NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR

(AN AUTONOMOUS INSTITUTE)

Affiliated to

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

Evaluation Scheme & Syllabus

For

Master of Computer Applications

First Year

(Effective from the Session: -2024-25)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Master of Computer Applications

MCA

Evaluation Scheme

SEMESTER-I

S.No	Subject Codes	Subjects	Types of Subject	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
		3 WEEKS COMPULSORY INDUCTION PROGRAM												
1	BMCA0105	Discrete Mathematics	Mandatory	3	0	0	30	20	50		100		150	3
2	BMCA0103Z	Operating Systems	Mandatory	3	1	0	30	20	50		100		150	4
3	BMCA0101NX	Workplace Communication Competence I	Mandatory	3	0	0	30	20	50		100		150	3
4	BMCA0106	Computer System & Organization	Mandatory	3	1	0	30	20	50		100		150	4
5	BMCA0154Z	Problem-Solving Using Python	Mandatory	0	0	6				50		100	150	3
6	BMCA0155	Personality Development & Professional Skills	Mandatory	0	0	2				50		50	100	1
7	BMCA0153	Operating Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BMCA0156	Computer System & Organization Lab	Mandatory	0	0	2				50		50	100	1
9	BMCA0151NX	Workplace Communication Competence I- Lab	Mandatory	0	0	4				50		50	100	2
		*Massive Open Online Courses	*MOOCs											
		TOTAL											**1150**	**23**

* List of MOOCs Based Recommended Courses for First year (Semester-I) MCA Students

S.No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0046	Linux for Beginners	IIHT (Infosys Springboard)	6h 2m	
2	BMC0031	Introduction to Python	Infosys Wingspan (Infosys Springboard)	24 h 6 min	

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)

Master of Computer Applications

MCA

Evaluation Scheme

SEMESTER-II

S.No	Subject Codes	Subjects	Types of Subject	L	T	P	CT	TA	Total	PS	TE	PE	Total	Credit
1	BMCA0202Z	Database Systems	Mandatory	3	0	0	30	20	50		100		150	3
2	BMCA0205	Data Structures	Mandatory	3	0	0	30	20	50		100		150	3
3	BMCA0204	Design Thinking – I	Mandatory	3	0	0	30	20	50		100		150	3
4		Departmental Elective-I	Departmental Elective	3	0	0	30	20	50		100		150	3
5	BMCA0206	Cognitive Ability	Mandatory	2	1	0	30	20	50		50		100	3
6	BMCA0253Z	Object Oriented Techniques using JAVA	Mandatory	0	0	6				50		100	150	3
7	BMCA0255	Data Structures Lab	Mandatory	0	0	2				50		50	100	1
8	BMCA0252	Database Systems Lab	Mandatory	0	0	2				50		50	100	1
9		Departmental Elective-I Lab	Departmental Elective	0	0	2				25		25	50	1
10	BMCA0257	Workplace Communication Competence II Lab	Mandatory	0	0	4				50		50	100	2
		*Massive Open Online Courses	*MOOCs											
		TOTAL											**1200**	**23**

* List of MOOCs Based Recommended Courses for First year (Semester-II) MCA Students

S.No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0012	Data Structures and Algorithms using Python - Part 1	Infosys Wingspan (Infosys Springboard)	29h 27m	
2	BMC0047	Java Concepts	IIHT (Infosys Springboard)	7h 34m	

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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.

List of Departmental Electives

S. No.	Subject Code	Subject Name	Types of Subject
1	BMCA0211	Fundamentals of Digital Marketing and Analytics	Departmental Elective-I
2	BMCA0212	Fundamentals of Digital Marketing and Optimization	Departmental Elective-I
3	BMCA0213	CRM Administration	Departmental Elective-I
4	BMCA0214	Software Testing	Departmental Elective-I

Departmental Elective-I Lab

S. No.	Subject Code	Subject Name	Types of Subject
1	BMCA0211P	Fundamentals of Digital Marketing and Analytics Lab	Departmental Elective Lab-I
2	BMCA0212P	Fundamentals of Digital Marketing and Optimization Lab	Departmental Elective Lab-I
3	BMCA0213P	CRM Administration Lab	Departmental Elective Lab-I
4	BMCA0214P	Software Testing Lab	Departmental Elective Lab-I

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science in Emerging Technologies

Subject Name: Discrete Mathematics	L-T-P [3-0-0]
Subject Code: BMCA0105	**Applicable in Department: MCA**
Pre-requisite of Subject: Basic Knowledge of Mathematics	
Course Objective: To develop mathematical ability in understanding mathematical reasoning, ability to perform combinatorial analysis and knowledge about discrete structures, perform operations on discrete mathematics such as sets, functions and relations, Verify the correctness of an argument using symbolic logic and truth tables. Solve problems using counting techniques and combinatorics, to improve formal reasoning skills acquisition and mathematical knowledge	

Course Outcomes (CO)		
Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO1	Develop mathematical ability in understanding mathematical reasoning, ability to perform combinatorial analysis and knowledge about discrete structures, perform operations on discrete mathematics such as sets, functions and relations, Verify the correctness of an argument using symbolic logic and truth tables. Solve problems using counting techniques and combinatorics, to improve formal reasoning skills acquisition and mathematical knowledge	**K4**
CO2	Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic.	**K3**
CO3	Identify and prove properties of Algebraic Structures like Groups, Rings and Fields	**K3**

CO4	Apply the concept of combinatorics to solve basic problems in discrete mathematics						K3
CO5	Solve recurrences and recursive functions						K4

		Syllabus				

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Set Theory	Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs, Set identities and	Lectures, PPTs and Notes	8L	Assignment based on set.	CO 1
	Relations & Functions	Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation and Recursive definition of relation	Lectures, PPTs and Notes		Assignment based on relations	CO 1
	Functions	Definition, Classification of functions, Operations on functions, recursively defined functions and Growth of Functions. Natural Numbers: Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases	Lectures, PPTs and Interactive Panel		Assignment based on functions	CO 1
II	Posets, Hasse Diagram and Lattices	Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice	Lectures, PPTs and Notes	10L	Assignment based on posets	CO 2
	Graphs	Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring	Lectures, PPTs and Interactive Panel		Assignment based on graphs	CO 2
	Trees	Definition, Binary tree, Binary tree traversal (BFS and DFS), Binary search tree.	Lectures, PPTs and Interactive Panel		Assignment based on trees	CO 2
III	Algebraic Structures	Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Cosets, Permutation and Symmetric groups.	Lectures, PPTs and Interactive Panel	8L	Assignment based on algebraic structures	CO 3

	Rings and Fields	Definition and elementary properties of Rings and Fields.	Lectures, PPTs and Interactive Panel		Assignment based on rings and fields	**CO 3**
IV	**Propositional & Predicate Logic**	Propositions well-formed formula, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction	Lectures and Hands on	**8L**	Assignment based on proposition	**CO 4**
	Predicate Logic	Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic.	Lectures, PPTs and Notes		Assignment based on predicate logic	**CO 4**
V	**Recurrence Relations and Generating Function**	Introduction and properties of Generating Function, Growth of functions, Recurrences from algorithms, Simple Recurrence relation with constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences Combinatorics: Introduction, Counting Techniques, Pigeon hole Principle, Pólya's Counting Theory.	Lectures and Hands on	**8L**	Assignment based on Recurrence Relations	**CO 5**
	Total			**42L**		

Textbooks	
Sr No	**Book Details**
1	"Discrete Mathematics and Its Applications", KennethH.Rosen,McGraw-Hill,2006
2	"Discrete Mathematical Structures", ,B.Kolman , R.C.Busby,andS.C.Ross,PrenticeHall,2004

Links	
Unit No	**Details**
Unit 1	https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20&index=1
Unit 2	https://www.youtube.com/watch?v=DmCltf8ypks&list=PL0862D1A947252D20&index=3
Unit 3	https://www.youtube.com/watch?v=kZ6UqFm8lnw&list=PL0862D1A947252D20&index=5
Unit 4	https://www.youtube.com/watch?v=ruwZxR2YRpE&list=PL0862D1A947252D20&index=6
Unit 5	https://www.youtube.com/watch?v=9AUCdsmBGmA&list=PL0862D1A947252D20&index=10

Subject Name: Operating Systems	L-T-P [3-1-0]
Subject Code: BMCA0103Z	Applicable in Department: MCA

Pre-requisite of Subject: Students are expected to be familiar with Computer Organization

Course Objective: 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 Outcomes (CO)

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1 Describe operating system concepts, functions and design CPU Scheduling algorithms	**K2**
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.	**K2**
CO4 Design and use Linux utilities to create and manage simple file processing operations.	**K5**
CO5 Implement shell scripts to perform more complex tasks in shell programming environment.	**K5**

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 **Fundam ental**	**Fundamental s of Operating Systems**	Operating System, Operating 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	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 26-29	**CO 1**

Concepts of Operating System	**Process Management**	Process Management: Process Concepts, State Transition Diagram. Types of Schedulers: Long Term, Mid Term, Short Term Process Control Block, Inter process communication	Lectures, PPTs and Interactive Panel			
	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	Lectures, PPTs and Interactive Panel			
II Processes and Deadlock	**Process Synchronisation**	Critical Section problem & their solutions, Introduction to Semaphores Classical Problems of Synchronization (Producer Consumer Problem, Readers Writer Problem, Dining philosophers' problem)	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 30-33	**CO 2**
	Dead Locks	Characterization, Deadlock concepts & Handling Techniques (Prevention and Detection & Recovery), Dead Lock Avoidance: Banker's Algorithm.	Lectures, PPTs and Interactive Panel			
III 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), Belady's Anomaly, Thrashing	Lectures, PPTs and Interactive Panel	10L+4P	Experiment/ Program 34-45	**CO 3**
	Disc Scheduling	FCFS, SSTF, SCAN, C-SCAN, LOOK and C-LOOK	Lectures, PPTs and Interactive Panel			
	File Management System	Concept and Organization, Access Methods, File System Implementation, Allocation Methods, Free Space Management, File System Security and Protection	Lectures, PPTs and Interactive Panel			
IV Linux Administration	**Linux administration**	Linux Components, Shells, Installation of Linux, Virtualization: Definition, Types, Advantages, Virtualization tools. User Administration, Files: Type, Ownership, Permissions and manipulations Commands: Internal and External, Directory and File commands, I/O commands, Pipes, Filters, shell commands. System Admin: man, uptime, users, service, pkill, ps	Lectures, PPTs and Interactive Panel	10L+4P	Experiment/ Program 1-7	**CO 4**

V Shell Programming and vi Editor	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 etc., Loop control structures– while, until, for, etc., Jumping control structures – break, continue, exit, etc., Integer and Real arithmetic in shell programs	Lectures, PPTs and Interactive Panel	10L+4P	Experiment/ Program 8-25	CO 5
Total				**46L + 20P**		

Textbooks	
Sr No	**Book Details**
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts Essentials" 8th Edition, (2010)
2	Andrew S. Tanenbaum, "Modern Operating Systems", Pearson Education, 4th Edition, (2014)
3	Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", (2014)
4	Marks G. Sobell, "A practical guide to Linux: Commands, Editors and Shell Programming" Fourth Edition, (2017)

Reference Books:

Reference Books	
Sr No	**Book Details**
1	"Operating Systems: Internals and Design Principles", William Stallings, 8th Edition, (2014)

2	"Operating System: A Design-oriented Approach", Charles Patrick Crowley, 9th Edition, (2017)
3	"Operating Systems: A Modern Perspective", Gary J. Nutt, (1997)
4	"Design of the UNIX Operating Systems", Maurice J. Bach., 1st Edition, (2015)
5	"Understanding the Linux Kernel", Daniel Pierre Bovet, Marco, 1st Edition, (2000)
6	"Operating Systems Design and Implementation", AS Tanenbaum, AS Woodhull, 3rd Ed., Prentice Hall, (2006)

Links	
Sr No	**Details**
Unit 1	https://archive.nptel.ac.in/courses/106/105/106105214/
Unit 2	https://www.youtube.com/watch?v=_IxqinTs2Yo
Unit 3	https://www.youtube.com/playlist?list=PLf3ZkSCyj1tdCS2oCYACXO6x-VKpDIMB6
Unit 4	**http://www.digimat.in/nptel/courses/video/117106113/L01.html**
Unit 5	https://www.youtube.com/watch?v=48zApVSX97s

Subject Name: Workplace Communication Competence 1	L-T-P [3-0-0]
Subject Code: BMCA0101NX	**Applicable in Department:** MCA

Pre-requisite of Subject: Comprehension of basic English language

Course Objective: To improve proficiency in the English language to the lower intermediate level of CEFR (Common European Framework of Reference) , To impart business communication skills, To motivate students to look within and create a better version of 'self.' and To introduce the key concepts of ethics, etiquette, and life skills.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Identify key concepts of life-skills.	K3
CO2	Develop effective listening skills.	K3
CO3	Compose clear and concise statements on a variety of subjects.	K6
CO4	Understand and analyse simple written texts.	K2, K4
CO5	Demonstrate clarity while writing.	K3

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Introduction to Communication	Module 1: Importance of communicating in English Module 2: Basics of workplace communication Module 3: Levels of communication Module 4: Barriers to effective communication	Interactive sessions, activities	6T+10P	Assignment 1	CO 1

II	**Art of Listening**	Module 1: Developing listening skills Module 2: Active and Passive listening Skills Module 3: Empathetic listening	Discussion, audio recordings and activity (TBL)Task Based Learning	6T+6P	Assignment 2	**CO 2**
III	**Speaking to Express**	Module 1: Effective Speaking: A Key to Professional Success Module 2: Etiquette & Ethics Module 3: Non-Verbal Cues: Making Verbal delivery effective Module 4: Group Discussion – Dos and Don'ts	Activity and Discussion	6T+20P	Assignment 3	**CO 3**
IV	**Reading with Cognitive Skills**	Module 1: Levels of comprehension Module 2: Critical reading Module 3: Acquiring vocabulary & sentence structure from texts	Interactive sessions, activities	8T+4P	Assignment 4	**CO 4**
V	**Harnessing Writing Skills**	Module 1: Honing the writing skills Module 2: Workplace vocabulary Module 3: Pauses in written documents	Interactive sessions, activities	10T+8P	Assignment 5	**CO 5**
Total				**36T+48P**		

Textbooks	
Sr No	**Book Details**
1	"Technical Communication – Principles and Practices", by Meenakshi Raman & Sangeeta Sharma, 4th Edition, Oxford University Press, 2023, New Delhi
2	"ABC Workbook", NIET Publishing House, Meerut, 2023

Reference Books:

Reference Books	
Sr No	**Book Details**
1	"Cambridge English Business Benchmark (Pre-intermediate to Intermediate)", 2nd edition, Norman Whitby, Cambridge University Press, 2013, UK.
2	"Technical Communication: A Practical Guide", by William S. Pfeiffer and Kaye A. Adkins, Pearson, 2020, UK.
3	"The Essentials of Technical Communication", by Elizabeth Tebeaux and Sam Dragga, Oxford University Press, 2021, UK.
4	"Listening in the Language Classroom", by John Field, Cambridge University Press, 2021, UK.
5	"Speaking: Second Language Acquisition, from Theory to Practice", by William Littlewood, Cambridge University Press, 2022, UK.
6	"Second Language Writing in Transitional Spaces: Teaching and Learning Across Languages and Cultures", edited by Viniti Vaish and Guangwei Hu, Routledge, 2019, UK.
7	"The Writing Revolution: A Guide to Advancing Thinking Through Writing in All Subjects and Grades", by Judith C. Hochman and Natalie Wexler, Jossey-Bass, 2022, USA.
8	"The Cambridge Handbook of Corrective Feedback in Second Language Learning and Teaching", edited by Hossein Nassaji and Eva Kartchava, Cambridge University Press, 2021, UK
9	"IELTS 11: General Training with answers", Cambridge English, 2018

Subject Name: Computer System & Organization	L-T-P [3-1-0]
Subject Code: BMCA0106	Applicable in Department: MCA

Pre-requisite of Subject: Basic Knowledge of Mathematics and Computer Science

Course Objective: The basic concepts and components of digital logic design, the different methods of data representation in computers, Combinational and Sequential circuits, the different micro operations and data transfer methods. Understand the design, functionality and taxonomy of CPU, Memory types, the I/O interface, I/O ports, modes of data transfer between CPU and I/O device, 8085 microprocessors

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1 Apply the concept of number systems, logic gates, Boolean algebra, Minimization techniques	**K1, K2, K3**
CO2 Define the concept of combinational and sequential circuits..	**K1, K2**
CO3 Discuss the concept of Register, the working of bus and memory transfer and ALU.	**K1, K2**
CO4 Describe the hierarchical memory system, cache memory and Input/output interface and modes of data transfer.	**K1, K2**
CO5 Discuss the 8085 microprocessor architecture, addressing modes¸ instruction cycle and formats.	**K1, K2**

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	**Introduction to Number System, Boolean Algebra**	Digital Computers and Number System, Complements, Logic Gates, Boolean Algebra, Map Simplification upto five variables, Data types, Fixed point representation, Fixed Point Addition & Subtraction, floating point Representation, Booth's Multiplication, IEEE754 Floatingpoint standards.	Chalk & Duster/ PPTs/ Lecture Notes	8T+4P	Experiment 1,4	**CO 1**

			/SmartBoard			
II	**Introduction to Combinational Circuits and Sequential Circuits**	Combinational Circuits – Code Converter, Half Adder, Full Adder, Half Subtractor, Full Subtractor, MUX, DEMUX, Encoder and Decode Sequential Circuits – Latch and Flip Flop – S-R, D, J-K and T, Shift Registers	Chalk & Duster/ PPTs/ Lecture Notes /SmartBoard	8T+4P	Experiment 2-3, 5-7	**CO 2**
III	**Register Transfer and ALU Design**	Register Transfer Language, Register Transfer, Bus and Memory Transfers, Common Bus System, Two Bus Organization, Three Bus Organization. Arithmetic & Logic unit design, RISC & CISC Architecture	Chalk & Duster/ PPTs/ Lecture Notes /SmartBoard	7T+4P	Assignment	**CO 3**
IV	**Memory Management and Input/output**	Memory Hierarchy, Main Memory (RAM and ROM chips), Associative memory,Cache Memory. I/O interface, I/O ports, Interrupts, Modes of data Transfer: Programmed I/O, Interrupt Initiated I/O, and Direct memory access (DMA)	Chalk & Duster/ PPTs/ Lecture Notes /SmartBoard	8T+4P	Assignment	**CO 4**
V	**8085 Microprocessor**	8085: Architecture, General register Organization, Stack Organization, pin diagram, Addressing modes, Instruction formats, instruction cycles and sub cycles (Fetch, decode, execute etc.), Instructions- Data Transfer, Arithmetic, Logical, Branch and Assembly language programming	Chalk & Duster/ PPTs/ Lecture Notes /SmartBoard	9T+4P	Experiment 8-10	**CO 5**
Total				**40T + 20P**		

	Textbooks
Sr No	**Book Details**
1	M Morris Mano and Rajib Mall, "Computer System Architecture", Pearson Education, 3rd Edition, 2017
2	Vaibbhav Taraate , "Digital Design Techniques and Exercises: A Practice Book for Digital Logic Design Hardcover" ,Springer Verlag, Singapore 1st edition, 2021

Reference Books:

	Reference Books
Sr No	**Book Details**
1	Andrew s. Tanenbaum and Todd Austin , "Structured Computer Organization", Pearson Education, 6th Edition, 2016
2	Dr. William Stallings, "Computer Organization and Architecture", Pearson Education, 11th Edition, 2022
3	Ramesh Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing, 6th Edition, 2013
	Links
UNIT 1	https://www.youtube.com/watch?v=yKPD_UkbgXo https://www.youtube.com/watch?v=L9X7XXfHYdU&list=PLxCzCOWd7aiHMonh3G6QNKg53C6oNXGrX
Unit 2	https://www.youtube.com/watch?v=FavBqeTTmO0 https://www.youtube.com/watch?v=LTtuYeSmJ2g https://www.youtube.com/watch?v=iaIu5SYmWVM

Unit 3	https://www.youtube.com/watch?v=vVDI2XZrgpM
Unit 4	https://www.youtube.com/watch?v=E82x-cug9YE
Unit 5	https://www.youtube.com/watch?v=p2vEXKrv_P4

Subject Name: Problem Solving Using Python	L-T-P [0-0-6]

Subject Code: BMCA0154Z	Applicable in Department: MCA

Pre-requisite of Subject: Basic Knowledge of Computer Science and Mathematics

Course Objective: To enhance students' problem-solving skills by guiding them in writing efficient and functional Python code, implementing object-oriented programming (OOP) principles, and applying Python to practical, real-world applications.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Equip with the foundational skills in Python programming	K1, K2
CO 2	Provide with a comprehensive grasp of advanced Python programming concepts.	K2, K3
CO 3	Provide with a strong foundation in object-oriented programming in Python	K3, K4
CO 4	Provide with hands-on skills in managing sequences, data structures, exception handling, and file operations in Python.	K4, K5
CO 5	Create Python applications with GUIs, data manipulation, and visualization skills.	K4, K5, K6

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Basics of Python Programming	**Introduction:** A Brief History of Python, Applications areas of python, The Programming Cycle for Python. **Elements of Python:** keywords and identifiers, variables, data types and type conversion, Indexing and Slicing, operators in python, Operator precedence and associativity, expressions in	Lectures, PPTs and Lab	6L + 8P	Experiment/Program 1- 83	CO 1

		python. **Conditional Statements:** if statement, if-else statement, Nested-if statement and elif statements. **Loops:** Purpose and working of loops, while loop, for loop, else with loop statement, Nested Loops, break, continue and pass statement.				
II	**Function and Modules**	Introduction of Function, built in function, user defined function, Function arguments, passing functions to a function, recursion, Lambda functions, Namespaces. **Functional Programming:** higher order functions, Map, filter, Reduce. Closures and its characteristics, Decorators, decorating function with argument and iterator, Building custom iterator, generator and generator expression, Co-routines. **Modules and Packages:** Importing Modules, writing own modules, Standard library modules, Packages in Python.	Lectures, PPTs and Lab	4L+ 10P	Experiment/Progr am 84-119	**CO 2**
III	**Object Oriented Concepts**	**Object-oriented programming:** User-defined classes, Object as an argument, Class variables and Instance variables, Constructor, Parameterized constructor, **Encapsulation:** Introduction, Data hiding, Instance methods, Class method, Static methods, property method, Magic Methods in python, Instances as Return Values. Inheritance: Introduction to inheritance, Types of inheritance, MRO and super (), **Abstraction**: Abstract class, Abstract methods, Containership. **Polymorphism:** Polymorphism in operators, Polymorphism in built-in function, Duck Typing, Polymorphism in inheritance (method overriding), Method Overloading, Operator overloading (defining new behavior of operators).	Lectures, PPTs and Lab	4L + 10P	Experiment/Progr am 120-139	**CO 3**
IV	**Basic Data structures ,**	**Python Basic Data Structures:** Sequence, Packing and Unpacking Sequences, Mutable Sequences, Strings, Basic operations of	Lectures, PPTs and	4L + 10P	Experiment/Progr am 140-221	**CO 4**

	Exception and File Handling	strings, comparing strings, string formatting, Built-in string methods and function, Lists, Tuples, Sets and Dictionaries with built-in methods, List Comprehension, Looping in basic data structures. **Exception Handling**, Errors, Run Time Errors, Handling I/O Exception, Try-except statement, Raise, Assert. **Files and Directories:** Introduction to File Handling, Reading and Writing files, Additional file methods, Working with Directories.	Lab			
V	GUI Programming and Libraries in Python	**Tkinter:** Introduction to GUI programming, Widgets: Frame, Label, Button, Entry, Radio button, Check button, Canvas, and Menu. Creating a GUI Application. **Libraries in Python-** **Intro to NumPy:** Basic Operation, Indexing, slicing and Iterating, multidimensional arrays, NumPy Data types, NumPy functions. **Intro to Pandas:** Series and Data Frames, Grouping, aggregation, Merge Data Frames, Generate summary tables, Group data into logical pieces, Manipulation of data, Reading and writing data on Files. **Intro to Matplotlib:** Scatter plot, Bar charts, histogram, Stack charts, Legend title Style, Figures and subplots, plotting function in pandas, Labelling and arranging figures, Save plots.	Lectures, PPTs and Lab	4L+10P	Experiment/Program 222-296	CO 5
Total				**22L+48P**		

Textbooks		
Sr No	**Book Details**	
1	Magnus Lie Hetland, "Beginning Python-From Novice to Professional", Third Edition, Apress (2017)	

2	Reema Thareja , "Python Programming using Problem solving approach", OXFORD Higher education (2017)
3	Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, (2012)

Reference Books:

Reference Books	
Sr No	**Book Details**
1	John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , (2013)
2	Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus". Wiley India Edition, (2013).
3	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers,(2016).
4	Robert Sedgewick, Kevin Wayne, Robert Dondero: "Introduction to Programming in Python: An Inter-disciplinary Approach," Pearson IndiaEducation Services Pvt. Ltd.,(2016).
5	Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python :Revised and updated for Python 3.2", Network Theory Ltd., (2011).

Subject : Problem Solving Using Python Lab	L-T-P [0-0-6]

Course Objective: To enhance students' problem-solving skills by guiding them in writing efficient and functional Python code, implementing object-oriented programming (OOP) principles, and applying Python to practical, real-world applications.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Write simple python programs and will make use of decision making and loop constructs	K3
CO 2	Explain user defined functions and modules in python	K5
CO 3	Implement OOPS concepts in Python	K3
CO 4	Implement python data structures–lists, tuples, set, dictionaries and will be able to perform file handling	K2
CO 5	Apply programming concepts to solve real world problem.	K5

Lab Experiments

Sr No	Program Title	CO Mapping
1	Python Program to Print Statement	CO 1
2	Swap two variables without using a temporary variable.	CO 1
3	Check if a given number is even or odd.	CO 1

4	Find the largest of three numbers.	CO 1
5	Convert a string to an integer.	CO 1
6	Convert an integer to a string.	CO 1
7	WAP to demonstrate implicit and explicit type conversion.	CO 1
8	Convert Revenue to Currency Format	CO 1
9	Write a program to Calculate Sum of 5 Subjects and Find Percentage (Max Mark in each subject is 100).	CO 1
10	Write a program to find gross salary.	CO 1
11	Write a program to Calculate Area of Rectangle, Square, Scalene Triangle and Right-angle Triangle..	CO 1
12	Write a program to find the perimeter of a circle, rectangle and triangle.	CO 1
13	Write a program to Compute Simple Interest.	CO 1
14	Write a program to swap the values of two variables with and without using third variable.	CO 1
15	Write a program to perform arithmetic operations on a = 8, b = 3.	CO 1
16	Write a program to apply relational operations on a=8, b=3.	CO 1
17	Write a program to apply assignment operations on a=8, b=3.	CO 1
18	Write a program to apply logical operations on a=8, b=3.	CO 1
19	Write a program to apply bitwise operations on a=8, b=3.	CO 1
20	Write a program to apply identity operators.	CO 1
21	Write a program to Swap the Contents of two Numbers using Bitwise XOR Operation	CO 1

22	WAP to find the absolute value of the given number.	CO 1
23	Write a program to Add two Complex Numbers.	CO 1
24	Write a Program to find roots of a quadratic expression.	CO 1
25	Program to calculate the average of a list of numbers using the division operator.	CO 1
26	Program to compare two numbers and determine if they are equal.	CO 1
27	Program to compare two numbers and determine whether they are greater than or less than .	CO 1
28	Program to check if a given string is equal to a specific value.	CO 1
29	Program to calculate compound interest using compound assignment operators.	CO 1
30	Program to check if a given number is odd or even using bitwise operators.	CO 1
31	Write a program to Accept two Integers and Check if they are Equal.	CO 1
32	Write a program to Check if a given Integer is Positive or Negative and Odd or Even.	CO 1
33	Write a program to Check if a given Integer is Divisible by 7 or not.	CO 1
34	Write a program to find the greatest of three numbers using else if ladder.	CO 1
35	Write a program to find the greatest of three numbers using Nested if.	CO 1
36	Write a program to convert an Upper-case character into lower case and vice-versa.	CO 1
37	Write a program to check weather an entered year is leap year or not.	CO 1
38	Write a Program to check whether an alphabet entered by the user is a vowel or a constant.	CO 1
39	Write a program to print day according to the day number entered by the user.	CO 1

40	Write a program to print color name, if user enters the first letter of the color name.	CO 1
41	Write a program to Simulate Arithmetic Calculator.	CO 1
42	Write a menu driven program for calculating area of different geometrical figures such as circle, square, rectangle, and triangle.	CO 1
43	WAP that accepts the marks of 5 subjects and finds the percentage marks obtained by the student. It also prints grades according to the following criteria: Between 90-100% Print 'A', 80-90% Print 'B', 60-80% Print 'C', 50-60% Print 'D', 40-50% Print 'E', Below 40% Print 'F'.	CO 1
44	WAP to enter a character and then determine whether it is a vowel, consonants, or a digit.	CO 1
45	Write a program to display all even numbers from 1 to 20	CO 1
46	Write a program to print all the Numbers Divisible by 7 from 1 to 100.	CO 1
47	Write a program to print table of any number.	CO 1
48	Write a program to Find the Sum of first 50 Natural Numbers using for Loop.	CO 1
49	Write a program to calculate factorial of a given number using for loop and also using while loop.	CO 1
50	Write a program to count the sum of digits in the entered number.	CO 1
51	Write a program to find the reverse of a given number.	CO 1
52	Write a program to Check whether a given Number is Perfect Number.	CO 1
53	Write a program to Print Armstrong Number from 1 to 1000.	CO 1
54	Write a program to Compute the Value of X^n.	CO 1

55	Write a program to Calculate the value of ^nC_r.	CO 1
56	Write a program to generate the Fibonacci Series.	CO 1
57	Write a program to check whether a given Number is Palindrome or Not.	CO 1
58	Write a program to Check whether a given Number is an Armstrong Number.	CO 1
59	Write a program to print all prime numbers from 1- 500.	CO 1
60	Write a program to find the Sum of all prime numbers from 1-1000.	CO 1
61	Write a program to display the following pattern: *	CO 1
62	Write a program to display the following pattern: * * * * * * * * * * * * * * *	CO 1
63	Write a program to display the following pattern: 1 1 2 1 2 3	CO 1

	1 2 3 4 1 2 3 4 5	
64	Write a program to display the following pattern: A B B C C C D D D D E E E E E	**CO 1**
65	Write a program to display the following pattern: * * * * * * * * * * * * * * *	**CO 1**
66	Write a program to display the following pattern: 1 2 3 4 5 1 2 3 4 1 2 3 1 2 1	**CO 1**

67	Write a program to display the following pattern:
	
	   *
	  * * *
	 * * * * *
	* * * * * * *
		CO 1

68	Write a program to display the following pattern: * * * * * * * * *	**CO 1**

| | ```
* * * * * * *
  * * * * *
    * * *
      *
``` | |
| **69** | Write a program to display the following pattern (Pascal Triangle):<br><br>```
        1
      1   1
    1   2   1
  1   3   3   1
 1 4   6   4 1
1 5 10 10 5  1
``` | **CO 1** |
| **70** | Write a program to display the following pattern:<br><br>```
  1
 2 3
 4 5 6
 7 8 9 10
``` | **CO 1** |
| **71** | Write a program to display the following pattern:<br><br>```
A
B C
D E F
G H I J
K L M N O
``` | **CO 1** |
72	Write a program to Find the Sum of A.P Series.	**CO 1**
73	Write a program to Find the Sum of G.P Series.	**CO 1**
74	Write a program to Find the Sum of H.P Series.	**CO 1**
75	Write a program to print the following sequence of integers. 1, 2, 4, 8, 16, 32	**CO 1**

76	Write a program to find the Sum of following Series: (1*1) + (2*2) + (3*3) + (4*4) + (5*5) + ... + (n*n)	CO 1
77	Write a program to find out L.C.M. of two numbers.	CO 1
78	Write a program to find out H.C.F. of two numbers.	CO 1
79	Python Program to Accept Three Digits and Print all Possible Combinations from the Digits.	CO 1
80	Python Program to Print Odd Numbers within a Given Range.	CO 1
81	Python Program to Find the Smallest Divisor of an Integer.	CO 1
82	Python Program to Count the Number of Digits in a Number	CO 1
83	Python program to find GCD between two given integer numbers.	CO 1
84	Write a Python function to find the Max of three numbers.	CO 2
85	Write a Python function to sum all the numbers in a list. Sample List : (8, 2, 3, 0, 7) Expected Output : 20	CO 2
86	Write a Python program to reverse a string. Sample String : "1234abcd" Expected Output : "dcba4321"	CO 2
87	Write a Python function to check whether a number falls in a given range.	CO 2
88	Write a Python function that accepts a string and calculate the number of upper-case letters and lower-case letters. Sample String: 'The quick Brow Fox' Expected Output : No. of Upper case characters : 3 No. of Lower case Characters : 1	CO 2
89	Write a Python function that takes a number as a parameter and check the number is prime or not.	CO 2

90	Write a Python function that checks whether a passed string is palindrome or not.	CO 2
91	Python function to convert height (in feet and inches) to centimeters	CO 2
92	Python function to Convert Celsius to Fahrenheit.	CO 2
93	Implement a function to check if two strings are anagrams of each other.	CO 2
94	Python function to display all the Armstrong number from 1 to n.	CO 2
95	Write a program using recursion to compute factorial of a given number.	CO 2
96	Write a program to print Fibonacci Series using recursion.	CO 2
97	Write a program to calculate sum of numbers 1 to N using recursion.	CO 2
98	Write a program to Find Sum of Digits of the Number using Recursive Function.	CO 2
99	Write a program to print Tower of Hanoi using recursion.	CO 2
100	Python Program to Determine How Many Times a Given Letter Occurs in a String Recursively	CO 2
101	Python Program to Find the Binary Equivalent of a Number Recursively	CO 2
102	WAP to compute the sum of all the elements of the list using reduce() function.	CO 2
103	Write a program to create a module and import the module in another python program.	CO 2
104	Write a program program to import all objects from a modules, specific objects from module and provide custom import name to the imported object from the module.	CO 2
105	Create a python package having atleast two modules in it.	CO 2
106	Create a python package having atleast one subpackage in it.	CO 2
107	WAP to Show the concept of inner function.	CO 2

108	WAP to create closure.	CO 2
109	WAP to create a decorator which will convert a string into upper case string.	CO 2
110	WAP to show the concept of nested decorator.	CO 2
111	WAP to calculate sum of 1,2,3,4,5 using reduce function.	CO 2
112	WAP to generate numbers from 1 to 10 using generator.	CO 2
113	WAP to decide number is even or odd using generator.	CO 2
114	WAP to generate square of 1,2,3,4,5,6,7,8,9,10 using generator.	CO 2
115	WAP to generate square of even number upto 10 using generator and save in list.	CO 2
116	WAP to make a co-routine which will print all name with prefix Dear.	CO 2
117	WAP to close a co-routine.	CO 2
118	WAP to iterate tuple using iter() and next() method.	CO 2
119	WAP to iterate a string using iter and next method.	CO 2
120	Write a program illustrating class definition and accessing class members.	CO 3
121	Write a program to implement default constructor, parameterized constructor, and destructor.	CO 3
122	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.	CO 3
123	Create a class called Numbers, which has a single class attribute called MULTIPLIER, 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. b. Write a class method called multiply, which takes a single number parameter a and returns the product of a	CO 3

	and MULTIPLIER.	
124	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. b. Write a method called display to display student information.	CO 3
125	Write a program that has a class called Fraction with attributes numerator and denominator. a. Write a method called getdata to enter the values of the attributes. b. Write a method show to print the fraction in simplified form.	CO 3
126	Write a program that has a class Numbers with a list as an instance variable. Write a method called insert_element that takes values from user. Write a class method called find_max to find and print largest value in the list.	CO 3
127	Create a class called Complex. Write a menu driven program to read, display, add and subtract two complex numbers by creating corresponding instance methods.	CO 3
128	Write a program that has a class Point with attributes x and y. a. 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.	CO 3
129	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.	CO 3
130	Implement a Python class called "BankAccount" with attributes account number, account holder name, and balance. Include methods to deposit and withdraw money from the account.	CO 3
131	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.	CO 3

132	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.	CO 3
133	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)	CO 3
134	Write a program to create class Employee. Display the personal information and salary details of 5 employees using single inheritance.	CO 3
135	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.	CO 3
136	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.	CO 3
137	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.	CO 3
138	Write a program to compare two-person object based on their age by overloading > operator.	CO 3
139	Write a program to overload in operator.	CO 3
140	Python program to check whether the string is Symmetrical or Palindrome	CO 4
141	Ways to remove i'th character from string in Python	CO 4
142	Python program to Check if a Substring is Present in a Given String	CO 4

143	Python program to print even length words in a string	**CO 4**
144	Python program to accept the strings which contains all vowels	**CO 4**
145	Remove all duplicates from a given string in Python	**CO 4**
146	Python Program to Form a New String where the First Character and the Last Character have been Exchanged	**CO 4**
147	Python Program to Count the Number of Vowels in a String	**CO 4**
148	Python Program to Take in a String and Replace Every Blank Space with Hyphen	**CO 4**
149	Python Program to Calculate the Length of a String Without Using a Library Function	**CO 4**
150	Python Program to Remove the Characters of Odd Index Values in a String	**CO 4**
151	Python Program to Calculate the Number of Words and the Number of Characters Present in a String	**CO 4**
152	Python Program to Take in Two Strings and Display the Larger String without Using Built-in Functions	**CO 4**
153	Python Program to Check if a String is a Pangram or Not (A pangram is a sentence that uses all 26 letters of the English alphabet at least once. like" The quick brown fox jumps over the lazy dog")	**CO 4**
154	Python Program to Accept a Hyphen Separated Sequence of Words as Input and Print the Words in a Hyphen-Separated Sequence after Sorting them Alphabetically-	**CO 4**
155	Python Program to Form a New String Made of the First 2 and Last 2 characters From a Given String	**CO 4**
156	Python Program to Count the Occurrences of Each character in a Given String Sentence	**CO 4**
157	Python Program to Check if a Substring is Present in a Given String	**CO 4**
158	Python Program to Find the Most Repeated Word in a String.	**CO 4**

159	Write a python program to check the validity of a password given by the user. The password should satisy the following criteria: i) Contain atleast 1 letter between a and z. ii) Contain atleast 1 number between 0 and 9. iii) Contain atleast 1 letter between A and Z. iv) Contain atleast 1 character from $,#,@. v) Maximum length of password 6. Maximum length of password:12.	CO 4
160	Write a python program to validate mobile number.	CO 4
161	Program to interchange first and last elements in a list	CO 4
162	WAP to find min, max and average of elements of a list having numeric data	CO 4
163	Program to check if element exists in list	CO4
164	Program for Reversing a List	CO 4
165	Program to Multiply all numbers in the list	CO 4
166	Program to find smallest and largest number in a list	CO4
167	Program to find second largest number in a list	CO 4
168	Program to print all even numbers in a range	CO 4
169	Program to print all negative numbers in a range	CO4
170	Program to Remove multiple elements from a list in Python	CO 4
171	Program to Cloning or Copying a list	CO 4

172	Program to Count occurrences of an element in a list	CO 4
173	Program to find Cumulative sum of a list	CO 4
174	Program to Break a list into chunks of size N in Python	CO 4
175	Python Program to transpose of Matrix.	CO 4
176	Python Program to Add and Multiply Two Matrices.	CO 4
177	Program to get Kth Column of Matrix	CO 4
178	WAP to print all even numbers of a list using list comprehension.	CO 4
179	WAP that prompts user to enter an alphabet and then print all the words that starts with that alphabet from the list of words.	CO 4
180	Write a program to calculate square of numbers upto n using list comprehension.	CO 4
181	Python program to Find the size of a Tuple	CO4
182	Python – Maximum and Minimum Kth elements in Tuple	CO 4
183	Create a list of tuples from given list having number and its cube in each tuple	CO 4
184	Python – Flatten tuple of List to tuple	CO4
185	Python Program to Count the Number of Vowels Present in a String using Sets	CO 4
186	Python Program to Check Common Letters in Two Input Strings	CO 4
187	Python Program that Displays which Letters are in the First String but not in the Second	CO4
188	Python Program to Add a Key-Value Pair to the Dictionary	CO 4
189	Python Program to Concatenate Two Dictionaries into One.	CO 4

190	Python Program to Check if a Given Key Exists in a Dictionary or Not	CO 4
191	Python Program to Generate a Dictionary that Contains Numbers (between 1 and n) in the Form (x,x*x).	CO 4
192	Python program to create an instance of an Ordered dict using a given dictionary. Sort the dictionary during the creation and print the members of the dictionary in reverse order.	CO 4
193	Python Program to Sum All the Items in a Dictionary	CO 4
194	WAP to create dictionary which has characters of given string as keys and frequency of characters as values.	CO4
195	Python Program to Map Two Lists into a Dictionary	CO 4
196	Write a program Filtering even numbers from a list using tuple comprehension	CO 4
197	Creating a list of tuples from two lists using comprehension function	CO4
198	Extracting the first character from each word in a list of strings	CO 4
199	Swapping keys and values in a dictionary	CO 4
200	Filtering even numbers from a dictionary:	CO4
201	Write a Program to calculate square of number using dictonary comprehension	CO 4
202	Python program to read file word by word	CO 4
203	Python program to read character by character from a file	CO 4
204	Python – Get number of characters, words, spaces and lines in a file	CO 4
205	Program to Find 'n' Character Words in a Text File	CO 4
206	Python Program to obtain the line number in which given word is present	CO 4
207	Count number of lines in a text file in Python	CO4

208	Python Program to remove lines starting with any prefix	CO 4
209	Python Program to Eliminate repeated lines from a file	CO 4
210	Python Program to read List of Dictionaries from File	CO4
211	Python – Append content of one text file to another	CO 4
212	Python program to copy odd lines of one file to other	CO 4
213	Python Program to merge two files into a third file	CO4
214	Python program to Reverse a single line of a text file	CO 4
215	Python program to reverse the content of a file and store it in another file	CO 4
216	Python Program to handle divide by zero exception.	CO 4
217	WAP to handle multiple exception.	CO 4
218	Python program to combine each line from first file with the corresponding line in second file.	CO 4
219	Write a program to copy the contents of one file to another.	CO 4
220	Write a program to print First 5 line in a file	CO4
221	a) Write a program to catch the following exception: i) Value error ii) Index error iii) Name error iv) Type error v) Divide zero error b) Write a program to create user defined exceptions.	CO 4

	c) Write a program to understand the use of else and finally block with try block. d) Write a python program that uses raise and exception class to throw an exception.	
222	Hello World: Display a simple "Hello, World!" message box.	CO 5
223	Button: Create a button that displays a message when clicked.	CO5
224	Entry: Create a text entry field and display the entered text.	CO 5
225	Check button: Create a checkbox and display the selected options	CO 5
226	Radio button: Create radio buttons and display the selected option.	CO5
227	List box: Create a list box and display the selected items.	CO 5
228	Text: Create a text area and display the entered text.	CO 5
229	Menu: Create a menu with different options.	CO 5
230	Message: Display a message in a dialog box.	CO 5
231	Progress bar: Create a progress bar that updates over time python	CO5
232	Scale: Create a scale widget and display the selected value.	CO 5
233	Spin box: Create a spin box and display the selected value.	CO 5
234	Canvas: Create a canvas and draw shapes on it.	CO5
235	Label Frame: Create a labeled frame with widgets inside.	CO 5
236	Scrollbar: Add a scrollbar to a widget like a text area or list box	CO 5
237	Frame: Create a frame and place widgets inside it.	CO 5
238	Tree view: Create a tree view widget to display hierarchical data	CO 5

239	Notebook: Create a notebook widget with tabs.	CO5
240	File Dialog: Open a file dialog to select a file.	CO 5
241	Color Dialog: Open a color dialog to select a color.	CO 5
242	Button Counter: Create a button that increments a counter when clicked.	CO5
243	Checkbox List: Display a list of checkboxes and show selected options.	CO 5
244	Dropdown Menu: Create a dropdown menu with multiple options.	CO 5
245	Slider Value Display: Display the current value of a slider widget.	CO 5
246	Text Input and Button: Take user input in a text box and display it when a button is clicked.	CO 5
247	Radio Buttons: Present a set of options as radio buttons and display the selected option.	CO5
248	Progress Bar: Show the progress of a task using a progress bar widget.	CO 5
249	Password Input: Create a password input field that hides the entered characters.	CO 5
250	File Uploader: Enable users to upload files and display the selected file name.	CO5
251	Creating Arrays: Create NumPy arrays using various methods like np.array(), np.zeros(), np.ones(), np.arange(), etc.	CO 5
252	Array Shape and Size: Get the shape and size of a NumPy array using the shape and size attributes.	CO 5
253	Array Indexing: Access and modify individual elements of a NumPy array using indexing	CO 5
254	Array Slicing: Extract a subset of elements from a NumPy array using slicing.	CO 5
255	Array Reshaping: Change the shape of a NumPy array using the reshape() function.	CO5
256	Array Arithmetic: Perform basic arithmetic operations (addition, subtraction, multiplication, division) on NumPy arrays.	CO 5

257	Array Broadcasting: Perform element-wise operations on arrays with different shapes using broadcasting rules.	CO 5
258	Array Aggregation: Calculate aggregate values on arrays, such as sum(), min(), max(), mean(), etc. using NumPy	CO5
259	Array Transposition: Transpose a NumPy array using the transpose() function.	CO 5
260	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.	CO 5
261	Array Sorting: Sort the elements of a NumPy array using the sort() function.	CO 5
262	Array Filtering: Filter elements in a NumPy array based on a condition using boolean indexing.	CO 5
263	Array Statistics: Calculate statistical measures like mean, median, standard deviation using functions like np.mean(), np.median(), np.std().	CO5
264	Array Randomization: Generate random numbers or arrays using functions from the np.random module.	CO 5
265	Array Dot Product: Compute the dot product of two NumPy arrays using the dot() function.	CO 5
266	Array File I/O: Save and load NumPy arrays from files using functions like np.save() and np.load().	CO5
267	Read and Load a CSV File into a Pandas DataFrame using pandas.read_csv.	CO 5
268	Access and Display the First N Rows of a DataFrame using DataFrame.head(N).	CO 5
269	Access and Display the Last N Rows of a DataFrame using DataFrame.tail(N).	CO 5
270	Retrieve Basic Information about a DataFrame using DataFrame.info.	CO 5
271	Perform Descriptive Statistics on a DataFrame using DataFrame.describe.	CO5
272	Filter Rows of a DataFrame based on a Condition using Boolean Indexing.	CO 5
273	Rename Columns in a DataFrame using DataFrame.rename.	CO 5

274	Group Data in a DataFrame using DataFrame.groupby.	CO5
275	Perform Aggregation on Grouped Data using GroupBy.agg.	CO 5
276	Sort a DataFrame by One or Multiple Columns using DataFrame.sort_values.	CO 5
277	Perform Basic Arithmetic Operations on Columns of a DataFrame.	CO 5
278	Apply a Function to Each Element or Column of a DataFrame using DataFrame.apply or DataFrame.applymap.	CO 5
279	Reshape Data using Pivot Tables using DataFrame.pivot_table.	CO5
280	Perform Data Visualization using pandas.plotting or matplotlib.pyplot.	CO 5
281	Save a DataFrame to a CSV File using DataFrame.to_csv.	CO 5
282	Create a Simple Line Plot using matplotlib.pyplot.plot.	CO5
283	Create a Scatter Plot using matplotlib.pyplot.scatter.	CO 5
284	Create a Bar Chart using matplotlib.pyplot.bar.	CO 5
285	Create a Histogram using matplotlib.pyplot.hist.	CO 5
286	Create a Pie Chart using matplotlib.pyplot.pie.	CO 5
287	Create a Box Plot using matplotlib.pyplot.boxplot.	CO5
288	Create a Heatmap using matplotlib.pyplot.imshow.	CO 5
289	Customize Plot Labels and Titles using matplotlib.pyplot.xlabel, matplotlib.pyplot.ylabel, and matplotlib.pyplot.title.	CO 5
290	Customize Plot Colors, Line Styles, and Marker Styles using matplotlib.pyplot.plot parameters.	CO 5
291	Add Gridlines to a Plot using matplotlib.pyplot.grid.	CO 5

292	Add Legends to a Plot using matplotlib.pyplot.legend.	CO5
293	Create Subplots using matplotlib.pyplot.subplots.	CO 5
294	Save a Plot as an Image File using matplotlib.pyplot.savefig.	CO 5
295	Create 3D Plots using mpl_toolkits.mplot3d module.	CO 5
296	Create Error Bars on a Plot using matplotlib.pyplot.errorbar.	CO 5
Required Software and Tools		

1. Jupyter Notebook
2. Anaconda
3. NumPy

Subject Name: Personality Development and Professional Skills					L-T-P [0-0-2]	
Subject Code: BMCA0155					Applicable in Department: MCA	

Pre-requisite of Subject: Basic understanding and foundational knowledge of general communication skills

Course Objective: The primary objective of this course is to equip students with the essential personal and professional skills required to excel in the modern workplace

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1 Develop self-awareness, set personal goals, and manage time and stress effectively	**K1, K2**
CO2 Communicate effectively, work well in teams, and practice professional etiquette in various settings.	**K3, K4**
CO3 Enhance quantitative, logical, and verbal reasoning skills for effective problem-solving and decision-making	**K3,K4**
CO4 Create impactful resumes, perform confidently in interviews and group discussions, and develop critical soft skills	**K6**
CO5 Apply project management principles, understand financial literacy, and demonstrate ethical behavior and digital professionalism	**K3**

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Foundations of Personal Development	**Self-Awareness and Self-Improvement** **Self-Assessment Tools**: Myers-Briggs Type Indicator (MBTI), StrengthsFinder. **Goal Setting**: SMART Goals, Personal Development Plans. **Time Management**: Prioritization, Scheduling, Avoiding Procrastination. **Stress Management**: Techniques for Managing Stress, Mindfulness, and Relaxation Exercises.	Lectures, PPTs and Notes	8L		CO 1

		Content	Methods				
		Communication Skills **Verbal Communication**: Public Speaking, Group Discussions, Debating. **Non-Verbal Communication**: Body Language, Eye Contact, Gestures. **Listening Skills**: Active Listening, Feedback Techniques. **Presentation Skills**: Creating Effective Presentations, Using Visual Aids, Storytelling					
II	Interpersonal and Professional Skills	**Interpersonal Skills, Teamwork**: Role of a Team Player, Group Dynamics, Conflict Resolution, **Leadership Skills**: Leadership Styles, Motivating Team Members, Decision Making. **Networking Skills**: Building Professional Relationships, Networking Strategies, Use of Social Media, **Professional Etiquette, Corporate Etiquette**: Professional, Behavior, Office Etiquette, Business Meetings. **Email Etiquette**: Professional Email Writing, Common Mistakes to Avoid. **Telephone Etiquette**: Handling Professional Calls, Voicemail Etiquette. **Dining Etiquette**: Business Dining Rules, Table Manners.	Lectures, PPTs and Notes	8L		CO 2	
III	Aptitude and Logical Reasoning	**Aptitude Skills**, **Quantitative Aptitude**: Basic Mathematics, Data Interpretation. **Logical Reasoning**: Analytical Puzzles, Logical Deductions. **Verbal Ability**: Grammar, Vocabulary, Reading Comprehension	Lectures, PPTs and Interactive Panel	8L		CO 3	
IV	Career Readiness and Interview Preparation	**Interview Preparation, Resume Writing**: Crafting an Effective Resume, Cover Letter Writing. **Mock Interviews:** HR Round, Technical Round, Stress Interviews. **Group Discussions:** Techniques to Excel, Common Topics, Role of a Moderator, **Personal Interview Tips:** Dressing for Success, Answering Common Questions, Handling Unexpected Questions, Soft Skills Development, **Creativity and Innovation:** Brainstorming Techniques, Creative Problem Solving. **Emotional Intelligence:** Understanding Emotions, Empathy, Handling Relationships. **Adaptability and Flexibility:** Coping with Change, Learning Agility. **Critical Thinking:** Evaluating Information, Problem-Solving Strategie	Lectures and Hands on	8L		CO 4	

V	Practical Workplace Skills and Ethics	**Digital Literacy and Online Presence**, **Professional Use of Social Media**: LinkedIn Profile Optimization, Building an Online Portfolio. **Cyber Etiquette**: Safe Online Practices, Digital Footprint Management. **Blogging and Content Creation**: Writing for the Web, Creating Engaging Content, **Workplace Skills**, **Project Management**: Basics of Project Management, Tools like MS Project, Agile Methodology. **Time and Task Management Tools**: Using Tools like Trello, Asana, and Calendar Apps. **Financial Literacy**: Basic Financial Planning, Understanding Salaries, Taxes, **Ethics and Values**, **Workplace Ethics**: Integrity, Accountability, Professional Conduct. **Diversity and Inclusion**: Understanding Diversity, Promoting Inclusivity, **Corporate Social Responsibility (CSR)**: Understanding CSR, Participating in CSR Activities	Lectures and Hands on	8L		CO 5
		Total		40L		

Textbooks	
Sr No	Book Details
1	Stephen R. Covey, "The 7 Habits of Highly Effective People", SIMON & SCHUSTER, 2020
2	Dr. R.S. Aggarwal "A Modern Approach to Verbal & Non-Verbal Reasoning", S. Chand, 2022

Links	
Sr. No	Details
1	https://www.youtube.com/watch?v=sO8eGL6SFsA&pp=ygUoU29mdHdhcmUgVGVzdGluZyBhbmQgQXBwbGljYXRpb25zIGNvdXJzZQ%3D%3D

2	https://www.youtube.com/watch?v=sbW4RThXNL8&pp=ygUoU29mdHdhcmUgVGVzdGluZyBhbmQgQXBwbGljYXRpb25zIGNvdXJzZQ%3D%3D
3	https://www.youtube.com/watch?v=xOB5ftSEv0c&list=PLrpK1inhO61VDiW_RBhkizmTYyUE0eoAF&pp=iAQB
4	https://youtu.be/zEgVjx85lWs

Operating Systems Lab BMCA0153	L-T-P [0-0-4]

Lab Experiments

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 Outcomes (CO)

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1	Implement Linux commands to understand the concept of virtualization	K4
CO 2	Solve the real-world problems using shell programming and shell scripting.	K5
CO 3	Analyze process management and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.	K5
CO 4	Implement Process Synchronization and analyze deadlock handling techniques.	K5
CO 5	Simulate the continuous and non-continuous memory allocation concepts and analyze disk scheduling algorithms.	K5

List of Practicals

Sr No	Program Title	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	CO 1

2	Status Alter Commands: chgrp command, chown command & chmod command	CO 1
3	Compile Commands: cc command	CO 1
4	Process Commands: ps command, kill command	CO 1
5	Miscellaneous Commands: Echo command, cal command, date command, whoami command, expr command & test command	CO 1
6	Filter Commands: cut command, paste command, head command & tr command	CO 1
7	Write a program to create a child process and print the process ids of parent and child process	CO 2
8	Write a Shell program to check the given number is even or odd.	CO 2
9	Write a Shell program to find the factorial of a number	CO 2
10	Write a Shell program to swap the two integers.	CO 2
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.	CO 2
12	Write a shell script to reverse the digits of a number.	CO 2
13	Write a shell script to compute the sum of digits.	CO 2
14	Write a shell script to convert the contents of files to uppercase, given multiple files on command line.	CO 2
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.	CO 2
16	Write a shell script to print a word n times. Taking the n and the word from command line.	CO 2
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.	CO 2
18	Write a shell script to delete all lines containing the word "unix" from all files provided as command line arguments.	CO 2
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.	CO 2

20	Write a shell script to sort the numbers provided as command line arguments in a descending order.	CO 2
21	Write a shell script to count the number of negative and positive numbers provided as command line arguments.	CO 2
22	Write a shell Script to Concatenate two Strings.	CO 2
23	Write a shell script to print Fibonacci series.	CO 2
24	Write a shell script to find whether a number is leap year or not.	CO 2
25	Write a shell script to find whether a number is prime or not.	CO 2
26	Write a program Using First-Come, First-Served (FCFS) Scheduling to find average turnaround time and average waiting time.	CO 3
27	Write a program Using SJF CPU scheduling algorithm to find average turnaround time and average waiting time.	CO 3
28	Write a program Using Priority CPU scheduling algorithm to find average turnaround time and average waiting time.	CO 3
29	Write a program Using Round Robin scheduling to calculate average turnaround time and average waiting time.	CO 3
30	Write a Program to execute Race Condition of Process Synchronization.	CO 4
31	Write a program to implement Producer Consumer Problem.	CO 4
32	Write a Program to Implement Dinning Philosophers Problem.	CO 4
33	Write a Program to Implement Banker's Algorithm	CO 4
34	Write a Program to Implement FIRST FIT Memory Allocation.	CO 5
35	Write a Program to Implement BEST FIT Memory Allocation.	CO 5
36	Write a Program to Implement WORST FIT Memory Allocation.	CO 5
37	Write a Program to Implement FIFO Page Replacement Algorithm.	CO 5
38	Write a Program to Implement LRU Page Replacement Algorithm.	CO 5
39	Write a Program to Implement Optimal Page Replacement Algorithm.	CO 5

40	Write a Program to Implement FCFS Disk Scheduling Algorithm.	**CO 5**
41	Write a program to Implement SSTF Disk Scheduling Algorithm.	**CO 5**
42	Write a Program to Implement SCAN Disk Scheduling Algorithm.	**CO 5**
43	Write a Program to Implement CSCAN Disk Scheduling Algorithm.	**CO 5**
44	Write a Program to Implement LOOK Disk Scheduling Algorithm.	**CO 5**
45	Write a Program to Implement CLOOK Disk Scheduling Algorithm.	**CO 5**
Required Software and Tools		

1. LINUX (Open Source)
2. Jupyter Notebook
3. Anaconda
4. NumPy

Computer System & Organization Lab BMCA0156	L-T-P [0-0-2]
Lab Experiments	

Course Objective: Students will gain practical experience with designing and implementing concepts of gates , Multiplexer, Flip Flops, 8085 microprocessor	

Course Outcomes (CO)	

Course outcome: After completion of this course students will be able to:	**Bloom's Knowledge Level(KL)**
CO 1 Design and verify logic gate	**K1, K2, K3**
CO 2 Design and verify and implement combinational circuit: Half adder, Full adder, Half subtractor, Full subtractor, Code convertor	**K1, K2, K3**
CO 3 Design and implement Decoder, Multiplexer	**K1, K2, K3**
CO 4 Demonstrate the working of flip-flops	**K1,K2**
CO 5 Demonstrate the working of 8085 microprocessor	**K1,K2**

List of Practicals		
Sr No	**Program Title**	**CO Mapping**
1	Verification of the functionality of all logic gates.	CO 1
2	Implementing HALF ADDER, FULL ADDER using basic logic gates.	CO 2
3	Implementing HALF SUBTRACTOR, FULL SUBTRACTOR using basic logic gates.	CO 2

4	Implementing Binary -to -Gray, Gray -to -Binary code conversions.	**CO 2**
5	Implementing 3-8 line DECODER.	**CO 3**
6	Implementing 4x1 and 8x1 MULTIPLEXERS.	**CO 3**
7	Verify the excitation tables of various FLIP-FLOPS.	**CO 4**
8	Introduction of 8085 microprocessor.	**CO 5**
9	Write a program to add two 8-bit hexadecimal numbers in 8085 microprocessor.	**CO 5**
10	Write a program to subtract two 8-bit hexadecimal numbers in 8085 microprocessor	**CO 5**

Required Software and Tools

Hardware : Breadboard, IC 7408, IC 7432, IC 7404, IC 7400, IC 7402, IC 7486

Software: 8085 microprocessor programming kit

Workplace Communication Competence 1- Lab BMCA0151NX	L-T-P [0-0-4]

Lab Experiments

Course Objective:

- To improve proficiency in the English language to the lower intermediate level of CEFR (Common European Framework of Reference).
- To impart business communication skills.
- To motivate students to look within and create a better version of 'self.'
- To introduce the key concepts of ethics, etiquette, and life skills.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1 Identify key concepts of life-skills	**K3**
CO 2 Develop effective listening skills	**K3**
CO 3 Compose clear and concise statements on a variety of subjects	**K6**
CO 4 Understand and analyze simple written texts	**K2, K4**
CO 5 Demonstrate clarity while writing	**K3**

List of Practicals

Sr No	Program Title	CO

		Mapping
1	The students will be familiarised with the examination pattern. Getting rid of stage fright and developing a sense of freedom and creativity	CO1
2	The students will be able to understand the meaning of messages conveyed using body language (through videos & games like Dumb Charades).	CO1
3	The students will practice greeting the peers and building rapport with the people around.	CO1
4	Developing active listening and accurate communication skills. Students will practice conveying information accurately and understand the importance of clear communication (through activities like Chinese whisper).	CO3
5	Students will enhance their reading comprehension abilities, improve vocabulary and language skills, and develop strategies for efficient and effective reading.	CO4
6	The students will practice and learn outcome-based writing	CO5
7	The students will practice professional introductions.	CO3
8	The students will learn to comprehend verbal instructions, pay attention to detail, and develop the ability to follow multi-step directions accurately.	CO2

9	The students will practice retention of the information given verbally and re-produce it through speaking.	CO3
10	Develop critical thinking skills, analyze the effectiveness of communication practices, and gain insights into real-world communication challenges and their solutions	CO4
11	Participants will be exposed to General Service List (GSL) by West and Academic Word List (AWL); the students will be asked to keep a journal of new words learnt every day.	CO1
12	The students will practice basic writing skills through sentence construction by understanding the requisites of a good sentence.	CO5
13	The students will practice listening to statements and writing exactly what they hear.	CO5
14	The students will practice responding effectively to queries/questions related to general everyday subjects (customer care, delivery agents, outlets etc.)	CO3
15	The students will be able to remove verbosity from their language. Students will participate in activities based on sample sentences and paragraphs.	CO1
16	Participants will listen to their peers reading aloud and write down the gist; and will repeat verbatim what is read.	CO2
17	Students will listen to the motivational speech by Dr A. P. J. Abdul Kalam and reflect on it.	CO2
18	Students will pair up and have short conversations with each other extracting specific information.	CO3
19	Students will learn to give directions, develop spatial awareness, and improve their navigational skills.	CO3

20	Students will learn to speak with confidence in public, using various verbal and non-verbal aspects of speech. Students will gain awareness of speaking in a professional environment and enhance their overall communication in English	CO3
21	To foster critical thinking, encourage creativity and expression, promote media literacy, and create an enjoyable learning experience by writing reviews.	CO5
22	Engaging in realistic scenarios, students will develop their communication abilities, cultural awareness, confidence, and proficiency in the target language.	CO3
23	Students will develop the ability to express their opinions, actively listen to others, and engage in constructive group discussions to develop well-rounded perspectives.	CO3
24	The students will share their key learnings from the course.	CO3
Required Software and Tools		
British Council English Score Mobile App		

Subject Name: Database Systems	L-T-P [3-0-0]
Subject Code: BMCA0202Z	Applicable in Department: MCA

Pre-requisite of Subject: Students are expected to be familiar with Basics of Mathematics and Computer Science.

Course Objective: To Introduce about database management systems, with an emphasis on how to organize, maintain andretrieve - 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)
CO 1 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.	**K6**
CO3 Implement the operators in complex queries and apply database connectivity for different applications.	**K6**
CO4 Discuss PL/SQL and analyze transaction and concurrency control in transaction management.	**K3**
CO5 Design and implement relational and non-relational database for the need of the real-world project.	**K2**

Syllabus						
Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**
1 Introduction of Databa	**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,	Lectures, PPTs and Interactive Panel		Assignment	**CO 1**

se & Conceptual Designing	Data models & Types of Data Models	Relational Database: Relation, Tuple, Attribute and Domain, Codd Rules, Design & Implement the ERDiagram:	Lectures, PPTs and Interactive Panel	8L+4P	Assignment	CO 1
	Data Modelling using the Entity Relationship Model	ER model concepts, Degree of relationship, Notations for ER diagram, mapping constraints, reduction of ER diagrams to tables. Extended EntityRelationship Diagram & reductionof EER diagram to tables.	Lectures, PPTs and Interactive Panel		Experiment/Program 1-4	CO 1
	Introduction on SQL	Implementsthe DDL, DML, DCL & TCL: Introduction on SQL & Types ofSQL commands: -DDL, DML, DCL, TCL.	Lectures, PPTs and Interactive Panel		Experiment/ Program 5-6,8	CO 1
	Introduction on Relational Algebra& relational Calculus:	Basic of Relation Algebra andRelational calculus	Lectures, PPTs and Interactive Panel		Assignment	CO 1
II Basic of SQL & Normalization	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	Lectures, PPTs and Interactive Panel	8L+4P	Assignment	CO 2
	Implementation of Data Constraint	Data Constraint: - Null, Not Null,Default and check Constraint	Lectures, PPTs and Interactive Panel		Experiment/ Program 7	CO 2
	Implementation of Aggregate function& clause	Use of Aggregate Function: -Min (), Max (), Count (), AVG (), Sum ().Use of Clause: Where, Group by,Having and Order by	Lectures, PPTs and Interactive Panel		Experiment/ Program 9	CO 2
	Understand & Implement the normalization	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.	Lectures, PPTs and Interactive Panel		Experiment/ Program 10	CO 2

	anddifferent types of functions in SQL:	Minimal Cover of FD's, Closure of an attribute, Lossless join decomposition				
III Introduction of Complex Queries	**Operator & Predicates**	Operator & Predicates: - Like, Between, Aliases, Distinct, Limit,,	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 12	**CO 3**
	Implementation of Logical operator	And, Or, Not.	Lectures, PPTs and Interactive Panel		Experiment/ Program 12	**CO 3**
	Set Theory Operator	Basic Set Operators: Selection, projection, rename, cross product, union, set difference	Lectures, PPTs and Interactive Panel		Experiment/ Program 14-15	**CO 3**
	Derived Operators	Intersection, Division, Join. Inner Join: - NaturalJoin, Equi Join & Non Equi Join Outer Join: - Left Outer Join, RightOuter Join and Full Outer Join.	Lectures, PPTs and Interactive Panel		Experiment/ Program 13	**CO 3**
	Nested Query	Nested Query, Sub Query or Corelated Query: -IN, NOT IN, Exists, Not Exists, All, Any	Lectures, PPTs and Interactive Panel		Experiment/ Program 11, 16	**CO 3**
	Understand & Implementation the database connectivity	Database connectivity with Java or Python	Lectures, PPTs and Interactive Panel		Experiment/ Program 24	**CO 3**
IV Introduction of	**Implementation index, Views and Array**	Managing Indexes, Synonyms and Sequences, Managing Views, Managing Data in Different Time Zones	Lectures, PPTs and Interactive Panel		Experiment/ Program 17-18	**CO 4**

PL/SQL and Transaction & Concurrency control	**Implementation ofPL/SQL**	Introduction of PL/SQL, Implementation of PL/SQL Function Procedure, Trigger, Cursor	Lectures, PPTs and Interactive Panel		Experiment/ Program 19-22	**CO 4**
	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	Lectures, PPTs and Interactive Panel	8L+4P	Assignment	**CO 4**
	Transaction & Data Control	Grant, Revoke, commit & Rollback	Lectures, PPTs and Interactive Panel		Experiment/ Program 8	**CO 4**
V Introductionof NoSQL with MongoDB	**Understand NoSQL Concept and implement the CURD operations**	Introduction of NoSQL Data Models: Document, Key Value, Column family, Graph. Overview of NoSQL Databases With their Types, Uses& Features of NoSQL Document Databases. CAP theorem, BASE Vs ACID.	Lectures, PPTs and Interactive Panel		Assignment	**CO 5**
	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	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 23	**CO 5**
	Relation and Aggregation in MongoDB	MongoDBCursor & Methods, Relations inMongoDB, Aggregation in \MongoDB	Lectures, PPTs and Interactive Panel		Experiment/ Program 23	**CO 5**
	Understand the concept of cloud database	Introduction of Cloud Database. MongoDB Cloud: - Atlas, Cloud Manager.	Lectures, PPTs and Interactive Panel		Experiment/ Program 25	CO 5
Total				**40L+20P**		

	Textbooks
Sr No	**Book Details**
1	Korth, Silbertz, Sudarshan," Database System Concepts", Seventh Edition, McGraw - Hill.(2019)
2	Elmasri, Navathe, "Fundamentals of Database Systems", Seventh Edition Addison Wesley.(2017)
3	Ivan Bayross "SQL, PL/SQL The programming language of Oracle", Fourth Edition, BPB Publication. (2010)
4	Brad Dayley "NoSQL with MongoDB in 24 Hours" Sams Publishing; 1st edition (2014)

Reference Books:

	Reference Books
Sr No	**Book Details**
1	Thomas Cannolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Third Edition,Pearson Education, (2007)
2	Raghu Ramakrishan and Johannes Gehrke "Database Management Systems" Third Edition, McGraw-Hill (2002)
3	C J Date, "An Introduction to Database Systems", Eighth Edition , Pearson,. (2004)
4	NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software First Edition by Ted Hills. (2016)
	Links

S. No	Details
Unit 1	https://archive.nptel.ac.in/courses/106/106/106106220/
Unit 2	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
Unit 3	https://nptel.ac.in/courses/106106093
Unit 4	https://swayam-uat-node1.appspot.com/proc_9i/preview
Unit 5	https://www.udemy.com/course/sql-to-nosql-database-handson-with-mongodb/

Subject Name: Data Structures	L-T-P [3-0-0]
Subject Code: BMCA0205	**Applicable in Department:** MCA

Pre-requisite of Subject: Knowledge of programming languages, basics of mathematics, organizing and problem-solving ability.

Course Objective: Learn the basic concepts of algorithm analysis, along with implementation of linear and non- linear data structures.

Course Outcomes (CO)	

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO1	Describe the need of data structure and algorithms in problem solving and Analyse Time space trade-off.	**K4,K6**
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.	**K6**
CO5	Identify and analyse the computational efficiencies of searching and sorting algorithms in real world problems	**K2,K4**

Syllabus						
Unit No	**Module Name**	**Topic covered**	**Pedagogy**	**Lecture Required (L+P)**	**Practical/ Assignment/ Lab Nos**	**CO Mapping**
UNIT 1 **Introductio n to Data Structures**	**Data Types**	Types of Data Structures- Linear & Non-Linear Data Structures, List, Tuple, Set, Dictionary. Arrays: Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array	Lectures, PPTs, Notes	8L+4P	Assignment, Lab (1 to 10)	**CO1**
	Analysis of algorithms	Time and Space Complexity of an algorithm, Asymptotic notations (Big Oh, Big Theta and Big Omega).				
UNIT 2 **Stack & Queues**	**Stacks**	Primitive Stack operations: Push & Pop, mutual conversion of Infix, Prefix, Postfix, Evaluation of postfix expression	Lectures, PPTs,	8L+4P	Assignment, Lab (11 to 20)	**CO2**
	Recursion	Principles of recursion, Types of Recursions, Problem solving using iteration, Tower of Hanoi,Trade-offs between iteration				

		and recursion.	Notes			
	Queues	Operations on Queue: Create, Insert, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue.				
UNIT 3 Linked Lists	Linked lists	Linked lists: Comparison of Array, List and Linked list Types of linked list: Singly Linked List, Doubly Linked List, CircularLinked List, Polynomial Representation and Addition of Polynomials**.	Lectures, PPTs, Notes	8L+4P	Assignment, Lab (21 to 30)	CO3
UNIT 4 Trees	Trees	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.	Lectures, PPTs, Notes	8L+4P	Assignment, Lab (31 to 40)	CO4
UNIT 5 Graphs	Graphs	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	Lectures, PPTs, Notes	8L+4P	Assignment, Lab (41 to 53)	CO5
	Hashing	Sorting Algorithms. Hashing: Hash Functions, Collision-Resolution Techniques.				
Total				**40L+20P**		
Textbooks						
Sr No	**Book Details**					
1.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python(An Indian Adaptation)", Wiley Publication					
2.	Dr Shriram K. Vasudevan (Author), Mr Abhishek S. Nagarajan (Author), Prof Karthick Nanmaran (Author) "DATA STRUCTURES USING PYTHON" 12 March 2021, Oxford Higher Education, First Edition					

3.	Hemant Jain "Problem Solving in Data Structures & Algorithms Using Python" 1 January 2022, Third Edition

Reference Books	
Sr No	**Book Details**
1.	Kiran Gurbani, Krupa Kamdar "Data Structure (Mumbai University), Himalaya Publishing House.
2.	Harsh Bhasin (Author) "Data Structures with Python: Get familiar with the common
3.	Data Structures and Algorithms in Python", 1 May 2023, BPB Publication.
4.	Sanjay Patidar Upendra Singh Sumit Kumar Sharma "DATA STRUCTURES AND ALGORITHMS USING PYTHON " 13 April 2023, Notion Press

Links
https://nptel.ac.in/courses/106/106/106106127/ https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F
https://www.youtube.com/watch?v=4OxBvBXon5w&list=PLBF3763AF2E1C572F&index=22
https://www.youtube.com/watch?v=cR4rxllyiCs&list=PLBF3763AF2E1C572F&index=23 https://nptel.ac.in/courses/106/106/106106127/
https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24
https://www.youtube.com/watch?v=hk5rQs7TQ7E&list=PLBF3763AF2E1C572F&index=25
https://www.youtube.com/watch?v=KW0UvOW0XIo&list=PLBF3763AF2E1C572F&index=5

Subject Name: Design Thinking - I				L-T-P [3-0-0]	

Subject Code: BMCA0204				Applicable in Department: MCA	

Pre-requisite of Subject: Basic Knowledge of English

Course Objective: The objective of this course is to familiarize students with the design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite their minds to create innovative ideas as develop solutions for real-time problems.

Course Outcomes (CO)	

Course outcome: After completion of this course students will be able to:	**Bloom's Knowledge Level(KL)**
CO 1	Develop a strong understanding of the design process and apply it in a variety of business settings	K2,K3
CO2	Analyse self, culture, and teamwork to work in a multidisciplinary environment and exhibit empathetic behaviour	K3
CO3	Formulate specific problem statements of real-time issues and generate innovative ideas using design tools	K3,K6
CO4	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes	K3
CO5	Demonstrate an enhanced ability to apply design thinking skills for the evaluation of claims and arguments	K3,K4

Syllabus					

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Introduction	An overview of future skills, introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world.	Smartboard/ PPT/Text book/Refere nce book	10L	Practical Approach (Discussion and Activities), Workshop at School of Future Skills Activity related to	CO 1

					observation & team building exercise	
II	**Ethical Values and Empathy**	Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family, society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools- Interviews, empathy maps, emotional mapping, immersion and observations, Emotional Intelligence, customer journey maps, classifying insights after Observations, Classifying Stakeholders, Individual activity- 'Moccasin walk'	Smartboard /PPT/Text book/Refere nce book	8L	Practical Approach (Discussion and Activities)/ Assignment Activity related to Empathy Map and Journey Mapping	**CO 2**
III	**Problem Statement and Ideation**	Defining the problem statement, creating personas, Point of View (POV) statements. Research identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, Jam Board.	Smartboard /PPT/Text book/Refere nce book	8L	Practical Approach (Discussion and Activities)/ Assignment Activity related to Brainstorming and Six Thinking Hats	**CO 3**
IV	**Critical Thinking**	Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills- linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.	Smartboard /PPT/Text book/Refere nce book	8L	Practical Approach (Discussion and Activities)/Assign ment Activity related to identifying Biases	**CO 4**
V	**Logic and Argumentatio n**	The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams,	Smartboard /PPT/Text book/Refere	8L	Practical Approach (Discussion and	**CO 5**

		logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.	nce book		Activities)/Assignment	
		Total		**42L**		

	Textbooks

Sr No	Book Details
1	Arun Jain, UnMukt : Science & Art of Design Thinking, 2020, Polaris
2	Jeanne Liedta, Andrew King and Kevin Benett, Solving Problems with Design Thinking – Ten Stories of What Works,2013,Columbia Business School Publishing
3	RR Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, First Edition, 2009, Excel Books: New Delhi

Reference Books:

	Reference Books

Sr No	Book Details
1	Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2	Mootee, I. (2013). Design thinking for strategic innovation: What they can't teach you at business or design school. John Wiley & Sons.
3	Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4	Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

	Links
Unit 1	https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/ https://designthinking.ideo.com/ https://blog.hypeinnovation.com/an-introduction-to-design-thinking-for-innovation-managers https://www.creativityatwork.com/design-thinking-strategy-for-innovation/ https://www.youtube.com/watch?v=GFffb2H-gK0
Unit 2	https://aktu.ac.in/hvpe/ http://aktu.uhv.org.in/ https://nptel.ac.in/courses/110/106/110106124/ https://swayam.gov.in/nd1_noc19_mg60/preview
Unit 3	https://nptel.ac.in/courses/110/106/110106124/ https://swayam.gov.in/nd1_noc19_mg60/preview https://www.udemy.com/course/design-thinking-for-beginners/ https://www.designthinking-methods.com/en/ https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them
Unit 4	https://www.forbes.com/sites/sap/2016/08/25/innovation-with-design-thinking-demands-critical-thinking/#340511486908 https://www.criticalthinking.org/pages/defining-critical-thinking/766
Unit 5	https://www.udemy.com/course/critical-thinker-academy/ https://swayam.gov.in/nd2_aic19_ma06/preview
	List of Suggested projects: An indicative list of projects where you will have to be actively engaged in field work to interact with stakeholders & apply Design Tools, such as –
	Institutional Projects: 1. Improving canteen experience 2. Improving library usage by students 3. Facilitating interaction between students of diverse ethnic backgrounds 4. Making college campus plastic-free 5. Segregating different kind of domestic waste 6. Adopting to plastic-ban 7. How can we improve classroom experience of students? 8. How can we ensure better communication with our institution alumni?

Social Projects:

9. How can we ensure that clean drinking water is handled properly?

10. How might we feed everybody in the world?

11. How can we solve voters' dissatisfaction by changing the voting system?

12. How can we help the school drop-outs to continue the study?

13. How to solve issue of waste management?

14. How can we solve issue of insensitivity of peoples towards street animals?

15. How to solve the issue of gender inequality in society / college / schools?

16. How can we improve College Experiences and helping teachers?

17. How can we ensure secured financial transactions and minimize scams?

18. Facilitating Water Conservation in domestic households

19. Making the elderly adapt to mobiles/smartphones.

20. Use design thinking to use empty lot's in our neighborhood.

Or A project on the theme: teens, human rights, water, privacy, violence, equity, immigration, change with growth, food waste and robotics.

Industrial Projects:

21. Windsor Airline's consistent flight delays are hurting the company's bottom line. How might we ensure that Windsor Airlines flights leave on time.

22. Being part of an ever-connected society, many people in the Global North can barely fathom that still more than 1.5 billion people live off the grid. Instead of simply plugging in, they use kerosene lanterns that only illuminate spots in their home, walk miles to charge their mobile phones, or run a diesel genset for their business. How do you reinvent Solar Energy Supply for them?

23. NGO provides services and financial support to people with developmental disabilities. But for parents of children with disabilities, navigating the long and sometimes bewildering bureaucratic process required to get such services often challenges their patience and persistence. Before NGO can determine which services, if any, are best for a child, staffers conduct a thorough assessment that entails meetings with parents, home visits by social workers, and evaluations by medical professionals including speech pathologists, psychologists, and nurses. Design a process to ensure Better and faster Service.

24. A company wish to provide internet access to everyone. Design a low cost, easily applicable model.

25. Use 'design thinking' can help lose weight, stop worrying, and change life of peoples.

26. Assume you are called in to help the struggling community bank, with around 40 employees and six branches. You immediately noticed that all banks offered the same lousy experience: bland, boring, forgettable. Most banks offer the same products at basically the same rates, too. If Xling was able to come up with a great product, it would be copied by the bigger banks within days. What could you do to make the bank better?

27. Your city metro train service is facing issues of troublesome experiences of travelers. The team has notices that the queues often built up at the service Counters because customers asked the same simple questions again and again. How would you improve the

services.

28. Violent crime and the loss of young lives in assaults pose a frightening problem in many urban city districts. Use design thinking to find how to 'Designing Out Crime Research Center' as solution.

29. City Hospital simply wishes improving staff hand-washing habits could prevent these needless infections. While hospitals have plenty of communal sinks and hand-sanitizing dispensers, time-strapped caregivers simply don't use them, they noticed medical staff wiped their hands on their scrubs. Use design thinking to give solutions.

30. The Wiley produces traditionally crafted 'Dutch Wax Print' fabrics for Indian markets. Lately, the organization faces disrupted markets, competition, and Chinese counterfeit. Use design thinking to come up with a new vision to secure its future Or any of your Startup Idea as project

Subject Name: Fundamentals of Digital Marketing and Analytics	L-T-P [3-0-0]

Subject Code: BMCA0211	Applicable in Department: MCA

Pre-requisite of Subject: Students should be able to think creatively.

Course Objective: The course aims to equip learners with foundational skills in digital marketing and analytics, covering strategies, tools, metrics, and analytics techniques essential for effective digital marketing campaign planning, execution, and optimization.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Develop proficiency in interpreting marketing strategies in the digital age and provide fundamental knowledge for working in an online team	K2
CO2	Discuss various concepts of data analytics pipeline	K2
CO3	Evaluate the productivity of digital marketing channels for business success	K3
CO4	Prepare candidates for global exposure of digital marketing practices to make them employable in a high growth industry	K2
CO5	Learn data mining basic concepts and understand association rules mining.	K3

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Fundam entals of Digital	Fundamental s of Digital marketing	Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities, Gen Y & Netizen's expectation & influence with respect to Digital Marketing.	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 1-4	CO 1

marketing						
II **Introduction to Data Analytics**	**Introduction to Data Analytics**	Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics.	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 6	**CO 2**
	Data Analytics Lifecycle	Need, key roles for successful analytic projects, various phases of data analytics lifecycle discovery, data preparation, model planning, model building, communicating results, operationalization				
III **Prepare Data for Exploration and Stakeholder**	**Prepare Data for Exploration and Stakeholder**	Data analysts, balance needs and expectations, managing stakeholder expectations, communication with your team.	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 5,8	**CO 3**
	Datatypes and structures	Generate data, Collection of data, analysis for data, Bias, credibility, privacy, ethics, and access-data analysts work, data is unbiased and credible, different types of bias in data, importance of data ethics and data privacy.				
IV **Organizing and protecting your data**	**Organizing and protecting your data Databases**	Where data lives- databases, access them and extract, filter, and sort the data, metadata and its different types and how analysts use them	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 7	**CO 4**
	Organizing and protecting your data	Organizing data and keeping it secure, analysts use file naming conventions.				
	Engaging in the data community	How to manage your online presence, benefits of networking with other data analytics professionals				

V Introduction to Data Mining	Introduction to Data Mining	Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity- Basics.	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 9	CO 5
Total				**40L+20P**		

Textbooks	
Sr No	**Book Details**
1	Vandana, Ahuja, "Digital Marketing" ,Oxford University Press India(2015)
2	Eric Greenberg ,and Kates, Alexander; "Strategic Digital Marketing: Top Digital Experts Share the Formula for Tangible Returns on Your Marketing Investment" ;McGraw-Hill Professional (2013)
3	David Whiteley; "E-Commerce: Strategy, Technologies and Applications", McGraw Hill Education (2017)
4	Han, J., Pei, J., &Kamber, M. "Data mining: concepts and techniques". Elsevier (2011)

Reference Books	
Sr No	**Book Details**
1.	Richa Mishra, Dr. Nirvikar Katiyar, Apoorv Mishra; "Basics of Data Analytics ", Notion Press(2023)
2.	Richard Dorsey; "Data Analytics: Become a Master in Data Analytics ", CreateSpace Independent Publishing Platform(2017)
3.	Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar; "Introduction to Data Mining, 2e", Pearson (2021)

	Links
Sr No	**Details**
1	ht tps://www.youtube.com/watch?v=68B3N0x3cPI&list=PLbRMhDVUMnge625uLkVoqfS-uK-KJTBgp&index=1
2	https://www.youtube.com/watch?v=3iSKFCKLUsI&list=PLbRMhDVUMnge625uLkVoqfS-uK-KJTBgp&index=2
3	https://www.youtube.com/watch?v=67lO4HtJitg&list=PLbRMhDVUMnge625uLkVoqfS-uK-KJTBgp&index=8
4	https://www.youtube.com/watch?v=fYSvrZD4G38&list=PLbRMhDVUMnge625uLkVoqfS-uK-KJTBgp&index=14
5	https://www.youtube.com/watch?v=GauClv1HsZA&list=PLbRMhDVUMnge625uLkVoqfS-

Subject Name: Fundamentals of Digital Marketing and Optimization		L-T-P [3-0-0]
Subject Code: BMCA0212		Applicable in Department: MCA
Pre-requisite of Subject: Students are expected to be able to inspect any site and know the keyword of any site.		
Course Objective: Understand how digital and social media have disrupted the way businesses sell to consumers, help students to Recognize how marketers use the customer journey model to influence purchase decisions on digital platforms using digital content and tools, identify the benefits and advantages to a business of using social media to engage an audience, Build, manage, and sustain an active social media community. .		

Course Outcomes (CO)		

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Describe importance of digital marketing.	K2
CO2	Reorganize how marketers use Google SEO projects to influence purchasing and selling decisions on digital platforms using digital content and tools.	K1
CO3	Analize the benefits of integrating traditional and digital marketing with Google SEO for sells and purchasing marketing strategies.	K3
CO4	Analyse the benefits of search advertising for a business that uses social media to target an audience.	K3
CO5	Implement an active social media community by using social media advertising.	K3

Syllabus					
Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
I	Social Media and Digital Marketing Fundamental	Digital Marketing Landscape: Digital Consumer Behaviour, The Digital Customer Journey, The Digital Opportunity, Digital and Your Organization, Business Growth and Digital. Digital Marketing Principles: Key Digital Marketing Concepts, Traditional and Digital	Lectures, PPTs and Interactive Panel	8L+4P	Assignment/ Experiment 1	CO 1

		Marketing, 3i Principles, Integrating Traditional and Digital Marketing, Tools for Digital Marketing				
II	Social Media and Social Content Strategy	Content Marketing for Social: Content Marketing, Content Types, Social Media Platforms, Content Creation Tools, Influencer Marketing, eBook and Whitepapers Social Media and Business Strategy: Social Media Platforms, Key Concepts of Social Media, Types and Primary Uses of Social Media Platforms, Benefits of Social Media to Business, Role of Social Media , Social Media Platforms for Business: Social Media Marketing Concepts, Key Social Media Platforms, Setting up Social on Key Platforms, The Value of Building a Social Media Community	Lectures, PPTs and Interactive Panel	8L+4P	Assignment/ Experiment 2	CO 2
III	Social Content Strategy and Promotion	Social Content Strategy: Content Seeding, Social Media Formats, Content Promotion, Content Optimization, Influencer Marketing, Word of Mouth Marketing, Measurement and Tracking, Content Promotion Strategy, Audience Segmentation Facebook Marketing Fundamentals: Introduction to Facebook, The Value to Marketers, Page Management, Facebook Live, Messenger Facebook Ads and Marketing: Facebook Ads, Ads Manager, Strategy Process, Buying Channels and Ad Auctions	Lectures, PPTs and Interactive Panel	8L+4P	Assignment/ Experiment 3	CO 3
IV	Instagram and Snapchat Marketing	Instagram and Snapchat - Social Apps: Introduction to Social Apps, Differentiating Social Apps, Basic Features, Instagram: Video, stories, live, Instagram Posts, Snapchat Meanings, Snapchat Story, Basic Features Instagram and Snapchat Marketing: Instagram Account Overview, Audience Development, Advertising Overview, 3V Advertising, Ads Manager, Snap Ads, Instagram Analysis, Snapchat Analysis, Campaign Setup, Snapchat Geo filters	Lectures, PPTs and Interactive Panel	8L+4P	Assignment/ Experiment 4	CO 4
V	Twitter LinkedIn and YouTube Marketing	Twitter Marketing: Twitter Concepts, Platform Features, Profile Promotion and management, Hashtags, Analysis and Reporting. LinkedIn and Social Selling: Social Selling and Personal Branding, The Benefits of Personal Branding, LinkedIn Concepts, Features and Functions, LinkedIn Social Plugins, LinkedIn Analytics. YouTube and Social Video Marketing: Misconceptions and Benefits, Platform Features, Channel Setup, Channel Promotion, Channel Management, YouTube Native Formats.	Lectures, PPTs and Interactive Panel	8L+4P	Assignment/ Experiment 5	CO 5
Total				40L+20P		

Textbooks	
Sr No	**Book Details**
1	"Digital Marketing Essentials You Always Wanted to Know", (Self-Learning Management Series) Paperback – July 2020 , Vibrant Publishers
2	"Digital Marketing| 3rd Edition", August 2022 , Seema Gupta
3	"Digital Marketing for Beginners : A Road Map to Successful Career in Digital Marketing", Paperback April 2023, V Venkata Krishna

Links	
Sr No	Details
UNIT 1	https://www.youtube.com/watch?v=vlRm8tqAYCs&list=PLNfnAKZ4ZsaoIFGUO3GWTHEI73SQV56rB&index=2
UNIT 2	https://www.youtube.com/watch?v=emUpshX-ToI
UNIT 3	https://www.youtube.com/watch?v=xNz4MmHxf0Y
UNIT 4	https://www.youtube.com/watch?v=8d8sI-3Bcc8
UNIT 5	https://www.youtube.com/watch?v=KcxD7oFWlvo

*

Subject Name: CRM Administration		L-T-P [3-0-0]
Subject Code: BMCA0213		Applicable in Department: MCA
Pre-requisite of Subject: Basic Knowledge of Computer Science		
Course Objective: Understand the concepts of Sales force App. Understand the concepts of Lightning Experience. Familiarize with concepts administration. Learn Admin Essentials in Lightning Experience		

Course Outcomes (CO)		

Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Describe the working of Trailhead.	K2
CO2	Describe the importance of Salesforce and its features.	K2
CO3	Implement the validations in Data modelling.	K3
CO4	Describe the importance of user management.	K2
CO5	Identify and implement Security concepts in Industry.	K2,K3

Syllabus					

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
I	Introduction	Salesforce Platform Basics, User Management, Data Modelling, Data Management, Identity Basic, Data Security, Lightning Experience Customization, Lightning APP Builder Salesforce Mobile App Customization, User Engagement, Formulas and Validation, Data Security, Pick list Administration.	Lectures, PPTs and Interactive Panel	10L+4P	Experiment/ Program 1	CO 1

II	Lightning & Sales force App Experience Customization	Formula and Validation, Accounts and Contacts for Lightning Experience, Lead and Opportunity for Lightning Experience, Product Quotes and Contracts, Campaign Basic	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 2-4	CO 2
III	Salesforce Administration	Service Cloud for lightning Experience, Sales force mobile app customization, App Exchange basic Duplicate Management Lightning Experience for Salesforce Classic Users, Chatter Administration for Lightning Experience, Reports and Dashboards for lightning experience, Lightning experience customization, Lightning experience rollout, Salesforce flow, Lightning experience report dashboard Specialist	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 5-6	CO 3
IV	Lightning Experience	Prepare Your Salesforce Org for Users, Customize an Org to Support a New Business Unit, Protect Your Data in Salesforce, Customize a Sales Path for Your Team, Customize a Salesforce Object, Import and Export with Data Management Tools	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 7-8	CO 4
V	Learn Admin Essentials in Lightning Experience	Learn about the custom object and custom field in Salesforce Lightning, uses of Custom Object and Custom field in Lightening, Workflow in Lightning, Update Record Field using Workflow , Send Email alert using Workflow, Data Loader in Salesforce Lightning.	Lectures, PPTs and Interactive Panel	8L+4P	Experiment/ Program 9-14	CO 5
Total				**42L+20P**		

Textbooks	
Sr No	**Book Details**
1	"Digital Marketing for Dummies", Ryan Deiss, Russ Henneberry, John Wiley & Sons
2	"Youtility", Jay Baer, Gildan Media, LLC
3	"Epic Content Marketing", Joe Pulizzi, McGraw Hill Education

	Links
Sr No	**Details**
UNIT 1	https://www.youtube.com/watch?v=bxtqhfyoTjY&list=PLaGX-30v1lh1BaUKgXa05gqrOP0vUg_6i&index=1
UNIT 2	https://www.youtube.com/watch?v=ZkQwm-6lsIw&list=PLaGX-30v1lh1BaUKgXa05gqrOP0vUg_6i&index=3
UNIT 3	https://www.youtube.com/watch?v=iWbVm_o9Z0Q&list=PLaGX-30v1lh1BaUKgXa05gqrOP0vUg_6i&index=8
UNIT 4	https://www.youtube.com/watch?v=oG5y-ynaREY&list=PLaGX-30v1lh1BaUKgXa05gqrOP0vUg_6i&index=11
UNIT 5	https://www.youtube.com/watch?v=8DefDrWgcJY&list=PL-gW8Fj5TGrqly1oIz8ljs-kHbahm4ydl

Subject Name: Software Testing	L-T-P [3-0-0]
Subject Code: BMCA0214	Applicable in Department: MCA
Pre-requisite of Subject: Basic Knowledge of Computer and able to work in Ms Excel.	
Course Objective: Give examples of why testing is necessary. Identify typical objectives of testing. Distinguish between error, defect, and failure. Explain the impact of context on the test process.	

Course Outcomes (CO)	

Course outcome: After completion of this course students will be able to:	Bloom's Knowledge Level(KL)
CO 1	Describe the concepts of software testing.	K1
CO2	Demonstrate how different development and testing practices, and different constraints on testing, may apply in optimizing testing to different Contexts.	K2
CO3	Apply test management principles for resources, strategies, planning, projectcontrol, and risk management.	K3
CO4	Apply different testing techniques of software testing.	K3
CO5	Discuss how testing activities and work products align with project objectives, measures, and targets.	K2

Syllabus						
Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
I	Introduction	Fundamentals of Testing: What is Testing, Typical Objectives of Testing, Testing and Debugging, Why is Testing Necessary? Quality Assurance and Testing, Errors, Defects, and Failures, Defects, Root Causes and Effects, Seven Testing Principles, Test Process, Traceability between the Test Basis and Test Work Products, The Psychology of Testing-Human Psychology and Testing, Tester's and Developer's Mindsets	Lectures, PPTs and Interactive Panel	10L+4P	Assignment/ Program 1	CO 1

II	**Testing Through out the Software Development Life cycle**	Software Development Life cycle Models, Software Development and Software Testing, Software Development Life cycle Models in Context, Test Levels— Component Testing, Integration Testing, System Testing, Acceptance Testing, Test Types- Functional Testing, Non- functional Testing, White-box Testing, Change-related Testing	Lectures, PPTs and Interactive Panel	8L+4P	Assignment / Experiment 2-6,13	**CO 2**
III	**Static Testing**	Static Testing Basics--Work Products that Can Be Examined by Static Testing, Benefits of Static Testing, Differences between Static and Dynamic Testing, Review Process--Work Product Review Process, Roles and responsibilities in a formal review, Review Types, Applying Review Techniques, Success Factors for Reviews	Lectures, PPTs and Interactive Panel	8L+4P	Assignment / Experiment 8-10	**CO 3**
IV	**Test Techniques**	Categories of Test Techniques- Categories of Test Techniques and Their Characteristics, Black-box Test Techniques, Equivalence Partitioning, Boundary Value Analysis, Decision Table Testing, State transition Testing, Use Case Testing, White-box Test Techniques, Statement Testing and Coverage, Decision Testing and Coverage, The Value of Statement and Decision Testing, Checklist-based Testing.	Lectures, PPTs and Interactive Panel	6L+4P	Assignment / Experiment 7, 11	**CO 4**
V	**Test Management**	Test Organization, Independent Testing, Tasks of a Test Manager and Tester, Test Planning and Estimation, Purpose and Content of a Test Plan, Test Strategy and Test Approach, Test Execution Schedule, Factors Influencing the Test Effort, Test Estimation Techniques, Test Monitoring and Control, Metrics Used in Testing, Configuration Management, Risks and Testing, Defect Management, Tool Support for Testing	Lectures, PPTs and Interactive Panel	8L+4P	Assignment / Experiment 12	**CO 5**
Total				**40L+20P**		

Textbooks	
Sr No	**Book Details**
1	Roger S. Pressman, "Software engineering- A practitioner's Approach", McGraw-Hill International 7 Editions, 2010
2	"Software Testing: Principles and Practices", Srinivasan Desikan, 2017

3	"Effective Software Testing: A Developer's Guide" 1st Edition, Maurício Aniche, 2022

Links	
Sr No	**Details**
UNIT 1	https://www.youtube.com/watch?v=sbW4RThXNL8
UNIT 2	https://www.youtube.com/watch?v=T0TynxN77oY&t=46s
UNIT 3	https://www.youtube.com/watch?v=Qc-a0tBpdQQ
UNIT 4	https://www.youtube.com/watch?v=BSjRmiYP7vg
UNIT 5	https://www.youtube.com/watch?v=NiDe8lj-wGs

Subject Name: Cognitive Ability	L-T-P [2-1-0]
Subject Code: BMCA0206	**Applicable in Department: MCA**

Pre-requisite of Subject: Basic Knowledge of Mathematics

Course Objective: This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Acquire the concept of LCM, HCF, Roots of equation and percentage	**K3**
CO2	Determine the concept of Probability, Profit and Loss, Simple and Compound Interest, Time, Speed	**K3**
CO3	Compute the concept of Trigonometry, Height and Distance, Algebras, Age and Geometry.	**K3**
CO4	Solve the concept of Coding – Decoding, Calendars, Clocks, Venn Diagrams, Seating Arrangement.	**K3**
CO5	Illustrate the concept of Data Interpretation, Tables, Column, Graphs, Bar, Graphs, Line Charts.	**K3**

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
I	**Quantitative Ability (Basic Mathematics)**	Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots and Cube, Roots, Average Problems on Ages, Surds & Indices, Percentages, Problems on Numbers	Class room Teaching, Smart Board, PPT, M- tutor.	8L	Assignment 1.1	CO 1

II	**Quantitative Ability (Applied and Engineering Mathematics)**	Logarithm, Permutation and Combinations, Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Time & Work, Ratio and Proportion, Area, Mixtures and Allegation	Class room Teaching, Smart Board, PPT, M- tutor.	10L	Assignment-2.1	**CO 2**
III	**Quantitative Aptitude**	Work & Wages, Pipes & Cistern, Time & Distance, Percentage, Trigonometry, Height and Distance, Algebras, Age, Simple Interest and Compound interest, Geometry.	Class room Teaching, Smart Board, PPT, M- tutor.	10L	Assignment-3.1	**CO 3**
IV	**Logical Reasoning (Deductive Reasoning)**	Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding – Decoding, Calendars, Clocks, Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations	Class room Teaching, Smart Board, PPT, M- tutor.	10L	Assignment-4.1	**CO 4**
V	**Data Interpretation**	Data Interpretation, Tables, Column, Graphs, Bar, Graphs, Line Charts, Pie Chart, Venn Diagrams	Class room Teaching, Smart Board, PPT, M- tutor.	8L	Assignment-5.1	**CO 5**
Total				**46 Hours**		

	Textbooks
Sr No	**Book Details**
1	"Analytical and Logical reasoning for CAT and other management entrance test" **Arihant Publications**, By Sijwali B S, 2020
2	"Quantitative Aptitude by Competitive Examinations", by Abhijit Guha 4th edition, McGraw Hill Education India, 2016

	Reference Books
Sr No	**Details**
1	"A Modern Approach To Verbal & Non Verbal Reasoning", By R S Agarwal, REVISED Edition,2018
2	"Analytical and Logical reasoning", By Sijwali B S,2014
3	"Quantitative aptitude for Competitive examination", By R S Agarwal, REVISED Edition,2017.

Subject Name: Object Oriented Techniques using JAVA					L-T-P [0-0-6]	
Subject Code: BMCA0253Z				Applicable in Department: MCA		

Pre-requisite of Subject: 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 andGUI 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)**
CO 1	Define the concepts of object-oriented programming.	K1
CO2	Describe OOP principles and concepts of lambda expressions.	K6
CO3	Analyze packages with different protection level resolving namespace collision and error handling concepts for uninterruptedexecution.	K4
CO4	Describe Concurrency control, I/O Streams and Annotations concepts.	K6
CO5	Explain GUI based application, Generics and Collections in Java to solve the real-world problem.	K5

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Basics	**Object Oriented**	Introduction and Pillars of OOP with real life example, JVM architecture and its components.	Smart Board/PPT/O	6L+8P	Experiment/	**CO 1**

of Java Programming	**Programming**		nline Programs		Program (1-13)	
	Control Statements	Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input/Output.				
	Class and Object:-	Object Oriented Concept in Java, Object Reference, Constructor, Abstraction: Abstract Class, Defining Methods, Static Class and Methods, Garbage Collection and finalize() Method etc.				
II OOPs features,arrays and lambda expressions	**Inheritance**	Introduction and Types of Inheritance in Java, Implementing Multiple Inheritance, Interface and it's uses, Access Modifiers, Constructors in inheritance, Use of "this" and "super" keyword.	Smart Board/PPT/Online Programs	4L+10P	Experiment/ Program (14-35)	**CO 2**
	Polymorphism	Introduction and Types, Overloading and Overriding				
	Lambda expression	Introduction and Working with Lambda Variables				
	Arrays	Introduction and its Types				
III Packages, Exception Handling and String Handling	**Packages**	Introduction and Types, Access Protection in Packages, Import and Execution of Packages.	Smart Board/PPT/Online Programs	4L+10P	Experiment/ Program (36-55)	**CO 3**
	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				
IV Concurrency in Java and I/O Stream	**Threads:**	Introduction and Types, Creating Threads, Thread Life- Cycle, Thread Priorities, Daemon Thread, Runnable Class, Synchronizing Threads etc	Smart Board/PPT/Online Programs	4L+10P	Experiment/ Program (56-70)	**CO 4**
	I/O Stream	Introduction and Types, Common I/O Stream Operations, Interaction with I/O Streams Classes				
	Annotations	Introduction, Custom Annotations and Applying Annotations				

V GUI Progra mming, Generic s and Collecti ons	GUI Programmin g	Introduction and Types, Swing, Components and Containers, Layout Managers and User- Defined Layout andEvent Handling concept	Smart Board/PPT/O nline Programs	4L+10P	Experime nt/ Program (71-91)	CO 5
	Generics	Introduction to Generic Classes, Initializing a GenericObject, 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				**22L+48P**		

Textbooks	
Sr No	**Book Details**
1	"Java: The Complete Reference, 7th Edn", Herbert Schildt, McGraw Hill Education, 2017
2	"Core Java: An Integrated Approach, New: Includes All Versions upto Java 8", R. Nageswara Rao and DT Editorial Services, Dreamtech Press, 2016
3	"Programming with Java 7th Edition", E. Balagurusamy, McGraw Hill, 2023

Reference Books	
Sr No	**Book Details**
1	"Schaum's Outline Of Programming With Java / 2nd Edition", Hubbard J.R., McGraw Hill, 2020
2	"Programming In Java Revised 2Nd Edition", Sachin Malhotra Saurabh Choudhary , Oxford University Press, 2018
3	"Core Java Volume I - Fundamentals, 12th Edition", Horstmann, Pearson Education, 2023

Links	
Unit 1	https://www.youtube.com/watch?v=AEo4KgwKYoU
Unit 2	https://www.youtube.com/watch?v=5RkikYKPvpc&t=284s

Unit 3	https://www.youtube.com/watch?v=bxcZ7cXbDI0&list=PLqleLpAMfxGAEfyXJyF-9UOs9C8dmir_Y
Unit 4	https://www.youtube.com/watch?v=jmZfuI3lDK0
Unit 5	https://www.youtube.com/watch?v=R0USRU90TOo https://www.youtube.com/watch?v=aXZrz8XKQpE https://www.youtube.com/watch?v=hKhlkx_6HeI&list=PLUDwpEzHYYLu9-xrx5ykNH8wmN1C1qClk

Object Oriented Techniques using JAVA Lab	L-T-P [0-0-6]

Lab Experiments

Course Objective: The objective of this course is to understand the object-oriented methodology, and its techniques to design stand alone andGUI 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)
CO 1	Implement object-oriented programming concepts.	K3
CO 2	Demonstrate the Java programs using OOP principles and implement the concepts of lambda expressions.	K3
CO 3	Implement packages with different protection level resolving namespace collision and the error handling concepts for uninterrupted execution of Java program.	K3
CO 4	Develop Concurrency control, I/O Streams and Annotations concepts by using Java program	K5
CO 5	Design and develop the GUI based application, Generics and Collections in Java to solve the real-world problem.	K5

List of Practicals

Sr No	Program Title	CO Mapping
1	Write ProgramsCompile and run first java file Byte Code and class file	CO 1
2	Program to display default value of all Primitive data types	CO 1
3	Implement the code using main() method to calculate and print the Totaland Average marks scored by a student from	CO 1

	the input given through thecommand line arguments.		
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.	CO 1	
5	Write code which uses if-then-else statement to check if a given accountbalance 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.	CO 1	
6	A class Number Palindrome with a public method is Number Palindromethat takes one parameter number of type int. Write a code to check whether the given number is palindrome or not. For example, Command Arguments: 333333 is a palindrome.	CO 1	
7	Write a class Fibonacci Series with a main method. The method receives one command line argument. Write a program to display Fibonacci seriesi.e. 0 1 1 2 3 5 8 13 21	CO 1	
8	Write a Java Program to find the Factorial of a given number.	CO 1	
9	Java Program to create a class, methods and invoke them inside main method	CO 1	
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.	CO 1	
11	Java program to illustrate the static field in the class.	CO 1	
12	Java Program to illustrate static class.		

13	Java program to explicit implementation of garbage collection by usingfinalize() method.	CO 1
14	JAVA program to implement Single Inheritance.	CO 2
15	JAVA program to implement multi-level Inheritance.	CO 2
16	JAVA program to implement constructor and constructor overloading.	CO 2
17	Write a java program to access the class members using super keyword.	CO 2
18	Java program to access the class members using this keyword.	CO 2
19	Implement an interface named MountainParts that has a constant namedTERRAIN 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.	CO 2
20	Java program to demonstrate nested interface inside a interface.	CO 2
21	Java program to demonstrate nested interface inside a class.	CO 2
22	JAVA program implement method overloading.	CO 2
23	JAVA program to implement method overriding.	CO 2
24	Java program to implement lambda expression without parameter.	CO 2
25	Java program to implement lambda expression with single parameter.	CO 2
26	Java program to implement lambda expression with multi parameter.	CO 2
27	Java program to implement lambda expression that iterate list of objects	CO 2
28	Java program to define lambda expressions as method parameters.	CO 2

29	Write a class CountOfTwoNumbers with a public method compareCountOf that takes three parameters one is arr of type int[] andother 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 compareCountOf should be boolean. Assumptions: • arr is never null • arg1 and arg2 may be same	CO 2
30	JAVA program to show the multiplication of two matrices using arrays.	CO 2
31	Java Program to search an element using Linear Search	CO 2
32	Java program to search an element using Binary Search	CO 2
33	Java Program to sort element using Insertion Sort	CO 2
34	Java Program to sort element using Selection Sort – Largest elementMethod	CO 2
35	Java program to Sort elements using Bubble Sort	CO 2
36	Java program to create user defined package.	CO 3
37	Java Program to create a sub- classing of package.	CO 3
38	Implement the following: 1. Import package.*; 2. import package.classname; Using fully qualified name.	CO 3
39	Implement and demonstrate package names collision in java.	CO 3
40	Java program to handle and Arithmetic Exception Divided by zero	CO 3
41	Java Program to implement User Defined Exception in Java	CO 3
42	Java program to illustrate finally block	CO 3

43	Java program to illustrate Multiple catch blocks	CO 3
44	Java program for creation of illustrating throw	CO 3
45	Java program to print the output by appending all the capital letters in theinput string.	CO 3
46	Java program that prints the duplicate characters from the string with itscount.	CO 3
47	Java program to check if two strings are anagrams of each other	CO 3
48	Java Program to count the total number of characters in a string	CO 3
49	Java Program to count the total number of punctuation characters existsin a String	CO 3
50	Java Program to count the total number of vowels and consonants in astring	CO 3
51	Java Program to show equals method and == in java	CO 3
52	Given a string, return a new string made of n copies of the first 2 chars ofthe 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 inputis "Wipped" then output should be "WiWiWiWiWi".	CO 3
53	Given two strings, a and b, create a bigger string made of the first char ofa, 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 "HWeolrllod".	CO 3
54	JAVA program to show the usage of string builder.	CO 3
55	JAVA program to show the usage of string buffer.	CO 3
56	Creating and Running a Thread	CO 4
57	Implementing Runnable Interface	CO 4

58	Synchronizing Threads with lock	CO 4
59	Synchronizing Threads without lock	CO 4
60	JAVA program to implement even and odd threads by using Thread class.	CO 4
61	JAVA program to implement even and odd threads by using Runnableinterface.	CO 4
62	JAVA program to synchronize the threads by using Synchronizestatements and Synchronize block.	CO 4
63	Demonstrate the concept of type annotations in the JAVA programminglanguage.	CO 4
64	JAVA program to implement that read a character stream from input fileand print it into output file.	CO 4
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.	CO 4
66	JAVA program to implement that merge the content of two files (file1.txt,file2.txt) into file3.txt.	CO 4
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.	CO 4
68	Write a Java program that reads the contents of one file and copies themto another file.	CO 4
69	Write a Java program that reads a text file and counts the number ofwords in it.	CO 4
70	Write a Java program that reads a text file and counts the frequency ofeach word in it.	CO 4
71	Program to create a frame with three button.	CO 5
72	Program to display message with radio buttons.	CO 5
73	Program to display "All the best" in 5 different colors on screen.	CO 5
74	Program to implement event handling in a button "OK"	CO 5

75	Java Program to implement Border Layout	CO 5
76	Java Program to implement Grid Layout	CO 5
77	Java Program to implement Box Layout	CO 5
78	Java Program to implement Card Layout	CO 5
79	Java program to implement Generic class	CO 5
80	Java program to illustrate Generic methods	CO 5
81	Java program to implement wild card in generics	CO 5
82	Java program to implement of methods of Hash Set	CO 5
83	Java Program to implement methods available in HashMap class	CO 5
84	Program to add, retrieve, and remove element from Array List	CO 5
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.	CO 5
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.	CO 5
87	Develop a java class with a method storeEvenNumbers(int N) using ArrayList to store even numbers from 2 to N, where N is a integer which is passed as a parameter to the method storeEvenNumbers(). The method should return the ArrayList (A1) created.	CO 5
88	Create a method that accepts the names of five countries and loads them to an array list and returns the list.	CO 5
90	Java program to implement autoboxing	CO 5

91	Java program to implement unboxing	CO 5
Required Software and Tools		
Software:-Eclipse/Net beans		

Subject Name:	Data Structures Lab	L-T-P [0-0-4]
Subject Code:	BMCA0255	Applicable in Department: MCA

Lab Experiments
Course Objective: Learn the basic concepts of algorithm analysis, along with implementation of linear and non-linear data structures.

Course Outcomes (CO)	
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

List of Practical		
Sr No	**Program Title**	**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
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
30.	Detect and remove a loop in a circular linked list.	CO3
31.	Construct a code to Insert, Delete and search and update a data in Binary Search Tree(BST)	CO4
32.	Construct a code for Tree Traversal (Preorder, Inorder, Postorder)	CO4
33.	Construct a code Count the number of Leaves in a Binary Tree	CO4
34.	Construct a code to find the Height of a Binary Tree	CO4
35.	Construct a code to print all Paths from the Root to Leaf Nodes in a Binary Tree	CO4
36.	Construct a code to convert a Binary Tree to its Mirror Tree	CO4
37.	Construct a code to find the Node with Minimum Value in a Binary Search Tree.	CO4
38.	Construct a code for Binary Search Tree (BST) Implementation	CO4
39.	A program to check if a Binary Tree is a Binary Search Tree (BST)	CO4
40.	Construct a code to check if a Binary Tree is a Balanced Binary Tree	CO4
41.	Construct a code to represent graph using adjacency matrix and adjacency list.	CO5
42.	Implement BFS and DFS algorithm.	CO5
43.	Implement the minimum cost spanning tree.	CO5
44.	Implement bubble sort in a non-recursive way.	CO5
45.	Implement selection sort in a non-recursive way.	CO5
46.	Implement insertion sort in a non-recursive way.	CO5
47.	Implement Merge sort in a non-recursive way.	CO5

48.	Implement Merge sort in a recursive way.	CO5
49.	Array-based Student Performance Analysis System	CO5
50.	Design a project based on stack data structure to create a web history checker.	CO5
51.	Design a dynamic Music Playlist using Linked List	CO5
52	Design Decision Tree Classifier for Disease Diagnosis using tree data structure.	CO5
53.	Design Road Network Navigation: Implementing a navigation system to find the shortest path between locations using road networks.	CO5
Required Software and Tools		

1. Vs Code
2. Jupiter Notebook

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Database Systems Lab BMCA0252	L-T-P [0-0-2]
Lab Experiments	

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)
CO 1	Design ER and EER diagram of database for solving the real-world problems.	K2
CO 2	Apply and analyze the Structured Query Language (SQL) to solve the complex queries and implement normalization.	K6
CO 3	Implement the operators in complex queries and apply database connectivity for different applications,	K6
CO 4	Discuss PL/SQL programs to solve complex problems in databases	K2
CO 5	Design and implement relational and non-relational database for the need of the real-world project.	K5

List of Practicals

Sr No	Program Title	CO Mapping
1	Creating ER Diagram for company Database. Company databases haveentities like employee, departments, projects and dependents also implement the relationship and cardinalities between the entities with their relevant attribute	CO 1
2	Design an ER diagram for a travel agency that includes entities such as travelers, bookings, destinations, and	CO 1

	itineraries. also implement the relationship and cardinalities between the entities with their relevantattribute	
3	Convert Company ER Model to Relational Model(Represent entities and relationships in tabular form, represent attributes as columns, identifying keys).	**CO 1**
4	Convert Travel Agency ER Model to Relational Model(Represent entities and relationships in tabular form, represent attributes as columns, identifying keys).	**CO 1**
5	Data Definition Language Queries: Create Tables STUDENT, BOOK, TRANS. 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	**CO 2**
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'	**CO 2**

	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	
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	CO 2
8	Queries on TCL 1. Create Savepoints 2. Rollback to SavePoints 3. Use Commit to save on	CO 2
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'	CO 2

10	String, Math andAdvanced 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)
		CO 2

	13. ROUND(X) 14. SQRT(X) 15. BIN() 16. COALESCE() 17. IF() 18. LTRIM 19. RTRIM 20. LPAD 21. RPAD 22. INITCAP	
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	**CO 3**
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. 2. Find the name, rollno and branch of students who are in 'CSE' branch or 'IT' branch 3. Find the title, author and cost of book for which cost is between 200 and 600 4. Find the title and author of book, which has the word 'NET' anywhere in its title. 5. Find the bookid and title of books with title either 'OS' or 'DBMS' 6. List the students who issued books on '1st may2000', '12 JAN 2021' ,'17 dec 2000' ,'10 Jan 2021' 7. Display all books which have cost more than the cost of all books authored by 'Yash' 8. Find all the distinct costs of books	**CO 2**
13	Join Operators 1. Perform Inner join on two tables 2. Perform Natural Join on two tables 3. Perform Left Outer Join on tables 4. Perform Right Outer join on tables 5. Perform Full Outer Join on tables	**CO 2**

14	**Set Theory Operators** 1. Show the use of UNION operator with union compatibility 2. Show the use of intersect operator with union compatibility 3. Show the use of minus operator with union compatibility 4. Find the cartesian product of two tables	**CO 2**
15	**Queries on Set Theory Operators** 1. List all books except 'Navathe' and 'Tannenbaum' in ascending order of costs 2. display all books that have not been issued so far 3. To display the students name who have been issued DBMS book by NAVATHE and OS book by TANNENBAUM. 4. To display the students name who have been issued DBMS book by NAVATHE OR OS book by TANNENBAUM	**CO 2**
16	**Complex Queries** 1. display all books that have been issued so far 2. to display all the students of CSE IN year 2021 who are staying in the hostel. 3. To display students name who have issued OS book by Tannenbaum 4. To display the names of students who have not issued any book so far 5. To display the names of students who have issued at least one book so far. 6. To display students name along with the book issued to them 7. Find the names of students who have paid fine Rs1000 for the book 'OS in Depth'. 8. Retrieve the name of students who have issued the book which has the maximum cost. 9. Retrieve the names of students who have issued all books written by 'Korth'	**CO 3**
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	**CO 3**

	9. Remove the view from database	

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
		CO 3

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
		CO 4

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
		CO 4

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
		CO 4

22	PL/SQL Programs on Implicit Cursors 1. Insert a record using %ROWTYPE	**CO 4**

23	2. Write a code using %NOTFOUND, %FOUND, %ROWCOUNT 3. Write a code using %TYPE	
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	CO 5

	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		
	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	**CO 3**
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	**CO 5**

Required Software and Tools

Software:-
1. Oracle 11 g
2. MySQL
3. Mongo Shell

Fundamentals of Digital Marketing and Analytics Lab BMCA0211P	L-T-P [0-0-2]
Lab Experiments	
Prerequisite: Basic Knowledge of Computer Science	
Course Objective: To provide hands-on experience in applying digital marketing strategies and using analytics tools. Students will learn to analyze data, optimize campaigns, and implement digital marketing techniques for practical scenarios.	
Course Outcomes (CO)	

	Course outcome: After completion of this course students will be able to:	**Bloom's Knowledge Level(KL)**
CO 1	Prepare spreadsheet for data manipulation, formula creation, and advanced functions like CONCATENATE, VLOOKUP, HLOOKUP, MATCH, and COUNTIF.	K3
CO 2	Develop skills in sorting, filtering, text-to-columns, and data validation to effectively analyze and interpret data for marketing insights.	K5
CO 3	Create, format, and interpret various types of charts to visualize data, enhance presentations, and support decision-making in digital marketing campaigns.	K5
CO 4	Utilize PivotTables for summarizing, analyzing, and presenting complex data sets, including customization, manipulation, and integration with Pivot Charts.	K4
CO 5	Prepare spreadsheets for navigation, sheet protection, macro recording,	K3
List of Practicals		

Sr No	Program Title	CO Mapping
1	Creating Formulas: Using Formulas, Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum	CO1
2	Columns & Rows: Selecting Columns & Rows, Changing Column Width & Row Height, Autofitting Columns & Rows, Hiding/Unhiding Columns & Rows, Inserting & Deleting Columns & Rows, Cell, Address of a cell, Components of a cell – Format, value, formula, Use of paste and paste special	CO1
3	Functionality Using Ranges: Using Ranges, Selecting Ranges, Entering Information Into a Range, Using AutoFill	CO1
4	Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim	CO1
5	Spreadsheet Charts: Creating Charts, Different types of chart, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table	CO3
6	Data Analysis: Sorting, Filter, Text to Column, Data Validation	CO2
7	PivotTables: Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data Field, Properties, Displaying a PivotChart, Setting PivotTable Options, . Adding Subtotals to PivotTables	CO4
8	Spreadsheet Tools: Moving between Spreadsheets, Selecting Multiple Spreadsheets, Inserting and Deleting Spreadsheets Renaming Spreadsheets, Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding , Protecting worksheets	CO3
9	Making Macros: Recording Macros, Running Macros, Deleting Macros	CO5
Required Software and Tools		

Software: Ms Excel

Fundamentals of Digital Marketing and Optimization Lab BMCA0212P		L-T-P [0-0-2]
Lab Experiments		
Prerequisite: Students are expected to be able to inspect any site and know the keyword of any site.		
Course Objective: Develop a basic display campaign and allocate ad dollars for success. Examine the pricing models for display and evaluate the best possible choice for your campaign		
Course Outcomes (CO)		
Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Identify the role that social marketing plays in the digital landscape and marketing mix.	**K2**
CO 2	Explain the differences between, and the convergence of, paid, earned, and owned media.	**K2**
CO 3	Identify and incorporate individual social and mobile platforms into a digital marketing strategy.	**K1**
CO 4	Apply On Page SEO for upgrading ranking.	**K3**
CO 5	Apply Technical SEO for upgrading ranking.	**K3**
List of Practicals		

Sr No	Program Title	CO Mapping
1	Basic Explanation and Setups: a. Name servers, theme & plugins setup b. Basic SEO, How Search Engine Works?	CO1

		c. Crawling, Indexing, Ranking d. GSC, Google Analytics, GTM, Google Alerts	
2		Content Frameworks: a. Keyword (Explanation, Research, Ranking factor) b. Keyword Classification, Finding Right Keyword c. Competitive Keyword Research Content framework	CO2
3		On Page: a. Element Explanation b. Title Tag, Header Tags c. Meta Description, The Body d. URL Structure, Images	CO3
4		Technical SEO Part – I a. Elements Explanation b. Site Architecture, Website Structure c. Understand Google Crawlability d. Robots.txt, Sitemaps, Mobile SEO, AMP	CO4
5		Technical SEO Part –II a. WordPress Speed Optimization b. CDN c. Structured Data d. Security	CO5
Required Software and Tools			
Site : KeyWord Planner			

CRM Administration Lab BMCA0213P		L-T-P [0-0-2]
Lab Experiments		
Prerequisite: Creative thinking and which is being used by the creative talent in your business areas.		
Course Objective: To make the students understand the organizational need, benefits and process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of e-CRM and e- CRM technologies. To enable the students, understand the technological and human issues relating to implementation of Customer Relationship Management in the organizations.		
Course Outcomes (CO)		
Course outcome: After completion of this course students will be able to:		**Bloom's Knowledge Level(KL)**
CO 1	Describe the working of Trailhead.	K2
CO2	Describe the importance of Salesforce and its features.	K2
CO3	Implement the validations in Data modelling.	K3
CO4	Describe the importance of user management.	K2
CO5	Identify and implement Security concepts in Industry.	K2,K3
List of Practicals		
Sr No	**Program Title**	**CO Mapping**

1	Quick Start: Lightning App Builder	CO1
2	Prepare Your Salesforce Org for Users	CO2
3	Customize an Org to Support a New Business Unit	CO2
4	Protect Your Data in Salesforce	CO2
5	Customize a Sales Path for Your Team	CO3
6	Setup the service Console	CO3
7	Build a discount approval process	CO4
8	Quick start process builder	CO4
9	Build a simple flow	CO5
10	Build a battle station App	CO5
11	Customize a Salesforce Object	CO5
12	Create Reports and Dashboards for Sales and Marketing Managers	CO5
13	Improve Data Quality for Your Sales and Support Teams	CO5
14	Create a Process for Managing Support Cases	CO5
Required Software and Tools		

Site Name:- Trailhead

Software Testing Lab BMCA0214P	L-T-P [0-0-2]
Lab Experiments	
Prerequisite: Basic Knowledge of Computer and able to work in Ms Excel.	
Course Objective: To equip students with practical skills in testing methodologies, tools, and techniques, to develop expertise in test case design, execution, automation, defect tracking, and performance testing for robust software development.	
Course Outcomes (CO)	

Course outcome: After completion of this course students will be able to:	**Bloom's Knowledge Level(KL)**
CO 1 Apply effective test cases for various programming constructs and application functionalities.	**K3**
CO 2 Identify and document potential causes of failures in software applications, such as matrix multiplication.	**K1**
CO 3 Prepare testing based on user interfaces and performance metrics for web applications, particularly focusing on registration and login pages.	**K3**
CO 4 Apply security testing techniques to ensure the robustness of web applications against potential vulnerabilities.	**K3**
CO 5 Write detailed system specifications, identify bugs, and create test cases for complex systems like ATM and banking applications.	**K3**
List of Practicals	

Sr No	Program Title	CO Mapping
1	Write the Test cases for programs in any language which demonstrate the working of the following constructs i) do. While ii) while iii) if…else iv) switch v) for.	CO1
2	Write down the possible reasons for failure of Matrix multiplication.	CO2
3	Write the Test cases based on UI of Registration Page in Online Banking System.	CO2
4	Write the Test cases based on Terms and Conditions field of Registration Page.	CO2
5	Write the Test cases based on Performance in Registration Page.	CO2
6	Write the Test cases for Functionality in Registration Page.	CO2
7	Write the Test cases based on Security in Registration Page.	CO4
8	Write the Test cases for Functionality in Login Page.	CO3
9	Write the Test cases based on UI in Login Page.	CO3
10	Write the Test cases based on Performance in Login Page.	CO3
11	Write the Test cases based on Security in Login Page.	CO4
12	Write system specifications for ATM and make report on various bugs.	CO5
13	Write the test cases for banking application in respect of Registration Page and Login Page.	CO2
Required Software and Tools		

Software:- Ms Excel

Workplace Communication Competence 2- Lab BMCA0257	L-T-P [0-0-4]
Lab Experiments	

Prerequisite: Comprehension of basic English language. The students should have completed Workplace Communication Competence course in first semester

Course Objective: To improve proficiency in Business English to the intermediate level of CEFR (Common European Framework of Languages), to introduce the key concepts of life skills and train for career enhancement and to impart Business Communication Skills

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:	**Bloom's Knowledge Level(KL)**
CO 1	Apply key concepts of life-skills and train for career roles	**K3, K4**
CO 2	Enhance effective listening skills	**K6**
CO 3	Acquire fluency and spontaneity while speaking professionally	**K3**
CO 4	Understand and analyze complex written texts	**K2, K4**
CO 5	Compose clear and detailed texts on a variety of topics	**K6**

List of Practicals		
Sr No	**Program Title**	**CO Mapping**

1	Students will know the course structure and examination pattern. Students will know how to meet, greet, and strike a conversation.	CO1
2	Students will learn through listening to conversations and understand common vocabulary and expressions in short, clear dialogues.	CO2
3	Students will learn to speak on personal interest and practice using professional phrases.	CO3
4	Students will listen to their peers reading aloud, write down the gist, and repeat what is read.	CO4
5	The students will understand and learn how to draft proper responses to different professional chat messages.	CO5
6	Students will practice listening to given audio clips and understand the importance of clear communication and active listening.	CO2
7	Students will demonstrate effective communication, active listening, and adaptability in various scenarios	CO3
8	Students will practice sample questions and answers for placements – offline & online.	CO3
9	Students will develop and improve their critical thinking and practice analytical writing.	CO4
10	Students will be provided with workplace situations and practice building their vocabulary by learning to use a variety of words.	CO5
11	Students will be practicing their active listening by analyzing TED Talks on subjects related to technology/science.	CO2
12	Students will engage in meaningful conversations, build connections, and create a positive networking atmosphere	CO3
13	The students will practice common interview questions.	CO4
14	Students will learn to write coherent sentences. They will also practice writing sentences using professional adjectives for specific purposes.	CO5
15	Students will enhance their listening skills, by listening to native speakers and learn to convey information accurately.	CO2

16	The students will practice professional writing skills through verbal prompts.	**CO5**
17	Students will enhance their ability to express their opinions, actively listen to others, and engage in constructive discussions to develop well-rounded perspectives.	**CO3**
18	Students will practice and enhance their reading skills, through reading select blog posts on technology and innovative businesses.	**CO4**
19	Students will learn to write about their career objectives, qualifications, and key skills in the form of a professional profile	**CO5**
20	The students will develop spontaneous thinking, and the ability to express their ideas effectively.	**CO4**
21	Students will practice effective communication strategies, develop empathy and understanding, and improve their speaking skills and ability to handle real-life situations through role-playing exercises.	**CO3**
22	The students will hone their presentation skills to develop and enhance effective speaking and non-verbal skills.	**CO3**
23	The students will learn co-ordination and improve their group presentation skills.	**CO3**
24	The students will discuss their key take away from the course.	**CO4**
Required Software and Tools		
Software:- British Council English Score Mobile App		