

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(An Autonomous Institute)



Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH LUCKNOW



Evaluation Scheme & Syllabus

For

Master of Computer Applications (Integrated)

Second Year

Effective from the Session: (2026-27)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA**(An Autonomous Institute)****MCA (Integrated)****Evaluation Scheme****SEMESTER III**

S. No	Subject Codes	Subjects	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	CMICA0301	Accounting and Financial Management	Mandatory	3	1	0	30	20	50		100		150	4
2	CMICA0302	Data Structure	Mandatory	3	1	0	30	20	50		100		150	4
3	CMICA0303	Emerging Trends and Technology	Mandatory	4	0	0	30	20	50		100		150	4
4	CMICA0304	Operating System	Mandatory	3	1	0	30	20	50		100		150	4
5	CMICA0352	Data Structure Lab	Mandatory	0	0	2				50		50	100	1
7	CMICA0354	Operating System Lab	Mandatory	0	0	2				50		50	100	1
8	CMICA0355	Advance Python Programming	Mandatory	0	0	8				50		100	150	4
9	CMICA0356	Skills for Career Enhancement Lab 2	Mandatory	0	0	4				50		50	100	2
10	CMICA0359	Internship Assessment-I	Mandatory	0	0	2				50		50	100	1
		MOOCs	*MOOCs											
		TOTAL							200	250	400	300	1150	25

List of MOOCs (Infosys Springboard) Based Recommended Courses for Second Year (Semester-III) MCA (Integrated)

S. No.	Subject Code	Course Name	University/Industry Partner Name	No. of Hours
1	CMC0001	Next Gen Technologies	Infosys Wingspan (Infosys Springboard)	29h 27m
2	CMC0042	Introduction to Unix	Infosys Wingspan (Infosys Springboard)	15h 21m

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam.
CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit,
MOOCs: Massive Open Online Courses.

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY GREATER NOIDA
(An Autonomous Institute)
MCA (Integrated)
Evaluation Scheme
SEMESTER IV

S. No	Subject Codes	Subjects	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	CMICA0401	Cloud Computing	Mandatory	3	1	0	30	20	50		100		150	4
2	CMICA0402	Database Management System	Mandatory	3	1	0	30	20	50		100		150	4
3	CMICA0403	Software Engineering	Mandatory	4	0	0	30	20	50		100		150	4
4	CMICA0404	Design Thinking-II	Mandatory	3	0	0	30	20	50		100		150	3
5	CMICA0451	Cloud Computing Lab	Mandatory	0	0	2				50		50	100	1
6	CMICA0452	Database Management System Lab	Mandatory	0	0	2				50		50	100	1
7	CMICA0455	Java Programming	Mandatory	0	0	8				50		100	150	4
8	CMICA0456	Skills for Career Enhancement Lab 3	Mandatory	0	0	4				50		50	100	2
9	CMICA0459	Project Based on Software Engineering Lab	Mandatory	0	0	4				50		50	100	2
		MOOCs	*MOOCs											
		TOTAL							200	250	400	300	1150	25

List of MOOCs (Infosys Springboard) Based Recommended Courses for Second Year (Semester-IV) MCA (Integrated)

S. No.	Subject Code	Course Name	University/Industry Partner Name	No. of Hours
1	CMC0067	Software Engineering	Infosys Wingspan (Infosys Springboard)	8h 30m
2	CMC0068	AWS Certified Developer - Associate Certification	Infosys Wingspan (Infosys Springboard)	16h 55m

Abbreviation Used:

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CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit,
MOOCs: Massive Open Online Courses.

Course Code: CMICA0301			Course Name: Accounting and Financial Management				L	T	P	C
Course Offered in: MCA-INT							3	1	0	4
Pre-requisite: Basic knowledge of finance and accounting.										
Course Objectives:										
This course aims to develop cognizance about the importance of accounting in organization financial statements. Students will become acquainted with the mechanics of financial statement preparation, understanding corporate financial statements, their analysis and interpretation, the significance of IFRS in accounting discipline, and the notion of management quality analysis and wealth generation.										
Course Outcome: After completion of this course students will be able to:							Bloom’s Knowledge Level (KL)			
CO1	Understand various Basics of Accounting and Balancing of Accounts						K1			
CO2	Understand Accounting Standards for Routine Business Transactions						K2			
CO3	Prepare and Present financial statements						K3			
CO4	Understand and apply accounting techniques for Analysis						K4			
CO5	Understand flow of Cash and Working Capital Management						K3			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	3	2	1	1	-	1	2	1		
CO2	2	2	1	2	-	2	3	1		
CO3	2	3	2	2	1	2	2	1		
CO4	2	3	2	3	1	2	1	2		
CO5	2	3	3	2	1	3	1	2		
Course Contents / Syllabus										
Unit 1		Introduction to Accounting							15 hours	
Overview: Accounting Concepts, Conventions, and Principles; Meaning and Scope of Accounting: Evolution and Users of Accounting, Types of Accounting, Basic Accounting terminologies, Accounting Equation; Artificial Intelligence in Accounting.										
Unit 2		Mechanics of Accounting							12 hours	
Accounting principles and standards: Matching of Indian Accounting Standards within ternational Accounting Standards, IAS, IFRS, Ind AS Double entry system of Accounting, Golden Rules of Accounting, journalizing of transactions; Ledger posting and Trial Balance.										
Unit 3		Preparation of Financial Statements							12 hours	
Financial Statement: Financial Statements and its presentation, Preparation of Income Statement and Balances sheet as per companies Act 2013,Use of Excel in preparation of Balance sheet										
Unit 4		Financial Statement Analysis							11 hours	
Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis.										
Unit 5		Working Capital Management							10 hours	

Working Capital Management: Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.			
		Total Lecture Hours	60 hours
Textbook:			
		Authors Name	
1.Advanced Accountancy Volume-I. Vikas Publishing House. 2001.		Maheshwari, S. N., & Maheshwari, S. K.	
2.Financial Accounting. Pearson Education India. 2002.		Tulsian, P. C.	
Reference Books:			
		Authors Name	
1. Financial Management: Text, Problems and Case. Journal of Services Research, 2011		Gupta, K.. Khan, MY and Jain, PK,	
2.Artificial Intelligence (AI) in accounting & auditing: A Literature review. Open Journal of Businessand Management, 10(1), 440-465.2021.		Hasan, A. R.	
3. Financial accounting theory and analysis: text and cases. JohnWiley & Sons.2022.		Schroeder, R. G., Clark, M. W., & Cathey, J. M.	
4.Accounting for managers: Interpreting accounting information for decision making. John Wiley &Sons 2015.		Collier, P. M.	
Self-Study Content Links:			Duration (in Hrs)
MOOCs	Financial Management in Healthcare - TOC Infosys Springboard		12 Hrs
Video Lectures	https://www.youtube.com/watch?v=eEo_aacpwCw https://www.youtube.com/watch?v=WJ-UaAaumNA https://www.youtube.com/watch?v=cNwEVYkx2Kk https://www.youtube.com/watch?v=W3yttwGE-C0		15 Hrs 10 Hrs 5 Hrs 14 Hrs
Web References	https://www.investopedia.com/accounting-4689745?utm https://www.accountingtools.com/articles/accounting-principles?utm https://www.accountingcoach.com?utm https://www.investopedia.com/terms/f/financial-statements.asp?utm https://www.accountingcoach.com/cash-flow-statement/explanation?utm https://www.investopedia.com/accounting-4689745?utm		

Course Code: CMICA0302			Course Name: Data Structures			L	T	P	C
Course Offered in: MCA-INT						3	1	0	4
Pre-requisite: Knowledge of programming languages, basics of mathematics, organizing and problem-solving ability.									
Course Objectives:									
Learn the basic concepts of algorithm analysis, along with implementation of linear and non- linear data structures.									
Course Outcome: After completion of this course students will be able to:									
Course Outcome								Bloom's Knowledge Level (KL)	
CO1	Describe the need of data structure and algorithms in problem solving and Analyse Time space trade-off.							K4	
CO2	Describe the real-world applications using stack and queue							K2	
CO3	Discuss different Linked list operations							K2	
CO4	Evaluate the real-world applications using non-linear data structures.							K4	
CO5	Identify and analyse the computational efficiencies of searching and sorting algorithms in real world problems.							K5	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)									
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
CO1	3	3	2	2	1	-	-	1	
CO2	2	3	3	2	1	-	-	1	
CO3	2	3	3	3	1	-	--	1	
CO4	2	3	3	3	1	1	-	2	
CO5	3	3	3	3	1	1	-	2	
Course Contents / Syllabus									
Unit 1		Introduction to Data Structures							15 hours
Data Types : Types of Data Structures- Linear & Non-Linear Data Structures. Arrays: Derivation of Index Formulae for 1-D,2-D,3-D and D Array.									
Analysis of algorithms: Time and Space Complexity of an algorithm, Asymptotic notations (Big Oh, Big Theta and Big Omega).									
Unit 2		Stack & Queues							12 hours
Stacks: Primitive Stack operations: Push & Pop, mutual conversion of Infix, Prefix, Postfix, Evaluation of postfix expressi									
Recursion: Principles of recursion, Types of Recursions, Problem solving using iteration, Tower of Hanoi, Trade-offs between iteration and recursion.									
Queues Operations on Queue: Create, Insert, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue.									
Unit 3		Linked Lists							12 hours
Linked lists: Comparison of Array, List and Linked list Types of linked list: Singly Linked List, Doubly Linked List, Circular Linked List,Polynomial Representation and Addition of Polynomials.									
Unit 4		Trees							11 hours
Trees: Basic terminology, Binary Trees, Binary Tree Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Extended Binary Tree,									
Tree Traversal algorithms: In-order, Pre-order and Post-order. Constructing Binary Tree from given Tree Traversal, Binary Heaps, Heap Operations, Threaded Binary trees, Traversing Threaded Binary trees, AVL Tree, B-Tree.									
Unit 5		Graphs							10 hours
Graphs: Terminology used with Graph, Graph Sorting Techniques: Representations: Adjacency matrices, Adjacency List. Connected Component, Spanning Trees, Prim's and Kruskal's algorithm, Shortest Path algorithms: Dijkstra Algorithm, Floyd Warshall's Algorithm. Sorting Algorithms. Hashing: Hash Functions, Collision Resolution Techniques.									
Total Lecture Hours								60 hours	

Textbook:		Authors Name
1. Operating System Concepts Essentials 8th Edition, 2010		Abraham Silberschatz, Peter Baer Galvin and Greg Ga'gne
2. Modern Operating Systems, Pearson Education, 4th Edition, 2014		Andrew S. Tanenbaum
3. Linux for Beginners: An Introduction to the Linux Operating System and Command Line , 2014		Jason Cannon
4. A practical guide to Linux: Commands, Editors and Shell Programming Fourth Edition, 2017		Marks G. Sobell
Reference Books:		Authors Name
1. Data Structure (Mumbai University), Himalaya Publishing House.		Kiran Gurbani, Krupa Kamdar
2. Data Structures with Python: Get familiar with the common		Harsh Bhasin
3. Data Structures and Algorithms in Python”, 1 May 2023,		BPB Publication.
4. DATA STRUCTURES AND ALGORITHMS USING		Sanjay Patidar Upendra Singh Sumit Kumar Sharma
Self-Study Content Links:		Duration (in Hrs)
MOOCs	Data Structures and Algorithms - TOC Infosys Springboard	18 Hrs
Video Lectures	https://www.youtube.com/watch?v=zWg7U0OEaE&list=PLBF3763AF2E1C572F	12 Hrs
	https://www.youtube.com/watch?v=4OxBvBXon5w&list=PLBF3763AF2E1C572F&index=22	20 Hrs
	https://www.youtube.com/watch?v=cR4rxllyiCs&list=PLBF3763AF2E1C572F&index=23	5 Hrs
	https://nptel.ac.in/courses/106/106/106106127/	23 Hrs
	https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24	4 Hrs
Web References	https://www.youtube.com/watch?v=hk5rQs7TQ7E&list=PLBF3763AF2E1C572F&index=25	8 Hrs
	https://www.geeksforgeeks.org/data-structures/?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm	7 Hrs
	https://www.tutorialspoint.com/data_structures_algorithms/index.htm?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm	
	https://www.geeksforgeeks.org/data-structures/linked-list/?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm	
	https://www.geeksforgeeks.org/graph-data-structure-and-algorithms/?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm	
	https://www.geeksforgeeks.org/hashing-data-structure/?utm_source=tutorialspoint&utm_medium=seo&utm_campaign=data_structures_algorithms/index.htm	

Course Code: CMICA0303				Course Name: Emerging Trends and Technology				L	T	P	C
Course Offered in: MCA-INT								4	0	0	4
Pre-requisite: The student must understand basic computer terminology. The student must have knowledge of some programming language.											
Course Objectives:Provide an understanding of the role computation can play in solving problems. Position students so that they can compete for research projects and excel in subjects with programming components.											
Course Outcome: After completion of this course students will be able to:									Bloom’s Knowledge Level (KL)		
CO1	Demonstrate the knowledge of the basic structure, components, Features and generations of computers.								K3		
CO2	Compare and contrast features, functioning & types of operating system and computer networks.								K4		
CO3	Demonstrate architecture, functioning & services of the Internet and basics of multimedia.								K3		
CO4	Implement the working concepts of MS-Office								K3		
CO5	Illustrate the emerging trends and technologies in the field of Information Technology.								K3		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)											
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			
CO1	3	2	1	1	-	-	-	1			
CO2	3	3	2	2	1	-	1	1			
CO3	2	2	2	3	1	-	1	2			
CO4	1	2	3	3	2	1	-	2			
CO5	2	2	2	3	1	1	1	3			
Course Contents / Syllabus											
Unit 1		Introduction to Computer								15 hours	
Introduction to Computer: Definition Computer: 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 Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.											
Unit 2		Operating system								13 hours	
Operating system: Operating system Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. Windows Operating System Commands Computer Network: Overview, Standalone, Types(LAN, WAN and MAN), Data communication, topologies.											

Unit 3	Internet	10 hours
Internet: 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.		
Unit 4	MS-Office	10 hours
MS-Office: Basic Concepts, Features, Applications and handling of MS-Word, MS-PowerPoint and MS-Excel.		
Unit 5	Emerging Technologies	12 hours
Emerging Technologies: Emerging Technologies: Introduction, overview, features, limitations and application areas of Cloud Computing, Big data, Grid Computing, Artificial Intelligence and Virtual Reality.		
Total Lecture Hours		60hours
Textbook:		
		Authors Name
1.Fundamentals of Computers, Prentice-Hall of India. 2003,		Raja Raman V.
2.Introduction to Computers, McGraw Hill Education. 2017.		Norton P.
Reference Books:		
		Authors Name
1. Fundamentals of Computers, McGraw-Hill. 2020		Balagurusamy E.
2. Fundamentals of Computers, Oxford University Press. 2023.		Thareja R.
3. The Tech Whisperer-on Digital Transformation and the Technologies that Enableit” Penguin		Bindra J.
Self-Study Content Links:		Duration (in Hrs)
MOOCs	ChatGPT: Project Management Mastery With ChatGPT - TOC Infosys Springboard	1 Hrs
Video Lectures	https://www.youtube.com/watch?v=eEo_aacpwCw https://www.youtube.com/watch?v=WJ-UaAumNA https://www.youtube.com/watch?v=cNwEVYkx2Kk https://www.youtube.com/watch?v=W3yttwGE-C0 https://www.youtube.com/watch?v=yCVy5Kw0l8s	12 Hrs 15 Hrs 10 Hrs 4 Hrs 7 Hrs
Web References	https://www.tutorialspoint.com/computer_fundamentals/computer_input_devices.htm?utm https://www.geeksforgeeks.org/computer-network-tutorials/?utm https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-iiot/?utm	

Course Code: CMICA0304			Course Name: Operating Systems			L	T	P	C
Course Offered in: MCA-INT						3	1	0	4
Pre-requisite: Students are expected to be familiar with computer organization.									
Course Objectives:									
The objective of this course is to provide an understanding of the basic structure and functions of an operating system and deliver the skills needed to develop Unix/Linux shell programs.									
Course Outcome: After completion of this course students will be able to:								Bloom's Knowledge Level (KL)	
CO1	Describe operating system concepts, functions and design CPU Scheduling algorithms.							K5	
CO2	Analyse the various issues related to inter process communication like Synchronization and Deadlocks.							K4	
CO3	Describe the concepts of Memory Management and Implement disk scheduling algorithms.							K5	
CO4	Design and use Linux utilities to create and manage simple file processing operations.							K4	
CO5	Implement shell scripts to perform more complex tasks in shell programming environment.							K3	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)									
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
CO1	3	2	1	2	1	-	-	1	
CO2	2	3	2	2	1	-	1	1	
CO3	3	3	2	2	-	-	-	1	
CO4	2	2	3	3	2	1	1	2	
CO5	2	2	3	3	2	1	1	3	
Course Contents / Syllabus									
Unit 1		Fundamentals of Operating Systems						15 hours	
Fundamentals of Operating Systems: Operating System, Operatic System characteristics, Functions of Operating Systems, Types of Operating System, Layered Structure, System call, Kernel, Multiprogramming and Multitasking, Overview of Windows OS, Unix/Linux OS Process Management Process Management: Process Concepts, State Transition Diagram. Types of Schedulers: Long Term, Mid Term, Short Term Process Control Block, Inter process communication Process Management: Process Concepts, State Transition Diagram. CPU Scheduling: CPU Scheduling Criteria, Pre-emptive and Non-Pre-emptive Scheduling, Scheduling Algorithm: FCFS, SJF, SRTF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling, Context Switching.									
Unit 2		Process Synchronization						12 hours	
Process Synchronization: Critical Section problem & their solutions, Introduction to Semaphores Classical Problems of Synchronization (Producer Consumer Problem, Readers Writer Problem, Dining philosophers' problem) Dead Locks: Characterization, Deadlock concepts & Handling Techniques (Prevention and Detection & Recovery), Dead Lock Avoidance: Banker's Algorithm.									
Unit 3		Memory management						12 hours	
Memory Management: Memory Management: Background, Swapping, Contiguous and Non-Contiguous memory allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory: Background, Demand paging, Allocation of frames: First Fit, Best Fit, and Worst Fit, Page replacement algorithms (FCFS, Optimal, LRU), Balady's Anomaly, Thrashing Disk Scheduling Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK and C- LOOK File Management System: File Management: Concept and Organization, Access Methods, File System Implementation Directory Structures, Allocation Methods, Free Space Management, Secondary Storage Structure, File System Security and Protection.									
Unit 4		Linux Administration						11 hours	
Linux Administration: Linux Components, Shells, Installation of Linux Virtualization: Definition, Types, Advantages, Virtualization tools. User Administration Files & Commands: Files: Type, Ownership, Permissions and manipulations Commands: Internal and External, Directory and File commands, I/O commands, Pipes, Filters, shell commands Linux Tools: Linux Networking Commands: ipconfig, traceroute, tracepath, ping, host, hostname, iwconfig. System Admin: man, uptime, users, service, ps, kill, ps.									
Unit 5		Shell Programming vi Editor						10 hours	

Shell Programming vi Editor: shell Programming - shell script features, shell variables, writing and executing a shell script, positional parameters. Introduction to vi editor, vi editor Models, invoking vi editor, Configuring the vi environment, The process - parent and child process, process creation, process related commands, Branching control structures- if, case, Loop control structures- while, until, for, jumping control structures – break, continue, exit, Integer and Real arithmetic in shell programs.

Total Lecture Hours | **60 hours**

Textbook:

	Authors Name
1. Operating System Concepts Essentials 8th Edition, 2010	Abraham Silberschatz, Peter Baer Galvin and Greg Ga'gne
2. Modern Operating Systems , Pearson Education, 4th Edition, 2014	Andrew S. Tanenbaum
3. Linux for Beginners: An Introduction to the Linux Operating System and Command Line, 2014	Jason Cannon
4. A practical guide to Linux: Commands, Editors and Shell Programming Fourth Edition, 2017	Marks G. Sobell

Reference Books:

	Authors Name
1. Operating Systems: Internals and Design Principles 8th Edition, 2014	William Stallings ,
2. Operating System: A Design-oriented Approach, 9th Edition, 2017	Charles Patrick Crowley
3. Operating Systems: A Modern Perspective, 1997	Gary J. Nutt,
4. Design of the UNIX Operating Systems, 1st Edition, 2015	Maurice J. Bach
5. Understanding the Linux Kernel 1st Edition, 2000	Daniel Pierre Bovet, Marco

Self-Study Content Links:		Duration (in Hrs)
MOOCs	CompTIA A+ Core 2: Operating System & Network Management - TOC Infosys Springboard	1Hrs
	Introduction to Unix - TOC Infosys Springboard	15Hrs
Video Lectures	https://www.youtube.com/watch?v=783KAB-tuE4	4 Hrs
	https://www.youtube.com/watch?v=ZaGGKFCLNc0	2 Hrs
	https://nptel.ac.in/courses/106/105/106105214/	5 Hrs
Web References	https://www.os-book.com?utm https://tldp.org?utm https://nptel.ac.in/courses?utm https://www.tutorialspoint.com/operating_system?utm https://www.geeksforgeeks.org/operating-systems?utm https://help.ubuntu.com?utm https://ocw.mit.edu?	

Course Code: CMICA0352					Course Name: Data Structures Lab					L	T	P	C
Course Offered in: MCA-INT										0	0	2	1
Pre-requisite: Students should possess a basic understanding of programming fundamentals, algorithms, arrays, functions, recursion, and problem-solving techniques. Familiarity with any programming language and logical reasoning skills will help in understanding linear and non-linear data structures, searching, and sorting algorithms.													
Course Objectives:													
Learn the basic concepts of algorithm analysis, along with implementation of linear and non-linear data structures.													
Course outcome: After completion of this course students will be able to:										Bloom's Knowledge Level (KL)			
CO1	Analyse systematic approach to organizing, writing and debugging Array programs									K4			
CO2	Implement Stack and Queue									K3			
CO3	Develop operations of linked list.									K5			
CO4	Construct non-linear data structure operations.									K5			
CO5	Implement sorting and searching algorithms using relevant data structures									K3			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)													
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					
C	3	2	1	2	-	-	1	1					
CO2	2	3	2	3	1	-	1	1					
CO3	2	3	3	3	1	1	1	2					
CO4	2	2	3	3	1	1	1	2					
CO5	2	3	3	3	1	2	1	3					
List Of Practical's													
Sr No.	Name of Experiments/ Programs										CO Mapping		
1.	Construct a Code to find the maximum element in an array.										CO1		
2.	Construct a Code to calculate the sum of all elements in an array.										CO1		
3.	Construct a Code to reverse the elements of an array.										CO1		
4.	Construct a Code to check if an array is sorted in ascending order.										CO1		
5.	Construct a Code to count the occurrence of a specific element in an array.										CO1		
6.	Construct a Code creation and traversal of 2D Array in row major and column majororder.										CO1		
7.	Construct a code to print the transpose of a given matrix using function										CO1		



NIET
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नोएडा अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, ग्रेटर नोएडा

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Approved by AICTE, Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow Uttar Pradesh, (Formerly Uttar Pradesh Technical University)



8.	Program to find if a given matrix is Sparse or Not and print Sparse Matrix	CO1
9.	Construct a code to Implement Linear Search	CO1
10.	Construct a code to implement Binary Search	CO1
11.	Implementation of stack using a list	CO2
12.	Construct a python code to Infix to postfix conversion using a stack	CO2
13.	Construct a code for Balanced parentheses checker using a stack	CO2
14.	Implement Reverse a string using a stack.	CO2
15.	Implement Binary Search using Recursion.	CO2
16.	Construct a python program to print Fibonacci Series using Recursion.	CO2
17.	Queue implementation using a list	CO2
18.	Construct a code for Simulating a printer queue using a queue.	CO2
19.	Construct a code for Implementing a circular queue.	CO2
20.	Implement queue using stack	CO2
21.	Create a single linked list and perform basic operations (insertion, deletion, traversal).	CO3
22.	Create a double linked list and perform basic operations (insertion, deletion, traversal).	CO3
23.	Create a circular linked list and perform basic operations (insertion, deletion, traversal).	CO3
24.	Reverse a single linked list.	CO3
25.	Check if a linked list is palindrome.	CO3
26.	Reverse a double linked list.	CO3
27.	Find the middle element of a single linked list.	CO3
28.	Find the middle element of a double linked list.	CO3
29.	Merge two sorted single linked lists.	CO3



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नोएडा अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, ग्रेटर नोएडा

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30.	Detect and remove a loop in a circular linked list.	C03
31.	Construct a code to Insert, Delete and search and update a data in Binary Search Tree(BST)	C04
32.	Construct a code for Tree Traversal (Preorder, Inorder, Postorder)	C04
33.	Construct a code Count the number of Leaves in a Binary Tree	C04
34.	Construct a code to find the Height of a Binary Tree	C04
35.	Construct a code to print all Paths from the Root to Leaf Nodes in a Binary Tree	C04
36.	Construct a code to convert a Binary Tree to its Mirror Tree	C04
37.	Construct a code to find the Node with Minimum Value in a Binary Search Tree.	C04
38.	Construct a code for Binary Search Tree (BST) Implementation	C04
39.	A program to check if a Binary Tree is a Binary Search Tree (BST)	C04
40.	Construct a code to check if a Binary Tree is a Balanced Binary Tree	C04
41.	Construct a code to represent graph using adjacency matrix and adjacency list.	C05
42.	Implement BFS and DFS algorithm.	C05
43.	Implement the minimum cost spanning tree.	C05
44.	Implement bubble sort in a non-recursive way.	C05
45.	Implement selection sort in a non-recursive way.	C05
46.	Implement insertion sort in a non-recursive way.	C05
47.	Implement Merge sort in a non-recursive way.	C05
48.	Implement Merge sort in a recursive way.	C05
49.	Array-based Student Performance Analysis System	C05
50.	Design a project based on stack data structure to create a web history checker.	C05
51.	Design a dynamic Music Playlist using Linked List	C05
52.	Design Decision Tree Classifier for Disease Diagnosis using tree data structure.	C05
53.	Design Road Network Navigation: Implementing a navigation system to find the shortest path between locations using road networks.	C05
		Total Hours: 15 hrs.



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LAB Course Code: CMICA0354	LAB Course Name: Operating Systems Lab	L	T	P	C
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Course Offered in: MCA-INT	0	0	2	1
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Pre-requisite: Students should have a basic understanding of computer fundamentals, programming concepts, Python syntax, data structures, file handling, and object-oriented programming concepts. Familiarity with internet technologies and logical problem-solving skills will be beneficial for learning data analysis, visualization, GUI development, and web scraping using Python.

Course Objective: This course gives an ability to students to construct codes for OS API and basics of OS mechanisms and Hands-on and practical experience with usage of the Linux OS and basics of Shell Programming.

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level (KL)
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CO1	Implement Linux commands to understand the concept of virtualization	K3
CO2	Solve the real-world problems using shell programming and shell scripting.	K3
CO3	Analyze process management and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.	K5
CO4	Implement Process Synchronization and analyze deadlock handling techniques.	K3
CO5	Simulate the continuous and non-continuous memory allocation concepts and analyze disk scheduling algorithms.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
	2	2	2	3	1	-	1	2
CO2	2	3	3	3	1	1	1	2
CO3	3	3	2	3	1	1	-	2
CO4	3	3	3	2	1	-	1	2
CO5	3	3	3	2	1	1	-	2

List Of Practical's

Sr No.	Name of Experiments/ Programs	CO Mapping
1	File Manipulation Commands: cat command, cp command, ls command, rm command, mv command, mkdir command, rmdir command, find command, grep command, wc command, sort command, more command, head command and tail command.	CO1
2	Status Alter Commands: chgrp command, chown command & chmod command.	CO1
3	Compile Commands: cc command	CO1
4	Process Commands: ps command, kill command.	CO1
5	Miscellaneous Commands: Echo command, cal command, date command, whoami command, expr command & test command.	CO1

6	Filter Commands: cut command, paste command, head command & tr command.	CO1
7	Write a program to create a child process and print the process ids of parent and child process.	CO2
8	Write a Shell program to check the given number is even or odd.	CO2
9	Write a Shell program to find the factorial of a number.	CO2
10	Write a Shell program to swap the two integers.	CO2
11	Write a shell script to calculate the gross salary if basic salary is given. DA is 40% of basic salary and HRA is 60% of basic salary.	CO2
12	Write a shell script to reverse the digits of a number.	CO2
13	Write a shell script to compute the sum of digits.	CO2
14	Write a shell script to convert the contents of files to uppercase, given multiple files on command line.	CO2
15	Write a shell script to print the just the time, just the day of month and just the day of week as desired by user.	CO2
16	Write a shell script to print a word n times. Taking the n and the word from command line.	CO2
17	Write a shell script to print the area and perimeter of a rectangle and area and circumference of a circle. The length, breadth and radius are inputted through keyboard.	CO2
18	Write a shell script to delete all lines containing the word “unix” from all files provided as command line arguments.	CO2
19	Write a shell script to search a number in the given list of numbers. Number is provided as first argument in command line arguments, the list of numbers follows after that.	CO2
20	Write a shell script to sort the numbers provided as command line arguments in a descending order.	CO2
21	Write a shell script to count the number of negative and positive numbers provided as command line arguments.	CO2
22	Write a shell Script to Concatenate two Strings.	CO2
23	Write a shell script to print Fibonacci series.	CO2
24	Write a shell script to find whether a year is leap year or not.	CO2
25	Write a shell script to find whether a number is prime or not.	CO2
26	Write a program Using First-Come, First-Served (FCFS) Scheduling to find average turnaround time and average	CO3

	waiting7time.	
27	Write a program Using SJF CPU scheduling algorithm to find average turnaround time and average waiting time.	CO3
28	Write a program Using Priority CPU scheduling algorithm to find average turnaround time and average waiting time.	CO3
29	Write a program Using Round Robin scheduling to calculate average turnaround time and average waiting time.	CO3
30	Write a Program to execute Race Condition of Process Synchronization.	CO4
31	Write a program to implement Producer Consumer Problem.	CO4
32	Write a Program to Implement Dinning Philosophers Problem.	CO4
33	Write a Program to Implement Banker's Algorithm .	CO4
34	Write a Program to Implement FIRST FIT Memory Allocation.	CO5
35	Write a Program to Implement BEST FIT Memory Allocation.	CO5
36	Write a Program to Implement WORST FIT Memory Allocation.	CO5
37	Write a Program to Implement FIFO Page Replacement Algorithm.	CO5
38	Write a Program to Implement LRU Page Replacement Algorithm.	CO5
39	Write a Program to Implement Optimal Page Replacement Algorithm.	CO5
40	Write a Program to Implement FCFS Disk Scheduling Algorithm.	CO5
41	Write a program to Implement SSTF Disk Scheduling Algorithm.	CO5
42	Write a Program to Implement SCAN Disk Scheduling Algorithm.	CO5
43	Write a Program to Implement CSCAN Disk Scheduling Algorithm.	CO5
44	Write a Program to Implement LOOK Disk Scheduling Algorithm.	CO5
45	Write a Program to Implement CLOOK Disk Scheduling Algorithm.	CO5
		Total Hours: 15 hrs



Course Code: CMICA0355			Course Name: Advance Python programming			L	T	P	C
Course Offered in: MCA-INT						0	0	8	4
Pre-requisite: Basic knowledge of Python programming.									
Course Objectives:									
To become familiar with Python's Object-Oriented Concepts, functional programming and create GUI application and to gain the knowledge of Python libraries.									
Course Outcome: After completion of this course students will be able to:								Bloom's Knowledge Level (KL)	
CO1	Describe OOPs concepts in Python.							K2	
CO2	Explain functional and GUI programming.							K5	
CO3	Discuss Python libraries for data handling.							K2	
CO4	Analyze data using visualization libraries.							K4	
CO5	Examine web scraping application for real world data.							K4	
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)									
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
CO1	3	2	2	2	1	-	-	1	
CO2	2	2	3	3	1	-	-	2	
CO3	2	2	2	3	1	-	-	2	
CO4	2	3	3	3	1	1	-	2	
CO5	2	3	3	3	2	1	2	3	
Course Contents / Syllabus									
Unit 1		Classes and Objects							15 hours
Classes and Objects: Introduction of Python Classes and objects, User-Defined Classes, Class Variables and Instance Variables, Instance methods, Class method, static methods, constructor in python, parametrized constructor, Magic Methods in python, Object as an argument, Instances as Return Values, namespaces, Introduction to inheritance and polymorphism, Abstract Class, Introduction to Abstraction and Encapsulation.									
Unit 2		Functional and GUI Programming							15 hours
Functional and GUI Programming: Introduction to GUI Programming, Settling widgets in the window's interior, Numeric Widgets, Boolean Widgets, Selection Widgets, String Widgets, Date Picker, Color Picker, Container Widgets, Creating a GUI Application, Tkinter, button, canvas. GUI Programming: Basic Operation, Indexing, slicing and Iterating, Multidimensional arrays, NumPy Data types, Reading and writing data on Files.									
Unit 3		Libraries for Data Handling							14 hours
NumPy: Basic Operation, Indexing, slicing and Iterating, Multidimensional arrays, NumPy Data types, Reading and writing data on Files. Pandas: Series and Data Frames, Grouping, aggregation, Merge Data Frames, Generate summary tables, Group data into logical pieces, Manipulation of data.									
Unit 4		Libraries in Data Visualization							14 hours
Matplotlib: Scatter plot, Bar charts, histogram, Stack charts, Legend title Style, Figures and subplots, plotting function in pandas, Labelling and arranging figures, Save plots. Seaborn: style function, color palettes, heatmaps, distribution plots, category plot, regression plot.									

Plotly: Lineplots, Areaplots, Scatterplots, Bubbleplots , Stacked bar charts, Grouped bar charts, Pie charts, Tables, Dashboards.

Unit 5	Web Scraping with Python	14 hours
Web Scraping: Introduction, Web Crawling v/s Web Scraping, Uses of Web Scraping, Components of a Web Scraper, working of a Web Scraper, Crawl, Parse and Transform Store the Data Beautiful Soup: Navigable Strings, Navigating and searching with Beautiful Soup, Web Scraping. Example: Scraping Flipkart Website, Introduction to Github.		
Total Lecture Hours		72 hours
Textbook:		
	Authors Name	
1.Fundamentals of Computers , Prentice-Hall of India.2003	Raja Raman V	
2. Introduction to Computers, McGraw Hill Education.2017	Norton P.	
3.Computer Fundamentals, Pearson.2010	Goel A	
Reference Books:		
	Authors Name	
1. Fundamentals of Computers, McGraw-Hill 2020	Balagurusamy E	
2. Fundamentals of Computers, Oxford University Press2023	Thareja R.	
Self-Study Content Links:		Duration (in Hrs.)
MOOCs	Python Fundamentals - TOC Infosys Springboard	10Hrs
Video Lectures:	https://www.youtube.com/watch?v=eEo_aacpwCw https://www.youtube.com/watch?v=WJ-UaAaumNA https://www.youtube.com/watch?v=cNwEVYkx2Kk https://www.youtube.com/watch?v=W3yttwGE-C0 https://www.youtube.com/watch?v=yCVy5Kw0l8s	10Hrs 3Hrs 8Hrs 7Hrs 8Hrs
Web References	https://www.geeksforgeeks.org/inheritance-in-python/?utm https://www.geeksforgeeks.org/python-gui-tkinter/?utm https://pandas.pydata.org/docs/user_guide/visualization.html?utm	

LAB Course Code: CMICA0355		LAB Course Name: Advance Python Programming		L	T	P	C
Course Offered in: MCA-INT				0	0	8	4
Pre-requisite: : Basic knowledge of Python programming.							
Course Objective: Develop proficiency in Python programming for effective problem-solving. Cover algorithms, data structures, debugging, and application across domains, emphasizing efficiency, documentation, and ethical considerations.							
Course outcome: After completion of this course students will be able to:				Bloom’s Knowledge Level (KL)			
CO1	Implement OOPs concepts in Python.			K3			
CO2	Create functional and GUI programming.			K5			
CO3	Demonstrate the use of Python libraries for data handling.			K3			
CO4	Construct visualization libraries concepts in python.			K5			
CO5	Apply web scraping application for data extraction.			K3			
List Of Practical’s							
Sr No	Name of Experiments/ Programs			CO Mapping			
1	Write a program illustrating class definition and accessing class members.			CO1			
2	Write a program to implement default constructor, parameterized constructor, and destructor.			CO1			
3	Create a Python class named Rectangle constructed by a length and width. a. Create a method called area which will compute the area of a rectangle.			CO1			
4	Create a class called Numbers, which has a single class attribute calledMULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers). a. Write an instance method called add which returns the sum of the attributes x and y. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER.			CO1			

5	Create a class named as Student to store the name and marks in three subjects. Use List to store the marks. a. Write an instance method called compute to compute total marks and average marks of a student. Write a method called display to display student information.	CO1
6	Create a Python class named Circle constructed by a radius. Use a class variable to define the value of constant PI. a. Write two methods to be named as area and circum to compute the area and the perimeter of a circle respectively by using class variable PI. Write a method called display to print area and perimeter.	CO1
7	Write a program that has a class called Fraction with attributes numerator and denominator. a. Write a method called get data to enter the values of the attributes. Write a method show to print the fraction in simplified form.	CO1
8	Write a program that has a class Numbers with a list as an instance variable. Write a method called insert a element that takes values from user. Write a class method called find_max to find and print largest value in the list.	CO1
9	Create a class called Complex. Write a menu driven program to read, display, add and subtract two complex numbers by creating corresponding instance methods.	CO1
10	Write a program that has a class Point with attributes x and y. Write a method called midpoint that returns a midpoint of a line joining two points. b. Write a method called length that returns the length of a line joining two points.	CO1
11	Create a class called Complex. Write a menu driven program to read, display, add and subtract two complex numbers by creating corresponding instance methods.	CO1
12	Write a Python program to create a class called "Rectangle" with attributes length and width. Include methods to calculate the perimeter and area of the rectangle.	CO1
13	Implement a Python class called "Bank Account" with attributes account number, account holder name, and balance. Include methods to deposit and withdraw money from the account.	CO1
14	Write a Python program to create a class called "Student" with attributes roll number, name, and marks in three subjects. Include a method to calculate the average marks of the student.	CO1
15	Implement a Python class called "Car" with attributes make, model, and year. Include methods to start the car, stop the car, and display its details.	CO1
16	Write a Python program to create a class called "Book" with attributes title, author, and price. Include methods to calculate the discounted price of the book based on a discount percentage provided.	CO1
17	Implement a Python class called "Bank" with attributes bank name and branch. Include methods to add a new account, display all accounts, and search for an account based on the account number.	CO1

18	Write a Python program to create a class called "Rectangle" with attributes length and width. Include a method to check if the rectangle is a square or not.	CO1
19	Implement a Python class called "Employee" with attributes name, designation, and experience. Include methods to promote an employee to a higher designation based on their experience.	CO1
20	Write a Python program to create a class called "Employee" with attributes name, employee ID, and salary. Include a method to display the employee details.	CO1
21	Write a program to illustrate the use of following built-in methods: a. hasattr(obj,attr) b. getattr(object, attribute_name [, default]) c. setattr(object, name, value) d. delattr(class_name, name)	CO1
22	Write a Program to illustrate the use of __str__(), __repr__(), __new__, __doc__, __dict__, __name__ and __bases__ methods.	CO1
23	Write a program to create class Employee. Display the personal information and salary details of 5 employees using single inheritance.	CO1
24	WAP that extends the class Employee. Derive two classes Manager and Team Leader from Employee class. Display all the details of the employee working under a particular Manager and Team Leader.	CO1
25	Write a program that has a class Point. Define another class Location which has two objects (Location and destination) of class Point. Also, define a function in Location that prints the reflection on the y-axis.	CO1
26	Write a program that create a class Distance with member's km and metres. Derive classes School and office which store the distance from your house to school and office along with other details.	CO1
27	Write a program to create an abstract class Vehicle. Derive three classes Car, Motorcycle and Truck from it. Define appropriate methods and print the details of vehicle.	CO1
28	Write a program to demonstrate hybrid inheritance and show MRO for each class.	CO1
29	Write a program to overload + operator to multiply to fraction object of fraction class which contain two instance variable numerator and denominator. Also, define the instance method simplify () to simplify the fraction objects.	CO1
30	Write a program to compare two-person object based on their age by overloading > operator.	CO1
31	Write a program to overload in operator.	CO1
32	WAP to create a Complex class having real and imaginary as its attributes. Overload the +, -, /, * and += operators for objects of Complex class	CO1
33	WAP to Show the concept of inner function.	CO2
34	WAP to create a decorator which will convert a string into upper case string.	CO2
35	WAP to show the concept of nested decorator.	CO2
36	WAP to decorate a function with arguments.	CO2

37	WAP to decorate instance method	CO2
38	WAP to calculate sum of 1,2,3,4,5 using reduce function.	CO2
39	WAP to generate numbers from 1 to 10 using generator.	CO2
40	WAP to decide number is even or odd using generator.	CO2
41	WAP to generate square of 1,2,3,4,5,6,7,8,9,10 using generator.	CO2
42	WAP to generate square of even number up to 10 using generator and save in list.	CO2
43	WAP to make a co-routine which will print all name with prefix Dear.	CO2
44	WAP to close a co-routine.	CO2
45	WAP to iterate tuple using iter() and next() method.	CO2
46	WAP to iterate a string using iter and next method.	CO2
47	WAP to print numbers from 1 to 20 using iterator and generate Stop Iteration exception once we reach limit.	CO2
48	Hello World: Display a simple "Hello, World!" message box.	CO2
49	Button: Create a button that displays a message when clicked.	CO2
50	Entry: Create a text entry field and display the entered text.	CO2
51	Check button: Create a checkbox and display the selected options	CO2
52	Radio button: Create radio buttons and display the selected option.	CO2
53	List box: Create a list box and display the selected items.	CO2
54	Text: Create a text area and display the entered text.	CO2
55	Menu: Create a menu with different options.	CO2
56	Message: Display a message in a dialog box.	CO2
57	Progress bar: Create a progress bar that updates over time python	CO2
58	Scale: Create a scale widget and display the selected value.	CO2

59	Spin box: Create a spin box and display the selected value.	CO2
60	Canvas: Create a canvas and draw shapes on it.	CO2
61	Label Frame: Create a labeled frame with widgets inside.	CO2
62	Scrollbar: Add a scrollbar to a widget like a text area or list box	CO2
63	Frame: Create a frame and place widgets inside it.	CO2
64	Tree view: Create a tree view widget to display hierarchical data	CO2
65	Notebook: Create a notebook widget with tabs.	CO2
66	File Dialog: Open a file dialog to select a file.	CO2
67	Color Dialog: Open a color dialog to select a color.	CO2
68	Button Counter: Create a button that increments a counter when clicked.	CO2
69	Checkbox List: Display a list of checkboxes and show selected options.	CO2
70	Dropdown Menu: Create a dropdown menu with multiple options.	CO2
71	Slider Value Display: Display the current value of a slider widget.	CO2
72	Text Input and Button: Take user input in a text box and display it when a button is clicked.	CO2
73	Radio Buttons: Present a set of options as radio buttons and display the selected option.	CO2
74	Progress Bar: Show the progress of a task using a progress bar widget.	CO2
75	Password Input: Create a password input field that hides the entered characters.	CO2
76	File Uploader: Enable users to upload files and display the selected file name.	CO2
77	Creating Arrays: Create NumPy arrays using various methods like np.array(), np.zeros(), np.ones(), np.arange(), etc.	CO3
78	Array Shape and Size: Get the shape and size of a NumPy array using the shape and size attributes. NumPy	CO3
79	Array Indexing: Access and modify individual elements of a NumPy array using indexing	CO3
80	Array Slicing: Extract a subset of elements from a NumPy array using slicing.	CO3

81	Array Reshaping: Change the shape of a NumPy array using the reshape() function.	CO3
82	Array Arithmetic: Perform basic arithmetic operations (addition, subtraction, multiplication, division) on NumPy arrays.	CO3
83	Array Broadcasting: Perform element-wise operations on arrays with different shapes using broadcasting rules.	CO3
84	Array Aggregation: Calculate aggregate values on arrays, such as sum(), min(), max(), mean(), etc. using NumPy	CO3
85	Array Transposition: Transpose a NumPy array using the transpose() function.	CO3
86	Write a program that demonstrates advanced array indexing techniques, such as indexing with boolean arrays or using fancy indexing to select specific elements or subsets of an array.	CO3
87	Write a program using NumPy to perform data manipulation tasks, such as sorting arrays, removing duplicates, or finding unique elements in an array.	CO3
88	Array Sorting: Sort the elements of a NumPy array using the sort() function.	CO3
89	Array Filtering: Filter elements in a NumPy array based on a condition using Boolean indexing.	CO3
90	Array Statistics: Calculate statistical measures like mean, median, standard deviation using functions like np.mean(), np.median(), np.std().	CO3
91	Array Randomization: Generate random numbers or arrays using functions from the np.random module.	CO3
92	Array Dot Product: Compute the dot product of two NumPy arrays using the dot() function.	CO3
93	Array Matrix Operations: Perform matrix operations like matrix multiplication, matrix inverse using functions from the np.linalg module.	CO3
94	Array File I/O: Save and load NumPy arrays from files using functions like np.save() and np.load().	CO3
95	Array Masking: Create a mask array to select or manipulate specific elements of a NumPy array based on a condition.	CO3
96	Array Broadcasting: Understand and utilize broadcasting rules in NumPy for efficient computations.	CO3
97	Write a program to find the cube root of values using scipy library.	CO3
98	Read and Load a CSV File into a Pandas DataFrame using pandas.read_csv.	CO3
99	Access and Display the First N Rows of a DataFrame using DataFrame.head(N).	CO3
100	Access and Display the Last N Rows of a DataFrame using DataFrame.tail(N).	CO3
101	Retrieve Basic Information about a DataFrame using DataFrame.info.	CO3

102	Perform Descriptive Statistics on a DataFrame using DataFrame.describe.	CO3
103	Filter Rows of a DataFrame based on a Condition using Boolean Indexing.	CO3
104	Rename Columns in a DataFrame using DataFrame.rename.	CO3
105	Group Data in a Data Frame using DataFrame.groupby.	CO3
106	Perform Aggregation on Grouped Data using GroupBy.agg.	CO3
107	Sort a Data Frame by One or Multiple Columns using Data Frame.sort_values.	CO3
108	Perform Basic Arithmetic Operations on Columns of a DataFrame.	CO3
109	Apply a Function to Each Element or Column of a DataFrame using DataFrame.apply or DataFrame.applymap.	CO3
110	Reshape Data using Pivot Tables using Data Frame.pivot_table.	CO3
111	Perform Data Visualization using pandas.plotting or matplotlib.pyplot.	CO3
112	Create a Simple Line Plot using matplotlib.pyplot.plot.	CO4
113	Create a Scatter Plot using matplotlib.pyplot.scatter.	CO4
114	Create a Bar Chart using matplotlib.pyplot.bar.	CO4
115	Create a Histogram using matplotlib.pyplot.hist.	CO4
116	Create a Pie Chart using matplotlib.pyplot.pie.	CO4
117	Create a Box Plot using matplotlib.pyplot.boxplot.	CO4
118	Create a Heatmap using matplotlib.pyplot.imshow.	CO4
119	Customize Plot Labels and Titles using matplotlib.pyplot.xlabel, matplotlib.pyplot.ylabel, and matplotlib.pyplot.title.	CO4
120	Customize Plot Colors, Line Styles, and Marker Styles using matplotlib.pyplot.plot parameters.	CO4
121	Add Gridlines to a Plot using matplotlib.pyplot.grid.	CO4
122	Add Legends to a Plot using matplotlib.pyplot.legend.	CO4
123	Create Subplots using matplotlib.pyplot.subplots.	CO4

124	Save a Plot as an Image File using matplotlib.pyplot.savefig.	CO4
125	Create 3D Plots using mpl_toolkits.mplot3d module.	CO4
126	Create Error Bars on a Plot using matplotlib.pyplot.errorbar.	CO4
127	Customize Axis Ticks and Tick Labels using matplotlib.pyplot.xticks and matplotlib.pyplot.yticks.	CO4
128	Create a Bar Plot with Stacked Bars using matplotlib.pyplot.bar and the bottom parameter.	CO4
129	Create a Scatter Plot using seaborn.scatterplot.	CO4
130	Create a Line Plot using seaborn.lineplot.	CO4
131	Create a Bar Plot using seaborn.barplot.	CO4
132	Create a Histogram using seaborn.histplot.	CO4
133	Create a Box Plot using seaborn.boxplot.yh9.**	CO4
134	Create a Violin Plot using seaborn.violinplot.	CO4
135	Create a Heatmap using seaborn.heatmap.	CO4
136	Create a Pair Plot using seaborn.pairplot.	CO4
137	Create a Joint Distribution Plot using seaborn.jointplot.	CO4
138	Create a KDE (Kernel Density Estimate) Plot using seaborn.kdeplot.	CO4
139	Create a Categorical Scatter Plot using seaborn.stripplot.	CO4
140	Create a Categorical Bar Plot using seaborn.countplot.	CO4
141	Create a Facet Grid using seaborn.FacetGrid.	CO4
142	Customize Plot Colors and Styles using seaborn.set_palette and seaborn.set_style.	CO4
143	Add Error Bars to a Plot using seaborn.barplot or seaborn.pointplot with the ci parameter.	CO4
144	Create a Clustered Heatmap using seaborn.clustermap.	CO4
145	Create a Regression Plot using seaborn.regplot.	CO4

146	Create a Pairwise Relationship Plot using seaborn.pairplot or seaborn.scatterplot with multiple variables.	CO4
147	Create a Boxen Plot using seaborn.boxenplot.	CO4
148	Create a Stacked Bar Plot using seaborn.barplot with the hue parameter.	CO4
149	Write a program to draw a line chart using Plotly	CO4
150	Write a program to draw a Bar chart using Plotly	CO4
151	Write a program to draw a Histogram chart using Plotly	CO4
152	Write a program to draw a scatter plot using Plotly	CO4
153	Write a program to draw a Bubble chart using Plotly	CO4
154	Write a program to draw a pie chart using Plotly	CO4
155	Write a program to draw a Boxplot using Plotly	CO4
156	Write a program to draw a Violin Plots using Plotly	CO4
157	Write a program to draw a Gant chart using Plotly	CO4
158	Write a Python program to find the title tags from a given html document.	CO5
159	Write a Python program to retrieve all the paragraph tags from a given html document.	CO5
160	Write a Python program to get the number of paragraph tags of a given html document.	CO5
161	Write a Python program to extract the text in the first paragraph tag of a given html document.	CO5
162	Write a Python program to find the length of the text of the first <h2> tag of a given html document.	CO5
163	Write a Python program to find the text of the first <a> tag of a given html text.	CO5
164	Write a Python program to find the href of the first <a> tag of a given html document.	CO5
165	Write a Python program to a list of all the h1, h2, h3 tags from the webpage python.org.	CO5
166	Write a Python program to extract all the text from a given web page.	CO5
167	Write a Python program to print the names of all HTML tags of a given web page going through the document tree.	CO5



NIET
Greater Noida
Autonomous Institute

Noida Institute of Engineering & Technology, Greater Noida

नोएडा अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, ग्रेटर नोएडा

(An Autonomous Institute)

Approved by AICTE, Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow Uttar Pradesh, (Formerly Uttar Pradesh Technical University)



168	Write a Python program to retrieve children of the html tag from a given web page.	CO5
169	Write a Python program to retrieve all descendants of the body tag from given web page.	CO5
170	Write a Python program to print content of elements that contain a specified string of a given web page.	CO5
171	Write a Python program to print the element(s) that has a specified id of a given web page.	CO5
172	Write a Python program to create a BeautifulSoup parse tree into a nicely matted Unicode string, with a separate line for each HTML/XML tag and string.	CO5
173	Write a Python program to find the first tag with a given attribute value in an html document.	CO5
174	Write a Python program to find tag(s) beneath other tag(s) in a given html document.	CO5
175	Write a Python program to find tag(s) directly beneath other tag(s) in a given html document.	CO5
176	Write a Python program to find the siblings of tags in a given html document.	CO5
177	Write a Python program to find tags by CSS class in a given html document.	CO5
178	Write a Python program to change the tag's contents and replace with the new string.	CO5
179	Write a Python program to add to a tag's contents in a given html documents.	CO5
180	Write a Python program to insert a new text within a url in a specified position	CO5
181	Write a Python program to insert tags or strings immediately before specified tags or strings.	CO5
182	Write a Python program to insert tags or strings immediately after specified tags or strings.	CO5
183	Write a Python program to remove the contents of a tag in a given html document.	CO5
184	Write a Python program to extract a tag or string from a given tree of html document.	CO5
185	Write a Python program to remove a tag from a given tree of html document and destroy it and its contents.	CO5
186	Write a Python program to remove a tag or string from a given tree of html document and replace it with the given tag or string.	CO5
187	Write a Python program to wrap an element in the specified tag and create the new wrapper.	CO5
188	Write a Python program to replace a given tag with whatever's inside a given tag.	CO5

LAB Course Code:			Course Name: Skills for Career Enhancement 2				L	T	P	C
Course Offered in: MCA Integrated, III Semester							0	0	4	2
Pre-requisite: The student should have completed the SCE1 course in semester II										
Course Objectives:										
1. Develop strong language skills for effective communication in professional settings. 2. Learn to adapt communication styles for diverse workplace scenarios and audiences. 3. Develop crucial skills like teamwork, leadership, and problem-solving to boost career prospects.										
Course Outcome: After completion of the course, the student will be able to								Bloom's Knowledge Level (KL)		
CO1	Identify the key elements of successful job interviews and explain the principles of building professional relationships.						K2			
CO2	Interpret complex conversations and summarize formal texts accurately.						K2			
CO3	Apply communication strategies to effectively manage cultural differences in diverse environments.						K3			
CO4	Evaluate professional interactions to select the most appropriate verbal and non-verbal communication methods.						K5			
CO5	Compose audience-sensitive professional documents with clarity and precision						K6			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	–	–	–	–	3	–	1	2		
CO2	1	1	1	1	3	1	1	2		
CO3	–	1	1	1	3	–	1	2		
CO4	1	2	1	1	3	1	1	2		
CO5	–	1	1	1	3	1	1	2		
List of Practical										
Practical 1		Introduction								
To the course · Exam Pattern · Anubhav Activity on score improvement										
Practical 2		Listening to Conversations								
The students will develop their listening ability to comprehend English conversations, understanding and responding to it effectively.										
Practical 3		Vocabulary Building								
The students will enhance their vocabulary through various exercises and word-games.										
Practical 4		Role Play: Everyday Scenarios								
The students will practice conversations, greetings, and introductions.										
Practical 5		Recognizing and Pronouncing words accurately								
To recognize and pronounce words with similar sounds accurately and understand their meanings in different contexts. Improve their overall pronunciation and comprehension.										
Practical 6		Summarizing Texts								
The students will develop the ability to summarize texts.										
Practical 7		Group Discussions								
The students will improve their ability to participate in group discussions.										
Practical 8		Basic Presentation Skills								
The students will learn to design and deliver simple presentations.										
Practical 9		Reading Comprehension								
The students will improve their comprehension of the written texts.										
Practical 10		Verbal Ability								
Sentence Completion - the students will practice completing sentences.										
Practical 11		Paragraph jumbled sentences								

Rearranging sentences to form a coherent paragraph.		
Practical 12	Professional Email Writing	
The students will practice writing professional emails within a time.		
Practical 13	Describing Pictures	
The students will respond to picture prompts.		
Practical 14	Story Writing and Narrating	
The students will practice writing short stories from their own experience and narrate it.		
Practical 15	Cross-Cultural Communication	
Understand challenges and opportunities of communicating across cultures.		
Practical 16	Nonverbal Communication	
Demonstrate the importance of nonverbal cues in various situational communication.		
Practical 17	Interview Preparation: FAQs	
Demonstrate the importance of nonverbal cues in various situational communication.		
Practical 18	Gender Stereotypes and Communication	
Demonstrate the importance of nonverbal cues in various situational communication.		
Practical 19	Networking and Building Relationships	
Develop skills to build professional relationships and network effectively.		
Practical 20	Miscommunication Reflection	
Students reflect on instances of miscommunication. They learn to avoid miscommunication.		
Practical 21	Intercultural Sensitivity and Awareness	
Develop understanding of cultural differences and nuances		
Practical 22	Empathetic Listening Scenarios	
Students will pair up in role play scenarios requiring empathetic responses. They will practice not only active listening but emotional intelligence in responses.		
Practical 23	Peer Feedback	
The students will learn to provide and receive constructive feedback.		
Practical 24	Self-Reflection	
The students will reflect on their learning experiences.		
Total Lecture Hours		48 hours

Course Code: CMICA0401				Course Name: Cloud Computing		L	T	P	C
Course Offered in: MCA-INT						3	1	0	4
Pre-requisite: Adequate knowledge of Basics of Computer and computer network.									
Course Objectives: To provide comprehensive knowledge of Cloud Computing concepts, technologies, and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.									
Course Outcome: After completion of the course, the student will be able to							Bloom's Knowledge Level (KL)		
CO1	Define the fundamentals of cloud computing and computing techniques.					K1			
CO2	Describe the concepts of virtualization and its role in cloud service delivery.					K2			
CO3	Discuss various services and architecture of cloud					K2			
CO4	Analyze the management of various cloud resources like instances, storage and network.					K4			
CO5	Analyze the importance of cloud security solutions with monitoring and auditing.					K4			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)									
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	
CO1	3	2	1	2	1	1	1	2	
CO2	3	2	2	3	1	1	1	2	
CO3	2	2	3	3	1	2	1	2	
CO4	2	3	3	3	2	2	1	2	
CO5	2	3	2	3	1	2	3	2	
Course Contents / Syllabus									
Unit 1			Cloud computing and its infrastructure					15 hours	
Introduction :Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Scalability & Elasticity in Cloud, On-demand Provisioning, Multitenancy, Cloud economics.									
Unit 2			Cloud virtualization basics					12 hours	
Basics and need of Virtualization: Basics and need of Virtualization, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory- I/O Devices, VMM and its types, Virtual Machines, Virtualization tools, Virtualization Support and Disaster Recovery, Resource Provisioning and Resource Provisioning Methods.									
Unit 3			Service models and reference architecture					12 hours	
Service Oriented Architecture: Service Oriented Architecture, Systems of Systems, Web Services, REST, Publish Subscribe Model, Deployment Model- Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Layered Cloud Architecture Design, Challenges and NIST Cloud Computing Reference Architecture, Benefits of CCRA, Architecture Overview- The conceptual Reference Model, Cloud Consumer, Cloud provider, Cloud Auditor, Cloud carrier, Scope of control between Provider and Consumer, IBM's Cloud Computing Reference Architecture (CCRA 2.0).									
Unit 4			Resource management					11 hours	
Resource Management: Managed and Unmanaged resources in cloud, Instance Management, EC2, Azure Virtual Machine, Google Compute Engine. Storage Services: Block Storage, Elastic File Storage, Object Storage, S3, RDS, Dynamo DB, Backup, disaster recovery and storage migration. Network Services: VPC, Subnets, Routing, Security Groups, DNS, Direct Connect, VPC Endpoints.									
Unit 5			Cloud security, monitoring and auditing					10 hours	
Cloud Security, Monitoring and Auditing: Challenges and Objectives; Cloud data life cycle; Common Attacks in Cloud; Security Standard: Confidentiality, Integrity, and Availability (CIA), Authentication and Authorization, Access controls: Role based access controls, multifactor authentication, Security policy management, IAM; Security Governance and Open Security Architecture; Monitoring and Auditing.									
Total Lecture Hours							60 hours		
Textbook:									
					Authors Name				

1.Cloud Computing: Implementation, Management And Security, CRC Press, 2017.	Ritting house, John W., And James F. Ransome.
2.Distributed And Cloud Computing, From Parallel Processing To The Internet Of Things”, Morgan Kaufmann Publishers, 2013.	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra
3.Mastering Cloud Computing, Tata Mcgraw Hill, 2013	. Raj kumar Buyya, Christian Vecchiola, S Thamaraiselvi
Reference Books:	
	Authors Name
1.Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.	Toby Velte, Anthony Velte, Robert Elsenpeter
2.Cloud Application Architectures: Building Applications and Infrastructure In The Cloud: Transactional Systems For EC2 And Beyond (Theory In Practice), O'Reilly, 2009.	George Reese
Self-Study Content Links:	
MOOCs	Introduction to Cloud Computing - TOC Infosys Springboard 5 Hrs
Video Lectures	https://www.youtube.com/watch?v=ynPjd9TKLc4 15 Hrs https://www.youtube.com/watch?v=b1b6JTYnbjU 5 Hrs https://www.youtube.com/watch?v=ab036IW3ASw 7 Hrs https://www.youtube.com/watch?v=HTb_VYOE4WM 17 Hrs https://www.youtube.com/watch?v=9CoMa2D7LwI 12 Hrs
Web References	https://csrc.nist.gov/publications/detail/sp/800-145/final?utm https://www.oracle.com/middleware/technologies/soa.html?utm



Course Code: CMICA0402				Course Name: Database Management System			L	T	P	C
Course Offered in: MCA-INT							3	1	0	4
Pre-requisite: : Students are expected to be familiar with Basics of Mathematics and Computer Science.										
Course Objectives:										
To Introduce about database management systems, with an emphasis on how to organize, maintain and retrieve- efficiently, and effectively -information in relational & non-relational databases										
Course Outcome: After completion of the course, the student will be able to								Bloom's Knowledge Level (KL)		
CO1	Design ER and EER diagram of database for solving the real-world problems						K2			
CO2	Apply and analyze the Structured Query Language (SQL) to solve the complex queries and implement normalization.						K4			
CO3	Implement the operators in complex queries and apply database connectivity for different applications						K3			
CO4	Discuss PL/SQL and analyze transaction and concurrency control in transaction management.						K4			
CO5	Design and implement relational and non-relational database for the need of the real-world project.						K5			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	3	3	3	2	1	1	1	2		
CO2	3	3	2	3	1	1	1	2		
CO3	2	3	3	3	2	1	1	2		
CO4	2	3	2	2	1	2	2	2		
CO5	3	3	3	3	2	2	2	3		
Course Contents / Syllabus										
Unit 1			Introduction of Database & Conceptual Designing						15 hours	
Introduction about the DBMS: Basic Concept: - Introduction of Data, Information, Database, DBMS, database system, structured, semi-structured and unstructured data. Database system Vs File system. Data models & Types of Data Models: Relational Database: Relation, Tuple, Attribute and Domain, Codd Rules, Design & Implement the ER Diagram Data Modelling using the Entity Relationship Mode: ER model concepts, Degree of relationship, Notations for ER diagram, mapping constraints, reduction of ER diagrams to tables. Extended Entity Relationship Diagram & reduction of EER diagram to tables Introduction on SQ: Implements the DDL, DML, DCL & TCL: Introduction on SQL & Types of SQL commands:- DDL, DML, DCL, TCL. Introduction on Relational Algebra & relational Calculus: Basic of Relation Algebra and Relational calculus.										
Unit 2			Basic of SQL & Normalization						12 hours	
Implementation of the Keys: Keys & Types of Keys: - Super key, Candidate Key, Primary Key, Alternative Key, Composite Primary key, Foreign Key, unique and Composite Unique key. Implementation of Data Constrains: Data Constraint: - Null, Not Null, Default and check Constraint Implementation of Aggregate function & clause: Use of Aggregate Function: -Min (), Max (), Count (), AVG (), Sum ().Use of Clause: Where, Group by, Having and Order by Understand & Implement the normalization and different types of functions in SQL: Uses of String Functions in SQL, Uses of mathematical functions in SQL. Uses of Advanced Functions in SQL Armstrong's axioms. Functional Dependencies, Normalization & Types of Normalization, 1NF, 2NF, 3NF, BCNF. Multivalued Dependency, Join Dependency. Minimal Cover of FD's, Closure of an attribute, Lossless join decomposition.										
Unit 3			Introduction of Complex Queries						12 hours	
Operator & Predicates: Operator & Predicates: - Like, Between, Aliases, Distinct, Limit Implementation of Logical operator: And, Or, Not Set Theory Operator: Basic Set Operators: Selection, projection, rename, cross product, union, set difference										

Derived Operators: Intersection, Division, Join. Inner Join: - Natural Join, Equi Join & Non Equi Join Outer Join:- Left Outer Join, Right Outer Join and Full Outer Join

Nested Query: Nested Query, Sub Query or Corelated Query: -IN, NOT IN, Exists, Not Exists, All, Any

Understand & Implementation the database connectivity: Database connectivity with Java or Python

Unit 4	Introduction of PL/SQL and Transaction & Concurrency control	11 hours
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Implementation index, Views and Array: Managing Indexes, Synonyms and Sequences, Managing Views, Managing Data in Different Time Zone

Implementation of PL/SQL: Introduction of PL/SQL, Implementation of PL/SQL Function Procedure, Trigger, Cursor

Implementation of Transaction management & concurrency control: Transaction system: - Life cycle of transaction, ACID Properties. Serial, non-serial schedule. Conflict Serializability. View Serializability. Recoverable Schedule, Cascade less schedule. Cascading rollback. Control Concurrency Techniques: Concurrency Control, Locking Techniques for concurrency control, 2-phase Locking protocol, strict 2-phase locking protocol, rigorous 2-phase locking protocol.

Transaction & Data Control: Grant, Revoke, commit & Rollback.

Unit 5	Introduction of NoSQL with MongoDB	10 hours
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Understand NoSQL Concept and implement the: Introduction of NoSQL Data Models CURD operations: Document, Key Value, Column family, Graph. Overview of NoSQL Databases With their Types, Uses & Features of NoSQL Document Databases. CAP theorem, BASE Vs ACID.

Introduction and Features of MongoDB: Sharding, Load Balancing, Indexing, Replication. MongoDB Shell & their commands Mongosh, MongoD, MongoDB Compass. MongoDB Collection, Document, Field & Value. MongoDB Operators, CRUD operations Implement the MongoDB Cursor

Relation and Aggregation in MongoDB: MongoDB Cursor & Methods, Relations in MongoDB, Aggregation in MongoDB

Understand the concept of cloud database: Introduction of Cloud Database. MongoDB Cloud: - Atlas, Cloud Manager.

Total Lecture Hours **60 hours**

Textbook:

	Authors Name
1. Database System Concepts, Seventh Edition, McGraw - Hill.2019	Korth, Silbertz, Sudarshan,”
2. Fundamentals of Database Systems, Seventh Edition Addison Wesley 2017	Elmasri, Navathe.
3. SQL, PL/SQL The programming language of Oracle, Fourth Edition, BPB Publication. 2010	Ivan Bayross

Reference Books:

	Authors Name
1. Database Systems: A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007	Thomas Cannolly and Carolyn Begg
2. Database Management Systems” Third Edition, McGraw-Hill 2002	Raghu Ramakrishnan and Johannes Gehrke
3. An Introduction to Database Systems”, Eighth Edition, Pearson,. 2004	C J Date

Self-Study Content Links:	Duration (in Hrs)
MOOCs	Database Management System Part - 1 - TOC Infosys Springboard 63 Hrs
Video Lectures	https://archive.nptel.ac.in/courses/106/106/106106220/ https://onlinecourses.nptel.ac.in/noc21_cs04/preview https://nptel.ac.in/courses/106106093 https://swayam-uat-node1.appspot.com/proc_9i/preview https://www.udemy.com/course/sql-to-nosql-database-handson-with-mongodb/ 15 Hrs 18 Hrs 25 Hrs 20 Hrs 12 Hrs
Web References	https://docs.oracle.com/en/database/?utm https://learn.microsoft.com/en-us/office/troubleshoot/access/database-normalization-description?utm https://www.postgresql.org/docs/current/queries.html?utm

Course Code: CMICA0403				Course Name: Software Engineering			L	T	P	C
Course Offered in: MCA-INT							4	0	0	4
Pre-requisite: Basic knowledge about software, along with any programming language										
Course Objectives:										
To enable students to develop methods and procedures for software development that can scale up for large systems and that can be used consistently to produce high, quality software at low cost and with a small cycle of time. Students will be able to understand the concepts of requirement engineering, designing and its principles, testing techniques and maintenance methods for effective software development										
Course Outcome: After completion of the course, the student will be able to							Bloom's Knowledge Level (KL)			
CO1	Explain various software characteristics and analyze different software Development Models.						K2			
CO2	Demonstrate the contents of an SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.						K3			
CO3	Discuss various methods for software design						K2			
CO4	Discuss testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing						K2			
CO5	Explain maintenance and different techniques for project management.						K2			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	3	3	2	2	1	1	1	2		
CO2	2	3	3	2	1	1	2	2		
CO3	2	2	3	3	1	1	1	2		
CO4	2	3	3	3	1	1	2	2		
CO5	2	2	2	1	2	3	2	2		
Course Contents / Syllabus										
Unit 1			Introduction					15 hours		
Introduction: Evolving role of Software, Software Characteristics, Software Crisis, Silver Bullet, Software Myths, Software Process, Software Engineering Phases, Team Software Process (TSP), Emergence of Software Engineering, Software process, Project, and Product. Software Process Models: SDLC, Waterfall Model, Prototype Model, Spiral, Model, Iterative Model, Incremental Model, V Process Model, Agile Methodology.										
Unit 2			Software Requirement Specification s					12 hours		
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Use Case Diagram, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.										
Unit 3			Software Design					12 hours		
Software Design: Design principles, the design process; Design concepts: Abstraction, Refinement, Modularity (Cohesion and coupling), Software Architecture (Function Oriented Design, Object Oriented Design), Control Hierarchy (Top-Down and Bottom-Up Design), Structural partitioning, Data structure, Software procedure, Information hiding. Software Measurement and Metrics: Various Size Oriented Measures, Function Point, Design Heuristics for effective modularity, Cyclomatic Complexity Measures: Control Flow Graphs.										
Unit 4			Software Testing					11 hours		
Software Testing: Testing Objectives, Unit Testing, Integration Testing, User Acceptance Testing, Regression Testing, testing for Functionality and Testing for Performance, Top Down and Bottom, Up Testing Strategies: Test Drivers and Test Stubs, Test Beds and Test Oracle, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards. Software Quality Assurance (SQA): Quality concepts, Software quality assurance, SQA activities, Formal approaches to SQA; Statistical software quality assurance; CMM. The ISO standard.										

Unit 5	Project Maintenance and management concepts	10 hours
Project Maintenance and management concepts: Preventive, Corrective and Perfective Maintenance, Project Management concepts, Planning the Software Project, Cost of Maintenance, Estimation—Empirical Estimation COCOMO, A Heuristic Estimation Techniques, Staffing Level Estimation, Team structures, Risk analysis and management, Configuration Management, Software reengineering, Reverse Engineering, restructuring, Forward engineering, Clean Room software engineering, CASE Tools.		
Total Lecture Hours		60hours
Textbook:		
	Authors Name	
1. Software Engineering, New Age International Publishers, Fourth Edition, 21 August 2022	KK Aggarwal and Yogesh Singh	
2. Software Engineering: A Practitioners Approach, McGraw Hill, 9th edition 2020	RS Pressman,	
3., Fundamentals of Software Engineering, PHI Publication. ,5th Edition 2018	Rajib Mall	
Reference Books:		
	Authors Name	
1. Software Engineering, Wiley. 1 January 2010	Pankaj Jalote,	
2. Software Engineering, Cengage Learning. 2009	Kassem Saleh,	
3. Software Engineering, Addison Wesley. 9th Edition. 29 October 2017	Ian Sommerville,	
Self-Study Content Links:		Duration (in Hrs)
MOOCs	Software Engineering - TOC Infosys Springboard	8 Hrs
Video Lectures	https://youtu.be/xjqSXYE4S4 https://youtu.be/mGkkZoFc4I https://youtu.be/sGxgZxwuHzc https://youtu.be/BNk7vni1Bo	10 Hrs 7 Hrs 9 Hrs 15 Hrs
Web References	https://www.computer.org/technical-committees/software-engineering/?utm https://www.geeksforgeeks.org/software-engineering-coupling-and-cohesion/?utm https://www.computer.org/technical-committees/software-engineering/?utm	

Course Code: CMICA0404				Course Name: Design Thinking-II			L	T	P	C
Course Offered in: MCA-INT							3	0	0	3
Pre-requisite: Student must complete Design Thinking-I course.										
Course Objectives: The objective of this course is to upgrade Design Thinking skills by learning & applying advanced and contextual Design Thinking Tools. It aims to solve a Real-Life Problem by applying Design Thinking to create an impact for all the stakeholders.										
Course Outcome: After completion of the course, the student will be able to										
Course Outcome								Bloom's Knowledge Level (KL)		
CO1	Learn sophisticated design tools to sharpen their problem-solving skills.						K2			
CO2	Construct innovate ideas using design thinking tools and converge to feasible idea for breakthrough solution						K6			
CO3	Implement storytelling for persuasive articulation						K3			
CO4	Understanding the nature of leadership empowerment						K2			
CO5	Understand the role of a human being in ensuring harmony in society and nature						K2			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	2	3	2	1	1	1	1	2		
CO2	1	3	3	2	2	1	1	2		
CO3	1	1	2	1	3	2	2	2		
CO4	1	1	1	1	3	3	2	2		
CO5	1	2	2	1	2	1	3	2		
Course Contents / Syllabus										
Unit 1			Introduction						09 hours	
Design Thinking & Innovation: Design Thinking Mindset and Principles, recap of 5-Step Process of Design Thinking, Design Approaches, additional in-depth examples of each design approaches. Simon Sinek's – Start with Why, The Golden Circle, Asking the “Why” behind each example (an in-class activity of asking 5-WHYS) The Higher Purpose, in-class activity for LDO & sharing insights Visualization and its importance in design thinking, reflections on wheel of life (in-class activity for visualization & Wheel of Life), Linking it with Balancing Priorities (in class activity), DBS Singapore and Bank of Americas’ Keep the Change Campaign. Litter of Light & Arvind Eye Care Examples, understanding practical application of design thinking tools and concepts, case study on McDonald’s Milkshake / Amazon India’s Rural Ecommerce & Gillette.Working on 1-hour Design problem, Applying RCA and Brainstorm on innovative solutions. Main project allocation and expectations from the project.										
Unit 2			Refinement and prototyping						09 hours	
Refine and narrow down: Refine and narrow down to the best idea, 10-100-1000gm, QBL, Design Tools for Convergence – SWOT Analysis for 1000gm discussion. In-class activity for 10-100-1000gm & QBL. Prototyping (Convergence): Prototyping mindset, tools for prototyping – Sketching, paper models, pseudo-codes, physical mockups, Interaction flows, storyboards, acting/role-playing etc, importance of garnering user feedback for revisiting Brainstormed ideas, Napkin Pitch, Usability, Minimum Viable Prototype, Connecting Prototype with 3 Laws, A/B Testing, Learning Launch. Decision Making Tools and Approaches: Vroom Yetton Matrix, Shift-Left, Up, Right, Value Proposition, Case study: Career buddy, You-Me-Health Story & IBM Learning Launch. In-class activities on prototyping- paper-pen / physical prototype/ digital prototype of project’s 1000gm idea										
Unit 3			Storytelling, testing and assessment						09 hours	
Storytelling: Elements of storytelling, Mapping personas with storytelling, Art of influencing, Elevator Pitch, Successful Campaigns of well- known examples, in-class activity on storytelling. Testing of design with people, conducting usability test, testing as hypothesis, testing as empathy, observation and shadowing methods, Guerrilla Interviews, validation workshops, user feedback, record results, enhance, retest, and refine design, Software validation tools, design parameters, alpha & beta testing, Taguchi, defect classification, random sampling.Final Project Presentation and assessing the impact of using design thinking										
Unit 4			Innovation, quality and leadership						09 hours	

Innovation: Innovation: Need & Importance, Principles of innovations, Asking the Right Questions for innovation, Rationale for innovation, Quality: Principles & Philosophies, Customer perception on quality, Kaizen, 6 Sigma. FinTech case study of Design Thinking application – CANVAS

Leadership, types, qualities and traits of leaders and leadership styles, Leaders vs Manager, Personas of Leaders & Managers, Connecting Leaders-Managers with 13 Musical Notes, Trait theory, LSM (Leadership Situational Model), Team Building Models: Tuckman's and Belbin's. Importance of Spatial elements for innovation

Unit 5	Understanding human desirability	09 hours
Comprehensive human goal: Comprehensive human goal: the five dimensions of human endeavour (Manaviya - Vyavstha) are: Education- Right living (Sikhsa- Sanskar), Health – Self-regulation (Swasthya - Sanyam), Justice – Preservation (Nyaya- Suraksha), Production – Work (Utpadan – Karya), Exchange – Storage (Vinimya – Kosh), Darshan-Gyan-Charitra (Shifting the Thinking) Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature Thinking expansion for harmony: Self-exploration (Johari's window), group behaviour, interpersonal behaviour and skills, Myers-Briggs personality types (MBTI), FIRO-B test to repair relationships.		
		Total Lecture Hours 45 hours
Textbook:		
		Authors Name
1. Science & Art of Design Thinking, 2020, Polaris Operating System: A Design-oriented Approach, Charles Patrick Crowley, 9th Edition, 2017.		Arun Jain, UnMukt
2. Basics Design 08: Design Thinking, 2010, AVA Publishing SA Design of the UNIX Operating Systems , Maurice J. Bach., 1st Edition, 2015		Gavin Ambrose and Paul Harris
3. G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Fi		R R Gaur, R Sangal
Reference Books		
		Authors Name
1. Solving Problems with Design Thinking – Ten Stories of What Works, Columbia Business School Publishing 2013,		Jeanne Liedtka, Andrew King and Kevin Benett
2. Universal Human Values and Professional Ethics Katson Books 2022,		Dr Ritu Soryan
3. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, John Wiley and Sons Inc, New Jersey 2013		Vijay Kumar
Self-Study Content Links:		Duration (in Hrs)
MOOCs	Design Thinking - TOC Infosys Springboard	3 Hrs
Video Lectures	https://www.youtube.com/watch?v=6_mHCOAAEI8 https://nptel.ac.in/courses/110106124 https://designthinking.ideo.com/ https://blog.experiencepoint.com/how-mcdonalds-evolved-with-design-thinking	10 Hrs 21 Hrs 12 Hrs 16 Hrs
Web References	https://designthinking.ideo.com?utm https://www.interaction-design.org/literature/topics/prototyping?utm https://hbr.org/topic/storytelling?utm https://nptel.ac.in?utm	

Note: Self-study material may include assignments, seminars, micro projects, industrial visits, any other student activities, etc.

Course Code: CMICA0451					Course Name: Cloud Computing Lab					L	T	P	C
Course Offered in: MCA-INT										0	0	2	1
Pre-requisite: : Adequate knowledge of Basics of Computer and computer network													
Course Objective:													
To provide hands-on experience in deploying, managing, and scaling applications on cloud platforms, emphasizing cloud services, virtualization, and distributed computing for efficient resource utilization													
Course outcome: After completion of this course students will be able to:										Bloom's Knowledge Level (KL)			
CO1	Discuss about the use AWS management console, create, and manipulate Amazon instances.									K2			
CO2	Discuss the encrypting and controlling of S3.									K2			
CO3	Describe how to create private and virtual private cloud.									K2			
CO4	Create IAM group in cloud.									K3			
CO5	Discuss the steps of Installation of Open Stack.									K2			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)													
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					
CO1	3	2	1	2	1	1	1	2					
CO2	3	2	2	3	1	1	1	2					
CO3	2	2	3	3	1	2	1	2					
CO4	2	3	3	3	2	2	1	2					
CO5	2	3	2	3	1	2	3	2					
List of Practical's													
Sr No	Program Title										CO Mapping		
1	Navigate the AWS Management Console.										CO1		
2	Create and manipulate Elastic Compute Cloud instances.										CO1		
3	Create AWS EC2 Virtual Machine Using AWS Console.										CO1		
4	Monitoring Virtual Resources in AWS.										CO1		
5	Getting Started with S3 in Cloud.										CO2		
6	Working with EBS in AWS										CO2		
7	Build a relational database server.										CO2		



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8	Create private cloud - Designing a Custom VPC (Virtual Private Cloud).	CO3
9	Create an IAM Group in Cloud.	CO4
10	Built a RESTful serverless API on AWS.	CO5
		Total Hours: 15

Course Code: CMICA0452		Course Name: Data Base Management System Lab		L	T	P	C
Course Offered in: MCA-INT				0	0	2	1
Pre-requisite: Students are expected to be familiar with Basics of Mathematics and Computer Science.							
Course Objective:							
The objective of the course is to introduce about database management systems, with an emphasis on how to organize, maintain and retrieve -efficiently, and effectively - information in relational & non-relational databases.							
Course Outcomes (CO)							
Course outcome: After completion of this course students will be able to:				Bloom's Knowledge Level (KL)			
CO1	Design ER and EER diagram of database for solving the real-world problems			K2			
CO2	Apply and analyze the Structured Query Language (SQL) to solve the complex queries and implement normalization			K4			
CO3	Implement the operators in complex queries and apply database connectivity for different applications.			K3			
CO4	Discuss PL/SQL programs to solve complex problems in databases			K2			
CO5	Design and implement relational and non-relational database for the need of the real-world project.			K5			
List of Practical's							
Sr No	Program Title			CO Mapping			
1	Creating ER Diagram for company Database. Company databases have entities like employee, departments, projects and dependents also implement the relationship and cardinalities between the entities with their relevant attribute			CO1			
2	Design an ER diagram for a travel agency that includes entities such as travelers, bookings, destinations, and itineraries. also implement the relationship and cardinalities between the entities with their relevant attribute			CO1			
3	Convert Company ER Model to Relational Model(Represent entities and relationships in tabular form, represent attributes as columns, identifying keys).			CO1			
4	Convert Travel Agency ER Model to Relational Model(Represent entities and relationships in tabular form, represent attributes as columns, identifying keys).			CO1			
5	Data Definition Language Queries: Create Tables STUDENT, BOOK, TRANS.			CO1			



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	STUDENT(Rollno, Name, Branch, Year, Section, Hostel, F_name, Address) BOOK(Bookid, Title, Author, Publisher, Cost, Copies) TRANS(Rollno, Bookid, date_issue, date_return, fine) 1. Add a new attribute state in student table 2. Remove attribute address from student table 3. Modify the data type of state attribute 4. Change the name of attribute hostel to resident 5. Change a table's name, student to stud 6. Use truncate to delete the contents of trans table 7. Remove the book table from database	
6	Data Manipulation Language Queries 1. Insert at least 10 records in tables student, book and trans 2. Show the contents in tables student, book and trans 3. Find the name and branch of all students 4. Find the name and rollno of all students who stay in hostel 5. Find all distinct branches of students 6. Delete the record of the student whose rollno is 204001 7. Delete all records of student table 8. Delete all records of students whose section starts with capital A. 9. Find the student names which have 'lk' in any position 10. Find the student name where 'R' is in the second position 11. Find the name of student whose name starts with 'V' and ends with 'A' 12. Change the State of all students to 'BOMBAY' 13. Change the state of student 'Vandana' to 'Goa' 14. Apply arithmetic operators on cost column of book table for the book which has bookid = 1101	CO1
7	Queries with Constraints 1. Create the book table with Primary Key Constraint 2. Create trans table with foreign key Constraint 3. Create an Employee table with UNIQUE Constraint 4. Create Employee Table with Check Constraints 5. Create Supplier table with Default Constraint	CO2
8	Queries on TCL 1. Create Savepoints 2. Rollback to SavePoints 3. Use Commit to save on	CO1

9	Aggregate Functions: 1. Find the minimum, maximum, average and sum of costs of books 2. Count the total number of books present 3. Retrieve the average cost of all books authored by 'navathe'	CO2
10	String, Math and Advanced Functions Implement The Following Functions: 1. ASCII() 2. CHAR_LENGTH() 3. CONCAT() 4. LCASE() 5. LOWER() 6. REPEAT() 7. REVERSE() 8. STRCMP() 9. ABS(X) 10. MOD(X,Y) 11. SIGN(X) 12. POWER(X,Y) 13. ROUND(X) 14. SQRT(X) 15. BIN() 16. COALESCE() 17. IF() 18. LTRIM 19. RTRIM 20. LPAD 21. RPAD 22. INITCAP	CO2
11	Queries on GROUP BY, HAVING AND ORDER BY Clauses 1. Display total costs of books by each author 2. Find the branch and the number of students in that branch for branches which have more than 1 student 3. Find all books sorted by title in ascending order and cost in descending order 4. Find the branch and the number of students in that branch	CO2
12	Queries on Operators 1. Find the title, author and cost of books which have cost equal to or greater than 200 and less than or equal to 600.	CO3



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	- Find the name, rollno and branch of students who are in 'CSE' branch or 'IT' branch - Find the title, author and cost of book for which cost is between 200 and 600 - Find the title and author of book, which has the word 'NET' anywhere in its title. - Find the bookid and title of books with title either 'OS' or 'DBMS' - List the students who issued books on '1st may 2000', '12 JAN 2021', '17 dec 2000', '10 Jan 2021' - Display all books which have cost more than the cost of all books authored by 'Yash' - Find all the distinct costs of books	
13	Join Operators - Perform Inner join on two tables - Perform Natural Join on two tables - Perform Left Outer Join on tables - Perform Right Outer join on tables - Perform Full Outer Join on tables	CO3
14	Set Theory Operators - Show the use of UNION operator with union compatibility - Show the use of intersect operator with union compatibility - Show the use of minus operator with union compatibility - Find the cartesian product of two tables	CO3
15	Queries on Set Theory Operators - List all books except 'Navathe' and 'Tannenbaum' in ascending order of costs - display all books that have not been issued so far - To display the students name who have been issued DBMS book by NAVATHE and OS book by TANNENBAUM. - To display the students name who have been issued DBMS book by NAVATHE OR OS book by TANNENBAUM	CO3
16	Complex Queries - display all books that have been issued so far - to display all the students of CSE IN year 2021 who are staying in the hostel. - To display students name who have issued OS book by Tannenbaum - To display the names of students who have not issued any book so far - To display the names of students who have issued at least one book so far. - To display students name along with the book issued to them - Find the names of students who have paid fine Rs1000 for the book 'OS in Depth'. - Retrieve the name of students who have issued the book which has the maximum cost. - Retrieve the names of students who have issued all books written by 'Korth'	CO3



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17	Queries on Views 1. Create a view of student table 2. Find rollno and name from the created view where hostel is 'YES' 3. Create a view selecting rollno, name, branch, year and section from student table 4. Insert a row in the created view 5. Find all data in the created view 6. Update the created view by changing the name to 'GOGUL' for student whose rollno is 101 7. Compare the data of created view and the original table student 8. Delete the record of student whose rollno is '101' from the created view 9. Remove the view from database	CO4
18	Queries on Sequence, Index 1. Set the column to ROWNUM of a table 2. Create a sequence and set a column of a table to the created sequence. 3. Create an Index on the customer table	CO4
19	PL/SQL Programs 1. Write a PL/SQL Code to add two numbers 2. Write a PL/SQL code for Fibonacci series 3. Write a PL/SQL Code for greatest of 3 numbers 4. Write a PL/SQL code for area and circumference of a circle	CO4
20	PL/SQL Programs on Cursors 1. Write a Program using CURSOR to display ssn and salary of 1st record of employee 2. Write a program using cursors to display the ssn and salary of all employees and then print the count of employees	CO4
21	PL/SQL Programs on Triggers, Procedures and Functions 1. Write a Program using TRIGGER on UPDATE 2. Write a command to See the effect of trigger 3. Write a Program using PROCEDURE to increase the salary by Rs.1000 for Employee whose ssn is passed as an argument. 4. Write a procedure to update the address of an employee whose ssn and address are passed as arguments and the procedure returns the name of employee whose address is updated. 5. Write a function to return the total number of employees 6. Write a function to return the department number for which the department name is passed 7. Write a function to find the sum total of salaries of all employees. 8. Write a procedure to insert record in the department table 9. Write a code using EXCEPTION	CO4



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22	PL/SQL Programs on Implicit Cursors 1. Insert a record using %ROWTYPE 2. Write a code using %NOTFOUND, %FOUND, %ROWCOUNT 3. Write a code using %TYPE	CO4
23	Mongo DB Queries 1. Create a collection. 2. Insert documents into Created Collection 3. Use insertMany() to insert more records 4. View the inserted records , raw and formatted 5. Select all documents in collection 6. Find count of all customers 7. .Show the records which have age equal to 18 8. Find all records which have fees between 2500 and 4500 9. retrieve all documents from the cust collection where status equals either "A" or "P" 10. Retrieve all documents where grade is equal to 'F' AND (fees is less than 3000 OR name starts with letter 'J') 11. Retrieve all documents where grade is equal to F OR fees is less than 4000 12. Update record with id 1, incrementing their fees by 50 13. Update the record of jack , set address to 'Delhi' and phoneno to '11221122' 14. Delete all records which have fees greater than 3000 15. Display only the grade and fees. 16. Get the grade, fees and custname of all records and sort by custname in ascending order. 17. Sort the Customers on their fees by descending order and get only first 2 records only 18. Update the postal code of 1st record and view it 19. select from the cust collection all documents where the grade equals "F": 20. Retrieve the document with exact value '5' 21. Retrieve documents where grade field contains values in given set. 22. Retrieve documents where grade field does not contain values in given set. 23. Retrieve all documents where grade is equal to "f" and fees is greater than or equal to 2000 and less than or equal to 4000. 24. Retrieve all documents which have grade not "F" nor "P". 25. Retrieve all documents where fees is not greater than or equal to 3000 26. Retrieve all documents where fees exists and is greater than or equal to 3000 27. Retrieve all documents which have fees type double 28. Retrieve all documents that have fees of type number 29. Retrieve all documents when we divide fees by 200 and remainder is 100	CO5



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	30. Retrieve all documents that have regular expression 'o' in the custname field 31. Retrieve all documents that have fees 2000 or 4300	
24	Connectivity with Database using Java or Python	CO5
25	Case Study Implementation of case Study on different domain 1. E-commerce Platform 2. Inventory Management 3. Railway System 4. Hospital Data Management 5. Voice-based Transport Enquiry System 6. SMS-based Remote Server Monitor system 7. Banking System	CO5
Total Hours:15		

Course Code: CMICA0455				Course Name: Java Programming				L	T	P	C
Course Offered in: MCA-INT								0	0	8	4
Pre-requisite: Understanding of basic Java syntax, familiarity with object-oriented concepts (classes, objects, inheritance, polymorphism), and problem-solving skills											
Course Objectives: The objective of this course is to understand the object-oriented methodology, and its techniques to design stand alone and GUI applications using hands-on engaging activities.											
Course Outcome: After completion of the course, the student will be able to											
Course Outcome									Blooms Level		
CO1	Define the concepts of object-oriented programming and relationships among them needed in modeling.								K1		
CO2	Demonstrate the Java programs using OOP principles and implement the concepts of lambda expressions.								K3		
CO3	Analyze packages with different protection level resolving namespace collision and error handling concepts for uninterrupted execution of Java program								K4		
CO4	Describe Concurrency control, I/O Streams and Annotations concepts by using Java program.								K6		
CO5	Design and develop the GUI based application, Generics and Collections in Java programming to solve the real-world problem.								K5		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)											
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			
CO1	3	2	2	2	1	1	1	2			
CO2	3	3	3	3	1	1	1	2			
CO3	2	3	2	3	1	1	1	2			
CO4	2	3	2	3	1	1	1	2			
CO5	3	3	3	3	2	2	1	3			
Course Contents / Syllabus											
Unit 1		Basics of Java Programming								15 hours	
Object Oriented Programming: Introduction and Pillars of OOP with real life example, JVM architecture and its components.											
Control Statements: Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input											
Class and Object: Object Oriented Concept in Java, Object Reference, Constructor, Abstraction: Abstract Class, Defining Methods, Garbage Collectionand finalize()Method etc											
Unit 2		OOPs Features, arrays and lambda expressions								15 hours	
Inheritance: Introduction and Types of Inheritance in Java Implementing Multiple Inheritance, Interface and its uses, Access Modifiers, Constructors, Use of “this” and “super” Keyword											
Polymorphism: Introduction and Types, Overloading and Overriding											
Lambda expression: Introduction and Working withLambda Variables											
Arrays: Introduction and its Types											
Unit 3		Packages, Exception Handling and String Handling								15 hours	
Packages: Introduction and Types, Access Protection in Packages, Importand Execution of Packages											
Exception Handling: Introduction and Types, Exceptions vs. Errors, Handling of Exception Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block											
String Handling: Introduction and Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class											
Unit 4		Concurrency in Java and I/O Stream								13 hours	
Threads: Introduction and Types, Creating Threads, Thread Life- Cycle, Thread Priorities, Daemon Thread, Runnable Class, Synchronizing Threads etc.											
I/O Stream: Introduction and Types, Common I/O Stream Operations, Interaction withI/O Streams Classes											
Annotations: Introduction, Custom Annotations and Applying Annotations											
Unit 5		GUI Programming, Generics and Collections								14 hours	

GUI Programming: Introduction and Types, Swing, Components and Containers ,Layout Managers and User- Defined Layout and Event Handling concept

Generics: Introduction to Generic Classes, Initializing a Generic Object, Generic Cell Driver Class, Generic Methods, Use enumerated type

Collections: Introduction, Using Method References, Using Wrapper Class, Using Lists, Sets, Maps and Queues, Collection using Generics, Iterators

Total Lecture Hours **72 hours**

LAB Course Code: CMICA0455			LAB Course Name: Java Programming					L	T	P	C
Course Offered in: MCA-INT								0	0	8	4
Pre-requisite: : Understanding of basic Java syntax, familiarity with object-oriented concepts (classes, objects, inheritance, polymorphism), and problem-solving skills											
Course Objective: The objective of this course is to understand the object-oriented methodology, and its techniques to design stand alone and GUI applications using hands-on engaging activities.											
Course Outcomes (CO)											
Course outcome: After completion of this course students will be able to:								Bloom's Knowledge Level (KL)			
CO1	Define the concepts of object-oriented programming and relationship among them needed in modeling.							K1			
CO2	Demonstrate the Java programs using OOP principles and implement the concepts of lambda expressions.							K3			
CO3	Analyze packages with different protection level resolving namespace collision and implement the error handling concepts for uninterrupted execution of Java program.							K4			
CO4	Describe Concurrency control, I/O Streams and Annotations concepts by using Java program							K5			
CO5	Design and develop the GUI based application, Generics and Collections in Java programming language to solve the real-world problem.							K5			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)											
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			
CO1	3	2	2	2	1	1	1	2			
CO2	3	3	3	3	1	1	1	2			
CO3	2	3	2	3	1	1	1	2			
CO4	2	3	2	3	1	1	1	2			
CO5	3	3	3	3	2	2	1	3			
List Of Practical's											
Sr No	Name of Experiments/ Programs							CO Mapping			
1	Write Programs Compile and run first Java file Byte Code and class file							CO1			
2	Program to display default value of all Primitive data types							CO1			
3	Implement the code using main() method to calculate and print the Total and Average marks scored by a student from the input given through the command line arguments.							CO1			
4	Assume that four command line arguments name, marks1, marks2, marks3 will be passed to the main() method in the below class with nameTotal And Avg Marks.							CO1			

5	Write code which uses if-then-else statement to check if a given account balance is greater or lesser than the minimum balance. Write a class Balance Check with public method check Balance that takes one parameter balance of type double. Use if-then-else statement and print Balance is low if balance is less than 1000. Otherwise, print Sufficient balance.	CO1
6	A class Number Palindrome with a public method is Number Palindrome that takes one parameter number of type int. Write a code to check whether the given number is palindrome or not. For example, Cmd Args : 333333 is a palindrome.	CO1
7	Write a class Fibonacci Series with a main method. The method receives one command line argument. Write a program to display Fibonacci series. i.e. 0 1 1 2 3 5 8 13 21	CO1
8	Write a Java Program to find the Factorial of a given number.	CO1
9	Java Program to create a class, methods and invoke them inside main method.	CO1
10	Write a Java program to illustrate the abstract class concept. Create an abstract class Shape, which contains an empty method numberOfSides(). Define three classes named Trapezoid, Triangle and Hexagon extends the class Shape, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure. Write a class Abstract Example with the main() method, declare an object to the class Shape, create instances of each class and call numberOfSides() methods of each class.	CO1
11	Java program to illustrate the static field in the class.	CO1
12	Java Program to illustrate static class.	CO1
13	Java program to explicit implementation of garbage collection by using finalize() method.	CO1
14	JAVA program to implement Single Inheritance.	CO2
15	JAVA program to implement multi-level Inheritance.	CO2
16	JAVA program to implement constructor and constructor overloading.	CO2
17	Write a Java program to access the class members using super keyword.	CO2
18	Java program to access the class members using this keyword.	CO2
19	Implement an interface named MountainParts that has a constant named TERRAIN that will store the String value "off_road". The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getSuspension, setSuspension, getType, setType.	CO2

20	Java program to demonstrate nested interface inside a interface.	CO2
21	Java program to demonstrate nested interface inside a class.	CO2
22	JAVA program implement method overloading.	CO2
23	JAVA program to implement method overriding.	CO2
24	Java program to implement lambda expression without parameter.	CO2
25	Java program to implement lambda expression with single parameter.	CO2
26	Java program to implement lambda expression with multi parameter.	CO2
27	Java program to implement lambda expression that iterate list of objects	CO2
28	Java program to define lambda expressions as method parameters.	CO2
29	Write a class Count Of Two Numbers with a public method compare Count Of that takes three parameters one is arr of type int[] and other two are arg1 and arg2 are of type int and returns true if count of arg1 is greater than arg2 in arr. The return type of compare Count Of should be boolean. Assumptions is never null arg1 and ar2meme	CO2
30	JAVA program to show the multiplication of two matrices using arrays.	CO2
31	Java Program to search an element using Linear Search	CO2
32	Java program to search an element using Binary Search	CO2
33	Java Program to sort element using Insertion Sort	CO2
34	Java Program to sort element using Selection Sort – Largest element Method	CO2
35	Java program to Sort elements using Bubble Sort	CO2
36	Java program to create user defined package.	CO3
37	Java Program to create a sub- classing of package.	CO3
38	Implement the following: 1. Import package.*; 2. import package.classname; 3. Using fully qualified name.	CO3

39	Implement and demonstrate package names collision in Java.	CO3
40	Java program to handle and Arithmetic Exception Divided by zero	CO3
41	Java Program to implement User Defined Exception in Java	CO3
42	Java program to illustrate finally block	CO3
43	Java program to illustrate Multiple catch blocks	CO3
44	Java program for creation of illustrating throw	CO3
45	Java program to print the output by appending all the capital letters in the input string.	CO3
46	Java program that prints the duplicate characters from the string with its count.	CO3
47	Java program to check if two strings are anagrams of each other	CO3
48	Java Program to count the total number of characters in a string	CO3
49	Java Program to count the total number of punctuation characters exists in a String	CO3
50	Java Program to count the total number of vowels and consonants in a string	CO3
51	Java Program to show equals method and == in Java	CO3
52	Given a string, return a new string made of n copies of the first 2 chars of the original string where n is the length of the string. The string may be any length. If there are fewer than 2 chars, use whatever is there. If input is "Wipped" then output should be "WiWiWiWi".	CO3
53	Given two strings, a and b, create a bigger string made of the first char of a, the first char of b, the second char of a, the second char of b, and so on. Any leftover chars go at the end of the result. If the inputs are "Hello" and "World", then the output is "HWeolrlld".	CO3
54	JAVA program to show the usage of string builder.	CO3
55	JAVA program to show the usage of string buffer.	CO3
56	Creating and Running a Thread	CO4
57	Implementing Runnable Interface	CO4
58	Synchronizing Threads with lock	CO4
59	Synchronizing Threads without lock	CO4

60	JAVA program to implement even and odd threads by using Thread class.	C04
61	JAVA program to implement even and odd threads by using Runnableinterface.	C04
62	JAVA program to synchronize the threads by using Synchronizestatements and Synchronize block.	C04
63	Demonstrate the concept of type annotations in the JAVA programminglanguage.	C04
64	JAVA program to implement that read a character stream from input fileand print it into output file.	C04
65	Write a Java program that reads a text file and adds line numbers to eachline. The program should create a new file with the line numbers added to the beginning of each line.	C04
66	JAVA program to implement that merge the content of two files (file1.txt,file2.txt) into file3.txt.	C04
67	Write a Java program that reads two binary files and compares them byteby byte to determine if they are identical. Display a message indicating whether the files are the same or different.	C04
68	Write a Java program that reads the contents of one file and copies themto another file.	C04
69	Write a Java program that reads a text file and counts the number ofwords in it.	C04
70	Write a Java program that reads a text file and counts the frequency ofeach word in it.	C04
71	Program to create a frame with three button.	C05
72	Program to display message with radio buttons.	C05
73	Program to display "All The Best" in 5 different colors on screen.	C05
74	Program to implement event handling in a button "OK"	C05
75	Java Program to implement Border Layout	C05
76	Java Program to implement Grid Layout	C05
77	Java Program to implement Box Layout	C05
78	Java Program to implement Card Layout	C05
79	Java program to implement Generic class	C05
80	Java program to illustrate Generic methods	C05
81	Java program to implement wild card in generics	C05



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Ministry of Education
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101-150 Rank Band in Engineering
151-200 Rank Band in Overall



Accredited
Grade A+ 3.23



CSE|IT|ECE|ME|BT
MBA|MCA



Prestigious 'Diamond'
Rating Q5 I-Gauge
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82	Java program to implement of methods of Hash Set	C05
83	Java Program to implement methods available in HashMap class	C05
84	Program to add, retrieve, and remove element from Array List	C05
85	Create a method which can accept a collection of country names and add it to Array List with generic defined as String and return the List.	C05
86	Create a method which can create a Hash Set containing values 1-10. The Set should be declared with the generic type Integer. The method should return the Set.	C05
87	Develop a Java class with a method store Even Numbers (int N) using Array List to store even numbers from 2 to N, where N is a integer which is passed as a parameter to the method store Even Numbers(). The method should return the Array List (A1) created.	C05
88	Create a method that accepts the names of five countries and loads them to an array list and returns the list.	C05
89	Create a method which can accept a collection of country names and add it to Array List with generic defined as String and return the List.	C05
90	Java program to implement autoboxing	C05
91	Java program to implement unboxing	C05



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Prestigious 'Diamond'
Rating QS I-Gauge
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LAB Course Code:				Skills for Career Enhancement 3				L	T	P	C
Course Offered in: MCA Integrated, IV Semester								0	0	4	2
Pre-requisite: The student should have completed the SCE2 course in semester III											
Course Objectives:											
1. Attain advanced level of fluency and accuracy in professional communication. 2. Develop the ability to communicate effectively and persuasively in real-world business scenarios. 3. Acquire the skills and competencies necessary to excel in the workplace and drive career growth.											
Course Outcome: After completion of the course, the student will be able to								Bloom's Knowledge Level (KL)			
CO1	Recall the key elements of navigating the placement process and building professional relationships.							K1			
CO2	Interpret complex conversations and formal texts to identify tone and intent.							K2			
CO3	Apply appropriate verbal and non-verbal communication strategies for the workplace.							K3			
CO4	Analyze workplace communication practices to identify strengths and weaknesses.							K4			
CO5	Compose audience-centric professional documents leveraging clarity, conciseness, and compelling content.							K6			
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)											
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			
CO1	–	–	–	1	3	–	1	1			
CO2	–	1	1	1	3	1	1	2			
CO3	–	–	–	–	3	–	–	1			
CO4	–	–	–	–	3	–	1	1			
CO5	–	1	1	1	3	1	1	2			
List of Practical											
Practical 1			Introduction to the Course								
Anubhav Activity on score improvement											
Practical 2			Advanced Vocabulary								
The students will enhance their vocabulary through various exercises.											
Practical 3			Writing Short Essays								
The students will learn to logically arrange and develop ideas.											
Practical 4			Presentation Skills								
The students will learn to design and deliver effective presentations.											
Practical 5			Group Discussions								
Domain specific topics and on current affairs to improve the grasp of students.											
Practical 6			Debate								
The students will learn persuasive speech and to differentiate between assertive and aggressive language.											
Practical 7			Verbal Ability								
Analogies – The students will practice solving simple analogies.											
Sentence Correction – The students will learn to spot grammatical errors and correct them.											
Practical 8			Video Conferencing								
The students will develop the skills to engage confidently in online communication, such as video conferencing											
Practical 9			Reporting								
Students practice converting direct to indirect speech											



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Practical 10	Describing real -life events	
The students will learn to narrate in front of an audience.		
Practical 11	Story Reading	
The students will learn correct pronunciation and voice modulation.		
Practical 12	Impromptu Speaking	
Preparing and speaking on random topics		
Practical 13	Role Play	
Students learn to carry out conversations in various professional settings.		
Practical 14	Online Presence; Writing Blogs & Creating Vlogs	
The students learn the nuances of what to write and what not to write on social media. The students will learn to write effective blogs for outreach and create engaging vlogs to communicate their ideas.		
Practical 15	Elevator Pitch	
Crafting a winning elevator pitch for showcasing innovative ideas, products, and services.		
Practical 16	Interview Skills	
Analyzing interview clips and techniques Mock interviews and feedback		
Practical 17	Podcast Listening and Summarization	
Listening to understand the key points.		
Practical 18	Virtual etiquette	
Online and Mobile Etiquette in virtual workplace meetings Camera and Microphone Etiquette/ Chat Box Communication Dress Code for Virtual Meetings/ Background and Environment Setup		
Practical 19	Professional Email Skills	
Responding to emails with clarity, tact, and professionalism		
Practical 20	Visual Communication	
Interpreting infographics and data visualizations		
Practical 21	Time Management for Effective Communication	
Prioritizing tasks and managing time for efficient communication		
Practical 22	Peer Evaluation	
The students will learn to evaluate and provide feedback.		
Practical 23	Personal Communication Audit	
Reflecting on communication development and progress		
Practical 24	Action Plan Development	
Students will create an action plan to apply their communication skills in real-life scenarios.		
Total Hours		48 hours

LAB Course Code: CMICA0459			Course Name: Project Based on Software Engineering Lab				L	T	P	C
Course Offered in: MCA-INT							0	0	4	2
Pre-requisite: Students should possess basic knowledge of software engineering principles, programming concepts, object-oriented modeling, databases, and software development life cycle (SDLC). Familiarity with requirement analysis, software design, testing, and project management concepts will be beneficial for understanding UML-based software modeling and Engineering tools.										
Course Objective:										
To provide practical experience in software development processes, including requirements analysis, design, coding, testing, and maintenance, using modern tools and methodologies for building high-quality software systems.										
Course outcome: After completion of this course students will be able to:								Bloom's Knowledge Level (KL)		
CO1	Discuss ambiguities, inconsistencies, and incompleteness from requirement a requirements specification and state functional and non-functional.							K3		
CO2	Explain different actors and use cases from a given problem statement and design use case diagram to associate use cases with different types of relationship							K4		
CO3	Design structural diagrams, behavioral diagram, interaction diagram for software							K4		
CO4	Demonstrate the modern tools for testing							K3		
CO5	Demonstrate the modern engineering tools for project management							K6		
CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)										
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		
CO1	3	3	2	2	1	1	1	2		
CO2	2	3	3	2	1	1	2	2		
CO3	2	2	3	3	1	1	1	2		
CO4	2	3	3	3	1	1	2	2		
CO5	2	2	2	1	2	3	2	2		
List of Practical's										
Sr No.	Program Title								CO Mapping	
1	Assignment of mini project based on real world problem and create the requirement statement for assigned mini project								CO1	
2	Prepare an SRS document in line with the IEEE recommended standards on assigned project								CO2	
3	Draw the use case diagram and DFD (0 level, 1 level, 2 level) for assigned project								CO2	
4	Create Structural Diagram: Class diagram, Object diagram. Component diagram, Deployment diagram (assigned								CO3	

	project)	
5	Create Behavioral diagram: Activity diagram, State diagram (assigned project)	CO3
6	Create Interaction diagram: Sequence diagram, Timing diagram, Collaboration diagram (assigned project)	CO3
7	Write Test cases for assigned project	CO4
8	Demo of JIRA software (Test case management & Agile software development).	CO4
9	Perform forward engineering using any language. (Model to code conversion)	CO5
10	Perform reverse engineering using any language. (Code to Model conversion)	CO5
11	Mini Project with CASE Tools	CO5
		Total Hours: 30