



SWAMI VIVEKANAND
SUBHARTI
UNIVERSITY
UGC Approved Meerut



Ordinance No. :- V-141-B-14

(Approved in Academic Council meeting held on 11.03.2026)

Proposed to be ratified in forthcoming executive council)

Evaluation Scheme and Syllabus
Of
Master of Computer Application (MCA)
TWO – YEAR POST GRADUATE
PROGRAM
(AS PER NEP-2020)

Keral Verma Subharti College of Science

Swami Vivekanand

SUBHARTI UNIVERSITY

Meerut

Effective from 2025-2026

KPV

A. K. Verma

M. K. Verma

M. K. Verma

M. K. Verma

M. K. Verma

Head
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S.V.S U., MEERUT

Program Educational Objectives (PEOs)

PEO 1 – Advanced Computing Competence

Graduates will develop strong theoretical and practical expertise in advanced computing concepts, including programming, algorithms, software engineering, data science, networking, AI, and cloud computing.

PEO 2 – Professional Excellence & Employability

Graduates will gain industry-relevant skills to excel as software developers, system analysts, data scientists, cybersecurity specialists, network administrators, and IT consultants.

PEO 3 – Research, Innovation & Higher Studies

Graduates will be prepared to undertake research, contribute to technological innovations, publish scholarly work, pursue Ph.D. programs, and engage in lifelong learning.

PEO 4 – Ethics, Responsibilities & Social Impact

Graduates will demonstrate professional ethics, cyber awareness, legal compliance, teamwork, and responsibility toward society, environment, and sustainable technology use.

PEO 5 – Leadership & Entrepreneurship

Graduates will develop leadership, communication, project management, and entrepreneurial skills to lead teams and establish technology-driven ventures.

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Program Outcomes (POs) – MCA

PO 1: Computational Knowledge

Understand and apply advanced knowledge of computing, mathematics, and domain-specific subjects to solve complex computing problems.

PO 2: Problem Analysis

Identify, analyze, and model complex computing problems and apply advanced techniques and algorithms for effective solutions.

PO 3: Design & Development of Solutions

Design and develop efficient, scalable, and secure software solutions using advanced tools, frameworks, and architectures.

PO 4: Professional Ethics & Cyber Responsibility

Follow ethical principles, data privacy norms, cybersecurity standards, and professional responsibilities in computing practice.

PO 5: Project Management & Finance

Apply project management principles, SDLC models, scheduling, budgeting, and resource management for successful project execution.

PO 6: Innovation & Entrepreneurship

Apply computing knowledge creatively in developing new products, services, startups, and IT business ventures.

Handwritten signatures and a stamp. The stamp is a purple rectangular stamp with the text: "Head, Dept. of Computer Application, Faculty of Science, S.V.S.U., MEERUT".

SWAMI VIVEKANAD SUBHARTI UNIVERSITY MEERUT

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Credit distribution table of Master of Computer Application (MCA)

		I	II	Internship after II Sem	III	IV	Total
1	Core Course	16	16	4	8	4	44
2	Elective (DEC)	-	-		8	8	16
3	PC/Dissertation/Project Work	8	8		8	12	36
4	SEMINAR/VAC/OEC/EEC/CHM	2 (SEMINAR)	2 (CHM)		2 (OEC)	2 (EEC)	8
	Total	26	26		26	26	108

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KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Course Name -MCA

Batch:2025-26

SEM:I

S. No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total
				L	T	P		CLAS S PARTICIPATION	Quiz/PT/Assignment (10)	Mid Sem Test (15)	TO T A L		
THEORY and PRACTICAL SUBJECTS													
1	CORE COURSE-1	MC A-101	Fundamental of Computers and Emerging Technologies	4	1	0	4	5	10	15	30	70	100
2	CORE COURSE-2	MC A-102	Problem Solving using C	4	1	0	4	5	10	15	30	70	100
3	CORE COURSE-3	MC A-103	Database Management System	4	1	0	4	5	10	15	30	70	100
4	CORE COURSE-4	MC A-104	Discrete Mathematics	4	1	0	4	5	10	15	30	70	100
5	PRACTICAL COURSE-1	MC A-102 -P	PROBLEM SOLVING USING C LAB	0	0	8	4	5	10	15	30	70	100
6	PRACTICAL COURSE-2	MC A-103 -P	DBMS Lab	0	0	8	4	5	10	15	30	70	100
7	SEMINAR	MC A-105		0	0	4	2	4	4	7	15	35	50
TOTAL CREDITS / ASSESSMENT							26	34	64	97	195	455	650

KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Course Name -MCA

Batch:2025-26

SEM:II

S. No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		CLASS PARTI CIPAT ION	Quiz/PP T/Assignment (10)	Mid Sem Test (15)	TOTAL			
THEORY and PRACTICAL SUBJECTS														
1	CORE COURSE-5	MCA-201	Data Structures & Analysis Of Algorithms	4	1	0	4	5	10	15	30	70	100	
2	CORE COURSE-6	MCA-202	Operating System	4	1	0	4	5	10	15	30	70	100	
3	CORE COURSE-7	MCA-203	Programming in Python	4	1	0	4	5	10	15	30	70	100	
4	CORE COURSE-8	MCA-204	Software Engineering	4	1	0	4	5	10	15	30	70	100	
5	PRACTICAL COURSE-3	MCA-201-P	Data Structure & Algorithm Lab	0	0	8	4	5	10	15	30	70	100	
6	PRACTICAL COURSE-4	MCA-203-P	Python Lab	0	0	8	4	5	10	15	30	70	100	
7	CHM	CHM-01		2	1	0	2	4	4	7	15	35	50	
TOTAL CREDITS / ASSESSMENT							26	34	64	97	195	455	650	

1. AN INTERNSHIP COURSE OF 4 CREDITS OF 4-6 WEEKS DURATION DURING SUMMER VACATION AFTER IIND SEMSTER TO BE COPLETED BY EVERY STUDENTS. INTERNSHIP CAN BE SITHER FOR ENHANCING THE EMPLOYAILITY OR AND DEVELOPING THE RESEACH APTITUDE.

2. THE POST GRADUATE DIPLOMA IN CMPUTER APPLICATION WILL BE AWARDED HERE AFTER THE SUBMISSION OF INTERNSHIP COURSES OF 04 CREDITS

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**MCA (MASTER OF COMPUTER APPLICATIONS) FIRST YEAR SYLLABUS
SEMESTER-I**

MCA-101 : FUNDAMENTAL OF COMPUTERS & EMERGING TECHNOLOGIES		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course, the student will be able to		
CO 1	Demonstrate the knowledge of the basic structure, components, features and generations of computers.	K ₁ , K ₂
CO 2	Describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts.	K ₂ , K ₃
CO 3	Compare and contrast features, functioning & types of operating system and computer networks.	K ₄
CO 4	Demonstrate architecture, functioning & services of the Internet and basics of multimedia.	K ₂
CO 5	Illustrate the emerging trends and technologies in the field of Information Technology.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to Computer: Definition, Computer Hardware & Computer Software Components: Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary. Software - Introduction, Types – System and Application. Computer Languages: Introduction, Concept of Compiler, Interpreter & Assembler Problem solving concept: Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.	08
II	Operating system: Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. Computer Network: Overview, Types (LAN, WAN and MAN), Data communication, topologies.	08
III	Internet: Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	08
IV	Block chain: Introduction, overview, features, limitations and application areas fundamentals of Block Chain. Crypto currencies: Introduction, Applications and use cases Cloud Computing: nature and benefits, AWS, Google, Microsoft & IBM Services	08
V	Emerging Technologies: Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface	08



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Suggested Readings:

1. Rajaraman V., "Fundamentals of Computers", Prentice-Hall of India.
2. Norton P., "Introduction to Computers", McGraw Hill Education.
3. Goel A., "Computer Fundamentals", Pearson.
4. Balagurusamy E., "Fundamentals of Computers", McGraw Hill.
5. Thareja R., "Fundamentals of Computers", Oxford University Press.
6. Bindra J., "The Tech Whisperer- on Digital Transformation and the Technologies that Enable it", Penguin Books.

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MCA-102 : PROBLEM SOLVING USING C		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Describe the functional components and fundamental concepts of a digital computer system including number systems.	K ₁ , K ₂
CO 2	Construct flowchart and write algorithms for solving basic problems.	K ₂ , K ₃
CO 3	Write 'C' programs that incorporate use of variables, operators and expressions along with data types.	K ₂ , K ₃
CO 4	Write simple programs using the basic elements like control statements, functions, arrays and strings.	K ₂ , K ₃
CO 5	Write advanced programs using the concepts of pointers, structures, unions and enumerated data types.	K ₂ , K ₃
CO 6	Apply pre-processor directives and basic file handling and graphics operations in advanced programming.	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Basics of programming: Approaches to problem solving, Use of highlevel programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming. Basics of C: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/Output, Operators and expressions.	08
II	Conditional Program Execution: if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else. Loops and Iteration: for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. Functions: Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunction program, Calling function by value, Recursive functions.	08


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III	<p>Arrays: Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays.</p> <p>Pointers: Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers.</p> <p>Strings: Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.</p>	08
IV	<p>Structure: Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure.</p> <p>Union: Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types</p> <p>Storage classes: Introduction, Types- automatic, register, static and external.</p>	08
V	<p>Dynamic Memory Allocation: Introduction, Library functions – malloc, calloc, realloc and free.</p> <p>File Handling: Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.</p> <p>Graphics: Introduction, Constant, Data types and global variables used in graphics, Library functions used in drawing, Drawing and filling images, GUI interaction within the program.</p>	08
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Kanetkar Y., "Let Us C", BPB Publications. 2. Hanly J. R. and Koffman E. B., "Problem Solving and Program Design in C", Pearson Education. 3. Schildt H., "C- The Complete Reference", Tata McGraw-Hill. 4. Goyal K. K. and Pandey H.M., "Trouble Free C", University Science Press 5. Gottfried B., "Schaum's Outlines- Programming in C", Tata McGraw-Hill Publications. 6. Kochan S.G., "Programming in C", Addison-Wesley. 7. Dey P. and Ghosh M., "Computer Fundamentals and Programming in C", Oxford University Press. 8. Goyal K. K., Sharma M. K. and Thapliyal M. P. "Concept of Computer and C Programming", University Science Press. 		



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MCA-103 : DATABASE MANAGEMENT SYSTEMS		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Describe the features of a database system and its application and compare various types of data models.	K ₂
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	K ₅ , K ₆
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K ₅ , K ₆
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	K ₂ , K ₃
CO 5	Explain different approaches of transaction processing and concurrency control.	K ₂
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	08
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	08
III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	08
IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System	08
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent	08


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	Transaction, Case Study of Oracle.	
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Silberschatz A., Korth H. and Sudarshan S., "Database Concepts", McGraw Hill. 2. Date C. J., "An Introduction to Database Systems", Addison Wesley. 3. Elmasri R. and Navathe S., "Fundamentals of Database Systems", Pearson Education. 4. O'Neil P., "Databases", Elsevier Publications. 5. Ramakrishnan R. Gehrke J., "Database Management Systems", McGraw Hill. 6. Leon A. and Leon M., "Database Management Systems", Vikas Publishing House. 7. Desai B.C., "An Introduction to Database Systems", Galgotia Publications. 8. Majumdar A. K. and Bhattacharya P., "Database Management System", Tata McGraw Hill. 		


 A series of handwritten signatures in blue ink, including 'KPR', 'A. K.', 'M', 'V', 'KG', and 'Om', followed by a blue stamp that reads: 'Head, Dept. of Computer Application, Faculty of Science, S.V.S.U., MEERUT'.

MCA-104: DISCRETE MATHEMATICS		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course, the student will be able to		
CO 1	Use mathematical and logical notation to define and formally reason about basic discrete structures such as Sets, Relations and Functions	K ₁ , K ₂
CO 2	Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic	K ₂ , K ₃
CO 3	Identify and prove properties of Algebraic Structures like Groups, Rings and Fields	K ₃ , K ₄
CO 4	Formulate and solve recurrences and recursive functions	K ₃ , K ₄
CO 5	Apply the concept of combinatorics to solve basic problems in discrete mathematics	K ₁ , K ₃
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Set Theory: Introduction, Size of sets and Cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set Identities. Relation: Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.	08
II	Posets, Hasse Diagram and Lattices: Introduction, Partial ordered sets, Combination of Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean functions, Karnaugh maps, Logic gates.	08
III	Propositional: Propositions, Truth tables, Tautology, Contradiction, Algebra of Propositions, Theory of Inference and Natural Detection. Predicate Logic: Theory of Predicates, First order predicate, Predicate formulas, Quantifiers, Inference theory of predicate logic.	08
IV	Algebraic Structures: Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism and Isomorphism of groups. Rings and Fields: Definition and elementary properties of Rings and Fields.	08
V	Natural Numbers: Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. Recurrence Relation & Generating functions: Introduction and properties of Generating Functions. Simple Recurrence relation with constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences. Combinatorics: Introduction, Counting techniques and Pigeonhole principle, Polya's Counting theorem.	08

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Suggested Readings:

1. Rosen K. H., "Discrete Mathematics and Its Applications", McGraw Hill.
2. Kolman B., Busby R.C and Ross S.C., "Discrete Mathematics Structures", Prentice Hall.
3. Girmaldi R.P, "Discrete and Combinatorial Mathematics", Addison Wesley.
4. Singh Y.N., "Discrete Mathematical Structures", Wiley- India.
5. Sarkar S., "A Textbook of Discrete Mathematics", S. Chand & Company PVT. LTD.
6. Krishnamurthy V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd.
7. Liptschutz S. and Lipson M.C., "Discrete Mathematics", McGraw Hill.
8. Trembely J.P. and Manohar R., "Discrete Mathematical Structure with application to Computer Science", McGraw Hill.

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MCA-102P : PROBLEM SOLVING USING C LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Write, compile, debug and execute programs in a C programming environment.	K ₃
CO2	Write programs that incorporate use of variables, operators and expressions along with data types.	K ₃
CO3	Write programs for solving problems involving use of decision control structures and loops.	K ₃
CO4	Write programs that involve the use of arrays, structures and user defined functions.	K ₃
CO5	Write programs using graphics and file handling operations.	K ₃
<p>1. Program to implement conditional statements in C language. 2. Program to implement switch-case statement in C language</p> <ol style="list-style-type: none"> 1. Program to implement looping constructs in C language. 2. Program to perform basic input-output operations in C language. 3. Program to implement user defined functions in C language. 4. Program to implement recursive functions in C language. 5. Program to implement one-dimensional arrays in C language. 6. Program to implement two-dimensional arrays in C language. 7. Program to perform various operations on two-dimensional arrays in C language. 8. Program to implement multi-dimensional arrays in C language. 9. Program to implement string manipulation functions in C language. 10. Program to implement structure in C language. 11. Program to implement union in C language. 12. Program to perform file handling operations in C language. 13. Program to perform graphical operations in C language. <p>Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		
MCA-103P : DATABASE MANAGEMENT SYSTEMS LAB		



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Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	K ₆
CO2	Write SQL commands to query a database.	K ₃
CO3	Write PL/SQL programs for implementing stored procedures, stored functions, cursors, trigger and packages.	K ₆
<p>9. Install oracle/ MYSQL.</p> <p>10. Create Entity-Relationship Diagram using case tools.</p> <p>11. Write SQL statements Using ORACLE /MYSQL:</p> <ol style="list-style-type: none"> a Write basic SQL SELECT statements. b Restrict and sort data. c Display data from multiple tables. d Aggregate data using group function. e Manipulate data. f Create and manage tables. <p>12. Normalization.</p> <p>13. Create cursor.</p> <p>14. Create procedure and functions.</p> <p>15. Create packages and triggers.</p> <p>16. Design and implement payroll processing system.</p> <p>17. Design and implement Library Information System.</p> <p>18. Design and implement Student Information System.</p> <p>19. Automatic Backup of Files and Recovery of Files</p> <p>Note: The instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		


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MCA-201 : DATA STRUCTURES & ANALYSIS OF ALGORITHMS		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Explain the concept of data structure, abstract data types, algorithms, analysis of algorithms and basic data organization schemes such as arrays and linked lists.	K ₂
CO 2	Describe the applications of stacks and queues and implement various operations on them using arrays and linked lists.	K ₃
CO 3	Describe the properties of graphs and trees and implement various operations such as searching and traversal on them.	K ₃
CO 4	Compare incremental and divide-and-conquer approaches of designing algorithms for problems such as sorting and searching.	K ₄
CO 5	Apply and analyze various design approaches such as Divide-and-Conquer, greedy and dynamic for problem solving.	K ₄
DETAILED SYLLABUS		4-0-0
Unit	Topic	Proposed Lecture
I	<p>Introduction to data structure: Data, Entity, Information, Difference between Data and Information, Data type , Build in data type, Abstract data type, Definition of data structures, Types of Data Structures: Linear and Non-Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complexity of various code structures, Order of Growth, Asymptotic Notations.</p> <p>Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D Array Application of arrays, Sparse Matrices and their representations.</p> <p>Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable.</p>	08


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II	<p>Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion-Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers.</p> <p>Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.</p> <p>Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing &</p>	08
	Collision resolution Techniques used in Hashing.	
III	<p>Sorting: Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort.</p> <p>Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component.</p>	08
IV	<p>Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search Tree. Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and B Tree.</p>	08
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijkstra Algorithm, Bellman Ford Algorithm, All- pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.	08

Suggested Readings:

20. Cormen T. H., Leiserson C. E., Rivest R. L. and Stein C., "Introduction to Algorithms", PHI.
21. Horowitz E., Sahni S. and Rajasekharan S., "Fundamentals of Computer Algorithms", Universities Press.
22. Dave P. H. and Dave H. B., "Design and Analysis of Algorithms", Pearson Education.
23. Lipschuts S., "Theory and Problems of Data Structures Schaum's Series)", Tata McGraw-Hill.
24. Goyal K. K., Sharma S. and Gupta A., "Data Structures and Analysis of Algorithms", HP Hamilton.
25. Samanta D., "Classic Data Structures", Prentice Hall India.
26. Goodrich M. T. and Tomassia R., "Algorithm Design: Foundations, Analysis and Internet Examples", John Wiley and sons.


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27. Sridhar S., "Design and Analysis of Algorithms", Oxford Univ. Press.
 28. Aho A., Ullman J. and Hopcroft J., "Design and Analysis of algorithms", Pearson Education.

MCA-202 : OPERATING SYSTEMS

Course Outcome (CO)

Bloom's Knowledge Level (KL)

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

CO 1	Explain main components, services, types and structure of Operating Systems.	K ₂
CO 2	Apply the various algorithms and techniques to handle the various concurrency control issues.	K ₃
CO 3	Compare and apply various CPU scheduling algorithms for process execution.	K ₂
CO 4	Identify occurrence of deadlock and describe ways to handle it.	K ₃
CO 5	Explain and apply various memory, I/O and disk management techniques.	K ₅

DETAILED SYLLABUS

3-0-0

Unit	Topic	Proposed Lecture
I	Introduction: Operating System Structure- Layered structure, System Components, Operating system functions, Classification of Operating systems- Batch, Interactive, Time-sharing, Real-Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08

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V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08
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Suggested Readings:

29. Silberschatz A., Galvin P. B. and Gagne G., "Operating Systems Concepts", Wiley Pub.
30. Halder S. and Arvind A. A "Operating Systems", Pearson Education.
31. Dietel H. M, " An Introduction to Operating System", Pearson Education.
32. Stallings W., "Operating Systems: Internals and Design Principles", Pearson Education.
33. Harris J.A., "Operating Systems (Schaum's Outlines)", McGraw Hill Education.


 A series of handwritten signatures in blue ink, including 'KPR', 'A. Kumar', 'M. K.', 'M.', 'K.', 'K.G.', and 'Omved'. To the right is a blue ink stamp that reads: 'Head, Deptt. of Computer Application, Faculty of Science, S.V.S U., MEERUT'.

MCA-203 : PROGRAMMING IN PYTHON		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course, the student will be able to		
CO 1	Explain basic principles of Python programming language	K ₁ , K ₂
CO 2	Implement object oriented concepts,	K ₂ , K ₃
CO 3	Implement database and GUI applications.	K ₄
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to Python: The basic elements of Python, Objects, expressions and numerical Types, Variables and assignments, IDLE, Branching programs, Strings and Input, Iteration Structured Types, Mutability and Higher-order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries	10
II	Functions, Exception, Modules and Files Difference between a Function and a Method, Defining a Function, Calling a Function, Returning Results from a Function, Returning Multiple Values from a Function, Functions are First Class Objects, Pass by Object Reference, Formal and Actual Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Variable Length Arguments, Local and Global Variables, The Global Keyword, Passing a Group of Elements to a Function, Recursive Functions, Anonymous Functions or Lambdas (Using Lambdas with filter() Function, Using Lambdas with map() Function, Using Lambdas with reduce() Function), Function Decorators, Generators, Structured Programming, Creating our Own Modules in Python, The Special Variable __name__	14
III	Exceptions Errors in a Python Program (Compile-Time Errors, Runtime Errors, Logical Errors), Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert Statement, User-Defined Exceptions, Logging the Exceptions	08
IV	Classes and Object-oriented Programming Classes: Creating a Class, The Self Variable, Constructor, Types of Variables, Namespaces, Types of Methods (Instance Methods, Class Methods, Static Methods), Passing Members of One Class to Another Class, Inner Classes Inheritance and Polymorphism: Constructors in Inheritance, Overriding Super Class Constructors and Methods, The super() Method, Types of Inheritance, Single Inheritance, Multiple Inheritance, Method Resolution Order (MRO), Polymorphism, Duck Typing Philosophy of Python, Operator Overloading, Method Overloading, Method Overriding	12

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V	Abstract Classes and Interfaces & File : Abstract Method and Abstract Class, Interfaces in Python, Abstract Classes vs. Interfaces, Files: Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing Whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods, Random Accessing of Binary Files, Random Accessing of Binary Files using mmap, Zipping and Unzipping Files, Working with Directories, Running Other Programs from Python Program	08
Suggested Readings: 1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016 2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010		


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MCA-204 : SOFTWARE ENGINEERING		
Course Outcome (CO)	Bloom's Knowledge Level (KL)	
At the end of course, the student will be able to		
CO 1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	K ₁ , K ₂
CO 2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	K ₂ , K ₃
CO 3	An ability to communicate effectively with a range of audiences	K ₄
CO 4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	K ₂
CO 5		K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction: Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.	10
II	Software Requirement Specification: Analysis Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control. Software-Design: Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach, functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling,	10
III	Top-Down and Bottom –Up programming, structured programming, information hiding, programming style and internal documentation. Testing: Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification & validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.	10
IV	Software Project Management The Management spectrum- (The people, the product, the process, the project), cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management	10



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V	<p>Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.</p> <p>CASE (Computer Aided Software Engineering): CASE and its Scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.</p>	10
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001 2. Jalote, Pankaj, "Software Engineering Ed.2", New Delhi: Narosa 2002 3. Schaum's Series, "Software Engineering", TMH 4. Ghezzi, Carlo and Others, "Fundamentals of Software Engineering", PHI 		


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MCA-201P : DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Write and execute programs to implement various searching and sorting algorithms.	K ₃
CO2	Write and execute programs to implement various operations on two-dimensional arrays.	K ₃
CO3	Implement various operations of Stacks and Queues using both arrays and linked lists data structures.	K ₃
CO4	Implement graph algorithm to solve the problem of minimum spanning tree	K ₃
<p>Program in C or C++ for following:</p> <ol style="list-style-type: none"> 1. To implement addition and multiplication of two 2D arrays. 2. To transpose a 2D array. 3. To implement stack using array. 4. To implement queue using array. 5. To implement circular queue using array. 6. To implement stack using linked list. 7. To implement queue using linked list. 8. To implement BFS using linked list. 9. To implement DFS using linked list. 10. To implement Linear Search. 11. To implement Binary Search. 12. To implement Bubble Sorting. 13. To implement Selection Sorting. 14. To implement Insertion Sorting. 15. To implement Merge Sorting. 16. To implement Heap Sorting. 17. To implement Matrix Multiplication by Strassen's algorithm. 18. Find Minimum Spanning Tree using Kruskal's Algorithm. <p>Note: The instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		
MCA-203P : PYTHON LAB		


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Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Explain basic principles of Python programming language	K ₃
CO2	Implement object oriented concepts,	K ₃
CO3	Implement database and GUI applications.	K ₃
<p>Program in PYTHON for following:</p> <ol style="list-style-type: none"> 1. Write a Python program to print "Hello Python" 2. Write a Python program to do arithmetical operations 3. Write a Python Program to check if a Number is Odd or Even 4. Write a Python Program to Check Armstrong Number 5. Write a Python Program to Find LCM using Function. 6. Write a Python Program to Make a Simple Calculator using function. 7. Write a Python program to print the elements of an array 8. Write a Python program that implements the concept of Constructor. 9. Write a Python program that implements the concept of Inheritance. 10. Write a Python program that implements the concept of Exception Handling. 11. Write a Python program that implements the concept of Interface. 12. Write a Python program that implements the concept of Abstract Class. <p>Note: The instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		


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KERAL VERMA SUBHARTI COLLEGE OF SCIENCE

Department of Computer Application

Course Name -MCA

Batch:2025-26

SEM:III

S. No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		CLASS PARTI CIPATION	Quiz/PT/Assignment (10)	Mid Sem Test (15)	TO TAL			
THEORY and PRACTICAL SUBJECTS								CLASS PARTI CIPATION	Quiz/PT/Assignment (10)	Mid Sem Test (15)	TO TAL	End Sem Exam (70)		
1	CORE COURSE-9	MCA-301	Object Oriented Programming with C++	4	1	0	4	5	10	15	30	70	100	
2	CORE COURSE-10	MCA-302	.Netframework with C#	4	1	0	4	5	10	15	30	70	100	
3	DISCIPLINE ELECTIVE COURSE -1	DES-01	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100	
4	DISCIPLINE ELECTIVE COURSE -1	DES-02	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100	
5	PRACTICAL COURSE- 5	MCA-301-P	C++ Lab	0	0	8	4	5	10	15	30	70	100	
6	PRACTICAL COURSE-6	MCA-302-P	.Net Lab	0	0	8	4	5	10	15	30	70	100	
7	OEC	OEC-1	To Be selected from the Bucket of Courses	2	1	0	2	4	4	7	15	35	50	
TOTAL CREDITS / ASSESSMENT							26	34	64	97	195	455	650	



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Department of Computer Application

Course Name -MCA

Batch:2025-26			SEM:IV											
S. No.	Course Type	Course Code	Course Name	Teaching Load			Credits	Internal Assessment				External Assessment	Total	Remark
				L	T	P		CLASS PARTICIPATION	Quiz/PP T/Assignment (10)	Mid Sem Test (15)	TO TAL			
THEORY and PRACTICAL SUBJECTS								CLASS PARTICIPATION	Quiz/PP T/Assignment (10)	Mid Sem Test (15)	TO TAL	End Sem Exam (70)		
1	COURSE COURSE E-11	MC A-401	Object Oriented Programming with Java	4	1	0	4	5	10	15	30	70	100	
3	DISCIPLINE ELECTIVE COURSE -3	DEC-3'	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100	
4	DISCIPLINE ELECTIVE COURSE -4	DEC-4'	To Be select from the Group of DEC	4	1	0	4	5	10	15	30	70	100	
5	DISSERTATION	PC-1		4	0	8	12	20	30	50	100	200	300	
7	EEC	EE C-1	To Be selected from the Bucket of Courses	0	0	0	2	4	4	7	15	35	50	
TOTAL CREDITS / ASSESSMENT							26	39	64	102	205	445	650	



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MCA-301 : Object Oriented Programming with C++		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course ,the student will be able to		
CO 1	Learn the basic concept of fundamentals of programming such as variables, conditional and iterative execution, methods, etc	K ₁ , K ₂
CO 2	To understand the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.	K ₂ , K ₃
CO 3	Summarize important topics and apply principles of software development using OOP.	K ₄
CO 4	Analyse how to write computer programs to solve specific problems.	K ₂
CO 5	Evaluate problems to solve a particular computer program and fix them..	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Object-Oriented Concepts: Data abstraction, Data Hiding, Encapsulation, polymorphism, modularity, hierarchy, typing, concurrency, persistence. C++ Basics: Classes and Objects, Data types, loops and decisions, structures and functions, Scope of class and its member, Nested Class, object arrays, Pointers, Constructor: parameterized constructor, multiple constructors, default constructor, copy constructor, implicit constructor, destructor function, dynamic allocation operators: new(), delete()..	10
II	Inheritance: Base and Derived Classes, Single inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid Inheritance, Multiple inheritance, Protected Members, Casting BaseClass Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base-Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes.	10
III	Polymorphism: Compile time and Run time, Abstract class, Virtual class, Virtual base classes, pointers to base and derived classes, virtual functions, early and late binding, Pure virtual function, virtual destructor, virtual derivation. Friend function & Friend class, Inline functions, function overloading, Operator Overloading: Unary, Binary.	12
IV	Generic Programming: Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters. Exception Handling: Try, Throw, Catch, Throwing an Exception, Catching an Exception, Re-throwing an Exception.	12
V	File Handling: Hierarchy of File Stream classes, Opening and Closing files, File modes, testing for errors, File pointers and their manipulations, ASCII & Binary files, Sequential and Random-access files. files, opening & closing a file, read () & write () functions, File manipulation using seekg (), tellg() functions.	10
Suggested Readings:		
<ol style="list-style-type: none"> 1. Deitel H.M. and Deitel P.J. – “How to Program C++” – PHI – 2003 2. Al stevenes – “C++ Programming” – Wiley dream tech – 2003. 3. Herbert Scheldt, “Complete Reference”. 4. Starting out with OOPS in C++ : Tony Gaddis, Wiley dream tech India Pvt. Ltd. 5. E. Balagurusamy “Object Oriented Programming with C++”. 		

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MCA-302 : .NET FRAMEWORK AND C#		
Course Outcome(CO)	Bloom's Knowledge Level(KL)	
At the end of course, the student will be able to		
CO 1	Understand the concept of .Net Framework and C# language fundamentals.	K ₁ , K ₂
CO 2	Evaluate C# OOPs concept and the .NET framework namespace contents.	K ₂ , K ₃
CO 3	Develop the console and GUI applications using C# .Net	K ₄
CO 4	Understanding of c# assembly, thread, app domain, serialization and Remoting concept	K ₂
CO 5	Set up various navigation techniques for integrating web pages using ASP.NET Controls within the site.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	The .NET framework: Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classe.	14
II	C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.	12
III	C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.	12
IV	Advanced Features: Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.	10
V	Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, Case Study (Messenger Application)	12

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Text Books

1. Shibi Panikkar and Kumar Sanjeev, "C# with .NET Frame Work", Firewall Media.
2. Schildt, "C#: The Complete Reference", TMH

Reference Books

1. Jeffrey Richter, "Applied Microsoft .Net Framework Programming", (Microsoft)
2. Fergal Grimes, "Microsoft .Net for Programmers", (SPD)
3. TonyBaer, Jan D. Narkiewicz, Kent Tegels, Chandu Thota, Neil Whitlow, "Understanding the .Net Framework", (SPD)
4. Balagurusamy, "Programming with C#", TMH

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MCA-301P : C++ LAB		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Attendee of course, the student will be able to		
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	K ₃
CO2	Design and Develop C++ program using the concept such as polymorphism, virtual function, exception handling and template.	K ₃
CO3	Apply object-oriente d techniques to analyze, design and develop a complete solution for a given problem.	K ₃
<ol style="list-style-type: none"> 1. Write a C++ program to find the sum for the given variables using function with default arguments. 2. Write a C++ program to swap the values of two variables and demonstrates a function using call by value. 3. Write a C++ program to swap the values of two variables and demonstrates a function using Call by reference using reference type (&). 4. Write a C++ program to swap the values of two variables and demonstrates a function using Call by reference using pointer (*). 5. Write a C++ program to swap the values of two dynamically allocated variables and release the memory after swapping. (use new & delete operators) 6. Write a program to find the largest, smallest & second largest of three numbers. (use inline function MAX and MIN to find largest & smallest of 2 numbers) 7. Write a program to calculate the volume of different geometric shapes like cube, cylinder and sphere and hence implement the concept of Function Overloading. 8. Write a C++ program to create a template function for Bubble Sort and demonstrate sorting of integers and doubles. <p>Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		



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MCA-302P : .NET FRAMEWORK & C# LAB		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Attendee of course, the student will be able to		
CO1	Create user interactive web pages using ASP.Net..	K ₃
CO2	Create simple data binding applications using ADO.Net connectivity.	K ₃
CO3	Performing Database operations for Windows Form and web applications.	K ₃
CO4	Write programs that involve the use of arrays, structures and user defined functions.	K ₃
CO5	Develop the console and GUI applications using C# .Net	K ₃
<p>Write programs in C# illustrating</p> <ol style="list-style-type: none"> 1. The use of sequence, conditional and iteration construct. 2. Various operators like logical, arithmetical, relational, etc. 3. Overloading of various operators. 4. Use of Fried, Inline, and Static Member functions, default arguments. 5. Use of destructor and various types of constructor. 6. Various forms of Inheritance. 7. Use of virtual functions, virtual Base Class, delegates. 8. File operation. 9. Simple web application using ASP Net. 10. Use of Active X controls. <p>Note : Students are advised to develop a small project illustrating the handling of database & screens in order to fully understand the C#.</p>		


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MCA-401 : OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Outcome(CO)		Bloom's KnowledgeLevel(KL)
At the end of course, the student will be able to		
CO 1	List the significance and key features of object-oriented programming and modeling using UML	K ₄
CO 2	Construct basic structural, behavioral and architectural models using object oriented software engineering approach.	K ₆
CO 3	Integrate object-oriented modeling techniques for analysis and design of a system.	K ₄ , K ₅
CO 4	Use the basic features of data abstraction and encapsulation in Java programs.	K ₄
CO 5	Use the advanced features such as Inheritance, polymorphism and virtual function in Java programs.	K ₃ , K ₄
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifiers, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays.	08
II	Inheritance, Interfaces and Packages: Inheritance: Super classes, sub classes, Protected members, constructors in sub classes, Object class, abstract classes and methods. Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces, Object cloning, inner classes. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention For Packages, Networking java.net package.	08
III	Exception Handling, I/O: Exceptions: exception hierarchy, throwing and catching exceptions, built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics: Byte streams and Character streams, Reading and Writing, Console Reading and Writing Files.	08
IV	Multithreading and Generic Programming: Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming: Generic classes, generic methods, Bounded Types: Restrictions and Limitations.	08

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V	Event Driven Programming: Graphics programming: Frame, Components, working with 2D shapes, Using colors, fonts, and images. Basics of event handling: event handlers, adapter classes, actions, mouse events, AWT event hierarchy. Introduction to Swing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus and Dialog Boxes.	08
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MCA-401P : OBJECT ORIENTED PROGRAMMING WITH JAVA LAB		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO1	Use the Concept of Data Abstraction and Encapsulation in C++ programs.	K ₃
CO2	Design and Develop C++ program using the concept such as polymorphism, virtual function, exception handling and template.	K ₃
CO3	Apply object-oriented techniques to analyze, design and develop a complete solution for a given problem.	K ₃
<p>34. Use Java compiler and eclipse platform to write and execute java program.</p> <p>35. Write programs to implement conditional statements and looping constructs.</p> <p>36. Write programs to implement basic input / output operations.</p> <p>37. Write programs using inheritance and polymorphism.</p> <p>38. Write programs to implement error-handling techniques using exception handling and multithreading.</p> <p>39. Write programs to demonstrate the use of java packages.</p> <p>40. Write programs to demonstrate the concept of file handling and establishment of database connection.</p> <p>41. Write program to develop a calculator application in Java.</p> <p>42. Write program to develop a Client Server Application.</p> <p>43. Write program to develop GUI applications using Swing components.</p> <p>Note: The instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.</p>		


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Academic Session 2025-26

Syllabus

Discipline Elective Courses- Group-1

DATA ANALYTICS

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(DIS1-FD(3A) FOUNDATIONS OF DATA SCIENCE		
Max Marks: 100 (70+30)		Credit-04
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to		
CO 1	Learn the fundamentals of Data Science and its methodologies	K ₁ , K ₂
CO 2	Implementation of data science concepts using python	K ₂ , K ₃
CO 3	Execution of various libraries in python	K ₄
CO 4	Knowledge of Machine Learning and Deep Learning using python libraries	K ₂
CO 5	Exploring the data using various OpenCV and Matplotlib	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Overview : Defined, Data Science Overview Data Science Methodologies Overview Data Science Pipeline Data Engineering, Data Preparation, Exploration Data Engineering, Data Preparation, Exploration Data Science vs. Business Intelligence vs Artificial Intelligence , Data Science vs. Business Intelligence Data Science vs. Artificial Intelligence, Types of Analysis Similarities Between Data Science and Business Intelligence Data Science alignment with Business Intelligence, Data Science Reinforcement with Business Intelligence, Data Science and Business Intelligence Together: Future Three Features for Data Science and Business Intelligence Getting Started with Data Science, Business Intelligence and AI Journey Data Science Methodologies, Introduction to Data Science Methodologies Business Understanding, Problem Statement Formulation Analytic Understanding, Understanding Data Requirements Data Collection Data Understanding	12
II	Modelling Data, Modelling Evaluation Data Science Essential Skill Matrix Introduction to Data Science Essential Skill Matrix, Mathematics and Statistical Skills Essential Programming Skills Data Engineering Skills Data Visualization Skills Business and Communication Skills Ethical Skills Python for Data Science Introduction to Python, Expression and Variables, Python String Operations Python Data Structures: List, Tuple, Dictionary, Sets. Python Conditional Statements Python Branching Statements, Python Case Statements Loops, Functions and Exception Handling, Objects and Classes Mathematical Computing with Python (Numpy) Getting Started with Numpy Creating Numpy Arrays Creating Numpy Array Indexing	12

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III	SciPy Sparse Data SciPy Graphs SciPy Spatial Data Overview SciPy Spatial Data Processing, SciPy Spatial Matlab Arrays, SciPy Interpolation Data Manipulation with Pandas Getting Started with Data Manipulation with Pandas Installing and Using Pandas, Exploring a data file Using Pandas Reading Data from a Excel file, Reading Data from a .csv file Reading Data from a .txt file Exploratory Data Analysis Getting Exploratory with Data Analysis	12
IV	Machine Learning Workflow Simple Machine Learning Implementation with the Iris Dataset Deep Learning with Tensor Flow and Keras Getting started with Deep Learning with Tensor Flow and Keras Getting started with Tensor Flow Getting started with Keras , Deep Learning Framework Deep Learning Workflow, Deep Learning Model Features Deep Learning Model Performance Simple Deep Learning Implementation with the Iris Dataset Natural Language Processing with NLTK Getting started with Natural Language Processing Getting started with NLP library NLK	12
V	Getting started with Computer Vision library OpenCV NumPy and Image Basics Image Processing with OpenCV Video Processing with OpenCV Object Detection with OpenCV, Object Tracking with OpenCV Data Visualization in Python using Matplotlib Getting started with Data Visualization Getting started with Data Visualization Library Matplotlib Bar. Column, Pie Graph using matplolib, Box Plot using matplolib Histogram using matplolib Line plots and Sub Plots Using Matplotlib Scatter Plot Using Matplotlib, Plot Customizations, Saving Plots	12

Text Books

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igal, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
2. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069
3. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487

References

4. Full-Stack JavaScript Development by Eric Bush.
5. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki


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DIS2-DE(3A) DATA ENGINEERING AND KNOWLEDGE REPRESENTATION		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Max Marks: 100 (70+30)		Credit-04
At the end of course, the student will be able to		
CO 1	Understand the basics of data engineering	K ₁ , K ₂
CO 2	Understand data modeling, ERD, Normalization, De-normalization, Index strategies	K ₂ , K ₃
CO 3	Apply the concepts of Big Data Technologies	K ₄
CO 4	Perform different knowledge representation techniques	K ₂
CO 5	Implement techniques for data quality and data governance	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Overview of Data Engineering: Definition and scope of data engineering in modern data ecosystems. Evolution of data engineering and its role in enabling data-driven decision-making. Importance of Data Engineering: Understanding the significance of data engineering in handling large volumes of data efficiently Impact of effective data engineering on business intelligence, analytics, and machine learning initiatives.	12
II	Data Engineering Lifecycle: Phases involved in the data engineering lifecycle, including data ingestion, processing, transformation, and analysis. Best practices for orchestrating and managing data workflows throughout the data engineering lifecycle Data Ingestion, Processing.	10
III	Introduction to Data Modelling: Fundamentals of data modeling and its importance in database development. Overview of different data modeling approaches and methodologies Conceptual, Logical, and Physical Data Models: Explanation of conceptual data models and their role in capturing high-level business requirements Understanding logical and physical data models and their transformation process from highlevel concepts to database implementation.	14
IV	Storage, and Retrieval: Techniques and methodologies for ingesting data from diverse sources into data storage systems. Strategies for processing, storing, and retrieving structured and unstructured data at scale. Trends in Data Engineering: Exploration of emerging technologies and trends shaping the future of data engineering, such as serverless computing, edge computing, and AI-driven data management.frameworks like Apache	14


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V	Tools and Technologies in Data Engineering: Overview of popular data engineering tools and platforms, such as Apache Spark, Hadoop, Comparison of different tools and technologies Data Engineering in	10
<p>Text Books</p> <p>6. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igal, L;Seghi', S. Springer, ISBN:978-3-319-50016-4</p> <p>7. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069</p> <p>8. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487</p> <p>References</p> <p>9. Full-Stack JavaScript Development by Eric Bush.</p> <p>10. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki</p>		


 A series of handwritten signatures in blue ink, including 'KPR', 'A. Kumar', 'M. K.', 'V.', 'K.G.', and 'Arvind'. To the right is a blue ink stamp that reads: 'Head, Deptt. of Computer Application, Faculty of Science, S.V.S U., MEERUT'.

(DIS3-AA(4A) Adaptive AI in Data Analytics and Predictive Modelling		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Max Marks: 100 (70+30)		Credit-04
At the end of course, the student will be able to		
CO 1	Understand the notion of a parametric model, point estimation of the parameters and properties of a good estimator.	K ₁ , K ₂
CO 2	Conquer the concept of interval estimation and confidence intervals.	K ₂ , K ₃
CO 3	Analyze and perform large-sample tests of hypotheses..	K ₄
CO 4	Discuss nonparametric tests of hypotheses.	K ₂
CO 5	Translate and correlate the statistical analysis into Statistical inference	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to Adaptive :AI Overview of Data Analytics and Predictive Modeling Importance of Adaptive AI in Model Improvement Practical Applications of Adaptive AI Ethical Considerations in AI and Data Analytics Introduction to Supervised Learning Introduction to Unsupervised Learning Introduction to Reinforcement Learning Exploring Neural Networks Introduction to Data reprocessing Data Cleaning Techniques Feature Selection Methods Feature Extraction Techniques Handling Missing Data Handling Outliers	14
II	Introduction to predictive analytics Business analytics: types, Applications collaborative Models: predictive models – descriptive models decision models – applications analytical techniques. Data transformations: Individual predictors, Multiple predictors, Dealing with missing values, Removing. Adding, Binning Predictors, Computing, Model Tuning Data Splitting, Resampling.	14
III	Propensity models: cluster models, collaborative filtering, applications and fundamental limitations. Statistical Modeling- Formal Definition, Model Comparison Classification. Measuring Performance in Regression Models Linear Regression and Its Cousins NonLinear Regression Models Regression Trees and Rule-Based Models Case Study: Compressive Strength of Concrete Mixtures Classification Models - Discriminant Analysis and Other Linear - Non-Linear	12


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IV	Classification Trees and Rule Based Models Model Evaluation Techniques The Effect of Class Alternate Cutoffs Adjusting Prior Probabilities Unequal Case Weights Sampling Methods Cost-Sensitive Training Measuring Predictor Importance Factors that can affect Model Performance	10
V	Methods for time series analyses – Analysis: Motivation Exploratory analysis Prediction and forecasting Classification Regression analysis Signal estimation Segmentation. Models Autoregressive model Partial autocorrelation function	10

Text Books

11. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igal, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
12. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069
13. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN:9781787127487

References

14. Full-Stack JavaScript Development by Eric Bush.
15. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki


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(DIS4-BA(4A) BIG DATA ANALYTICS	
Course Outcome(CO)	Bloom's Knowledge Level(KL)
Max Marks: 100 (70+30)	Credit-04
At the end of course, the student will be able to	
CO 1	Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications. K ₁ , K ₂
CO 2	Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration. K ₂ , K ₃
CO 3	Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as hig K ₄
CO 4	Analyse how to write computer programs to solve specific problems. K ₂
CO 5	Evaluate problems to solve a particular computer program and fix them.. K ₁ , K ₂
DETAILED SYLLABUS	
Unit	Topic
I	INTRODUCTION TO BIG DATA AND HADOOP :Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets. 14
II	HDFS (Hadoop Distributed File System) :The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. 12
III	Map Reduce :Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features 10
IV	Hadoop Eco System : Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction 14
V	Data Analytics with R :Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR 10

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- Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References

- Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
- Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
- Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
- Anand Rajaraman and Jeffrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
- Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007
- Pete Warden, “Big Data Glossary”, O’Reily, 2011.
- Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
- ArvindSathi, “BigDataAnalytics: Disruptive Technologies for Changing the Game”, MC Press, 2012
- 16. • Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform " , Tata McGraw Hill Publications, 2012.

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Academic Session 2025-26

Syllabus

Discipline Elective Courses- Group-2

AI & ROBOTICS

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(DIS1-AI(3B) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Understand different AI concepts and Develop an understanding of problem-solving techniques in Artificial Intelligence	K ₁ , K ₂
CO 2	Apply Artificial intelligence techniques for problem-solving and acquire knowledge of artificial intelligence search strategies	K ₂ , K ₃
CO 3	Identify and analyze different types of models of artificial neural networks	K ₂ , K ₃
CO 4	Analyze the fundamentals of machine learning, the learning algorithms, and the paradigms of supervised and unsupervised learning	K ₂ , K ₃
CO 5	Analyze and interpret the predictive performance of machine learning models	K ₂ , K ₃
CO 6	Identify methods to enhance accuracy and resilience in forecasting by merging predictions from multiple models	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Artificial Intelligence, Application of AI, AI Problems, Problem Formulation, Intelligent Agents, Types of Agents, Agent Environments, PEAS representation for an Agent, Architecture of Intelligent Agents.	08
II	Search Strategies: Solving problems by searching, Search- Issues in the Design of Search Programs, Un-Informed Search- BFS, DFS; Informed Search (Heuristic Search Techniques) - Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Alpha-beta search algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis	10
III	Neural Networks: Neural Networks- Introduction to Neural Networks, Model of Artificial Neuron, Learning rules, and various activation functions. Perceptron Networks, Adaline, Multilayer Perceptrons,	08


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IV	<p>Introduction to Machine Learning: Introduction. Motivation and role of machine learning in computer science and problem-solving, Different types of learning,</p> <p>Feature Selection: forward search, backward search, univariate, multivariate feature selection approach, Feature reduction (Principal Component Analysis)</p> <p>Supervised Learning and Unsupervised Learning, Introduction to reinforcement learning</p>	10
V	<p>Forecasting and Learning Theory:</p> <p>Regression: Non-linear regression, Logistic regression, Probability and Bayes Learning: Bayesian Learning, Naïve Bayes, Bayesian Belief networks, Introduction, Optimal Separating Hyperplane, Separating data with maximum margin, Support Vector Machine (SVM),</p> <p>Ensemble Methods: Mixture Models, Classifier using multiple samples of the data set, Random forest,</p>	08
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. George F Luger, Artificial Intelligence, Fifth Edition-2009, Pearson Education Publications ,ISBN-978-81-317-2327-2 2. Stuart Russell, Peter Norvig, Artificial Intelligence – A Modern Approach, , Pearson Education / Prentice Hall of India, 3rd Edition, 2009.ISBN- 13: 9780136042594 3. Ethem Alpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203-5078-6. 4. Tom Mitchell, Machine Learning, McGraw-Hill, First Edition, ISBN No. 0-07115467-1. 		




(DIS2-IR(3B) INTRODUCTION TO ROBOTICS AUTOMATION		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	To Understanding the Evolution and Classification of Robotics	K ₁ , K ₂
CO 2	To Exploring Automation Principles and Technologies	K ₂ , K ₃
CO 3	To Developing Proficiency in Python Programming for Robotics	K ₂ , K ₃
CO 4	Acquire knowledge about various sensors, actuators.	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Robotics, Automation, History, Laws, Classifications by coordinate system, Robot components, Concept of work space, Basic robot motions - Point to point control - Continuous path control.	08
II	Coordinate frames, Mappings: Changing descriptions from frame to frame, Translations, Rotations and Transformations, Kinematic Modelling of the manipulator, D-H Representation, Forward Kinematics and Inverse Kinematics. Introduction to sensors. Classification, Types of sensors: Position sensors, Potentiometers, Force sensors, Encoders, etc., Applications.	10
III	Introduction to actuators, Role and characteristics of robotic actuators; Electrical motors – servos, stepper motors, and drive mechanisms; Pneumatic and hydraulic actuators; Soft robotic actuators; shape memory actuators, and emerging paradigms; Biomimetic actuators, artificial muscle technology and wearable actuators; Role of 3D printing.	10
IV	Medical robots and its application: Robots for navigation – Movement replication – Robots for imaging Rehabilitation and prosthetics – Describing spatial positioned orientation – Standardizing kinematic analysis – Computing joint angles – Quaternions – Robot kinematics -Three-joint robot – Six-joint robot.	08
Suggested Readings: 1. Robotics and Control, R.K. Mittal & I.J.Nagrath, 2 nd ed., Tata McGraw Hill, 8 th reprint 2014. 2. Fundamentals of Robotics, D. K Pratihari, Narsa Publishers, 2018. 3. Robot Dynamics and Control, Spong M. and Vidyasagar M., “”, 2 nd ed., John Wiley & Sons, 2014.		


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(DIS3-AI4B) : Artificial Intelligence and Machine Learning for Robotics		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Introduce the fundamentals of AI	K ₁ , K ₂
CO 2	Understand the applications of artificial intelligence	K ₂ , K ₃
CO 3	Understand the basic concepts of machine learning.	K ₂ , K ₃
CO 4	Understand the Robot operating system fundamentals	K ₂ , K ₃
CO 5	Understand the fundamental of Robotics programming and development.	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Problem solving and Scope of AI, Introduction to Artificial Intelligence, Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert Systems, AI techniques- search knowledge, abstraction, Problem Solving State space Search, Production systems, search space control: depth-first, breadth-first search, Heuristic search, Hill climbing, best-first search,	10
II	Introduction to Machine Learning, Data and Features, Machine Learning Pipeline, Data Preprocessing: Standardization, Normalization, Missing data problem, Data imbalance problem, Data visualization - Setting up training, development and test sets, Different types of machine learning	08
III	Introduction to Robotics, Fundamentals of Robotics, Robot Kinematics, Position Analysis, Dynamic Analysis and Forces,	05
IV	Robot Programming languages & systems, Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages, Analysis of Robot Programming Language.	07
Suggested Readings: 1. E. Rich and K. Knight, "Artificial Intelligence", TMH, 3rd edition, 2017, ISBN: 9780070087705. 2. Kevin P. Murphey. Machine Learning, a probabilistic perspective. The MIT Press Cambridge 3. Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication.		


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(DIS4-GA(4B) WORKING WITH GENERATIVE AI AND LARGE LANGUAGE MODELS		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Understand Generative AI	K ₁ , K ₂
CO 2	Introduction to Generative models	K ₂ , K ₃
CO 3	Understanding OpenAI Technology	K ₂ , K ₃
CO 4	Understand Generative Adversarial Networks	K ₂ , K ₃
CO 5	OpenAI tools	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Generative AI: Definition and scope of generative AI. Significance of generative AI in various industries. Generative Models Overview :Explanation of autoencoders and their applications. Introduction to Generative Adversarial Networks (GANs) and their architecture. Types of Generative Models Understanding Variational Autoencoders (VAEs) and their probabilistic interpretation.	10
II	Understanding OpenAI: History and evolution of OpenAI as a research organization. OpenAI's collaborations and partnerships with industry and academia. OpenAI's Technologies: Overview of GPT (Generative Pre-trained Transformer) models and their capabilities.	08
III	Introduction to GANs: Definition and motivation behind Generative Adversarial Networks (GANs). Overview of Generative Adversarial Networks (GANs). GANs Architecture: generator and discriminator networks' architectures. Role of activation functions and normalization techniques in GAN architecture. Understanding the challenges of GAN training, such as mode collapse and convergence issues.	05
IV	Introduction to Text Generation: Explanation of different types of text generation tasks, such as language modeling, text completion, and dialogue generation. Applications of text generation, Text Generation Techniques: Exploration of techniques such as greedy decoding, beam search, and nucleus sampling used for text generation with GPT models. openAI tools.	07
<p>Suggested Readings:</p> <ol style="list-style-type: none"> Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning (Chapter 20: Generative Models). "Hands-On Generative Adversarial Networks with PyTorch 1.x: Implement next-generation neural networks to build powerful GAN models using Python" by Stefano Van Der Walt, Benjamin Kallus, and Alex Lavin "GANs in Action: Deep learning with Generative Adversarial Networks" by Jakub Langr and Vladimir Bok 		


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Syllabus

Discipline Elective Courses- Group-3

APPLICATION DEVELOPMENT

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(DIS1-IC(3C) INTRODUCTION TO COMPUTER VISION		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to		
CO 1	To understand the fundamentals of computer vision, their applications, image types and basic operations	K ₁ , K ₂
CO 2	To apply various image processing techniques to binary images and understand different color spaces	K ₂ , K ₃
CO 3	To understand image representation using different feature extraction algorithms	K ₄
CO 4	To understand the methods used for analysis of videos	K ₂
CO 5	High-level vision: Recognition and scene analysis	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to computer vision: Introduction to computer vision. Image processing v/s computer vision. Applications of computer vision. Types of images: binary, greyscale, color image. Image channels, splitting and merging channels, manipulating color pixels. Mathematical operations on images.	10
II	Binary Image Processing: Thresholding, Erosion and Dilation, opening and closing. Connected component analysis, contour analysis. Color spaces: RGB, HSV, CMYK, Y'CbCr, Y'UV. Image filtering, smoothing and gradient	10
III	Feature Extraction: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Gabor filters, LBP, GLCM.	12
IV	Video Analysis: Motion Estimation using Optical Flow, Video stabilization, object tracking, Kalman filter, MeanShift and CamShift. Background Subtraction and Modeling. Optical Flow, KLT, SpatioTemporal Analysis, Dynamic Stereo; Motion parameter estimation.	12
V	Recognition: Object/face detection and recognition, instance recognition, category recognition, context and scene understanding.	10
Text Books		
<ol style="list-style-type: none"> 1. Computer Vision: Algorithms and Applications by Richard Szeliski 2. Computer Vision: A Modern Approach (Second Edition) by David Forsyth and Jean Ponce 3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, 		


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Second Edition, Cambridge University Press

References

4. Multiple View Geometry in Computer Vision, 2/e, A. Zisserman and R. Hartley, Cambridge University Press, 2004.
5. Robot Vision, B.K.P. Horn, MIT Press, 1986.
6. Computer Vision: A Modern Approach, 2/e, David A. Forsyth and Jean Ponce, Prentice Hall, 2011.

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(DIS2-WA(3C) WEB APPLICATION DEVELOPMENT		
Course Outcome(CO)	Bloom's Knowledge Level(KL)	
At the end of course, the student will be able to		
CO 1	To study the insights of the Web architecture and how servlets works.	K ₁ , K ₂
CO 2	To gain knowledge in interfacing Java Servlet Program with JDBC Connection	K ₂ , K ₃
CO 3	To be trained to dynamically generate the web pages using Java Server Pages.	K ₄
CO 4	To understand the designing applications over web using Spring Framework.	K ₂
CO 5	5. To get acquainted with applications over the web using 'Django' Framework.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL , HTTP. PHP: Declaring Variables, Data types, Operators, Control structures, Functions. MVC Framework and Design Pattern, Types of PHP MVC framework.	14
II	Servlets: Introduction to Servlets, Benefits of Servlets, use as controller in MVC, basic HTTP, servlet container, Servlets API, javax.servelet Package, Reading Servlet parameters, service method detail. HTML clients, servlet lifecycle. Servlets with JDBC, JDBC: Architecture - JDBC API, Passing Control and Data between Pages..	12
III	Java Server Pages: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects. Conditional Processing – Displaying Values, setting attributes, Error Handling and Debugging	12
IV	Spring Framework Overview, Spring Web MVC Overview, Controllers, Handler Methods, Install and Configure WebServer, Developing Web Application using Spring.	10
V	Introduction to Django, Django architecture, Django Models and Database Backends, Developing Web Application using Django	12


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Text Books

1. Hans Bergsten , Java Server Pages, O'Reilly, 2003
2. Jason Hunter, William Crawford , Java Servlet Programming, Second Edition, , O'Reilly Media

REFERENCE BOOKS

7. Joseph J. Bambara, Paul R. Allen, Mark Ashnault, Ziyad Dean, Thomas Garben, Sherry Smith J2EE UNLEASHED — SAMS Techmedia 5 StepahnieBodoff, Dale Green, Kim Hasse, Eric Jendrock, Monica Pawlan, Beth Stearns , The J2EE Tutorial, Pearson Education , Asia.
8. Learning Django Web Development, SanjeevJaiswalRatanKumar,PACKT Publishing.
9. <https://www.djangoproject.com/> spring framework (IBM)

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(DIS3-AA4C) ANROID APPLICATION DEVELOPMENT		
Course Outcome(CO)		Bloom's KnowledgeLevel(KL)
At the end of course, the student will be able to		
CO 1	Analyze architecture of android and current trends in mobile operating systems.	K ₁ , K ₂
CO 2	2. Apply suitable software tools and APIs for the development User Interface of a particular mobile application.	K ₂ , K ₃
CO 3	3. Apply intents and broadcast receivers in android application.	K ₄
CO 4	4. Develop and design apps for mobile devices using SQLiteDatabase.	K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to Android Operating System: Android OS and Features – Android development framework; Installing and running applications on Android Studio, Creating AVDs, Types of Android application; Creating Activities, Activity Life Cycle, Activity states, monitoring state changes;	14
II	Android application components – Android Manifest file, Externalizing resources like Simple Values, Drawables, Layouts, Menus, etc, Building User Interfaces: Fundamental Android UI design, Layouts – Linear, Relative, Grid and Table Layouts. User Interface (UI) Components.	12
III	Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities,	12
IV	Intents and Broadcasts: Using intents to launch Activities, Types of Intents, Passing data to Intents, Getting results from Activities, Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters;	10
V	Database: Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data;	12
<p>TEXT BOOKS:</p> <p>17. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012</p> <p>18. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013</p> <p>REFERENCES:</p>		



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19. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
20. Android Application Development (with Kitkat Support), Black Book, Pradeep Kothari, 2014, Dreamtech Press publisher, Kogent Learning Inc.,2014.
21. Android Programming: Pushing the Limits, Erik Hellman, 1st Edition,Wiley Publications, 2014

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(DIS4-FS(4C) FULL STACK DEVELOPMENT		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to		
CO 1	To become knowledgeable about the most recent web development technologies.	K ₁ , K ₂
CO 2	Idea for creating two tier and three tier architectural web applications.	K ₂ , K ₃
CO 3	Design and Analyse real time web applications.	K ₄
CO 4	Constructing suitable client and server side applications.	K ₂
CO 5	To learn core concept of both front end and back end programming.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git & Github HTML, CSS	10
II	Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format.	10
III	REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication	12
IV	Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application usingMaven	12
V	Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud	10
Text Books		
<p>10. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas</p> <p>11. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to CreatingDynamic Websites by Robin Nixon</p> <p>12. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015</p>		



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References

13. Full-Stack JavaScript Development by Eric Bush.
14. Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl , Kamil Przeorski , Maciej Czarnecki

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Academic Session 2025-26

Syllabus

Discipline Elective Course- Group-4

IOT

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(DIS1-BI(3D) : BASIC OF IOT		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Understand about IOT	K ₁ , K ₂
CO 2	Known basic protocols in sensor networks.	K ₂ , K ₃
CO 3	Program and configure Arduino boards for various designs.	K ₂ , K ₃
CO 4	Design IoT applications in different domains	K ₂ , K ₃
CO 5	interfacing for Raspberry Pi.	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.	08
II	Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino	10
III	Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics,	08
IV	Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring	10
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press) 2. "Make sensors": Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media,2014. 3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madiseti 		




(DIS2-II(3D) INTELLIGENT INTERNET OF THINGS (IIOT))		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Analyze the key aspects of Industry 4.0.	K ₁ , K ₂
CO 2	Summarize the features of Smart IIoT and its industrial applications.	K ₂ , K ₃
CO 3	Explain the IIoT analytics for industrial processes	K ₂ , K ₃
CO 4	Interpret the plant safety and security aspects.	K ₂ , K ₃
CO 5	Outline the frameworks for IIoT applications in industries.	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Industry 4.0: Internet of Things (IoT), IoT vs Baseline Technologies (Machine to Machine (M2M) communications, Cyber-Physical Systems (CPS), Web of Things (WoT)), IoT – Architecture (Sensing layer, Networking Layer, Service Layer, Interface Layer). Industrial Revolution and Historical Context, Characteristics and Features of Industry 4.0, Design Requirements of Industry 4.0, Drivers of Industry 4.0 (Mega Trends, Tipping Point), Smart Business Perspective (Monitor, Control, Optimize, Automate), Characteristics of Smart Business Model, Impacts of Industry 4.0 (Economy Perspective, Business Perspective, Global Perspective), Applications of Industry 4.0 (Smart Factory and Manufacturing System, Smart City, Logistics, Agriculture, Public Transport, Construction, Food Production).	10
II	Industrial Internet of Things (IIoT): Introduction to IIoT, Comparison between IoT and IIoT, Prerequisites of IIoT, Architecture of IIoT, Industrial Sensing, Traditional Sensing, Contemporary Sensing, Smart Sensors, Application of Smart Sensors in Industries (Agriculture, Health Care, Retail, Supply Chain, Manufacturing), Features of IIoT for Industrial Processes, Future Architecture of Industries, Applications of IIoT (Smart Health Care, Smart Supply Chain, Smart Transportation, Smart Manufacturing System, AR and VR Applications).	08
III	IIoT Analytics: Introduction to IIoT Analytics, Positive Impacts of Data Analytics on Industries, Categorization of Analytics (Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Streaming Analytics, Spatial Analytics, Time-Series Analytics), Artificial Intelligence (Machine Learning (ML), Deep Learning (DL)), Usefulness of IIoT Analytics, Challenges of Analytics in Industries	06


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IV	Plant Safety and Security: Introduction to Plant Safety, IIoT Applications for Undertaking Safety Measures in Plant, Plant Security (Culture, Compliance, Capital), Network Security (Access control, Antivirus and Anti-Malware Software, Application Security, Behavioral Analytics, Email Security, Firewalls, Intrusion Prevention Systems (IPS), Mobile Device Security, Virtual Private Network (VPN), Web Security), Mobile Device Security (Endpoint Security, Virtual Private Network (VPN), Secure Web Gateway (SWG), Email Security)	06
V	Health Care Applications in Industries: Introduction to Health Care Applications in Industries, Major Challenges Associated with Healthcare, Applications of Healthcare in Industries, IIoT Based Health Care System, Smart Devices (Smart Electrocardiogram (ECG) Monitor, Smart Blood Pressure Monitor, Smart Body Temperature Monitor, Smart Oxygen Saturation Monitor, Smart Health Monitoring Chair)	05
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Sudip Mishra, Chandana Roy, and Anandarup Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0, CRC Press. , 2020. 2. R. Anandan, Suseendran Gopalakrishnan, S. Pal, N. Zaman, Industrial Internet of Things (IIoT): Intelligent Analytics for Predictive Maintenance, Wiley-Scrivener , 2022 		



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(DIS3-IO4D) : IOT CLOUD INFRASTRUCTURE AND IOT PROTOCOLS

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	Understanding cloud basics is vital for IoT.	K ₁ , K ₂
CO 2	Knowing IoT protocols ensures effective device communication.	K ₂ , K ₃
CO 3	Familiarity with cloud IoT platforms streamlines IoT development.	K ₂ , K ₃
CO 4	Security is crucial in cloud-based IoT setups.	K ₂ , K ₃
CO 5	Staying updated with IoT trends is essential for future readiness.	

DETAILED SYLLABUS**3-1-0**

Unit	Topic	Proposed Lecture
I	Introduction to IoT Cloud Infrastructure: Definition and significance of cloud computing, Characteristics of cloud services, Cloud service models: IaaS, PaaS, SaaS, Overview of major cloud service Providers, IoT applications and cloud computing, Cloud-based IoT architecture, Challenges in implementing IoT on cloud infrastructure, Fog computing and its role in IoT, Future trends in cloud-based IoT, Cloud Service Deployment Models.	10
II	Cloud Platforms for IoT: Overview of AWS IoT Core, Key features and services offered by AWS IoT, Microsoft Azure IoT Suite: Introduction and features, Google Cloud IoT Core: Overview and Capabilities, Comparison of major cloud IoT platforms, Device provisioning and management on cloud platforms.	08
III	IoT Protocols: Introduction to IoT communication protocols, MQTT (Message Queuing Telemetry Transport): Overview and applications, HTTP and HTTPS protocols for IoT applications, AMQP (Advanced Message Queuing Protocol) in IoT, Comparison of IoT protocols: Performance, scalability, and security, MQTT vs. CoAP: Choosing the right protocol for IoT applications,	05
IV	Security and Data Management in IoT Cloud : Security challenges in cloud-based IoT deployments, Data encryption techniques for IoT communication, Role-based access control (RBAC) in IoT cloud environments, IoT security best practices, Data management strategies for IoT Applications, Advanced Topics in IoT Cloud: Block chain technology for secure IoT transactions, DevOps practices in IoT cloud deployments	07

Suggested Readings:

- "Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" by Maciej Kranz.
- "IoT Solutions in Microsoft's Azure IoT Suite: Data Acquisition and Analysis in the Real World" by Scott Klein, Manisha Yadav, and Nishith Pathak

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(DIS4-IO(4D)) : IoT Devices with Computer Vision Technologies		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course, the student will be able to		
CO 1	To introduce Internet of Things (IoT) environment and its technologies for designing smart systems	K ₁ , K ₂
CO 2	Explore the system management and domain for various applications of IoT Categorize the various protocols that are used for developing IoT applications.	K ₂ , K ₃
CO 3	Inculcate the fundamentals of computer vision	K ₂ , K ₃
CO 4	To teach the functions of a Computer vision techniques involved in training the Computer vision models on different problems	K ₂ , K ₃
CO 5	Build intelligent and automated real-world Computer vision applications	
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Physical design of IoT , Things in IoT, logical Design of IoT, IoT Functional Blocks, Communication Models in IoT, Communication Models in IoT, Device to Cloud Model, Device to Gateway Model, M2M, Differences between IoT and M2M, Architecture of M2M, Software Defined Networking (SDN), Architecture of SDN,	10
II	Computer Vision -Introduction, Computer Vision Overview, Computer Vision defined from academic perspective, Computer Vision defined from Industry perspective, Signal Processing for Computer Vision, Pattern recognition of Computer Vision, Challenges of Computer Vision, Computer Vision Data Requirements	08
III	Computer Vision Workflow Steps, Business Problem Identification, Success Criteria Definition, Right Computer Vision Techniques, Collect Training Data, Label Train and Test Datasets, Train the computer vision model, Evaluate the computer vision model, Test the model, Deploy the model, Computer vision architecture	05
IV	Computer Vision Techniques an Overview: Image Processing, Image Processing Techniques, Image Restoration, Linear Filtering , Independent Component Analysis , Pixelation, Challenges and opportunities in integrating IoT with computer vision, Overview of edge computing and its role in IoT.	07
Suggested Readings:		
1. ArshdeepBahga and Vijay Madiseti, "Internet of Things - A Hands-on Approach", Universities Press, 2015. 2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014. 3. R. Jain, R. Kasturi, and B. G. Schunck, Machine Vision, McGraw-Hill, Inc. 1995. 4. Digital Image Processing and Analysis: Application with MATLAB and CVIptools, 3rd Edition, SE Umbaugh, Taylor&Francis/CRC Press, 2018		


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Syllabus

Employability and Entrepreneurship Skills Course

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EEC-401 : DIGITAL MARKETING		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
Max Marks: 50 (35+15)		Credit-02
At the end of course, the student will be able to		
CO 1	Understand the core concepts of Digital Marketing.	K ₁ , K ₂
CO 2	Understand the basics of Mobile Marketing.	K ₂ , K ₃
CO 3	Summarize the core concepts of Online Marketing.	K ₂ , K ₃
CO 4	Discuss E-mail marketing techniques.	K ₂ , K ₃
CO 5	Understand Search Engine Marketing	K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Digital marketing: Concept, Features, Difference between traditional and digital marketing, Moving from traditional to digital Marketing; c Digital Marketing Channels: Intent Based- SEO, Search Advertising; Brand Based Display Advertising; Community Based-Social Media Marketing; Others Affiliate, Email, Content, Mobile. Customer Value Journey: 5As Framework; The Ozone O3 Concept Key; Traits of online consumer.	05
II	Content and Email Marketing: Content Marketing: Step-by-step Content Marketing Developing a content marketing strategy Email Marketing: Types of Emails in email marketing, Email Marketing best practices.	05
III	Social Media Marketing and Display Marketing : Social Media Marketing: Building Successful Social Media strategy; Social Media Marketing Channels; Facebook, LinkedIn, YouTube (Concepts and strategies) Display Advertising: Working of Display Advertising; Benefits and challenges; Overview of Display ad Process.; Define- Customer, Publisher, Objectives; Format Budget, Media, Ad Formats, Ad Copy.	08
IV	Search Engine Marketing Introduction of SEM: Working of Search Engine; SERP Positioning; online search behaviour, DMI's 5P Customer Search Insights Model. Search Engine Optimization: Overview of SEO Process; Goal Setting-Types. On-Page Optimization: Keyword Research, SEO Process -Site Structure, Content, Technical Mechanics, Headings, Image & Alt text, Social Sharing, Sitemaps, Technical Aspects- Compatibility, Structured Data Markup. Off Page Optimisation: Link Formats, Link Building, Content Marketing, Social Sharing; Black and White Hat Techniques Search Advertising: Overview of PPC Process; Benefits of Paid Search; Basis of Ranking; Goal Setting-Objectives; Account Setting-Creation of Google Ads, Campaign architecture,	12

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	Campaign setup, Targeting, Bid Strategy, Delivery, Ad Scheduling, Ad Rotation, Keyword Selection; Ad Copy composition, Ad Extension	
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Suggested Readings:

1. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.
2. Kartajaya, H., Kotler, P., & Setiawan, I. (2016). Marketing 4.0: moving from traditional to digital. John Wiley & Sons.
3. Ryan, Damien: Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.

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EEC-402 : Soft Skills Development		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
Max Marks: 50 (35+15)		Credit-02
At the end of course, the student will be able to		
CO 1	Student will get Effective Communication Skills.	K ₁ , K ₂
CO 2	Develop good Interpersonal Skills and Teamwork in students.	K ₂ , K ₃
CO 3	Personal and Professional Development.	K ₂ , K ₃
CO 4		K ₂ , K ₃
CO 5		K ₂ , K ₃
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Communication Skills: Verbal and Non - Verbal communication - The active vocabulary - Conversational Etiquette - KOPPACT syndrome	06
II	Emotional Skills: Emotional Intelligence - The five steps to Emotional Quotient - Self- Awareness and Regulation - Empathy - Social Intelligence - stress management - coping with failures	08
III	Functional Skills: Using the tools of communicatory and emotional skills - Resume writing - Preparation of Curriculum Vitae - interview skills - Acing the interview - Group dynamics - Mock interviews and Group discussions	06
IV	Interpersonal Skills: Synergising relationships - SWOT analysis - SOAR analysis - The social skills - Time Management - Decision making - problem solving - prioritising and Implementation. Personality Skills: Leadership skills - Attributes and Attitudes - Social leader Vs The Boss - critical and creative thinking.	10




Suggested Readings:

1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India.
3. Soft Skills - Enhancing Employability, M. S. Rao, I. K. International

EEC-403 : Business Analytics**Course Outcome (CO)****Bloom's Knowledge Level (KL)****Max Marks: 50 (35+15)****Credit-02****At the end of course, the student will be able to**

CO 1	Understand the need for effective business analytics within an organization.	K ₁ , K ₂
CO 2	Analyze complex problems using advanced analytics tools.	K ₂ , K ₃
CO 3	Apply various optimization models such as linear optimization, integer linear optimization and non-linear optimization	K ₂ , K ₃
CO 4	Demonstrate descriptive, predictive and prescriptive business analytics.	K ₂ , K ₃

DETAILED SYLLABUS**3-1-0**

Unit	Topic	Proposed Lecture
I	Data and Data Science; Data analytics and data analysis, Classification of Analytics, Application of analytics in business, Types of data: nominal, ordinal, scale; Big Data and its characteristics, Applications of Big data. Challenges in data analytics.	10
II	Data Preparation, Summarisation and Visualisation Using spreadsheet (6 hours) Data Preparation and Cleaning, Sort and filter, Conditional formatting, Text to Column, Removing Duplicates, Data Validation, identifying outliers in the data, covariance and correlation matrix, Moving Averages, Finding the missing value from data; Summarisation; Visualisation: scatter plots, line charts, histogram, etc., Pivot Tables, pivot charts and interactive dashboards.	08
III	Business Analytics Applications Why resource constraints are important to support business analytics: introduction, business analytics personnel, business analytics data, Descriptive: Visualizing and exploring data, sampling and estimation, Predictive: Logic Driven Models, data driven models, data mining. Prescriptive Analysis: Prescriptive modeling: non-linear optimization	05
IV	Measures & metrics and Performance Management Need for measurement, characteristics of measures, measurement system terminology, Salient attributes of a good metric, SMART test for ensuring metric relevance to business, Supply chain associated with the metric, Fact-based decision making and KPIs,	07



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Suggested Readings:

1. Camm, J. D., Cochran, J. J., Fry, M. J., Ohlmann, J. W., & Anderson, D. R. (2015). Essentials of business analytics (2nd ed.). Cengage Learning.
2. Schniederjans, M. J., Schniederjans, D. G., & Starkey, C. M. (2014). Business analytics: Principles, concepts and applications. Pearson
3. Prasad, R. N., & Acharya, S. (2011). Fundamentals of business analytics. Wiley

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Syllabus

OPEN ELECTIVE COURSES

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MCA- OEC-301 COMPUTER NETWORKS		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Max Marks: 50 (35+15)		Credit-02
At the end of course, the student will be able to		
CO 1	Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.	K ₁ , K ₂
CO 2	Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.	K ₂ , K ₃
CO 3	Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as hig.	K ₄
CO 4	Analyse how to write computer programs to solve specific problems.	K ₂
CO 5	Evaluate problems to solve a particular computer program and fix them..	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, Integrated services digital networks, terminal handling.	10
II	Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Link Layer- elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control	10
III	Network Layer: Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, IPv6	12
IV	Transport Layer: Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.	12
V	Application Layer: Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.	10
Text Books		
References		
1. S Tanenbaum, "Computer Networks, 3rd Edition", PHI		
2. W. Stallings, "Data and Computer Communication", Macmillan Press		




3. Comer, "Computer Networks & Internet", PHI.
4. Comer, "Internetworking with TCP/IP", PHI
5. Forouzan, "Data Communication and Networking", TMH

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MCA- Group1-OEC-302 WEB TECHNOLOGY		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Max Marks: 50 (35+15)		Credit-02
At the end of course, the student will be able to		
CO 1	Analyze a web page and identify its elements and attributes	K ₁ , K ₂
CO 2	Create web pages using XHTML and Cascading Style Sheets	K ₂ , K ₃
CO 3	Build dynamic web pages using JavaScript (Client side programming).	K ₄
CO 4	Create XML documents and Schemas.	K ₂
CO 5	Build interactive web applications using AJAX.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India. Introduction to International Cyber laws, Web project, Web Team, Team dynamics.	10
II	Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.	10
III	HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML. JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas	12
IV	XML: Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage.	12
V	Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).	10
Text Books		
1. Burdman, "Collaborative Web Development", Addison Wesley.		
2. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley		
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.		


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- 1 Shishir Gundavarma, "CGI Programming on the World Wide Web", O'Reilly & Associate.
2. DON Box, "Essential COM", Addison Wesley.
3. Greg Buczek, "ASP Developer's Guide", TMH.

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MCA- Group1-OEC-303 Cyber Security		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
Max Marks: 50 (35+15)		Credit-02
At the end of course, the student will be able to		
CO 1	Analyze a web page and identify its elements and attributes	K ₁ , K ₂
CO 2	Create web pages using XHTML and Cascading Style Sheets	K ₂ , K ₃
CO 3	Build dynamic web pages using JavaScript (Client side programming).	K ₄
CO 4	Create XML documents and Schemas.	K ₂
CO 5	Build interactive web applications using AJAX.	K ₁ , K ₂
DETAILED SYLLABUS		4-1-4
Unit	Topic	Proposed Lecture
I	Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.	10
II	Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics	10
III	Cybercrime: 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, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.	12
IV	Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.	12
V	Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc	10


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1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives,Wiley
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