Systems**
Category: Professional Core
Semester: II Semester
Course Code: 24ACSE41T
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able to
1. To introduce the fundamental concepts and architecture of database systems and the basics of SQL
2. To understand database design using the Entity-Relationship (ER) model and its mapping to relational models.
3. To develop skills in writing SQL and PL/SQL queries, including functions, procedures, and triggers.
4. To understand normalization techniques and schema refinement for maintaining data integrity and reducing redundancy.
5. To learn transaction management concepts and concurrency control mechanisms in database systems.

Course Outcomes:
At the end of the course, the student will be able to
1. Explain the basic structure, components, and applications of database systems and perform basic SQL operations.
2. Design conceptual data models using ER diagrams and convert them into relational schemas.
3. Write complex SQL and PL/SQL queries including joins, views, sub queries, triggers, and cursors.
4. Apply normalization techniques and functional dependency concepts to design efficient and consistent database schemas.
5. Understand and implement transaction properties, concurrency control, and recovery mechanisms in DBMS.

Unit 1 Introduction to DBMS and Basics of SQL 10

INTRODUCTION: Database-System Applications, Characteristics, Purpose of Database Systems, View of Data, Database Languages, Data Storage and Querying, Transaction Management, Data Base Architecture, Database Users and Administrators.

Basic SQL: Simple Database Schema ,data types, table definitions(create, alter),different DML operations(insert, delete, update)

Unit 2 Database Design 10

DATABASE DESIGN: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Case study: The Internet Shop.

The Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Data Base Design: ER to Relational.

Unit 3 SQL and PL/SQL 10

SQL AND PL/SQL: Introduction to SQL, Data Definition Commands, Data Manipulation Commands, Basic SQL Querying(Select and project) Select Queries, **Virtual Tables:** Creating View, Altering View, Updating View, Destroying View, Relational Set Operators, SQL Join Operators, Sub Queries and Correlated Queries, implementation of different integrity constraints, Aggregate Functions, **Procedural SQL:** Stored Procedures, Stored Functions, Triggers, Cursors

Unit 4 Introduction to schema Refinement 10

Introduction to Schema Refinement: Purpose of Normalization or Schema refinement Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Functional Dependencies, Reasoning about FDs, **Normal Forms:** 1NF, 2NF, 3NF, BCNF, **Properties of Decomposition:** Lossless Join Decomposition, Dependency Preserving Decomposition, Multivalued Dependencies, 4 NF.

Unit 5 Transactions and concurrency control 10

ACID Properties: Consistency and Isolation, Atomicity and Durability, Transactions and Schedules, Serializability, Recoverability, Testing for serializability, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, Transaction Support in SQL. Deadlocks, Recovery and Atomicity.

Prescribed Textbooks:

1. Silberschatz, Korth, Sudarshan, Database System Concepts. McGraw Hill, 5th Edition.
2. C.J.Date, Introduction to Database Systems, Pearson Education

Reference Books:

1. RaghuRamaKrishnan, Johannes Gehrke, Database Management Systems, McGraw Hill, Third Edition.
2. Database Management System,6th edition,Ramez Elmasri,Shamkant B.Navathe, Pearson.

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24ACSE41T-1	3	2	1	1	2	-	-	1	2	-	2
24ACSE41T-2	3	3	3	2	2	-	-	1	2	1	2
24ACSE41T-3	3	2	3	2	3	-	-	1	2	1	2
24ACSE41T-4	3	3	3	2	2	-	-	-	1	-	2
24ACSE41T-5	3	3	2	3	3	-	-	-	1	1	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Software Engineering**
Category: Professional Core
Semester: II Semester
Course Code: 24ACSE42T
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able

1. To understand the evolution of software engineering and various software development life cycle models.
2. To impart knowledge on software project management, including estimation techniques, risk management, and requirement analysis.
3. To study software design principles, including modularity, cohesion, coupling, and interface design.
4. To learn coding standards, testing strategies, software quality assurance, and reliability techniques.
5. To explore software maintenance, CASE tools, and software reuse concepts and methodologies

Course Outcomes:

At the end of the course, the student will be able to

1. Explain the software development life cycle models and identify suitable models for different software projects.
2. Analyze and document software requirements using specification techniques and apply estimation models like COCOMO.
3. Design function-oriented and user-friendly software systems with proper design strategies and user interfaces.
4. Implement coding standards and conduct effective testing to ensure software reliability and quality.
5. Understand the processes of software maintenance, CASE tools, and approaches to software reuse

Unit 1 Introduction to Software Engineering 10

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model

Unit 2 Software Requirement Analysis 10

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL

Unit 3 Software Design 10

Software Design: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Textbook 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

Unit 4 Software Coding and Testing 10

Coding And Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and some general issues associated with testing.

Software Reliability and Quality Management: Software Reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma.

Unit 5 Software Maintenance 10

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, and Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Prescribed Textbooks:

1. Fundamentals of Software Engineering, Rajib Mall, 5th Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9th Edition, Mc-Graw Hill International Edition

Reference Books:

1. Software Engineering, Ian Sommerville,10th Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105182/

2)https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview

3)https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
23A0542T-1	3	3	2	1	2	-	-	1	1	1	2
23A0542T-2	3	3	3	2	3	-	-	1	1	1	2
23A0542T-3	3	3	3	3	3	-	-	2	1	2	3
23A0542T-4	3	3	3	3	3	2	-	2	1	2	3
23A0542T-5	3	3	3	3	3	2	-	2	2	2	3

ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Principles of Artificial Intelligence**
Category: Professional Core
Semester: II Semester
Course Code: 24AEEE11T
Branch/es: AI&ML, CSE(AI) and CSE(AIML

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: This course will be able to
1. The student should be made to study the concepts of Artificial Intelligence
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. To learn different knowledge representation techniques

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the importance of artificial Intelligence in real world environment
2. Apply the artificial intelligence algorithms for problem solving
3. Analyse the various reasoning and knowledge representation techniques
4. Solve the problems using classification and planning techniques
5. Learn about Expert system techniques in uncertain environment for obtaining solution

Unit 1 Introduction **10**

AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

Unit 2 Searching 10

Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

Unit 3 Representation of Knowledge 10

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempster shafer theory.

Unit 4 Logic concepts 10

First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

Unit 5 Expert Systems 10

Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Prescribed Textbooks:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw 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 problem solving", 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

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AAIM41T-1	3	3	-	-	-	3	-	3	2	-	2
24AAIM41T-2	3	3	3	3	-	3	-	3	-	-	2
24AAIM41T-3	3	3	3	3	-	3	-	3	2	-	-
24AAIM41T-4	3	3	3	3	1	3	-	3	-	-	-
24AAIM41T-5	3	3	3	3	-	3	-	3	-	-	-

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(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Probability and Statistics**
Category: BS&H
Semester: II Semester
Course Code: 24AMAT41T
Branch/es: CSE, AIDS, AIML, CSE (AI), CSE (DS), CSE(AIML), CSE(IOT), ME, CE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: The course aims to build a strong foundation in probability and statistics for modeling and analyzing data under uncertainty. It covers probability theorems, random variables, distributions, correlation, estimation, and hypothesis testing for large and small samples. Students will gain the ability to apply statistical tools in data analysis, research, and engineering problem-solving.

Course Outcomes:
At the end of the course, the student will be able to
1. Apply the concepts of probability theorems in stochastic process
2. Apply the probability distribution in real life problems
3. Calculate the correlation between two variables
4. Evaluate the hypotheses of large samples

5. Evaluate the hypotheses of small samples

Unit 1 Probability 10

Probability - axioms of probability – addition theorem of probability - conditional probability-multiplication theorem of probability (without proof) - Baye's theorem.

Random variables - discrete and continuous - Distribution functions - Mean and Variance.

Unit 2 Probability distributions 8

Probability distributions – Binomial and Poisson distribution - fitting - normal distribution - their properties.

Unit 3 Introduction of statistics 8

Introduction of Statistics – Mean - Median and Mode for ungrouped and grouped data.

Correlation - **correlation coefficient :** Karl Pearson's coefficient - Spearman's rank correlation

Unit 4 Estimation and Testing of hypothesis for large samples 10

Estimation - Point estimation - Interval estimation of one mean (small and large) - one Proportion (large).

Test of Hypothesis: Types of errors, one and two tailed tests, level of significance, single mean -difference of means - single proportion - difference of proportions (large).

Unit 5 Testing of hypothesis for small samples 8

Student t-distribution test for single mean **-** two means and paired t-test,

Testing of equality of variances (F-test) - $\chi 2$ test for goodness of fit - $\chi 2$ test for independence of attributes.

Prescribed Textbooks:

1. Miller and Freund, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. T. K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, Probability and Statistics, 2nd edition, S. Chand, 2010.

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AMAT41T.1	3	2	1	2	-	-	-	-	-	-	-
24AMAT41T.2	3	2	1	2	-	-	-	-	-	-	-
24AMAT41T.3	3	2	1	2	-	-	-	-	-	-	-
24AMAT41T.4	3	3	1	2	-	-	-	-	-	-	-
24AMAT41T.5	3	3	1	2	-	-	-	-	-	-	-

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(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)
RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: Management Science
Category: MBA
Semester: I Semester
Course Code: 24AMBA22T
Branch/es: CSE, AI&DS, AIML, CSE (AI) and CSE (DS)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

- To summarize the basic concepts of Management and Organization Structures, types, merits and demerits.
- To comprehend the various functions of HRM.
- To design an idea about Operations Management and Project Management
- To understand the basic concepts of financial management, and Marketing Management.

To summarize the concepts of TQM, SCM, Ethics and MIS

Course Outcomes:

At the end of the course, the student will be able to

1. Summarize the basic concepts of management and organization structures.
2. Analyze the different human resource management process.
3. Apply the concepts of PERT, CPM to find the critical path for project success.
4. Apply different financial and marketing strategies in the organization.
5. Comprehend the different concepts of TQM, SCM, Ethics, and MIS & ERP in an organization.

Unit 1 Management and Organization Structure 12

Meaning, Nature, Concept and Importance of Management, Functions of Management, Evolution of Management Thought: Taylor Scientific Management, Fayol's Administrative Management, Systems Approach. Roles and Skills of Manager, Principles and Need of Organization Structure, Forms of Organization Structure: Line, Line and Staff, Functional, Divisional and Matrix Organizations.

Unit 2 Human Resources Management (HRM) 9

Definition, Significance of HRM, Functions of HRM, HR Planning Process, Job Analysis, Job Design, Recruitment and Selection, Placement, Induction and Training, Performance Appraisal, Compensation, Industrial Relations.

Unit 3 Operations Management and Project Management 14

Introduction and Functions of Operations, Plant Location and Layout, Methods of Production (Job, Batch and Mass Production), Objectives of Inventory Management, Need for Inventory Control, Method of Inventory Management: EOQ, ABC Analysis. Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM).

Unit 4 Financial Management and Marketing Management 14

Objectives, Scope, Techniques of Investment Analysis, Pay Back Period, Accounting Rate of Return, and Working Capital, Cost of Capital, Sources of Financing, Definitions of Marketing, Core Concepts of Marketing, Marketing Mix, Product Levels – Product Life Cycle, Pricing Objectives, Pricing Methods.

Unit 5 Advances in Management Practices 10

Definitions of quality, Basic concepts of TQM, TQM framework, Principles of Total Quality Management (TQM), Definitions of Supply Chain Management, Decision Phases in Supply Chain, Transportation Services, Overview Of Ethics, Nature and Objectives of Ethics, Relationship Between Ethics and Organization, Basic Concepts and Overview of Management Information System (MIS), Enterprise Resource Planning (ERP).

Prescribed Textbooks:

1. Principles and Practice of Management by L M Prasad.,Sultan Chand & Sons Publisher.
2. Human resource management, Aswathappa, 4th Edition, THM 2006.
3. Management Science by Aryasri, McGraw Hill Education India, ISBN: 9780070090279.
4. Operations Management by James R Evans & David A Coller, Thompson Press Publications.
5. Marketing Management By Philip Kotler, Kevin Lane Kellar, 12/e, Pearson 2007.

Reference Books:

1. Stoner, Freeman, Gilbert, Management, Pearson Edu., 2005, 6th Ed. ISBN: 9788131707043. 2. Panneer Selvam, Production and Operations Management. PHI, 2004. ISBN, 8120324528, 9788120324527

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AMBA22T.1	2	1	2	-	1	-	1	1	1	-	1
24AMBA22T.2	2	2	2	1	1	1	1	1	1	1	1
24AMBA22T.3	1	1	-	1	-	1	2	2	1	-	1
24AMBA22T.4	1	2	2	1	1	1	-	-	-	2	-
24AMBA22T.5	2	2	2	1	1	1	2	2	1	-	1

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Database Management Systems Lab**
Category: Professional Core Lab
Semester: II Semester
Course Code: 24AMEC11L
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS), CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	-	4	3

Course Objectives: This course will be able to

1. Populate and query a database using SQL DDL/DML Commands
2. Declare and enforce integrity constraints on a database
3. Writing Queries using advanced concepts of SQL
4. Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of the course, the student will be able to

1. Understand and apply SQL commands for creating, altering, and managing database tables and constraints.
2. Construct complex SQL queries using various conditions, aggregate functions, and subqueries.
3. Develop PL/SQL programs utilizing control structures, exception handling, and transaction management.
4. Implement stored procedures, functions, and triggers to enhance database operations and integrity.
5. Create Java applications that connect to databases using JDBC for data manipulation and retrieval.

Exercise 1 **3**

Draw Relational Databases and ER Diagrams for the following applications.

a) Student Information System, Student(Student No, Student Name, Address, Mobile No, Email ID, Institute Name, Branch Name, Fee, Mark1, Mark2, Mark3, Mark4, Mark5,TotalMarks,Percentage,Grade)

b) Employee Information System, Employee (Employee ID, Employee Name, Address, Mobile No, Email ID, Organization Name, Employee Designation, Basic Salary, DA, HRA, Gross Salary, Deductions, Net Salary)

Exercise 2 **3**

Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command

Exercise 3 **3**

Queries (along with sub-Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example: - Select the roll number and name of the student who secured fourth rank in the class

Exercise 4 **3**

Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

Exercise 5 **3**

Write SQL queries to perform JOIN OPERATIONS (i.e. CONDITIONAL JOIN, EQUI JOIN, LEFT OUTER JOIN, RIGHT OUTER JOIN, FULL OUTER JOIN

Exercise 6 **3**

Queries using Conversion functions (to_char, to number and to date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sys date, next day, add months, last day, months between, least, greatest, trunc, round, to_char, to date)

Exercise 7 **3**

a) Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block

Exercise 8 **3**

Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions

Exercise 9 **3**

a) Write SQL queries to perform KEY CONSTRAINTS (i.e. primary key, foreign key, unique not null, check, default).
b) Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
c) Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

Exercise 10 **3**

a) Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables
b)Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

Exercise 11 **3**

Create a table and perform the search operation on table using indexing and non-indexing techniques

Exercise 12 **3**

a)Write a Java program that connects to a database using JDBC
b)Write a Java program to connect to a database using JDBC and insert values into it
c) Write a Java program to connect to a database using JDBC and delete values from it.

Reference Books:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning

24ACSE41L-1	3	3	3	-	-	-	-	-	-	-	-
24ACSE41L -2	3	3	3	3	-	-	-	-	-	-	-
24ACSE41L-3	3	3	3	3	3	-	-	-	-	-	-
24ACSE41L-4	3	3	3	3	3	-	-	-	-	-	-
24ACSE41L-5	3	3	3	3	3	-	-	-	-	-	-

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(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Software Engineering Lab**
Category: Professional Core Lab
Semester: II Semester
Course Code: 24ACSE42L
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS) and CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
-	-	3	1.5

Course Objectives: This course will be able

1. To familiarize students with software engineering processes, tools, and techniques through hands-on implementation.
2. To develop the ability to gather requirements and create software requirement specifications (SRS) for real-world applications.
3. To enable students to design system models using Data Flow Diagrams (DFDs) and Unified Modeling Language (UML).
4. To implement test cases and apply software testing techniques like black-box and white-box testing.
5. To promote teamwork, documentation, and presentation skills through mini projects or case studies.

Course Outcomes:

At the end of the course, the student will be able to

1. Prepare Software Requirement Specifications (SRS) and functional models for given problems.
2. Design and document software using tools such as DFDs, UML diagrams, and design notations.
3. Implement and validate software components using software engineering practices and testing strategies.
4. Apply software testing tools and write test cases to ensure software quality and reliability.
5. Demonstrate teamwork

Exercise 1 **3**

a) Define a problem statement.

b) Preparation of Software Requirement Specification Document, Design Document.

Exercise 2 **3**

Define the functional and non-functional requirements of the system using use cases and prepare a SRS document also

Exercise 3	**3**
a) Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated. b) Design and document a use case diagram for a problem statement	

Exercise 4 **3**

Design a use case diagram class diagram and object diagrams using Rational tools for any one application

Exercise 5 **3**

a) Write C/C++/Java/Python program for classifying the various types of cohesion and coupling.

b) Develop test cases for unit testing and integration testing

Exercise 6 **3**

Schedule all the activities and sub-activities Using the PERT/CPM charts

Exercise 7 **3**

Define an appropriate metrics for at least 3 quality attributes for any software application

Case study-1 **A POINT OF SALE (POS) SYSTEM** **6**

Problem Statement: A POS System is a computerized application used to record sales and handle payments; it is typically used in a retail store. It includes hardware components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is, even if remote services and temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client – side terminals and interfaces such as browser, PDA‟s, touch – screens

Case study-2 **A POINT OF SALE (POS) SYSTEM** **6**

Problem Statement: The online auction system is a design about a website where sellers collect and prepare a list of items they want to sell and place it on the website for visualizing. To accomplish this purpose the user has to access the site. Incaseit‟s a new user he has to register. Purchaser‟s login and select items they want to buy and keep bidding for it. Interacting with the purchasers and sellers through messages does this. There is no need for customer to interact with the sellers because every time the purchasers bid, the details will be updated in the database. The purchaser making the highest bid for an item before the close of the auction is declared as the owner of the item. If the auctioneer or the purchaser doesn't want to bid for the product then there is fixed cutoff price mentioned for every product. He can pay that amount directly and own the product. The purchaser gets a confirmation of his purchase as an acknowledgement from the website. After the transition by going back to the main menu where he can view other items.

Case study-3 **ONLINE AUCTION SALES** **6**

Problem Statement: In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company. The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview. There may be different rounds for interview like the written test, technical interview, and HR interview. After the successful completion of all rounds of interview, the selected candidates‟ names are displayed. Meanwhile HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate

Case study-4 **ONLINE TICKET RESERVATION FOR RAILWAYS** **6**

Problem Statement: Computer play an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description

Prescribed Textbooks:

1. Software Engineering A Practitioner's Approach, Roger S. Pressman, Seventh Edition, 2009, McGraw-Hill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Fourth Edition, 2014,PH
3. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education

Reference Books:

1. Software Engineering, Ian Sommerville, Ninth edition, Pearson education
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24ACSE42L-1	3	3	3	-	-	-	-	-	-	-	-
24ACSE42L -2	3	3	3	3	-	-	-	-	-	-	-
24ACSE43L-3	3	3	3	3	3	-	-	-	-	-	-
24ACSE44L-4	3	3	3	3	3	-	-	-	-	-	-
24ACSE45L-5	3	3	3	3	3	-	-	-	-	-	-

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(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Principles of Artificial Intelligence Lab**
Category: Professional Core Lab
Semester: II Semester
Course Code: 24AAIM41L
Branch/es: AI&ML, CSE(AI) and CSE(AIML)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
-	-	3	1.5

Course Objectives: This course will be able to
1. Study the concepts of Artificial Intelligence.
2. Learn the methods of solving problems using Artificial Intelligence.
3. Introduce the concepts of Expert Systems and machine learning.

Course Outcomes:
At the end of the course, the student will be able to
1. Understand AI problems, the foundation and history of AI, and the functioning of intelligent agents in various environments
2. Understand and analyze various search strategies, heuristic methods, and algorithms for game playing and problem reduction.
3. Gain skills in knowledge representation, logic programming, and reasoning under uncertainty using various probabilistic and rule-based methods.
4. Understand and apply logic concepts, inference methods, and various learning techniques including decision trees and reinforcement learning.
5. Understand AI problems, the foundation and history of AI, and the functioning of intelligent agents in various environments

Exercise 1 **3**

Pandas Library
a) Write a python program to implement Pandas Series with labels.
b) Create a Pandas Series from a dictionary.
c) Creating a Pandas Data Frame.
d) Write a program which makes use of the following Pandas methods
i) describe () ii) head () iii) tail () iv) info ()

Exercise 2 **3**

Pandas Library: Visualization
a) Write a program which use pandas inbuilt visualization to plot following graphs:
1. Bar plots ii) Histograms iii) Line plots iv) Scatter plots

Exercise 3 **3**

Write a Program to Implement Breadth First Search and Depth First Search using Python.

Exercise 4 **3**

Write a program to implement Best First Searching Algorithm and heuristic search Algorithm

Exercise 5 **3**

Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)

Exercise 6 **3**

Write a Program to Implement Water-Jug problem using Python.

Exercise 7 **3**

Write a Program to Implement Alpha-Beta Pruning using Python.

Exercise 8 **3**

Write a Program to implement 8-Queens Problem using Python.

Exercise 9 **3**

Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.

Exercise 10 **3**

Write a program to implement the Unification algorithm

Exercise 11 **3**

Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain

Exercise 12 **3**

Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table

Prescribed Textbooks:

1. Prateek Joshi,Artificial Intelligence with Python,Packt Publishing, 2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022

Reference books:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , "Core Python Programming" Dreamtech Press India Pvt Ltd 2018.

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AAIM41L-1	3	3	3	-	-	-	-	-	-	3	3

24AAIM41L-2	3	3	3	2	3	-	-	2	-	3	3
24AAIM41L-3	3	3	-	-	-	1	-	-	-	3	3
24AAIM41L-4	-	3	-	3	3	-	-	3	-	3	-
24AAIM41L-5	-	3	3	2	-	-	-	3	-	3	3

ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Advanced Java Programming**
Category: Skill Course
Semester: II Semester

Course Code: 24ACSE44L
Branch/es: AI& DS, AI&ML, CSE, CSE(AI), CSE(AIML),CSE(DS) and CSE(IOTCSBT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
1	0	2	2

Course Objectives: This course will be able to
1.Develop JAVA Program to access DATA from database
2. Develop user interface applications
3. Develop data persistence, messaging, location based services

Course Outcomes:
At the end of the course, the student will be able to
1. Understand JavaFX GUI Programming Concepts.
2. Apply JavaFX Controls and event handling in GUI applications.
3. Understand and apply JDBC API to retrieve data from Data Base.
4. Understand and apply Servlets in server side programming.
5. Understand and apply JSPs in developing web applications

Unit 1 Introduction JavaFX GUI Programming 10

JavaFX Basic Concepts -The JavaFX Packages, the Stage and Scene Classes, Nodes and Scene Graphs, Layouts, the Application Class and the Lifecycle Methods, Launching a JavaFX Application, A JavaFX Application Skeleton, Compiling and Running a JavaFX Program. **A Simple JavaFX Control:** Label, Using Buttons and Events - Event Basics, Introduction, Demonstrating Event Handling and the Button

Unit 2 Exploring JavaFX Controls 10

Exploring JavaFX Controls: Using Image and Image View, Toggle Button, Radio Button, CheckBox, ListView, ComboBox, TextField, ScrollPane, TreeView. Adding Tooltips, Disabling a Control. **JavaFX Menus:** Menu Basics, An Overview of MenuBar, Menu, and MenuItem. Create a Main Menu, Add Menu Items, Add Images to Menu Items

Unit 3 Java Database Connectivity 10

JDBC API: Introduction to JDBC API. System Requirements. Types of JDBC Drivers. Creating a Database Table-Oracle Database. Connecting to a Database. Setting the Auto-Commit Mode. Committing and Rolling Back Transactions, JDBC-Types-to-Java-Types Mapping. Knowing About the Database.
Executing SQL Statements. Processing Result Sets. Making Changes to a ResultSet. Handling Multiple Results from a Statement. Connecting Java to relational databases (MySQL, PostgreSQL, etc.)

Unit 4 Introduction to Java Servlets 10

Introducing Servlets: Background, The Life Cycle of a Servlet. Servlet Development Options. Using Tomcat A Simple Servlet. Create and Compile the Servlet Source Code. Start Tomcat. Start a Web Browser and Request the **The Servlet API:** The javax.servlet Package. Reading Servlet Parameters. The javax.servlet.httpPackage. Handling HTTP Requests and Responses. Handling HTTP GET Requests. Handling HTTP POST Requests. Using Cookies .Session Tracking. Accessing Databases with JDBC using servlets.

Unit 5 Introduction to JSP 10

JSP Basics: What's Wrong with Servlets? Running Your First JSP, How JSP Works, The JSP Servlet Generated Code, The Generated Servlet Revisited, Implicit Objects, JSP Syntax, Directives, Scripting Elements, Standard Action Elements, Comments.
Developing JSP Beans: Calling Your Bean from a JSP Page, Accessing Properties Using jsp:getProperty and jsp:setProperty, Accessing Databases with JDBC using JSP

Prescribed Textbooks:

1. JAVA The Complete Reference 9th edition, Herbert Schildt Oracle Press(Unit-1,2,4).
2. Beginning java8 Apis extensions and libraries, Kishori Sharan, Apress (Unit-3)
3. Java for the Web with Servlets, JSP, and EJB: A Developer's Guide to J2EE Solutions By Budi Kurniawan.(Unit-5)

Reference Books:

1. Java 6 Programming, Black Book, Dreamtech
2. Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
3. Advanced Java Technology, By M.T. Savaliya, Dreamtech

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24ACSE44L-1	3	2	2	-	-	-	-	-	-	-	2
24ACSE44L-2	3	2	3	-	-	-	-	-	-	-	2
24ACSE44L-3	3	2	2	2	3	-	-	-	-	-	2
24ACSE44L-4	3	3	3	2	3	-	-	-	-	-	2
24ACSE44L-5	3	3	3	2	3	-	-	-	-	-	2

Title of the Course: **Environmental Science**

Category:	MC	
Semester:	I Semester	II Semester
Course Code:	24AENS31T	24AENS41T
Branch/es:	CSE, CSE(AIML), CSE(IOT), EEE, ME	CSE(AI), AIML, CSE(DS), AIDS, CE & ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
2	0	0	0

Course Objectives: This course aims to raise environmental awareness, promote sustainable practices aligned with the Sustainable Development Goals (SDGs), and highlight the significance of ecosystems and biodiversity. It sensitizes students to major pollution issues and related legislative measures, fosters ethical responsibility and problem-solving skills to tackle environmental challenges, and explains the impact of human population growth on the environment and public health. The course also emphasizes the role of education, information technology, and public policy in promoting environmental sustainability

Course Outcomes:

At the end of the course, the student will be able to

1. Explain how natural resources should be utilised with a focus on sustainability.
2. Describe the need to protect ecosystems and biodiversity for future generations.
3. Comprehend major pollution problems related to ecosystems.
4. Summarize key environmental issues, sustainable practices, and laws supporting environmental protection in the context of sustainable development goals.
5. Explain the effects of population growth on environment and health, and the role of education, IT, and welfare programs in managing them.

Unit 1 Natural resources 7

Natural Resources: Renewable and non-renewable resources – Forest resources: Uses, deforestation – Water resources: Uses, floods, drought – **Mineral resources:** Uses, environmental effects of extracting mineral resources– Energy resources: Renewable and non-renewable energy sources (overview only).

Unit 2 Ecosystems, Biodiversity and its conservation 6

Ecosystems: Producers, consumers and decomposers – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and functions of the following ecosystems: Forest ecosystem and lake ecosystem.

Biodiversity and its conservation: Definition – Values of biodiversity – Hot-spots of biodiversity – Threats to biodiversity – Conservation of biodiversity

Unit 3 Environmental pollution 5

Definition, causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.

Self-learning: Genetically modified.

Unit 4 Social issues and the Environment 6

Sustainable development – Rainwater harvesting – Environmental ethics – Climate change, global warming, acid rain, ozone layer depletion – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Environment Protection Act.

Unit 5 Human population and the Environment 6

Population explosion – Family welfare programmes – Environment and human health – Value education – Role of information technology in environment and human health, Field work – Visit to a local area to document environmental assets.

Prescribed Textbooks:

1. Kaushik, Anubha, and C. P. Kaushik. Perspectives in Environmental Studies. 7th ed., New Age International Publishers, 2022.
2. Chawla, Shashi. A Textbook of Environmental Studies. 1st ed., McGraw Hill Education, 2017.

Reference Books:

1. Joseph, Benny. Environmental Studies. 3rd ed., McGraw Hill Education India, 2017.
2. Dhinakaran, A., and Sankaran, B. A Textbook of Environmental Studies. 1st ed., Himalaya Publishing House, 2023.
3. Basu, Mahua, and Xavier, S. Fundamentals of Environmental Studies. 1st ed., Cambridge University Press, 2017.
4. Bharucha, Erach. Textbook of Environmental Studies for Undergraduate Courses. 3rd ed., Universities Press (India), 2021.
5. Tiwari, Vijay Kumar. A Textbook of Environmental Studies. 1st ed., Himalaya Publishing House, 2024.

CO-PO Mapping:

Course outcomes	Engineering Knowledge	Problem Analysis	Design/Development t of solutions	Conduct investigations of Complex Problems	Engineering tools usage	The Engineer and World	Ethics	Individual and collaborative teamwork	Communication	Project Ma engagement and Finance	Life-long Learning
24AENS31T/41T.1	2	2	-	-	-	-	2	-	-	-	2
24AENS31T/41T.2	2	2	-	-	-	-	2	-	-	-	2
24AENS31T/41T.3	2	2	-	-	-	-	2	-	-	-	2
24AENS31T/41T.4	3	2	-	-	-	-	2	-	-	-	3
24AENS31T/41T.5	2	2	-	-	-	-	2	-	-	-	2