



**SIDDHARTHA**  
**ACADEMY OF HIGHER EDUCATION**

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

91 866 2582333

866 2582334

866 2584930

**SCHOOL OF SCIENCE**  
**DEPARTMENT OF COMPUTER APPLICATIONS**

**Scheme of Instructions**  
**and**  
**Syllabus of MCA Programme**  
**w.e.f. 2024-'25**  
**(SU-24 Regulation)**





# SIDDHARTHA

## ACADEMY OF HIGHER EDUCATION

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

91 866 2582333  
866 2582334  
866 2584930

### SCHOOL OF SCIENCE

#### SCHEME OF INSTRUCTION FOR MCA PROGRAMME w.e.f. 2024-25

#### SEMESTER I

CONTACT HOURS: 29/week

S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	24CA501	PC	Problem Solving with Python	2	0	3	3.5
2.	24CA502	PC	Data Structures using OOP	3	0	2	4
3.	24CA503	PC	Computer Networks	2	0	2	3
4.	24CA504	PC	AI Tools and Applications	2	0	2	3
5.	24MA501	BS	Discrete Mathematics	2	0	2	3
6.	24EN501	HS	Professional Communication	2	0	3	3.5
7.	24MA581	HS	Personality Development Course-1 (Logical Reasoning and Aptitude)	0	0	2	1
<b>Total</b>				13	0	16	21

#### SEMESTER II

CONTACT HOURS: 29/week

S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	24CA505	PC	Database Management Systems	3	0	2	4
2.	24CA506	PC	OOPs with JAVA	3	0	2	4
3.	24CA507	PC	Cryptography and Network Security	2	0	2	3
4.	24CA508	PE	Elective-I A. Data Mining B. Operating Systems C. Design & Analysis of Algorithms D. Software Engineering	2	0	2	3
5.	24MA502	BS	Probability and Statistics	3	0	2	4
6.	24EN502	HS	Business Communication	2	0	2	3
7.	24EN581	HS	Personality Development Course-2 (English, Campus Recruitment Training)	0	0	2	1
<b>Total</b>				15	0	14	22

**SEMESTER III****CONTACT HOURS: 30/week**

S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	24CA601	PC	Machine Learning using Python	3	0	2	4
2.	24CA602	PC	Cyber Security	2	0	2	3
3.	24CA603	PC	Big Data Analytics	2	0	2	3
4.	24CA604	PC	Web Design and Development	3	0	2	4
5.	24CA605	PC	Cloud Computing	2	0	2	3
6.	24CA606	PE	Elective-II A. Advanced Database Technology B. Distributed Systems C. Computer Graphics D. Software Project Management	3	0	0	3
7.	24CA681	PR	Mini Project	0	0	4	2
<b>Total</b>				14	0	16	22

**SEMESTER IV****CONTACT HOURS: 27/week**

S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	24CA607	PC	Full Stack Web Development	2	0	2	3
2.	24CA608	PE	Elective-III A. Deep Learning B. Dot Net Programming C. Digital Image Processing D. Software Testing	2	0	2	3
3.	24CA609	PE	Elective-IV A. AI and ML for Management Applications B. Research Methodology C. Self-Learning Course (MOOCs)	3	0	0	3
4.	24CA682	PR	Major Project	0	0	16	8
<b>Total</b>				7	0	20	17

L – Lecture, T – Tutorial, P – Practical, C – Credits

**CREDIT DISTRIBUTION - Category wise and Semester wise - MCA24**

	PC (Program Core)	PE (Program Elective)	HS (Humanities & Sciences)	BS (Basic Sciences)	PR (Project)	Total
<b>Sem-1</b>	13.5	0	4.5	3	0	21
<b>Sem-2</b>	11	3	4	4	0	22
<b>Sem-3</b>	17	3	0	0	2	22
<b>Sem-4</b>	3	6	0	0	8	17
<b>Total</b>	44.5	12	8.5	7	10	82



**SIDDHARTHA**  
**ACADEMY OF HIGHER EDUCATION**

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

---

91 866 2582333

866 2582334

866 2584930

# SEMESTER - I



**24CA501: PROBLEM SOLVING WITH PYTHON**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	3hrs/week	<b>Credits:</b>	3.5
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Infer basic concepts of computers and program design tools	
	<b>CO2</b>	Explain Python primitives for solving problems	
	<b>CO3</b>	Apply problem solving strategies and techniques	
	<b>CO4</b>	Illustrate python function, classes and modules to solve various problems	
	<b>CO5</b>	Use advanced problem solving techniques to solve real world problems	
<b>UNIT–I Introduction to Mechanical Devices and Computing</b>			
<p><b>Evolution of Computers:</b> Mechanistic Devices, Grading Machines, Sorters. Introduction to Programmable Calculators and Computers: Computer Hardware and Software: components and functionalities of computer devices. Overview of Networked Computing and Cloud Computing</p> <p><b>Data Representation:</b> How data is represented and stored in computers (binary, ASCII, etc.).</p> <p><b>Introduction to Operating Systems:</b> Basic functions and types of operating systems, Computer Languages: Machine level and High level languages.</p> <p><b>Problem-Solving Strategies:</b> Identifying and defining problems, breaking down problems into manageable parts with logical thinking.</p> <p><b>Program Design Tools:</b> Flow Chart, Algorithm, implementation of algorithms, Raptor and Scratch tools.</p>			
<b>UNIT–II Introduction to Python</b>			
<p><b>Basics of Python Programming:</b> Features of Python, History and future of Python, Execution of python program, Literal constant, Variables and Identifiers, Data Types, Input and Output Operations, Reserved Words, Indentation, Operators and Expressions</p> <p><b>Decision control Statements:</b> Selection: if, if-else, nested if, if-elif-else, Loop: while, or, nested loop, break, continue, pass, else statement in Loop.</p> <p><b>Strings:</b> Concept of Strings, String operations, String Formatting Operator, Slice Operation, in and not in Operators, Built-in Methods and Functions, String Modules.</p>			
<b>UNIT–III Introduction to Problem Solving</b>			
<p><b>Types of Problems:</b> Simple, Complex, Structured, Unstructured Problem, Solving with Computers.</p> <p><b>Difficulties with Problem Solving:</b> Common challenges in problem-solving, Cognitive barriers and how to overcome them, Debugging and troubleshooting techniques.</p> <p><b>Stages of Problem Solving:</b> Defining the problem, planning the solution, implementing the solution, Evaluating and iterating</p>			

**Strategies for Problem Solving:** Domain Specific Problem Solving

**Domain Independent Problem Solving:** Generate and Test, Means-Ends Analysis, Backward Search, Other Strategies.

**Cognitive Problem-solving Techniques:** Inductive Reasoning, Combinatorial Reasoning, Top-Down Design.

#### **UNIT–IV Python Programming Language**

**Python Data Structures:** Tuple, List, Set and Dictionary

**Functions and Modules:** Need of functions, Function Definition, Function Call, Variable Scope and Lifetime, Return Statement, Defining functions with additional features, Lambda Function, introduction to modules, introduction to packages in python.

**Object Oriented Programming:** Programming paradigm, Features of object-oriented programming, Classes and Objects, Class Methods and Self Object, Constructor, Class variables and Objects, Public and Private Members, Class Methods.

#### **UNIT–V Advanced Problem-Solving Techniques**

**Recursion:** Factorial, Fibonacci Series

**Inheritance:** Generalization, Aggregation, Composition.

**Brute Force:** Introduction, Naïve String Matching.

**Divide and Conquer:** General Method, Binary Search, Quick Sort, Merge Sort.

#### **Learning Resources**

##### **Text Books:**

- [1] Puntambekar, A. A. (2020). *Programming and Problem-Solving using Python* (1st ed.). India: Repro Books Limited.
- [2] Thareja, R. (2019). *Python Programming: Using Problem Solving Approach* (2nd ed.). India: Oxford University Press.
- [3] Sahni, B. K. (2023). *MPC-001: Cognitive Psychology, Learning and Memory - Study Guide*. Gyaniversity Publications.
- [4] Goodrich, M. T., Tamassia, R., & Goldwasser, M. H. (2013). *Data Structures and Algorithms in Python*. United Kingdom: Wiley.

##### **Reference Books:**

- [1] Basalla, G. (1988). *The Evolution of Technology* (1st ed.). United Kingdom: Cambridge University Press.
- [2] Hadfield, S., Weingart, T., & Brown, W. (2018). *An Introduction to Programming and Algorithmic Reasoning Using RAPTOR*. CreateSpace Independent Publishing Platform.
- [3] Guttag, J. (2016). *Introduction to Computation and Programming Using Python: With Application to Understanding Data* (2nd ed.). United Kingdom: MIT Press.
- [4] Beecher, K. (2017). *Computational Thinking: A Beginner's Guide to Problem-Solving and Programming* (Illustrated ed.). United Kingdom: BCS Learning & Development Limited.
- [5] Izadkhah, H., & Behzadidoost, R. (2023). *Challenging Programming in Python: A Problem-Solving Perspective*. Springer International Publishing AG.

## 24CA502: DATA STRUCTURES USING OOP

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Explain the basic concepts of object oriented programming.	
	<b>CO2</b>	Illustrate constructors and destructors, inheritance and polymorphism for problem solving.	
	<b>CO3</b>	Analyze the time and space complexities of various algorithms and illustrate various searching and sorting algorithms.	
	<b>CO4</b>	Identify real-world scenarios where linear data structures are useful.	
	<b>CO5</b>	Apply non-linear data structures to solve complex problems and learn techniques for optimizing the performance of algorithms.	
<b>UNIT–I Principles of OOP, Functions, Classes and Objects</b>			
<p><b>Principles of Object Oriented Programming:</b> OOP Paradigm, Basic Concepts of OOPS, OOP Languages, structure of C++ program, compiling and linking, tokens, keywords, identifiers and constants, datatypes, variables, operators, manipulators, type cast operators, expressions and their types, control structures.</p> <p><b>Functions in C++:</b> Introduction, Main function, Function prototyping, Call by Reference, Inline functions, Default arguments, Function overloading.</p> <p><b>Classes and Objects:</b> Specifying a class, Defining member functions, Nesting member functions, private member functions, Memory allocation for objects, static data members, static member functions, Arrays of objects, Objects as function arguments, Friendly functions</p>			
<b>UNIT–II Constructors, Destructors, Inheritance and Polymorphism</b>			
<p><b>Constructors and Destructors:</b> Introduction, Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments, Destructors.</p> <p><b>Inheritance:</b> Introduction, Defining derived classes, Types of Inheritance-single, multilevel, multiple and hybrid.</p> <p><b>Pointers, Virtual Functions and Polymorphism:</b> Introduction, pointers, pointers to objects, this pointer, polymorphism, pointers to derived classes, virtual functions.</p>			
<b>UNIT–III Sorting and Searching techniques and their performance analysis</b>			
<p><b>Algorithm Performance Analysis:</b> Criteria of an algorithm, Algorithm Specification and performance analysis</p> <p><b>Sorting Techniques:</b> Bubble Sort, Selection Sort, Insertion Sort and Merge Sort and their time complexities.</p> <p><b>Searching Techniques:</b> Sequential Search, Binary Search and Fibonacci Search and their time complexities.</p>			

**UNIT–IV Representation and Applications of Linear Data Structures**

**Introduction to Data Structures:** Definition, Types of data structures.

**Linked list:** Singly Linked List, Double Linked List, Circular Linked List - insertion, deletion and traversal operations.

**Stacks:** Operations of Stack, Representation, implementation and applications of stacks.

**Queue:** Operations of Queue, Representation, implementation and applications of Queue, Circular Queues –Operations and their implementation.

**UNIT–V Representation and Applications of Non-Linear Data Structures**

**Trees:** Introduction, Definition, Terminology, Representation of Tree, *Binary Tree*- Definition, Representation of Binary Tree, Types of Binary Tree, Binary Tree Traversal (recursive traversal), Formation of Binary Tree from its traversals, *Binary Search Trees* -Definition, Inserting a node, Searching for a key, Deleting a node, *Expression Tree*.

**Graphs:** Introduction, Terminology, Graph Representation, Graph Traversal.

**Learning Resources****Text Books:**

- [1] Balaguruswamy, E. (2018). *Object Oriented Programming with C++*. (7<sup>th</sup> Ed.). McGraw-Hill Education.
- [2] Horowitz, E., Sahni, S., Dinesh, M. (2007). *Fundamentals of Data Structures in C++*. (2<sup>nd</sup> Ed.). Universities Press.

**Reference Books:**

- [1] John R. Hubbard. (2000). *Programming with C++ (Schaum's Outlines)*. (2<sup>th</sup> Ed.). Tata McGraw-Hill.
- [2] Malik. D.S.(2003). *Data Structures using C++*, India edition, CENGAGE Learning
- [3] Debasis, S. (2009). *Classic Data Structures*. (2<sup>nd</sup> Ed.).PHI Learning Pvt. Ltd.
- [4] Langsam, Y., Augenstein, M.J., &Tanenbaum, A. M. (2007). *Data Structures using C And C++*. (2<sup>nd</sup> Ed.). Pearson Education.

## 24CA503: COMPUTER NETWORKS

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Analyze types of computer networks, components, network protocols and architectures	
	<b>CO2</b>	Identify different types of guided transmission media and error control mechanisms in the data link layer	
	<b>CO3</b>	Describe the design issues and services provided by the network layer and its routing algorithms	
	<b>CO4</b>	Understand the mechanisms of connection establishment and release	
	<b>CO5</b>	Compare TCP with other transport protocols (e.g., UDP) in terms of reliability, function of DNS in translating domain names to IP addresses	

### UNIT-I Introduction

**Uses of Computer Networks:** Business Applications, Home Applications, Mobile Users, Social Issues. Network Hardware: Personal Area Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks.

**Network Software:** Protocol Hierarchies, Design Issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives.

**Reference Models:** The OSI Reference Model, The TCP/IP Reference Model, A Comparison of OSI and TCP/IP Reference Model.

### UNIT-II Physical Layer And Data Link Layer

#### Physical Layer:

Guided Transmission Media: Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optics.

#### Data Link Layer:

**Data Link Layer Design Issues:** Services Provided to the Network Layer, Framing, Error Control and Flow Control.

**Error Detection and Correction :** Error-Correcting Codes, Error-Detecting Codes.

**Elementary Data Link Protocols :** A simplex Stop-and-Wait Protocol for an Error Free Channel, A simplex Protocol for a Noisy channel.

**Sliding Window Protocols:** A One-Bit sliding Window Protocol, A Protocol using Go Back N and Selective Repeat.

### UNIT-III Network Layer

**Design Issues:** Store and Forward Packet Switching, Services provided to the Transport Layer, Implementation of Connectionless Services, Implementation of Connection Oriented Services, Comparison of Virtual Circuit and Datagram Networks.

**Routing Algorithms:** The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.

**Congestion Control Algorithms:** Approaches to Congestion Control, Traffic-Aware Routing, Congestion Control.

#### **UNIT–IV The Transport Layer**

**The Transport Service:** Services provided to the Upper Layers, Transport Services Primitives and Berkeley Sockets.

**Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release, Flow Control.

**The Internet Transport Protocols: UDP:** Introduction to UDP, Remote Procedure Call.

#### **UNIT–V Internet Transport Protocols and Application Layer**

**The Internet Transport Protocols: TCP:** Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP segment header, TCP connection establishment, TCP connection release

**The Application Layer:**

**DNS - The Domain Name System:** The DNS Name Space, Resource Records, Name Servers.

#### **Learning Resources**

##### **Text Books:**

- [1] Andrew S. Tanenbaum, David J. Wetherall. (2011). *Computer Networks*. Pearson Education.
- [2] William Stallings. (2017). *Data and Computer Communications*. Pearson Education.

##### **References:**

- [1] Natalia Olifer, Victor Olifer, (2005), *Computer Networks: Principles, Technologies and Protocols for Network Design*, Wiley Publications. <https://www.wiley.com/en-br/Computer+Networks%3A+Principles%2C+Technologies+and+Protocols+for+Network+Design-p-9780470869826>
- [2] William Stallings, (2016), *Network Security Essentials: Applications and Standards*. (Global Ed.), Pearson Publications. <https://www.amazon.in/NETWORK-SECURITY-ESSENTIALS-APPLICATIONS-STANDARDS/dp/1292154853>

## 24CA504 : AI TOOLS AND APPLICATIONS

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand the basic concepts of AI and its historical evolution.	
	<b>CO2</b>	Apply AI tools for productivity enhancement.	
	<b>CO3</b>	Develop logical reasoning and analytical skills using AI tools.	
	<b>CO4</b>	Conduct literature reviews and write articles using generative AI.	
	<b>CO5</b>	Implement AI solutions in the field of Computer Applications.	
<b>UNIT–I Introduction to AI &amp; Applications</b>			
Definition and History of AI - Evolution of AI: From Early Concepts to Modern Developments - Types of AI: Narrow AI, General AI, and Super AI - AI Applications in Industry and Daily Life - Ethical and Societal Implications of AI			
<b>UNIT–II AI as a Personal Assistant for Productivity Enhancement</b>			
AI-driven Personal Assistants (e.g., Siri, Google Assistant) - AI in Task Management and Scheduling - AI in Email Management and Communication - AI for Personal Productivity: Time Management, Reminder Systems			
<b>UNIT–III AI as a Learning Tool for Logical Reasoning &amp; Mathematical Analytics</b>			
AI in Problem-Solving and Decision-Making - AI in Mathematical Modeling and Simulation – AI-Driven Analytical Tools for Data Analysis - Enhancing Logical Reasoning with AI			
<b>UNIT–IV Generative-AI for Literature-Review, Gap-Analysis, Ideation and Article Writing</b>			
Introduction to Generative AI - Using AI for Literature Review and Research - AI for Identifying Research Gaps and Ideation - AI in Academic and Article Writing			
<b>UNIT–V AI Applications in Computer Applications</b>			
AI in Software Development: Code Generation, Bug Detection - AI in Cyber security: Threat Detection, Incident Response - AI in Data Management: Data Cleaning, Analysis - Examples/Applications: AI for Automated Testing, AI in Network Security			
<b><u>Learning Resources</u></b>			
<b>Textbooks:</b>			
[1] Russell, S., Norvig, P. (2020). <i>Artificial Intelligence: A Modern Approach</i> . Pearson Education			
[2] Goodfellow, I., Bengio, Y., Courville, A. (2016). <i>Deep Learning</i> . United Kingdom: MIT Press.			

**References Books:**

- [1] Géron, A. (2019). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*. United States: O'Reilly Media.
- [2] Deisenroth, M. P., Faisal, A. A., Ong, C. S. (2020). *Mathematics for Machine Learning*. United Kingdom: Cambridge University Press.

## 24MA501 : DISCRETE MATHEMATICS

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Apply propositional logic and predicate logic to infer statements to validate arguments and to determine normal forms	
	<b>CO2</b>	Apply basic counting techniques to solve combinatorial problems	
	<b>CO3</b>	Solve the recurrence relations of homogeneous and inhomogeneous	
	<b>CO4</b>	Illustrate the types of different relations and verify isomorphism in groups	
	<b>CO5</b>	Show whether the graphs are isomorphic, and determine the chromatic number of graph	
<b>UNIT–I Propositional Calculus</b>			
<p><b>Fundamentals of Logic:</b> Propositions, Connectives, Propositional functions, Truth tables, Tautology, Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication. First Order Predicate Logic: Predicate, Quantifiers, Rules of inference for Quantified propositions.</p>			
<b>UNIT–II Basics of Counting</b>			
<p>Sum and product rules, Indirect counting, One to one correspondence, Combinations and permutations, Enumerating combinations and permutations with and without repetitions, Enumerating combinations and permutations with Constrained repetitions, Binomial and multinomial theorem.</p>			
<b>UNIT–III Advanced Counting Techniques</b>			
<p>Generating function of sequences, Recurrence relations, solving recurrence relations – substitution-Generating functions-The method of characteristic roots, Solution of in homogeneous recurrences relations.</p>			
<b>UNIT–IV Relations and Digraphs</b>			
<p>Relations and basic graphs, Special properties of binary relations, and illustrate the types of relations, paths and closures, Directed graphs and Adjacency matrices, Transitive closure, Warshall's algorithm.</p>			
<b>UNIT–V Graph Theory</b>			
<p>Introduction (graphs, subgraphs, circuits, trees) Sum of degrees' theorem, Isomorphism and sub graphs, planar graphs, Euler's formula, Multi graphs and Euler's circuits, Hamiltonian graphs, Grin-berg's theorem, Graph coloring, Chromatic numbers.</p>			

**Learning Resources**

**Text Books:**

- [1] Mott, J. L., Kandel, A., Baker, T. P. (2015). *Discrete Mathematics for Computer Scientists and Mathematicians*. (2<sup>nd</sup> Ed.). PHI publications.
- [2] Rosen, K. H. (2009). *Discrete Mathematics and Its Applications*. (6th Ed.). McGraw Hill Publications.

**Reference Books:**

- [1] Vani Sharma, Mamta Chaudhary and Dr. Pooja Yadav(2022). *Elements of Discrete Mathematics*, Sultan Chand & Sons
- [2] Chandrasekharan.N, Uma Parvathi.M. *Discrete Mathematics*, PHI learning
- [3] Biswal, Purna Chandra . *Discrete Mathematics and Graph Theory*, PHI learning..

**24EN501 : PROFESSIONAL COMMUNICATION**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	3hrs/week	<b>Credits:</b>	3.5
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Relate and recall the verbal and nonverbal processes of Communication.	
	<b>CO2</b>	Demonstrate active listening skills and acquire the traits of a good listener.	
	<b>CO3</b>	Apply English speaking skills to deliver effective presentations.	
	<b>CO4</b>	Appraise reading techniques like skimming and scanning to enhance employability skills.	
	<b>CO5</b>	Assess writing techniques like outlining and clustering to enhance employability skills.	
<b>UNIT-I Introduction to Communication</b>			
Basics of Communication, Process of Communication, Levels of Communication, Verbal and Nonverbal Communication, Channels of Communication, Barriers to Communication.			
<b>UNIT-II Listening Skills</b>			
Effective Listening, Active Traits of a Good Listener, Listening Modes, Types of Listening, Barriers to Effective Listening, Listening for general content.			
<b>UNIT-III Speaking Skills</b>			
Achieving Confidence, Clarity & Fluency, Effective Presentation Strategies, Meetings, Conferences, Paralinguistic Features, Barriers to Speaking.			
<b>UNIT-IV Reading Skills</b>			
Reading Techniques, Techniques for Good Comprehension, Study Skills, Reading and Interpretation, Intensive, Extensive & Critical Reading, Reading for Different Purposes.			
<b>UNIT-V Writing Skills</b>			
Technical Writing, Importance and Characteristics, Techniques for Good Technical Writing, Paragraph Construction, Essays, Reports.			

**Learning Resources**

**Text Book:**

- [1] Raman, M., & Sharma, S. (2012). *Technical Communication* (2<sup>nd</sup> ed.). Oxford University Press.

**Reference Books:**

- [1] Pushplata, & Kumar, S. (2011). *Communication Skills*. Oxford University Press.  
[2] Rizvi, A. (2005). *Effective Technical Communication*. Tata McGraw-Hill Publishing Company Limited.  
[3] Mishra, S, & Muralikrishna, C. (2006). *Communication Skills for Engineers*. Pearson.

**Web Resources:**

- [1] [http://ndl.iitkgp.ac.in/he\\_document/ekumbh/ekumbh/85?e=5|text%20books%20on%20technical%20communication](http://ndl.iitkgp.ac.in/he_document/ekumbh/ekumbh/85?e=5|text%20books%20on%20technical%20communication)||| Kulbhushan Kumar. *English for Technical Professionals*.  
[2] <https://www.gtuelibrary.edu.in/publication/Technical%20communication%205th%20June'09.pdf>  
[3] Prof. (Dr.) M. D. Desai, *Technical Communication*.  
[https://gnindia.dronacharya.info/CSE-AI-ML/Common-Subjects/Downloads/Technical Communication/Books/Technical-Communication-Book-1.pdf](https://gnindia.dronacharya.info/CSE-AI-ML/Common-Subjects/Downloads/Technical%20Communication/Books/Technical-Communication-Book-1.pdf)  
[4] *Technical Communication Principles and Practice* Meenakshi Raman and Sangeeta Sharn

## 24MA581 : PERSONALITY DEVELOPMENT COURSE-1 (Logical Reasoning and Aptitude)

<b>Lecture</b>	-	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	1
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Develop skills in deductive, inductive, and analytical reasoning	
	<b>CO2</b>	Develop time management skills by approaching different shortcut methods	
	<b>CO3</b>	Utilize systematic approaches to solve complex problems	
	<b>CO4</b>	Analyze, summarize and present information in quantitative forms including table, graphs and formulas	
<b>CO5</b>	Apply skills in academic, professional and everyday problem-solving contexts		
<b>UNIT–I Logical Reasoning</b>			
Series Completion - Coding-Decoding - Blood Relation - Puzzles test - Direction sense test - Logical Venn diagrams			
<b>UNIT–II Verbal Reasoning</b>			
Number test, ranking test - Mathematical operations - Arithmetical Reasoning - Inserting missing character - Syllogism			
<b>UNIT–III Arithmetic Aptitude</b>			
Number system - HCF & LCM, Partnership - Percentages - Profit & Loss - Time & Work - Pipes & Cistern - Chain Rule			
<b>UNIT–IV Arithmetic Aptitude</b>			
Time & Distance - Calendar and Clock - Allegation - Simple and compound interest - Permutations and Combination - Probability			
<b>UNIT–V Data interpretation</b>			
Tabulation, Bar graphs, Pie charts, line graphs			
<b><u>Learning Resources</u></b>			
<b>Textbook(s) / Reference Book(s):</b>			
[1] Aggarwal, R.S. (2017). “ <i>Verbal and Non-Verbal Reasoning</i> ”, Revised Edition, S Chand Publication, 2017 ISBN:81-219-0551-6.			
[2] Vikramjeeth. (2023). “ <i>Verbal and Non-Verbal Reasoning</i> ”, Multilingual Edition. ISBN :978-9358706000.			
[3] Aggarwal, R.S.(2017). “ <i>Quantitative Aptitude</i> ”, Revised., S Chand Publication, ISBN:8121924987 .			
[4] Aashish Arora, (2022). “ <i>Quantitative Aptitude</i> ”, ISBN 13 : 978-9394106925.			





**SIDDHARTHA**  
**ACADEMY OF HIGHER EDUCATION**

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

---

91 866 2582333

866 2582334

866 2584930

# SEMESTER - II



## 24CA505 : DATABASE MANAGEMENT SYSTEMS

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand fundamental database concepts and architecture	
	<b>CO2</b>	Apply data models to design schemas and enforce constraints	
	<b>CO3</b>	Execute complex queries using relational algebra, calculus, and SQL-99	
	<b>CO4</b>	Normalize schemas to ensure data integrity and reduce redundancy	
	<b>CO5</b>	Evaluate transaction processing and concurrency control techniques	

### UNIT–I Fundamentals of Database Systems

**Databases and Database Users:** Introduction, An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach.

**Database System Concepts and Architecture:** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.

### UNIT–II Data Modeling and Relational Data Model Concepts

**Data Modeling Using the Entity-Relationship (ER) Model:** Using High-Level Conceptual Data models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Weak Entity Types.

**The Relational Data Model and Relational Database Constraints:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations.

### UNIT–III Advanced Database Concepts and SQL-99

**The Relational Algebra and Relational Calculus:** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, The Tuple Relational Calculus, The Domain Relational Calculus.

**SQL-99: Schema Definition, Constraints, Queries, and Views:** SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE Statements in SQL.

### UNIT–IV Functional Dependencies, Normalization, and Relational Database Design

**Functional Dependencies and Normalization for Relational Databases:** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

**Relational Database Design Algorithms and Further Dependencies:** Multivalued Dependencies

and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

### **UNIT–V Transaction Processing and Concurrency Control in Databases**

**Introduction To Transaction Processing Concepts and Theory:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability.

**Concurrency Control Techniques:** Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques.

### **Learning Resources**

#### **Text Book:**

- [1] Ramez Elmasri, Shamkant B. Navathe. (2007). *Fundamentals of Database Systems*. (6<sup>th</sup> Ed.), Pearson Education.

#### **Reference Books:**

- [1] Abraham Silberschatz, Henry F. Korth, S. Sudarshan, (2006), *Database System Concepts*. (6<sup>th</sup> Ed.) McGraw hill.
- [2] Peter Rob, A. Anand Rao, Carlos Coronel, *Database Management Systems*. Cengage Learning
- [3] Raghu Ramakrishnan, (2015), *Database Management Systems*. (4<sup>th</sup> Ed) McGraw-Hill.
- [4] Peter Rob & Carlos Coronel, (2008), *Database System Concepts*. Cengage Learning.

#### **Web Resources:**

- [1] Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 2013, “**Database System Concepts**”, (6<sup>th</sup> Edition), McGraw hill,  
<https://www.amazon.in/Database-System-Concepts-Abraham-Silberschatz/dp/9332901384>
- [2] Elmasri and Navathe : Fundamentals of Database Systems,  
<https://edurev.in/p/97587/Fundamentals-of-Database-Systems-by-Elmasri--Navat>,  
<https://www.amazon.in/Fundamentals-Database-Systems-Elmasri-Shamkant/dp/B076K8CM55>
- [3] P .S. Gill, Database Management System,  
<https://www.amazon.in/Database-Management-Systems-P-Gill-ebook/dp/B01GUZBN9K>, [https://books.google.co.in/books?id=mK4COraJvIIC&printsec=copyright&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.in/books?id=mK4COraJvIIC&printsec=copyright&redir_esc=y#v=onepage&q&f=false)
- [4] Raghu Ramakrishnan, Database Management System,  
<https://www.amazon.in/Database-Management-Systems-Raghu-Ramakrishnan/dp/0072465638>,  
<https://xuanhien.wordpress.com/wp-content/uploads/2011/04/database-management-systems-raghu-ramakrishnan.pdf>

## 24CA506 : OOPs WITH JAVA

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Write simple Java programs using various control statements and basic class structures	
	<b>CO2</b>	Implement inheritance and interfaces, packages, exception handling mechanisms in java programs	
	<b>CO3</b>	Summarize how multithreading enhances program performance, responsiveness, efficiency of different I/O and multithreading techniques in Java	
	<b>CO4</b>	Write java programs that implement basic network communication	
	<b>CO5</b>	Develop simple applets and embed them in web pages	

### UNIT–I Fundamental Concepts of Java

**An Overview of Java:** Object-Oriented Programming, Two Paradigms, Abstraction, The Three OOP Principles, A First Simple Program, Lexical Issues.

**Data Types, Variables and Arrays:** The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type Conversion And Casting, Arrays.

**Control Statements:** Java's Selection Statements, Iteration Statements, Nested Loops, Jump Statements.

**Introducing Classes:** Class Fundamentals, Declaring Objects, A Closer Look at new operator, Assigning Object Reference Variables, Introducing Methods, Constructors, this keyword.

**A Closer Look at Methods and Classes:** Overloading Methods, Overloading Constructors, Using Objects as Parameters, Returning Objects, Recursion

### UNIT–II Inheritance, Packages and Interfaces

**Inheritance:** Inheritance Basics, Superclass Variable-Reference a Subclass Object, using super, using super to call Superclass Constructors, A Second use for Super, creating a Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance.

**Packages and Interfaces:** Defining a Package, Access Protection, Importing Packages, Interfaces: Defining an Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be extended.

### UNIT–III Exception Handling and Multithreaded Programming

**Exception Handling:** Exception Handling Fundamentals, Java's built-in Exceptions, creating Your Own Exception Subclasses.

**Multithreaded Programming:** Creating a Thread: Implementing Runnable, Extending Thread, Creating Multiple threads, using isAlive() and join(), Thread Priorities, Synchronization,

Interthread Communication.

#### **UNIT–IV Input/Output Streams**

**Input/Output:Exploring java.io**-The I/O Classes and Interfaces, File-Directories, The Stream Classes, TheByteStreams-InputStream, OutputStream, FileInputStream, FileOutputStream, BufferedByteStreams, DataInputStream and DataOutputStream, RandomAccessFile,The CharacterStreams-Reader, WriterFileReader, FileWriter, BufferedReader, PrintWriter,

#### **UNIT–V The Applet Class**

**The Applet Class:** Applet Basics, The Applet Class, Applet Architecture, An Applet Skeleton, Applet Initialization and Termination, A Simple Banner Applet, Using the Status Window, The HTML APPLET Tag, Passing Parameters to Applets, getDocumentBase() and getCodeBase().

#### **Learning Resources**

##### **Textbooks:**

- [1] Herbert Schildt. *The Complete Reference Java*.(8<sup>th</sup> Ed.). TMH Publishing Company Ltd., New Delhi.
- [2] David J. Eck. (2020). *Introduction to Programming Using Java*. Self-published.

##### **Reference Books:**

- [1] University of California, San Diego.(2021). *Java Programming and Software Engineering Fundamentals*. Coursera.
- [2] David Reilly, Michael Reilly. (2002). *Java Network Programming and Distributed Computing*. Addison-Wesley.
- [3] Paul Deitel, Harvey Deitel. (2017). *Java: How to Program, Early Objects*. Pearson Education.
- [4] Cay S. Horstmann. *Core Java Volume I--Fundamentals*(7<sup>th</sup> Ed.). Pearson Education.
- [5] Cay S. Horstmann. (2018). *Core Java Volume II--Advanced Features*. Pearson Education.
- [6] P.Radha Krishna, *Object Oriented Programming through JAVA*.
- [7] Bruce Eckel, *Thinking in Java*(3<sup>rd</sup> Ed.).

## 24CA507 : CRYPTOGRAPHY AND NETWORK SECURITY

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Summarize the fundamental principles of access control models and techniques, authentication and secure system design	
	<b>CO2</b>	Compare and contrast public key cryptography with conventional cryptographic systems in terms of security	
	<b>CO3</b>	Demonstrate standard algorithms used to provide confidentiality, integrity and authenticity	
	<b>CO4</b>	Identify digital signature techniques and authentication protocols to provide confidential and secure communication	
	<b>CO5</b>	Employ encryption techniques to secure data in transit across data networks	
<b>UNIT–I Introduction to Cryptography and Classical Encryption</b>			
<p><b>Introduction:</b> The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.</p> <p><b>Classical Encryption Techniques:</b> Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.</p>			
<b>UNIT–II Block Ciphers and Key Distribution</b>			
<p><b>Block Cipher and the Data Encryption Standard:</b> The Data Encryption Standard, The Strength of DES.</p> <p><b>Confidentiality Using Symmetric Encryption:</b> Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.</p>			
<b>UNIT–III Number Theory and Public Key Cryptography</b>			
<p><b>Introduction to Number Theory:</b> Fermat’s and Euler’s Theorems, Discrete Logarithms.</p> <p><b>Public Key Cryptography and RSA:</b> Principles of Public Key Cryptosystems, The RSA Algorithm.</p> <p><b>Key Management:</b> Other Public-Key Cryptosystems: Key Management, Diffie-Hellman Key Exchange.</p>			
<b>UNIT–IV Hash Functions and Digital Signatures</b>			
<p><b>Message Authentication and Hash Functions:</b> Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes.</p> <p><b>Digital Signatures and Authentication Protocols:</b> Digital Signatures, Authentication Protocols, Digital Signature Standard.</p>			
<b>UNIT–V IP and Web Security</b>			
<p><b>IP Security:</b> IP Security Overview, IP security architecture, Authentication Header, Encapsulating Security Payload.</p>			

**Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

**Learning Resources**

**Textbook:**

- [1] Stallings, W. (2022). *Cryptography and Network Security: Principles and Practice* (Global Ed.). Pearson Education.

**Reference Books:**

- [1] Stallings, W. (2018). *Network Security Essentials: Applications and Standards*, (Global Ed.). Pearson Education.
- [2] Krawetz, N. (2007). *Introduction to Network Security*. Charles River Media.
- [3] Forouzan, B. A. (2007). *Cryptography & Network Security*. McGraw-Hill Education.

## 24CA508A : DATA MINING

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Infer various techniques for designing Data Mining Systems .	
	<b>CO2</b>	Understand the functionality of various Data Warehousing components.	
	<b>CO3</b>	Analyze the strengths and limitations of various data mining models.	
	<b>CO4</b>	Apply data mining techniques to real-world problems and datasets.	
	<b>CO5</b>	Apply data mining techniques to various domains.	
<b>UNIT–I Introduction to Data Mining</b>			
<b>Introduction:</b> Why Data Mining - What Is Data Mining? - What Kinds of Data Can Be Mined?- What Kinds of Patterns Can Be Mined? - Which Technologies Are Used? - Which Kinds of Applications Are Targeted? - Major Issues in Data Mining.			
<b>Getting to Know Your Data:</b> Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.			
<b>Data Preprocessing:</b> An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.			
<b>UNIT–II Data Warehousing and Online Analytical Processing</b>			
<b>Data Warehousing and Online Analytical Processing:</b> Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and usage, Data Warehouse Implementation.			
<b>UNIT–III Mining Frequent Patterns, Associations, Correlations, Classification</b>			
<b>Mining Frequent Patterns, Associations, and Correlations</b> - Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Method			
<b>Classification - Basic Concepts:</b> Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification.			
<b>UNIT–IV Cluster Analysis and Outlier Detection</b>			
<b>Cluster Analysis</b> - Basic Concepts and Methods: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.			
<b>Outlier Detection:</b> Outliers and Outlier Analysis, Outlier Detection Methods.			
<b>UNIT–V Mining Complex Data Types, Data Mining Applications</b>			
<b>Mining Complex Data Types:</b> Mining Sequence Data, Graph Mining, Social Network Analysis.			
<b>Data Mining Applications:</b> Web Mining, Spatial Data Mining, Temporal Data Mining.			

**Learning Resources**

**Textbook:**

- [1] Jiawei Han, Micheline Kamber(2012). *Data mining Concepts & Techniques (3rdEd.)*. Morgan Kaufmann Publishers.

**References Books:**

- [1] Margaret H. Dunham. *Data Mining - Introductory and Advanced Topics*. Pearson Education.  
[2] D. Hand, H. Mannila, and P. Smyth. (2001). *Principles of Data Mining*. PHI.

## 24CA508B : OPERATING SYSTEMS

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand the concepts of operating system operations services process and Multi-threading	
	<b>CO2</b>	Understand the process concept, multithreaded programming, and process scheduling including criteria, algorithms, and real-time CPU scheduling in operating systems	
	<b>CO3</b>	Understanding of synchronization techniques including semaphores and monitors, and strategies for deadlock handling such as prevention, avoidance, detection, and recovery in operating systems	
	<b>CO4</b>	Apply knowledge to master memory management strategies and virtual memory techniques	
	<b>CO5</b>	Understand the concepts of memory management strategies and virtual memory techniques through comprehensive study of operating system principles	
<b>UNIT-I Introduction to Operating Systems and System Structures</b>			
<b>Introduction:</b> Introduction to Operating Systems, Computer System Architecture, Operating System Structure, Operating System Operations, Distributed Systems, Special Purpose Systems, Computing Environments, Open-Source Operating Systems.			
<b>System Structures:</b> Operating System Services, User Operating Systems, System Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation Operating System Structure, Virtual Machines			
<b>UNIT-II Processes, Threads, and Scheduling in Operating Systems</b>			
<b>Process Concept:</b> Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client Server Systems.			
<b>Multithreaded Programming:</b> Overview, Multithreading Models, Thread Libraries, Threading Issues, Operating System Examples.			
<b>Process Scheduling:</b> Basic Concepts, Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real Time CPU Scheduling.			
<b>UNIT-III Synchronization and Deadlocks in Operating Systems</b>			
<b>Synchronization:</b> Background, Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.			
<b>Deadlocks:</b> System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.			
<b>UNIT-IV Memory Management in Operating Systems</b>			
<b>Memory Management Strategies:</b> Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.			

**Virtual Memory Management:** Background, Demand Paging, CopyonWrite, Page replacement, Allocation of Frames, Thrashing, Other Considerations.

**UNIT–V File Systems and I/O Systems in Operating Systems**

**File System:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

**Implementing File Systems:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

**Mass Storage Structure:** Disk Structure, Disk Scheduling, Disk Management.

**I/O Systems:** I/O Hardware- polling, interrupts, DMA.

**Learning Resources**

**Textbook:**

- [1] Abraham Silberschatz, PeterB.Galvin, GregGagne (2012). *Operating Systems Concepts* (8th Ed.). Wiley Publications.

**References Books:**

- [1] Géron, A. (2019). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*. United States: O'Reilly Media.
- [2] William Stallings (2011). *Operating Systems: Internals and Design Principles* (7th Ed.). Pearson Education.

## 24CA508C : DESIGN & ANALYSIS OF ALGORITHMS

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Explain the significance of pseudo code for algorithm specification, evaluate an algorithm's efficiency based on space and time complexity and build a strong foundation in data structures to design and implement efficient algorithms	
	<b>CO2</b>	Apply the divide and conquer method to design efficient algorithms for computational problems and utilize the greedy method to develop optimal solutions for specific optimization challenges	
	<b>CO3</b>	Compare and contrast Dynamic Programming with the Greedy method, Divide and Conquer technique in solving problems that exhibit overlapping sub problems and optimal substructure properties	
	<b>CO4</b>	Develop proficiency in implementing basic traversal and search techniques for binary trees and graphs, alongside mastering the application of backtracking algorithms to solve combinatorial optimization problems	
	<b>CO5</b>	Explain the Branch and Bound technique to effectively solve combinatorial optimization problems, alongside understanding the fundamental concepts of NP-Hard and NP-Complete problems	
<b>UNIT–I Introduction to Algorithms and Elementary Data Structures</b>			
<b>Introduction:</b> What is an algorithm, Algorithm Specification- Pseudo code Conventions, Recursive Algorithms; Performance Analysis - Space Complexity, Time Complexity; Asymptotic notations.			
<b>Elementary Data Structures:</b> Stacks, Queues, Trees and Graphs.			
<b>UNIT–II Divide and Conquer and Greedy Method</b>			
<b>Divide and Conquer:</b> General Method, Binary Search, Finding Maximum and Minimum Element, Merge Sort, Quick Sort.			
<b>The Greedy Method:</b> The general method, Knapsack Problem, Minimum Cost Spanning Trees-Prim's Algorithm, Kruskal's Algorithm; Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.			
<b>UNIT–III Dynamic Programming</b>			
<b>Dynamic Programming:</b> The general method, Multistage graphs, All-Pairs Shortest Paths, Single Source Shortest Paths, Optimal Binary Search Trees, 0/1Knapsack Problem, Reliability Design, Traveling Salesperson Problem.			

**UNIT–IV Basic Traversal and Search Techniques and Backtracking**

**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for graphs- Breadth First Search, Depth First Search traversals; Connected Components and Spanning Trees

**Backtracking:** The general method, 4-Queen problem, The 8-Queens problem, Sum of Subsets, Graph coloring, Hamiltonian cycles

**UNIT–V Branch and Bound & NP-Hard and NP-Complete Problem**

**Branch and Bound:** The Method: Least Cost search, Control abstractions for LC search, Bounding, FIFO Branch and Bound, LC Branch and Bound, Traveling Salesperson problem

**NP-Hard and NP-Complete Problems:** Basic concepts-Non deterministic algorithms, The classes NP hard and NP Complete

**Learning Resources****Textbooks:**

- [1] Horowitz, E., Sahni, S., Rajasekaran, S. (2008). *Fundamentals of Computer Algorithms*. (2<sup>nd</sup> Ed.). Universities Press.

**Reference Books:**

- [1] Anany Levitin. (2007). *Introduction to the Design and Analysis of Algorithms*. (2<sup>nd</sup> Ed.). Pearson Education.
- [2] Horowitz, E., Sahni, S., Mehta Dinesh. *Fundamentals of Data Structures in C++* (2<sup>nd</sup> Ed.). Universities Press.
- [3] Mark Allen Weiss. (2006). *Data Structure and Algorithm Analysis in C*. (2<sup>nd</sup> Ed.). Pearson Education

## 24CA508D : SOFTWARE ENGINEERING

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Review the evolving role of software and its changing nature, identifying common software myths	
	<b>CO2</b>	Choose various software process models to real-world software development scenarios	
	<b>CO3</b>	Compare different software engineering practices and testing tactics to ensure software quality and reliability	
	<b>CO4</b>	Develop software project plans using project management principles, metrics, and estimation techniques	
	<b>CO5</b>	Construct comprehensive models for software systems to facilitate effective software development and deployment	
<b>UNIT–I Exploring Evolutionary Process Models and Agile Methodologies</b>			
<b>Introduction to Software Engineering:</b> The Evolving Role of Software, Software, The Changing Nature of Software, Software Myths. <b>A Generic View of Process:</b> Software Engineering-A Layered Technology, A Process Framework, The Capability Maturity Model Integration (CMMI). <b>Process Models:</b> Prescriptive Models, The Waterfall Model, Incremental Process Models- The Incremental Model, The RAD Model, Evolutionary Process Model- Prototyping, The Spiral Model, The Concurrent Development Model. <b>An Agile View of Process:</b> What is Agility? What is Agile Process? Agile Process Models: Extreme Programming, Scrum.			
<b>UNIT–II Software Engineering Practices with advanced Testing Tactics</b>			
<b>Software Engineering Practice:</b> Software Engineering Practice, Communication Practices, Planning Practices, Modeling Practices, Construction Practices, Deployment. <b>Testing Tactics:</b> Software Testing Fundamentals, Black Box and White Box Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black Box Testing.			
<b>UNIT–III Project Management and Metrics Integration for Effective Software Development</b>			
<b>Project Management:</b> The Management Spectrum, The People, The Product, The Process, The Project, The W5HH Principles. <b>Metrics for Process and Projects:</b> Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics within Software Process, Metrics for Small Organizations.			
<b>UNIT–IV Effective Estimation and Quality Management in Software Projects</b>			
<b>Estimation:</b> Observations on Estimations, The project planning process, Software Scope and Feasibility, Resources, Software Project Estimation. <b>Quality Management:</b> Quality Concepts, Software Quality Assurance, Software Reviews, Formal			

Technical Reviews, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan.

**UNIT-V Integrated Modelling Techniques in Software Engineering**

**Class Modelling:** Object and Class Concepts, Link and Association concepts, Generalization and Inheritance, A Sample Class Model.

**State Modelling:** Events, States, Transitions, and Conditions state diagrams

**Interaction Modelling:** Use Case Models, Sequence Models, Activity Models.

**Learning Resources**

**Textbooks:**

- [1] Pressman, R. S. (2010). *Software Engineering: A Practitioner's Approach* (6th ed.) McGraw-Hill Higher Education.
- [2] Blaha, M. (2007). *Object - Oriented Modeling And Design With UML*(2nd ed.). Pearson Education.

**Reference Books:**

- [1] Sommerville, I. (2010). *Software Engineering* (9th ed.). Addison Wesley Longman.
- [2] Sommerville, I. Sawyer, P. (2009). *Requirements Engineering: A Good Practice Guide*. United Kingdom: Wiley.
- [3] Booch G. (2008). *Object Oriented Analysis & Design With Application*(2nd ed.). Pearson Education.

## 24MA502 : PROBABILITY AND STATISTICS

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Utilize discrete random variables to determine probability distributions like Binomial and Poisson for decision making	
	<b>CO2</b>	Apply continuous random variables to the normal distribution, approximate the binomial distribution using the normal distribution, and utilize other probability densities	
	<b>CO3</b>	Implement point and interval estimation methods to estimate population parameters and test hypotheses concerning the one and two means	
	<b>CO4</b>	Utilize interval estimation to estimate variance and proportion, testing of hypotheses concerning variances and proportions	
	<b>CO5</b>	Evaluate correlation coefficient and analysis regression between the variables	
<b>UNIT–I Probability Distributions</b>			
<b>Discrete Probability Distributions:</b> Random Variables (discrete and continuous), Expectation, Variance and Standard deviation of discrete random variable, Binomial distribution, Poisson distribution			
<b>UNIT–II Probability Densities</b>			
<b>Continuous Probability Distributions:</b> Expectations, Variance and standard deviation of continuous random variables, Normal distribution, Normal approximation to the Binomial distribution, Uniform, log normal, exponential, beta, gamma and Weibul distributions			
<b>UNIT–III Hypotheses Concerning Mean</b>			
<b>Sampling Distributions:</b> Introduction, Populations and Samples <b>Inferences Concerning Mean:</b> Point Estimation, Interval Estimation <b>Test of Hypothesis –</b> Null Hypothesis and Tests of Hypothesis, Hypothesis concerning one and two means.			
<b>UNIT–IV Hypotheses Concerning Variances and Proportions</b>			
<b>Inferences Concerning Variances:</b> Estimation of variances, Hypothesis concerning one variance, Hypothesis concerning two variances. <b>Inference Concerning Proportions:</b> Estimation of Proportions, Hypothesis concerning one Proportion, Hypothesis concerning several Proportions, The Analysis of r x c Tables, Goodness of fit.			
<b>UNIT–V Correlation and Regression Analysis</b>			
<b>Correlation:</b> Types of Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, Rank Correlation. <b>Regression Analysis:</b> The method of least squares, Multiple Regression.			

**Learning Resources**

**Text book:**

- [1] Richard A. Johnson , *Probability and Statistics for Engineers* (8<sup>th</sup> Ed), Prentice Hall of India.

**Reference Books:**

- [1] Walpole, R.E. , Myers, R.H. and Myers, S.L. , *Probability & Statistics for Engineers and Scientist* (6<sup>th</sup> Ed.), Prentice Hall of India / Pearson Education.
- [2] Purna Chandra Biswal. (2007), *Probability and Statistics*, Pearson Education Prentice Hall of India.
- [3] Iyengar, T.K.V. , Krishna Gandhi, B. , Ranganatham, S. Prasad, M.V.S.S.N. , *Probability and Statistics*, S Chand.

**24EN502 : BUSINESS COMMUNICATION**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Identify the nature and scope of business communication with an emphasis on communication styles and strategies for professional environments.	
	<b>CO2</b>	Demonstrate effective public speaking and presentation skills, ensuring they can confidently and clearly convey information to diverse audiences	
	<b>CO3</b>	Apply 7Cs of writing for constructive business correspondence to create constructive and effective business correspondence	
	<b>CO4</b>	Analyse business proposals and reports to enhance their ability to develop and implement effective corporate communication strategies	
	<b>CO5</b>	Evaluate and implement effective corporate communication strategies, social responsibility and cross-cultural communication	
<b>UNIT–I Nature and Scope of Communication</b>			
Introduction – Functions of Communication – Roles of a Manager – Communication Basics – Communication Networks – Informal communication: Beyond the Organizational Hierarchy – Tips for Effective Internal Communications – Miscommunication – Strategies for Improving Organizational Communication			
<b>UNIT–II Business Presentation and Public Speaking</b>			
Introduction – Business Presentations and Speeches – Introduction to a Presentation – Main Body – Conclusion – Controlling Nervousness and Stage Fright – Business Presentations: Sample Outlines – Effective Sales Presentations			
<b>UNIT–III Business Correspondence</b>			
Introduction - The Seven Cs of Business Letter Writing – Effective Business Correspondence: Basic Principles – Common Components of Business Letters – Strategies for Writing the Body of a Letter – kinds of Business Letters – Writing Effective Memos – Case Study.			
<b>UNIT–IV Business Reports and Proposals</b>			
Introduction – What is a Report? – Purpose of Business Reports – Steps in Writing a Routine Business Report – Parts of a Report – Corporate Reports – Business Proposals – Format of Proposals – Proposal Layout and Design – Five key Elements of Winning Business Proposals – Case Studies.			
<b>UNIT–V Corporate Communication</b>			
Introduction – Corporate Communication – Corporate Citizenship and Social Responsibility – Corporate Communication Strategy – Cross-Cultural Communication – Case Study.			

**Learning Resources**

**Text Book:**

- [1] Meenakshi Raman and Prakash Singh. (2009). *Business Communication*. Oxford University Press.

**Reference Books:**

- [1] Hory Sankar Mukerjee. (2013). *Business Communication*, Oxford Higher University Press.
- [2] Herta A Murphy, Herbert W Hildebrandt & Jane P Thomas. (2009). *Effective Business Communication*. (7<sup>th</sup> Edition). Tata McGraw-Hill.

**Web Resources:**

- [1] <https://gnindia.dronacharya.info/ME/Common-Subjects/Downloads/Technical-Communication/Books/Technical-Communication-Book-9.pdf>
- [2] <https://www.cag.edu.tr/uploads/site/lecturer-files/mary-guffey-essentials-of-business-communication-2016-yzss.pdf>
- [3] <https://dcomm.org/wp-content/uploads/2019/05/Business-Communication-PDFDrive.com.pdf>

**24EN581 PERSONALITY DEVELOPMENT COURSE-2**  
**(English, Campus Recruitment Training)**

<b>Lecture</b>	-	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	1
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Recall the fundamentals of language in terms of grammar & lexical resource in communication	
	<b>CO2</b>	Understand how to listen, reflect, and speak while communicating with others.	
	<b>CO3</b>	Apply language skills, Etiquettes, Team Building and Leadership in professional and social contexts with clarity and accuracy	
	<b>CO4</b>	Analyze ideas with coherence, cohesion and precision in formal written communication.	
	<b>CO5</b>	Evaluate grammar and vocabulary using versant test.	
<b>UNIT-I Versant Test</b>			
Overview of the Versant Test – Purpose and Importance – Format of the Test – Types of Questions – Practice.			
<b>UNIT-II Elocution</b>			
Define – Discuss the Importance – Key Components – Voice Modulation – Articulation – Posture and Gestures – Practice.			
<b>UNIT-III Extempore</b>			
Introduction – Significance – Developing Quick Thinking – Communication Skills – Confidence – Strategies for Effective Speaking – Practice.			
<b>UNIT-IV Story Telling</b>			
Definition – Narratives through Spoken Words – Gestures and Expressions – Importance of Culture – Story Telling Techniques – Vocal Modulation – Pacing – Gestures and Facial Expressions – Practice			
<b>UNIT-V Debate</b>			
Introduction – Understanding the Structure – Purpose of a Debate – Developing Basic Debating skills – Do's and Don'ts – Practice			
<b>UNIT-VI Short Story Writing</b>			
Introduction – Key Characteristics – Brevity – Theme – Types –Creating Relatable Characters.			
<b>UNIT – VII Blog Writing</b>			
Introduction – Purpose in Digital World – Different types of Blogs – Benefits – Building Online Presence – Sharing Knowledge – Connecting with Others			
<b>UNIT – VIII Biographical Sketch</b>			
Purpose – Overview of Person's Life – Key Events – Conclusion.			

**UNIT – IX Vocabulary**

Idiomatic Expressions – Idioms with Body Parts – Animal Idioms – Colour Idioms – Phrasal Verbs – One-word Substitutes – Analogies – Practice

**UNIT – X Functional English Grammar**

Modal Verbs – Subject-Verb Agreement – Active & Passive Voice – Reported Speech – Question Tags – Practice Exercises

**UNIT – XI Team Building & Leadership**

Team Building traits: Forming – Storming – Norming – Performing – Adjourning.  
Leadership traits: Vision – Integrity – Decisiveness – Confidence – Empathy – Flexibility – Innovation.

**UNIT – XII Corporate Etiquette**

Social Etiquette – Business Etiquette – Telephone Etiquette – Dining Etiquette – Summary.

**Learning Resources****Text Book:**

- [1] Personality Development Lab Manual

**Reference Books:**

- [1] Wren & Martin. (2023). *English Grammar and Composition*. S. Chand & Company.  
[2] Dale Carnegie. (2016). *The Quick and Easy way to Effective Speaking*. Rupa Publications,  
[3] Richard A. Spears. (2005). *McGraw-Hill's Dictionary of American Idioms and Phrasal Verbs*. McGraw Hill.  
[4] Jon M. Ericson, James J. Murphy, Raymond Bud Zeuschner. (2003). *The Debater's Guide*. (Third Edition). Southern Illinois University Press, Carbondale.  
[5] S. P. Dhanavel. (2010). *English and Soft Skills*. Orient Blackswan.  
[6] Barun K. Mitra. (2011). *Personality Development and Soft Skills*. Oxford University Press.

**Web Resources:**

- [1] <https://www.pearson.com/languages/hr-professionals/versant.html> Softx





**SIDDHARTHA**  
**ACADEMY OF HIGHER EDUCATION**

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

---

91 866 2582333

866 2582334

866 2584930

# SEMESTER - III



**24CA601: MACHINE LEARNING USING PYTHON**

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand fundamental concepts, types, and applications of machine learning	
	<b>CO2</b>	Apply supervised learning algorithms like regression, decision trees, and SVM to real-world problems	
	<b>CO3</b>	Implement unsupervised learning techniques, including clustering and dimensionality reduction	
	<b>CO4</b>	Analyze and interpret the working of Genetic Algorithms and Neural Networks	
	<b>CO5</b>	Use Evaluate machine learning models for accuracy, efficiency, and performance improvement	

**UNIT–I Introduction to Machine Learning & Feature Engineering**

**Introduction to Machine Learning:** Human Learning and its types; Machine Learning and its Types; Well-posed Learning Problem; Applications of Machine Learning; Issues in Machine Learning

**Feature Engineering :** Feature construction; Feature extraction -PCA, SVD, LDA; Feature selection

**UNIT–II Probabilistic Learning & Regression Models**

**Bayesian Concept Learning:** Bayes' Theorem- Prior and Posterior Probability Likelihood; Concept Learning; Bayesian Belief Networks

**Supervised Learning :** Regression – Linear, Polynomial and Logistic

**UNIT–III Classification & Clustering Techniques**

**Classification:** KNN, Decision Trees and SVM

**Clustering :** k-Means, DBSCAN

**UNIT–IV Fundamentals of Neural Networks**

**Basics of Neural Networks:** Understanding Biological Neuron and Artificial Neuron; types of activation functions; early implementation- McCulloch Pitt's Rosenblatt's perception.

**UNIT–V Deep Learning & Neural Network Training**

Neural Network Architectures & Learning Process.

Introduction to Deep Learning: Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN)

**Learning Resources****Text Book:**

[1] SaikatDutt, Subramanian Chandramouli, Amit Kumar Das (2019).*Machine Learning*, Pearson, (Global Ed.). Pearson Education.

[2] <https://developers.google.com/machine-learning/crash-course/>(UNIT-5)

[3] <https://www.deeplearningbook.org/>(UNIT-5)

**Reference Books:**

[1] Tom M. Mitchell (2013). *Machine Learning*, India Edition , McGraw Hill Education.

[2] Ethem Alpaydin . *Introduction to Machine Learning*, Second Edition, MIT Press.

**Web Resource:**

[1] <https://nptel.ac.in/courses/106/104/106104189>

## 24CA602: CYBER SECURITY

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Compare and contrast the issues related to different types of activities in cybercrime	
	<b>CO2</b>	Examine how cybercriminals plan and execute attacks	
	<b>CO3</b>	Examine the security challenges on mobile devices	
	<b>CO4</b>	Analyze the tools and methods used in cybercrime	
	<b>CO5</b>	Analyze the strengths and weaknesses of Indian IT Act	
<b>UNIT–I Introduction to Cybercrime</b>			
<p><b>Introduction to Cybercrime:</b> Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes - E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.</p>			
<b>UNIT–II Cyber Offenses</b>			
<p><b>Cyber Offenses:</b> How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.</p>			
<b>UNIT–III Cybercrime: Mobile and Wireless Devices</b>			
<p><b>Cybercrime:</b> Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security - Cryptographic Security for Mobile Devices, LDAP Security for Hand-Held Mobile Computing Devices, RAS Security for Mobile Devices, Media Player Control Security, Networking API Security for Mobile Computing Applications, Attacks on Mobile/Cell Phones - Mobile Phone Theft, Mobile Viruses, Mishing, Vishing, Smishing, Hacking Bluetooth, Organizational security Policies and Measures in Mobile Computing Era - Importance of Security Policies relating to Mobile Computing Devices, Operating Guidelines for Implementing Mobile</p>			

Device Security Policies, Organizational Policies for the Use of Mobile Hand-Held Devices, Laptops.

#### **UNIT–IV Tools and Methods Used in Cybercrime**

**Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing - How Phishing Works?, Password Cracking - Online Attacks, Offline Attacks, Strong, Weak and Random, Random Passwords, Key loggers and Spywares - Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, Virus and Worms – Types of Viruses, Trojan Horses and Backdoors - Backdoor, How to Protect from Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks - DoS Attacks, Classification of DoS Attacks, Types or Levels of DoS Attacks, Tools Used to Launch DoS Attack, DDoS Attacks, How to Protect from DoS/DDoS Attacks.

#### **UNIT–V Cybercrimes and Cyber security**

**Cybercrimes and Cyber security:** The Legal Perspectives: Introduction, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act - Public-Key Certificate, Representation of Digital Signatures in the ITA 2000, Impact of Oversights in ITA 2000 Regarding Digital Signatures, Implications for Certifying Authorities, The Current Scenario Regarding Digital Signatures under the Indian IT Act, Amendments to the Indian IT Act - Overview of Changes made to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

#### **Learning Resources**

##### **Text Book:**

- [1] Nina Godbole, Sunit Belapure, (2011). *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives* (India Publications Released). Wiley

##### **Reference Books:**

- [1] Harish Chander (2012). *Cyber Laws & IT Protection*, PHI learning Pvt. Ltd..  
 [2] Dhiren R Patel (2010). *Information Security Theory & Practice*, PHI learning Pvt. Ltd.

##### **Web Resources:**

- [1] [https://onlinecourses.swayam2.ac.in/cec20\\_cs15/](https://onlinecourses.swayam2.ac.in/cec20_cs15/)  
 [2] OWASP (Open Web Application Security Project): <https://owasp.org>  
 [3] SANS Cyber Aces: <https://www.sans.org/cyber-aces/>  
 [4] Cyber security & Infrastructure Security Agency (CISA): <https://www.cisa.gov>  
 [5] Official ITA 2000 website: <https://www.meity.gov.in>  
 [6] Case law database: <https://indiankanoon.org>

**24CA603: BIG DATA ANALYTICS**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Examine the concepts of Big Data and Big Data Analytics	
	<b>CO2</b>	Analyze the Hadoop Architecture and Hadoop Distributed File System	
	<b>CO3</b>	Acquire knowledge on MapReduce Framework and HBase	
	<b>CO4</b>	Evaluate the process of storing data in RDBMS and Hadoop	
	<b>CO5</b>	Acquire knowledge on RDBMS NoSQL, Hadoop and Big Data	
<b>UNIT-I Types of Digital Data and Introduction to Big Data</b>			
<b>Types of Digital Data:</b> Classification of Digital Data.			
<b>Introduction to Big Data:</b> Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data? Other Characteristics of Data which are not Definitional Traits of Big Data, Why Big Data? Are we just an Information Consumer or Do We also Produce Information? Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today? What is changing in Realms of Big Data?			
<b>UNIT-II Big Data Analytics</b>			
<b>Big Data Analytics:</b> Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Why this Sudden Hype Around Big Data Analytics?, Classification of Analytics, Greatest Challenges that Prevent Businesses from Capitalizing on Big Data, Top Challenges Facing Big Data, Why is Big Data Analytics Important?, What Kind of Technologies are we Looking Toward to Help Meet the Challenges Posed by Big Data?, Data Science, Data Scientist, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency, Few Top Analytics Tools			
<b>UNIT-III Big Data Technology Landscape and Introduction to Hadoop</b>			
<b>The Big Data Technology Landscape:</b> NoSQL(Not Only SQL), Hadoop.			
<b>Introduction to Hadoop:</b> Introducing Hadoop, Why Hadoop?, Why not RDBMS?, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS, Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN, Interacting with Hadoop Ecosystem			
<b>UNIT-IV Understanding Map Reduce Fundamentals, HBase and Big Data Technology Foundation</b>			
<b>Understanding Map Reduce Fundamentals and HBase:</b> The Map Reduce Framework, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce, Role of HBase in Big Data Processing.			

**Understanding Big Data Technology Foundations:** Exploring the Big Data Stack, Virtualization and Big Data, Virtualization Approaches

**UNIT–V Storing Data in Databases, Data Warehouse and in Hadoop**

**Storing Data in Databases and Data Warehouses:** RDBMS and Big Data, Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouses, Big Data Analysis and Data Warehouse, Changing Deployment Models in Big Data Era.

**Storing Data in Hadoop:** Introducing HDFS, Introducing HBase, Combining HBase and HDFS, Selecting the Suitable Hadoop Data Organization for Applications

**Learning Resources**

**Text Books:**

[1] Seema Acharya, Subhashini Chellappan (2015). *BIG DATA AND ANALYTICS*, Wiley Publications (2015)

**UNIT I:** Chapters 1 and 2

**UNIT II:** Chapters 3 and 4

**UNIT III:** Chapters 4 and 5

[2] *BIG DATA Black Book*, DT Editorial Services, DreamTech Press (2015)

**UNIT IV:** Chapters 5 and 6

**UNIT V:** Chapters 7 and 8

**Reference Books:**

[1] Rajiv Sabherwal, Irma cerra – Fernandez, John(2011). *Business Intelligence – Practice, Technologies and Management*, Wiley.

[2] Lariss T.Moss, ShakuAtre. *Business Intelligence Roadmap*, Addison-Wesley IT Service.

[3] Yuli Vasiliev, SPD Shroff (2012). *Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting*.

**Web Resources:**

[1] <http://nptel.ac.in/courses/106/105/106104189/>

## 24CA604 : WEB DESIGN AND DEVELOPMENT

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Develop web pages using XHTML, CSS, JavaScript.	
	<b>CO2</b>	Implement web pages using BootStrap.	
	<b>CO3</b>	Use MySQL commands to create and manage tables and databases	
	<b>CO4</b>	Embed PHP code within HTML for dynamic content generation and perform MySQL database operations using PHP scripts	
	<b>CO5</b>	Explain what a session is and how PHP implements sessions	
<b>UNIT-I XHTML, CSS and JavaScript</b>			
<p><b>XHTML:</b> Introduction, Headers, Linking, Images, Special characters, Tables, Tables and formatting, Forms, Interlinking, Image maps, Meta Elements, Frames, Nested Frames.</p> <p><b>CASCADING STYLE SHEETS (CSS):</b> Introduction, Inline styles, Embedded style sheets, External Style Sheets</p> <p><b>Java Script:</b> Introduction to Scripting, Control Statements, Functions, Arrays, Objects</p>			
<b>UNIT-II BootStrap</b>			
<p><b>BootStrap:</b> CSS Overview , Typography, Tables, Forms, Buttons , Images , Helper Classes Responsive utilities , Glyphicons, Dropdowns , Button Groups , Button Dropdowns, Input Groups, Navigation Elements ,Navbar , Pagination , Badges , Alerts , Progress Bars, Media Object , List Group , Panels , Wells , Plugins Overview</p>			
<b>UNIT-III Introduction to MySQL</b>			
<p><b>Introduction to MySQL:</b> The SHOW DATABASE and CREATE DATABASE Commands, The USE Command, The CREATE TABLE and SHOW TABLES Commands, The DESCRIBE Command, The INSERT Command, The SELECT Command, The UPDATE Command, The DELETE Command, Table Joins, Loading and Dumping a Database</p>			
<b>UNIT-IV Introduction to PHP and MySQL</b>			
<p><b>Introduction:</b> Embedding PHP into HTML, Configuration, A Couple of Quick Examples.</p> <p><b>Language syntax:</b> Variables, Data types, Arrays, Web Variables, Operators, Flow control Constructs, Writing PHP functions.</p> <p><b>Built in PHP functions:</b> Important Functions, Array functions, String functions, Other functions.</p> <p><b>PHP and MYSQL:</b> MySQL Functions Part 1 &amp; Part 2, More PHP MySQL Functions.</p>			
<b>UNIT-V Sessions and Authentication</b>			
<p><b>Sessions and Authentication:</b> Introduction to Sessions, Definition of session, Perpetuation of a Session, Session Security, How PHP implements Sessions, Basic PHP Sessions, Limitations of Basic PHP Sessions</p>			

**Learning Resources**

**Textbooks:**

- [1] H.M.Deitel, P.J.Deitel, A.B.Goldberg. *Internet and World Wide Web How To Program* Third Edition, , PHI Pvt. Ltd., New Delhi.
- [2] Silvio Moreto. *Bootstrap 4 Quickly*.
- [3] James Lee and Brent Ware. *Open Source Web Development with LAMP*.
- [4] Ed Lecky Thompson, Steven D.Nowicki, Thomas Myer. *Professional PHP6*.

**References Books:**

- [1] C. Bates(2006). *Web Programming Building Internet Applications*, Willey Dream Tech, 3rd edition.
- [2] Kevin Tatroe, Peter MacIntyre(2013). *Programming PHP*, O'REILLY, 3rd Edition.
- [3] Adam Trachtenberg, David Sklar(2006). *PHP Cookbook: Solutions and Examples for PHP Programmers*,O'REILLY, 2nd Edition.
- [4] Lucas Carlson, Leonard Richardson(2015). *Ruby Cookbook*, O'REILLY, 2<sup>nd</sup> Edition.
- [5] Jay McGavren(2015). *Head First Ruby*, O'REILLY, 2nd Edition.
- [6] Robert W. Sebesta(2007). *Programming the World Wide Web*, Third Edition, Pearson Education .
- [7] Chris Bates(2007) *Web Programming–Building Internet Applications*, Second Edition, Wiley.
- [8] Jeffrey C. Jackson(2008). *Web Technologies – A Computer Science Perspective*, Pearson Education .

**Web Resource:**

<https://nptel.ac.in/courses/106/106/106106222/>

## 24CA605 : CLOUD COMPUTING

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Explain the basic concepts of cloud computing, its applications, benefits, limitations and the role of major providers (Google, Microsoft, Amazon) in supporting organizational needs	
	<b>CO2</b>	Describe the concepts of hardware and infrastructure, methods of accessing the cloud, cloud storage providers and standards in cloud computing.	
	<b>CO3</b>	Apply the concepts of Software as a Service and Software plus Services to demonstrate how businesses can integrate mobile devices with cloud-based solutions.	
	<b>CO4</b>	Apply the features of platforms like Google, Microsoft, Intuit Quick Base, Cast Iron Cloud and Bungee Connect to develop and demonstrate basic cloud-based applications.	
	<b>CO5</b>	Analyze the role of virtualization, server solutions and evaluate best practices for migrating to cloud services across different markets.	
<b>UNIT-I</b>			
<b>Cloud Computing Basics:</b> Cloud Computing Overview, Applications, Intranets and the cloud. <b>Your Organization and Cloud Computing:</b> When you can use cloud computing, Benefits, Limitations. <b>Cloud computing with the Titans:</b> Google, Microsoft, and Amazon. <b>The Business case for going to the cloud:</b> Cloud computing services, How those applications help your business.			
<b>UNIT-II</b>			
<b>Hardware and Infrastructure:</b> Clients, Security, Network. <b>Accessing the Cloud:</b> Platforms, Web Applications, Web APIs, Web Browsers. <b>Cloud Storage:</b> Cloud Storage Providers <b>Standards:</b> Application, Client			
<b>UNIT-III</b>			
<b>Software as a service:</b> Overview, Driving Forces, Company offerings. <b>Software plus Services:</b> Overview, Mobile Device Integration.			
<b>UNIT-IV</b>			
<b>Developing Applications:</b> Google, Microsoft, Intuit Quick Base, Cast Iron Cloud, Bungee Connect.			

**UNIT-V**

**Local clouds and Thin Clients:** Virtualization, Server Solutions.

**Migrating to the Cloud:** Cloud Services for Individuals, Cloud services aimed at the mid-market.

**Best practices and the future of cloud computing:** Analyze Your Service, Best Practices.

**Learning Resources****Text Book:**

- [3] Anthony T.Velte, Toby.J Velte, Robert Elsenpeter(2010). *Cloud Computing: A Practical Approach*, Tata McGraw- Hill.

**Reference Books:**

- [1] Michael Miller(2008). *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing.
- [2] George Reese(2009). *Cloud Applications Architectures: Building Applications and Infrastructure in the Cloud*, O'Reilly Media Inc.
- [3] John W. Rittinghouse, James F.Ransome (2010). *Cloud Computing Implementation, Management and Security*, CRC Press, Taylor & Francis group.
- [4] Beard Haley (2008). *Cloud Computing Best Practices for Managing and Measuring Processes for On-Demand Computing, Applications and Data Centers in the Cloud with SLAs*, Emereo Pty. Ltd., ISBN 978-1921523199.

## 24CA606A : ADVANCED DATABASE TECHNOLOGY

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Apply EER modeling concepts and transform EER diagrams into relational schemas	
	<b>CO2</b>	Demonstrate file structures, indexing, and hashing techniques for efficient data retrieval	
	<b>CO3</b>	Analyze physical database design strategies and implement database security mechanisms	
	<b>CO4</b>	Evaluate distributed database concepts, query optimization, and concurrency control techniques	
	<b>CO5</b>	Explore advanced data models and apply information retrieval techniques for web search	
<b>UNIT–I Enhanced Entity-Relationship (EER) Model and Relational Database Design</b>			
<b>The Enhanced Entity-Relationship (EER) Model:</b> Subclasses, Superclasses, and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies.			
<b>Relational Database Design by ER – and EER-to-Relational Mapping:</b> Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model Constructs to Relations			
<b>UNIT–II File Structures, Indexing, and Hashing</b>			
<b>Disk Storage, Basic File Structures, and Hashing:</b> Introduction, Buffering of Blocks, Placing File Records on Disk, Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques.			
<b>Indexing Structures for Files:</b> Types of Single-Level Ordered Indexes, Multilevel Indexes.			
<b>UNIT–III Physical Database Design, Tuning, and Security</b>			
<b>Physical Database Design and Tuning:</b> Physical Database Design in Relational Databases, An overview of Database Tuning in Relational Systems.			
<b>Database Security:</b> Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security, Introduction to Statistical Database Security, Introduction to Flow Control, Encryption and Public Key Infrastructures, Privacy Issues and Preservation, Challenges of Database Security.			
<b>UNIT–IV Distributed Databases</b>			
<b>Distributed Databases:</b> Distributed Database Concepts, Types of Distributed Database Systems, Distributed Database Architectures, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Query Processing and Optimization in Distributed Databases,			



**24CA606B : DISTRIBUTED SYSTEMS**

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand the core concepts and design principles of distributed systems	
	<b>CO2</b>	Analyze the challenges and complexity of distributed environments, including communication and synchronization issues	
	<b>CO3</b>	Implement naming mechanisms and manage name spaces effectively in distributed applications	
	<b>CO4</b>	Apply synchronization, consistency, and fault tolerance techniques to ensure reliability and security in distributed systems	
	<b>CO5</b>	Evaluate different distributed file systems and their real-world applications	
<b>UNIT-I Introduction to Distributed Systems</b>			
<b>Introduction:</b> Definition of a Distributed System, Goals of Distributed Systems. Hardware Concepts, Software Concepts			
<b>UNIT-II Communication in Distributed Systems</b>			
Layered Protocols, Remote Procedure Call (RPC) -Basic RPC Operation, Parameter Passing, Extended RPC Models-Remote Object Invocation -Distributed Objects, Binding a Client to an Object, Static vs. Dynamic Remote Method Invocation-ParameterPassing,Message-OrientedCommunication-Persistence& Synchronicity, Transient & Persistent Communication, Stream-Oriented Communication			
<b>UNIT-III Processes and Naming</b>			
<b>Processes:</b> Threads, Clients, Servers, Code Migration, Software Agents, Naming: Naming Entities (Names, Identifiers, Addresses), Name Resolution, Implementation of a Name Space, Locating Mobile Entities, Removing Unreferenced Entities			
<b>UNIT-IV Synchronization and Consistency</b>			
<b>Synchronization:</b> Clock Synchronization, Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions			
<b>Consistency &amp; Replication:</b> Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution & Consistency Protocols			
<b>UNIT-V Fault Tolerance &amp; Distributed File Systems</b>			
<b>Fault Tolerance:</b> Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit & Recovery,			
<b>Distributed File Systems:</b> Sun Network File System, The Coda File System			

**Learning Resources**

**Textbook:**

- [5] Andrew S. Tanenbaum & Maarten Van Steen, "*Distributed Systems: Principles and Paradigms*", Pearson Education, 2002.

**Reference Books:**

- [1] Coulouris, Dollimore, Kindberg & Blair, *Distributed Systems: Concepts and Design*, 5th Edition, Pearson Education.
- [2] Mukesh Singhal & Niranjan G. Shivaratri, *Advanced Concepts in Operating Systems*, Tata McGraw-Hill.
- [3] Pradeep K. Sinha, *Distributed Operating Systems: Concepts and Design*, Prentice Hall.

## 24CA606C : COMPUTER GRAPHICS

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	4
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Analyze the basics of computer graphics and graphical user interface	
	<b>CO2</b>	Apply computer graphics primitive operations and its attributes	
	<b>CO3</b>	Demonstrate different 2D object transformations and viewing techniques	
	<b>CO4</b>	Demonstrate the representation of three-dimensional objects and apply three-dimensional geometric and modeling transformations	
	<b>CO5</b>	Create various concepts related to Animation and Multimedia	
<b>UNIT-I Introduction to Computer Graphics and GUI</b>			
<p><b>Overview of Computer Graphics:</b> Introduction to Computer graphics, Applications of computer graphics, Video Display Devices, Raster Scan Displays, Random Scan Displays, Colour CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Raster Scan Systems, Random Scan Systems, Input Devices &amp; output Devices.</p> <p><b>Graphical User Interfaces and Interactive Input Methods:</b> The User Dialogue, Windows and Icons, Input of Graphical Data, Input Functions</p>			
<b>UNIT-II Overview of graphics primitives and attributes</b>			
<p><b>Output Primitives:</b> Points and Lines, Line-Drawing Algorithms: DDA Algorithm, Bresenham's Line Algorithm, Circle Generation Algorithms, Ellipse Generation Algorithms.</p> <p><b>Attributes of output Primitives:</b> Line Attributes, Area Fill Attributes, Character Attributes, Bundled Attributes, Anti- aliasing.</p>			
<b>UNIT-III Geometric Transformation and viewing</b>			
<p><b>Two Dimensional Geometric Transformations:</b> Basic Transformations, Matrix Representation and Homogenous Coordinates, Composite Transformations, Other Transformations.</p> <p><b>Two-Dimensional Viewing:</b> The Viewing pipeline, Viewing Coordinates Reference Frame, Window to Viewport Coordinate Transformations, Two-Dimensional Viewing Functions, Clipping Operations, Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping, Polygon Clipping: Sutherland-Hodgeman Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping</p>			
<b>UNIT-IV 3D Object Representation and Modeling Transformations</b>			
<p><b>Three-dimensional Object Representations:</b> Polygon Surfaces, Quadric Surfaces, Superquadrics.</p> <p><b>Three Dimensional Geometric and Modeling Transformations:</b> Translation, Rotation, Scaling, Composite Transformations. Three-Dimensional Transformation Functions, Projections, Types of projections.</p>			
<b>UNIT-V Basics Of Computer Animations And Multimedia</b>			

**Animations:** Creating Animations: Creating Key-frames, Layers in Animation, Steps for Creating Animation, Frame-by-Frame Animation, Tweened Animations

**Multimedia:** Introduction to Multimedia, Multimedia Applications, Building Blocks of Multimedia, Visual elements, Sound Elements, Multimedia storage

**Learning Resources**

**Text Books:**

- [1] Donald Hearn and M.Pauline Baker. *Computer Graphics*, 2nd Edition, PHI/Pearson Education. (UNIT - I, II, III,IV)
- [2] Malay K.Pakhira. *Computer Graphics, Multimedia and Animation*, PHI Publications. (UNIT - V)

**Reference Books:**

- [1] Donald Hearn and M.Pauline Baker. *Computer Graphics C version*, Pearson Education.
- [2] Zhigandxiang, Roy Plastock. *Computer Graphics 2nd Edition*, Schaum's outlines, Tata Mc- Graw hill edition.
- [3] David F Rogers. *Procedural elements for Computer Graphics* , Tata McGraw hill, 2nd Edition.

**Web Resources:**

- [1] <http://www.mhhe.com/ansinha/cg>

## 24CA606D : SOFTWARE PROJECT MANAGEMENT

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand fundamental concepts of software project management and its key components	
	<b>CO2</b>	Apply stepwise project planning to define scope, estimate effort, and schedule activities	
	<b>CO3</b>	Analyze risks in software projects and apply risk management strategies	
	<b>CO4</b>	Evaluate project monitoring, earned value analysis, and change management techniques	
	<b>CO5</b>	Create strategies for managing teams, contracts, and software quality standards	
<b>UNIT-I Introduction to Software Project Management and Evaluation</b>			
<p><b>Introduction to Software Project Management:</b> Introduction, Why is Software project management important? What is a Project? Software projects versus other types of projects, Contract management and Technical project management, Activities in SPM, Plans, methods, and Methodologies, Categorizing projects, Stakeholders, Setting, Objectives, The business case, Project success and failure, What is management? Management control, Traditional versus Modern Project management.</p> <p><b>Project evaluation and Programme management:</b> A business case, Project portfolio management, Evaluation of individual projects, Cost-benefit evaluation techniques, Programme management</p>			
<b>UNIT-II Project Planning and Activity Scheduling</b>			
<p><b>An Overview of Project Planning:</b> Select Project, Identify Project Scope and Objectives, Identify Project Infrastructure, Analyse Project Characteristics, Identify Project Products and Activities, Estimate Effort for Each Activity, Identify Activity Risks, Allocate Resources, Review/Publicize Plan, Execute Plan/Lower Levels of Planning.</p> <p><b>Activity Planning:</b> Introduction, The objectives of activity planning, When to plan, Project schedules, Projects and activities, Sequencing and scheduling activities, Network planning models, Formulating a network model, Adding the time dimension, The forward pass, The backward pass, Identifying the critical path, Activity float, Shortening the project duration, Identifying critical activities, Activity-on-arrow networks.</p>			
<b>UNIT-III Risk Management and Resource Allocation</b>			
<p><b>Risk management:</b> Introduction, Risk, Categories of risk, A framework for dealing with risk, Risk identification, Risk assessment, Risk planning, Risk management, Evaluating risks to the schedule, Applying the PERT technique, Monte Carlo simulation, Critical chain concepts.</p>			

**Resource allocation:** Introduction, The nature of resources, Identifying resource requirements, Scheduling resources, Creating critical paths, Counting the cost, Being specific, Publishing the resource Schedule, Cost schedules, The scheduling sequence.

#### **UNIT–IV Project Monitoring, Control, and Contract Management**

**Monitoring and control:** Introduction, Creating the framework, Collecting the data, Visualizing progress, Cost monitoring, Earned value analysis, Prioritizing monitoring, Getting the project back to target, Change control.

**Managing contracts:** Introduction, Types of contracts, Stages in contract placement, Typical terms of a contract, Contract management, Acceptance.

#### **UNIT–V Managing People, Teams, and Software Quality**

**Managing people in software environments:** Introduction, Understanding behaviour, Organization behaviour: a background, Selecting the right person for the job, Instruction in the best methods, Motivation, The Oldham–Hackman job characteristics model, Stress, Health and safety, Some ethical and professional concerns.

**Working in teams:** Introduction, Becoming a team, Decision making, Organizational structures, Coordination, dependencies, Dispersed and virtual teams, Communication genres, Communication plans, Leadership.

**Software quality:** Introduction, The place of software quality in project planning, The importance of software Quality, Defining software quality, ISO 9126, Product versus process quality management, Quality management systems, Process capability models, Techniques to help enhance software quality, Testing, Quality plans.

#### **Learning Resources**

##### **Textbook:**

- [8] Bob Hughes, Mike Cotterell & Raji Mall. (2011). *Software Project Management*. (5<sup>th</sup> Ed.). McGraw Hill Education (India) Private. Ltd.

##### **Reference Books:**

- [1] Bob Hughes, Mike Cotterell & Raji Mall. (2017). *Software Project Management*. (6<sup>th</sup> Ed.). McGraw Hill Education (India) Private. Ltd.
- [9] Mickey W. Mantle. (2012). *Managing the Unmanageable: Rules, Tools, and Insights for Managing Software People and Teams*. Addison Wesley.
- [10] Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*. (5th Ed.).
- [11] Gene Kim, Kevin Behr & George Spafford. (2014) *The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win*. Reprint edition. IT Revolution Press.

##### **Web Resources :**

- [1] IT Project Management courses on Coursera,  
<https://www.coursera.org/courses?query=project%20management&>
- [2] IT Project Management Professional Certificate by the University of Washington on edX,  
<https://www.edx.org/certificates/professional-certificate/uwashingtonx-it-project-management>

## 24CA681 : MINI PROJECT

<b>Lecture</b>	-	<b>Continuous Assessment</b>	60
<b>Tutorial</b>	-	<b>Summative Assessment</b>	40
<b>Practical</b>	4hrs/week	<b>Credits:</b>	2
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Identify and understand real-world computing problems	
	<b>CO2</b>	Analyze system requirements and architectural alternatives	
	<b>CO3</b>	Apply concepts of database management, algorithms and software engineering.	
	<b>CO4</b>	Evaluate the developed system using testing methodologies	
	<b>CO5</b>	Present and document the project effectively, demonstrating technical knowledge and problem-solving skills.	



**SIDDHARTHA**  
**ACADEMY OF HIGHER EDUCATION**

An Institution **DEEMED TO BE UNIVERSITY**

(Under Section 3 of UGC Act, 1956)

Kanuru, Vijayawada - 520 007, AP. [www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

91 866 2582333

866 2582334

866 2584930

# SEMESTER - IV



**24CA607: FULL STACK WEB DEVELOPMENT**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Design and style structured, responsive web pages by applying knowledge of HTML document structure, basic markup tags and CSS techniques, including text and image formatting, selectors and Flexbox layouts	
	<b>CO2</b>	Create and implement functions to perform specific tasks and Work with JSON including its syntax, data types, objects, arrays, and parsing methods.	
	<b>CO3</b>	Identify system requirements for running Node.js applications and need for Express.js framework in Node.js applications	
	<b>CO4</b>	Compose multiple components to build modular UI structures and Pass data between components using properties	
	<b>CO5</b>	Perform CRUD Operations in MongoDB.	

**UNIT-I HTML and CSS**

Structure of **HTML** Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox.

**UNIT-II JavaScript**

**JavaScript:** Data Types and Variables, Functions, Events-Mouse,JSON-Intro, syntax, data types, parse, objects ,arrays

**UNIT-III Introduction to Node.js and File System**

**Node.Js-**Node introduction, Node Get started, Node JS Requirements, Node Cmd Line, Node Architecture, Node Modules- HTTP module, File System.

**Express-**Routing, Request Matching, Route Parameters, Route Lookup, Handler Function, Request Object, Response Object

**UNIT-IV React Components and State**

**React Components-**React Classes, Composing Components, Passing Data using properties, Passing Data using children.

**React State-**Initial State, Async State Initialization, updating state, lifting state up, Event Handling

**UNIT-V MongoDB**

**MongoDB Basics-**Documents, collections, Databases, Query language, Installation, The Mongo shell

**MongoDB CRUD operations-**Create, Read, Projection, Update, Delete.

**Learning Resources**

**Text Book:**

- [1] Vasan Subramanian, *Pro MERN Stack-Full Stack Web App Development With Mongo, Express, React and Node*, (2<sup>nd</sup> Edition), Apress Publications.

**Recommended Books / References**

- [R1] <https://www.w3schools.com/html>  
[R2] <https://www.w3schools.com/js>  
[R3] <https://www.w3schools.com/nodejs/>  
[R4] Eric Freeman & Elisabeth Robson, *Head First JavaScript Programming*, O'Reilly Media  
[R5] Paul Wilton & Jeremy McPeak, *Beginning JavaScript*, (5th Edition), Wrox Publications  
[R6] Ethan Brown, *Learning JavaScript*, (3rd Edition), O'Reilly  
[R7] Andrew Mead. *Learning Node.js Development*  
[R8] Alex Giamas *Mastering MongoDB 6.x*

**24CA608A: DEEP LEARNING**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Explain deep learning fundamentals and neural network architecture.	
	<b>CO2</b>	Implement machine learning and deep learning models using Scikit-Learn, Keras and TensorFlow.	
	<b>CO3</b>	Design and optimize CNN and RNN architectures for image and sequence data.	
	<b>CO4</b>	Evaluate and tune deep learning models using advanced techniques.	
	<b>CO5</b>	Apply deep learning to real-world applications.	
<b>UNIT–I Introduction to Deep Learning</b>			
Definition and importance of Deep Learning, Difference between Machine Learning and Deep Learning, Applications of Deep Learning in daily life, Overview of Neural Networks, Basic concepts: neuron, layers, activation function.			
<b>UNIT–II Basics of Neural Networks</b>			
Structure of Artificial Neural Networks (ANN), Working of a neuron: input, weight, bias and output, Types of layers: input, hidden and output, Activation functions: Sigmoid, ReLU, Tanh (basic idea), Training process: Forward pass and Backpropagation.			
<b>UNIT–III Deep Learning Architectures</b>			
Concept of Deep Neural Networks (DNN), Introduction to Convolutional Neural Networks (CNN) – image processing basics, Introduction to Recurrent Neural Networks (RNN) – sequence data basics, Differences between CNN, RNN and ANN, Applications of CNN and RNN			
<b>UNIT–IV Tools and Frameworks</b>			
Overview of Python libraries: TensorFlow, Keras and PyTorch, Loading and preparing datasets (using MNIST as an example), Building a simple neural network using Keras, Training, testing and evaluating models, Visualization using Matplotlib.			
<b>UNIT–V Applications and Trends</b>			
Real-life applications: image recognition, speech recognition and self-driving cars, Transfer learning – simple concept, Introduction to Generative AI (ChatGPT, DALL•E) , Challenges and limitations of Deep Learning, Mini project / case study (e.g., digit recognition, emotion detection)			

**Learning Resources**

**Text Books:**

- [1] Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow*, O'Reilly Media, 2023.
- [2] Francois Chollet, *Deep Learning with Python*, O'Reilly Media, 2021.

**Reference Books:**

- [1] Ian Goodfellow, Yoshua Bengio, Aaron Courville — *Deep Learning*, MIT Press.
- [2] Michael Nielsen, *Neural Networks and Deep Learning* (online text).
- [3] Andrew Ng — *Deep Learning Specialization*, Coursera.

**24CA608B: DOT NET PROGRAMMING**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3

<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Develop problem-solving skills using variables, data types, operators and control statements.	
	<b>CO2</b>	Understand the principles of Object-Oriented Programming (OOP) using C#.	
	<b>CO3</b>	Understand the ASP.NET life cycle and ASP.NET Web Forms.	
	<b>CO4</b>	Understand the need and importance of validation in web applications to ensure correct and secure user input	
<b>CO5</b>	Understand the concept of databases and how applications interact with them.		

**UNIT-I C#**

What is C# ?, Features, Example, Variables, Data Types, Operators ,Control Statements-if-else, switch, For Loop, While Loop, Do-While Loop, Break, Continue, Goto, Comments.Arrays-Arrays, Array to Function, Multidimensional Array.

**UNIT-II Object Class**

Object and Class, Constructor, Destructor, this, Inheritance, polymorphism, method overloading and method over riding.

**UNIT-III ASP.NET Essentials**

Introduction to Features of ASP.NET, ASP.NET Life cycle, creating a sample ASP.NET web application. Web Forms: Label Control, Button Control, TextBox Control, File Upload Control, Hyper Link Control, Link Button, Check Box Control, Radio Button Control

**UNIT-IV Validation Controls**

Base Validator Class, Required Field Validator Control, Range Validator Control, Regular Expression Validator Control, Compare Validator Control, Custom Validator Control.

**UNIT-V Data Access with ADO.NET**

Understanding Databases, Features of ADO.NET, Architecture of ADO.NET, Types Vs. Untyped Datasets, Data Reader, Connection String, Connecting to a Data base: SQL Server Database, Data Adapter : Dataset and Data Adapter, Paging with Data Adapter, Updating with Data Adapter, Adding Multiple Tables to a Dataset, Creating a Data View, Data Reader to work with databases.

**Learning Resources**

**Text Books:**

- [1] Vikas Gupta and Kogent Learning Solutions Inc, *.NET PROGRAMMING, Covering .NET Framework 3.5, VB2008, ASP.NET 3.5 and C#*, 2008, Dream Tech Press,
- [2] Vikas Gupta and Kogent Learning Solutions, *.NET 4.5 PROGRAMMING, Black Book*, 2013, Dream Tech Press,

**Web Resources:**

- <https://www.javatpoint.com/c-sharp-tutorial>
- <https://www.javatpoint.com/asp-net-tutorial>
- <https://www.javatpoint.com/ado-net-tutorial>.

**24CA608C : DIGITAL IMAGE PROCESSING**

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3.5
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Understand the fundamental concepts and Applications of Digital Image Processing.	
	<b>CO2</b>	Apply spatial domain Image enhancement techniques and segmentation techniques for effective analysis and improvement of digital image.	
	<b>CO3</b>	Implement Image compression techniques to reduce data redundancy for effective storage and transmission of digital image.	
	<b>CO4</b>	Understand the importance of digital image security and apply techniques like watermarking, steganography, cryptography to protect digital image.	
	<b>CO5</b>	Analyze and interpret the working of various color image models, noise effects, full color image processing techniques for improved image quality and analyzing.	
<b>UNIT–I Introduction To Digital Image Processing</b>			
What is Digital Image Processing? Origins of Digital Image Processing, Examples of fields that use Digital Image Processing, Electromagnetic Spectrum, Fundamental Steps in Digital Image Processing, Components of Image Processing system, Elements of visual perception, Image sensing and acquisition, Image Sampling and Quantization.			
<b>UNIT–II Image Enhancement in Spatial Domain &amp; Image Segmentation</b>			
<b>Image Enhancement in the Spatial Domain:</b> Importance of Digital Image Enhancement, Image enhancement in Spatial Domain, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.			
<b>Image Segmentation:</b> Importance and Applications of Digital Image Segmentation, Detection of Discontinuous (Point detection & Line detection), Thresholding, Region-based segmentation (Region growing, Region splitting and merging).			
<b>UNIT–III Digital Image Compression</b>			
Image Compression Fundamentals, Importance of Digital Image Compression, Types of Image Compression, Image Compression models, Comparison between Lossy & Lossless Compression, Error-Free Compression, Lossy Compression – Lossy prediction coding, Block Transform coding, Image Compression Standard.			
<b>UNIT–IV Security in Digital Image Processing</b>			
<b>Security in Digital Image Processing:</b> Introduction to Digital Image Security, Techniques of Digital Image Security (Watermarking, Steganography, Cryptography), Differences between Watermarking and Steganography, Introduction to Watermarking, Types of Watermarking, Image watermarking system – Watermarking Embedding, Extraction/Detection process, Design Requirements of an Image Watermarking System, Digital Watermarking Applications, Steganography, Cryptography.			

**UNIT–V Color Image Processing**

Color Fundamentals, Color Models – The RGB color model, The CMY and CMYK color models, The HSI color model, Basics of Full-color Image processing, Noise of color images.

**Learning Resources**

**Textbooks:**

- [1] Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, 2nd Edition, Pearson.
- [2] Anil K. Jain, *Fundamentals of Digital Image Processing*, PHI.
- [3] Frank Y. Shih, *Digital Watermarking and Steganography*, Special Indian Edition, CRC Press

**Reference Books:**

- [1] Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, 2nd Edition, Pearson.
- [2] S. Jayaraman, S. Esakkirajan, T. Veerakumar, *Digital Image Processing*, McGraw Hill.

**E-resources and other digital material**

- [onlinecourses.nptel.ac.in](http://onlinecourses.nptel.ac.in)
- <https://www.coursera.org/learn/digital>

## 24CA608D : SOFTWARE TESTING

<b>Lecture</b>	2hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	2hrs/week	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Apply software testing techniques to identify and capture requirements and defects in software systems.	
	<b>CO2</b>	Verify and validate software artifacts using static and dynamic testing methods to ensure correctness and reliability.	
	<b>CO3</b>	Design and implement test cases using black box, white box and automation techniques to improve software quality.	
	<b>CO4</b>	Investigate software failures and perform debugging using modern tools to enhance system performance.	
	<b>CO5</b>	Communicate testing results effectively and work collaboratively, while embracing ethical practices and continuous learning.	
<b>UNIT–I Fundamentals of Software Testing</b>			
<b>Introduction to Software Testing:</b> Introduction, Evolution of Software Testing, Software Testing – Myths and Facts, Goals of software Testing, Software Testing Definitions, Model for Software Testing, Effective software testing vs Exhaustive Software Testing.			
<b>Software Testing Terminology and Life Cycle:</b> Testing terminology, Software Testing Life Cycle (STLC), Testing methodologies and their importance.			
<b>UNIT–II Verification, Validation and Static Testing</b>			
<b>Verification and Validation (V&amp;V):</b> Verification and Validation(V & V) Activities, Verification, Verification of Requirements, Verification of High-level Design, Verification of Low-level Design, How to verify code, Validation.			
<b>Static Testing:</b> Inspections and structured walkthroughs, Technical reviews, Benefits and challenges in static testing.			
<b>UNIT–III Dynamic Testing Techniques</b>			
<b>Black Box Testing Techniques:</b> Boundary Value Analysis (BVA), Equivalence Class Testing, State Table based Testing, Decision Table based Testing, Cause -Effect Graphing based Testing, Error Guessing.			
<b>White Box Testing Techniques:</b> Need of White Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Data Flow Testing, Mutation Testing.			
<b>Case study:</b> Income tax calculator.			
<b>UNIT–IV Test Management and Quality Assurance</b>			
<b>Test Management:</b> Test planning, organization and structure, Test design, specifications and documentation.			
<b>Software Quality and Metrics:</b> Quality control vs. Quality assurance, Software metrics, cyclomatic complexity and function points, Measurement models and improving test process maturity.			

**UNIT–V Automation, Specialized Testing and Debugging**

**Test Automation and Tools:** Introduction, Test automation life cycle, Test automation approach, Test automation framework, Test automation etrics and Test automation process.

**Testing in Specialized Environments and Debugging:** Object-oriented testing concepts, Testing web-based systems and challenges, Debugging techniques, processes, and tools.

**Learning Resources****Text Books:**

- [1] Naresh Chauhan, *Software Testing Principles and Practices*, Oxford University Press, 2010.
- [2] Rajeev Gupta, *Agile automation and unified functional testing*, Pearson 2017.
- [3] David Burns, *Selenium 2 Testing Tools Beginner's Guide*, Published by Packt Publishing Ltd, 2012.

**Reference Books:**

- [1] Brian Marick , *The Craft of Software Testing*, Pearson Education, 2007
- [2] Edward Kit , *Software Testing in the Real World*, Pearson.2002
- [3] Perry, *Effective methods of Software Testing*, 3rd Edition, John Wiley,2006
- [4] Meyers, *Art of Software Testing*, 3rd Edition John Wiley. 2015
- [5] Dr.K.V.K.K.Prasad , *Software Testing Tools* , Dreamtech, 2009.

**Web Resources:**

- [6] Prof. Rajib Mall, IIT Kharagpur, NPTEL SOFTWARE Testing video. Available: <https://nptel.ac.in/courses/106105150/>
- [7] Software testing MIT.  
Available: [https://ocw.mit.edu/courses/6-005-elements-of-software-construction-fall-2008/resources/mit6\\_005f08\\_1ec09/](https://ocw.mit.edu/courses/6-005-elements-of-software-construction-fall-2008/resources/mit6_005f08_1ec09/)

## 24CA609A : AI AND ML FOR MANAGEMENT APPLICATIONS

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Explain the core concepts of artificial Intelligence and digital transformation, and understand how emerging technologies like cloud computing, blockchain, AR/VR drive organizational growth and competitiveness	
	<b>CO2</b>	Interpret the ethical, regulatory and societal challenges associated with Responsible AI, including issues of bias, fairness, privacy, accountability and emerging governance trends.	
	<b>CO3</b>	Apply appropriate machine learning models and project management techniques to design, develop, test and deploy AI and ML solutions for organizational digital transformation.	
	<b>CO4</b>	Apply reinforcement learning and swarm intelligence techniques to solve problem-based scenarios, including Q-learning decisions and swarm-based optimization tasks	
	<b>CO5</b>	Apply agent-based modeling and robotic process automation concepts to design and analyze autonomous agent behavior and human-machine collaborative systems in real-world scenarios.	
<b>UNIT–I Introduction to AI and Digital Transformation in Organisations</b>			
<p><b>Introduction to AI :</b> What is AI!, Goals of AI, Managerial view of AI, Challenges and Ethics.</p> <p><b>Digital Transformation in Organisations :</b> Digital Transformation in Organisations, Digital Transformation and Competition, Traditional Vs Digital Operating Models, Properties of Digital Goods, Open-source Software, Cloud Computing, Augmented Reality and Virtual Reality, Blockchain Technology , AI and ML in Digital Transformation.</p>			
<b>UNIT–II Responsible AI</b>			
<p>Introduction, Challenges of Using AI-----Bias in Hiring, Problems with Facial Recognition, Misinformation and Manipulation, Surveillance and Monitoring, Environment impact of Large ML models; Bias---Selection, Label, Confirmation, Prejudice, Evaluation, Out-group biases; Explainability and Interpretability, Accountability and Inclusivity, Reliability and Safety, Privacy and Security; AI Regulation--- Unacceptable Risk, High Risk, Limited and Minimal Risk, General-purpose AI Models, Innovation and Governance; Future Trends---AI Governance, Transparency.</p>			

**UNIT–III Managing AI and ML Projects**

Introduction to Machine Learning, Problem of Learning by Induction-----Induction and Deduction; Types of Machine Learning Models-----Supervised Learning, Unsupervised Learning, Reinforcement Learning, Criteria for Model Selection.

An Introduction to Digital Transformation in Organisations, Managing AI and ML Projects---- Identify the problem, Build a Pilot, Model Design, Data Preparation, Model Development, Testing and Validation, Deployment for Production, Training and Skill Development, Monitoring and Maintenance; Implementation of Machine Learning Projects.

**UNIT–IV Reinforcement Learning and Swarm Intelligence**

**Reinforcement Learning:** Introduction, Applications of Reinforcement Learning, Basic idea of Reinforcement Learning, Q-Learning, An Example of Q- Learning---Q-Learning for the Water Jug Problem, How the Q-values Evolve! ; Design of a Q-Learner.

**Swarm Intelligence :** Introduction, Swarm Behaviour, Applications of Swarm Intelligence----- Cargo Routing, Bucket Brigades, Machine Assignment for Jobs, Ant Behaviour, Finding the Shortest Path.

**UNIT–V Agents and Robots**

**Agent-Based Modeling :** Agent based modeling-----Agent Design; Environment Design, Modeling Steps, An Example: Flight of Birds.

**Agents and Robots:** Autonomous Agents, Agentic AI, Robots in Use Today, Robot Design--- Subsumption Architecture; Human-Machine Collaboration-----Human Roles, Machine Roles; Industrial Robot Design-----Design and Training, Feedback from Users, Measures of Success; Robotic Process Automation-----Robotic Process Automation in Banking and Finance, Robotic Process Automation in Manufacturing; Managing Automation with Robots and Agents.

**Learning Resources****Text Book:**

- [1] Rahul De (2025). *AI for Managers*. Cengage Learning India Pvt. Ltd.

**Reference Books:**

- [1] Stuart Russel & Peter Norvig . *Artificial Intelligence: A Modern Approach*, Prentice- Hall.  
 [2] Fei Tao, Thippa Reddy G., Vikas Kumar, Victoria Akberdina, Evgeny Kuzmin (2025). *Artificial Intelligence and Digital Transformation: From Innovation to Implementation*, Springer.  
 [3] Shalev-Shwartz, S., Ben-David, S. *Understanding Machine Learning: From Theory to Algorithms*. Latest Edition, Cambridge University Press.  
 [4] Kaswan, Kuldeep Singh; Dhatteval, Jagjit Singh; Kumar, Avadhesh(2023). *Swarm Intelligence: An Approach from Natural to Artificial*. Wiley.  
 [5] Langmann, Christian; Turi, Daniel(2023). *Robotic Process Automation (RPA): Digitization and Automation in Business Processes*. Springer.

**24CA609B : RESEARCH METHODOLOGY**

<b>Lecture</b>	3hrs/week	<b>Continuous Assessment</b>	40
<b>Tutorial</b>	-	<b>Summative Assessment</b>	60
<b>Practical</b>	-	<b>Credits:</b>	3
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Demonstrate proficiency in formulating research problems, applying scientific methods and understanding the significance of research methodology in academic and professional settings.	
	<b>CO2</b>	Achieve proficiency in critically reviewing literature, enhancing research methodologies and designing effective research studies that contribute to knowledge broadening and contextual understanding.	
	<b>CO3</b>	Gain proficiency in designing reliable sampling strategies, applying measurement scales and executing data collection methods to minimize errors and enhance research validity.	
	<b>CO4</b>	Demonstrate hypothesis tests, interpret test statistics and utilize data analysis methods to enhance research validity.	
	<b>CO5</b>	Describe key techniques of data interpretation and outline the essential steps and structure of effective research report writing and presentation.	
<b>UNIT–I Research Methodology and Problem Definition</b>			
<b>Introduction to Research Methodology:</b> Meaning, Objectives, Motivation, Approaches, Significance and Scientific Methods.			
<b>Research Process:</b> Steps, Criteria of Good Research and Common Problems Encountered by Researchers in India.			
<b>Defining the Research Problem:</b> Selecting and Defining the Problem, Techniques and Illustration.			
<b>UNIT–II Literature Review and Research Design</b>			
<b>Reviewing the Literature:</b> Importance, Methodology Improvement, Knowledge Broadening and Contextual Findings.			
<b>Research Design:</b> Meaning, Need, Features of a Good Design, Concepts, Basic Principles and Experimental Designs			
<b>UNIT–III Sampling Design and Data Collection</b>			
<b>Design of Sampling:</b> Introduction, Sample Design, Sampling and Non-sampling Errors, Sample vs. Census Survey.			
<b>Measurement and Scaling:</b> Qualitative and Quantitative Data, Measurement Scales, Goodness and Sources of Error.			
<b>Data Collection:</b> Experimental and Surveys, Primary and Secondary Data Collection, Case Study Method.			

**UNIT–IV Hypothesis Testing and Data Analysis**

**Testing of Hypotheses:** Procedure for Hypothesis Testing, Tests of Hypotheses, t-Test, Z-Test, Chi-Square Test and One Way ANOVA.

**Data Analysis:** Techniques and Tools for Analyzing Collected Data.

**UNIT–V Interpretation and Report Writing**

**Interpretation:** Meaning of Interpretation, Why Interpretation, Techniques of Interpretation, Precautions in Interpretation, Role of Subjectivity in Interpretation, Common Errors in Data Interpretation.

**Report Writing:** Significance of Report Writing, Different Steps in Writing a Report, Layout of the Research Report, Types of Reports, Oral Presentation, Use of Visual Aids in Report Presentation, Structuring a Research Paper.

**Learning Resources****Text Books:**

- [1] C.R. Kothari(2018), *Research Methodology*, (2<sup>nd</sup> Ed.), New Age International Publisher.
- [2] Panneerselvam R (2014), *Research Methodology*,(2<sup>nd</sup> Ed.), PHI Learning Private Limited.

**Reference Books:**

- [1] Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8<sup>th</sup> Ed.). Pearson Education.
- [2] Thomas, G. (2017). *The Research Process: A Step-by-Step Guide for Beginners* (3<sup>rd</sup> Ed.). SAGE Publications.
- [3] Argyrous, G. (2011). *Statistics for Research: With a Guide to SPSS*. SAGE Publications.
- [4] Bhattacharya, D. K.(2006) *Research Methodology*, (2<sup>nd</sup> Ed.), Excel Books, New Delhi.
- [5] Gupta S.P.(2014). *Statistical Methods*, (43<sup>rd</sup> Ed.), Sultan Chand, New Delhi.

**24CA682 : MAJOR PROJECT**

<b>Lecture</b>	-	<b>Continuous Assessment</b>	60
<b>Tutorial</b>	-	<b>Summative Assessment</b>	40
<b>Practical</b>	16hrs/week	<b>Credits:</b>	8
<b>Course Outcomes</b>	Upon successful completion of the course, the student will be able to:		
	<b>CO1</b>	Identify and understand real-world computing problems	
	<b>CO2</b>	Analyze system requirements and architectural alternatives	
	<b>CO3</b>	Apply programming skills, database concepts and software engineering practices	
	<b>CO4</b>	Evaluate the developed system using testing methodologies	
	<b>CO5</b>	Create and deploy an innovative, scalable software product	

**MCA-SU24 REGULATIONS**