SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

Master of Computer Applications

CURRICULUM and SYLLABI

[For students admitted in 2023-2024]

PG Regulations 2023

Approved by BOS and Academic Council meetings

MCA

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Semester I under Regulations 2023 (CBCS)
Branch: Master of Computer Applications

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
	Theory Courses									
1.	P23MAT101F	Mathematical Foundations for Computer Applications	2	1	0	0	3	FC	45	TT
2.	P23MCA101	Data Structures	3	0	0	0	3	PC	45	T
3.	P23MCA102	Operating Systems	3	0	0	0	3	PC	45	T
4.	P23MCA103	Computer Organization and Architecture	3	0	0	0	3	PC	45	T
5.	P23MCA104	Object Oriented Software Engineering	3	0	0	0	3	PC	45	T
6.	P23MCA105	Web Programming Essentials	2	0	2	0	3	PC	60	TL
	Practical Courses									
7.	P23MCA106	Data Structures Laboratory	0	0	4	0	2	PC	60	L
8.	P23MCA107	Soft Skills, Aptitude and Career Enhancement Laboratory - I	0	0	2	0	1	EEC	30	L
9.	P23MCA108	Python Programming Laboratory	1	0	4	0	3	PC	75	LT
Total Credits							**24**			

* T - Theory, TT - Theory with Tutorial, TL - Theory with Laboratory, TP - Theory with Project, TLP - Theory with Laboratory with Project, L-Laboratory, LT - Laboratory with Theory, LP - Laboratory with Project.

Approved By

Chairperson, MCA - BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr. T. Padma	**Dr. R. Shivakumar**	**Dr. J. Akilandeswari**	**Dr. S. R. R. Senthil Kumar**

Copy to:-
HOD-MCA/ First Semester MCA Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Semester II under Regulations 2023 (CBCS)
Branch: Master of Computer Applications

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MCA201	Design and Analysis of Algorithms	3	0	0	0	3	PC	45	T
2.	P23MCA202	Relational Database Management Systems	3	0	0	0	3	PC	45	T
3.	P23MCA203	Computer Networks	3	0	0	0	3	PC	45	T
4.	P23MCA204	Cloud Computing Technologies	2	0	0	2	3	PC	60	TP
5.	P23MCA205	Data Science	2	0	2	0	3	PC	60	TL
6.	noc24-cs43	**Elective: NPTEL Course:** Programming in Java	3	0	0	0	3	PE	45	T
Practical courses										
7.	P23MCA206	Design and Analysis of Algorithms Laboratory	0	0	4	0	2	PC	60	L
8.	P23MCA207	Relational Database Management Systems Laboratory	0	0	4	0	2	PC	60	L
9.	P23MCA208	Soft Skills, Aptitude and Career Enhancement Laboratory - II	0	0	2	0	1	EEC	30	L
						Total Credits	**23**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

	Shivakumar 12.2.24		
Chairperson, MCA- BoS	**Member Secretary/ Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr. T. Padma	**Dr. R. Shivakumar**	**Dr. J. Akilandeswari**	**Dr. S. R. R. Senthil Kumar**

Copy to:-

HOD/ MCA, Second Semester MCA Students and Staff, COE

MCA

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Semester I under Regulations 2023 (CBCS)
Branch: Master of Computer Applications

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
	Theory Courses									
1.	P23MAT101F	Mathematical Foundations for Computer Applications	2	1	0	0	3	FC	45	TT
2.	P23MCA101	Data Structures	3	0	0	0	3	PC	45	T
3.	P23MCA102	Operating Systems	3	0	0	0	3	PC	45	T
4.	P23MCA103	Computer Organization and Architecture	3	0	0	0	3	PC	45	T
5.	P23MCA104	Object Oriented Software Engineering	3	0	0	0	3	PC	45	T
6.	P23MCA105	Web Programming Essentials	2	0	2	0	3	PC	60	TL
	Practical Courses									
7.	P23MCA106	Data Structures Laboratory	0	0	4	0	2	PC	60	L
8.	P23MCA107	Soft Skills, Aptitude and Career Enhancement Laboratory - I	0	0	2	0	1	EEC	30	L
9.	P23MCA108	Python Programming Laboratory	1	0	4	0	3	PC	75	LT
Total Credits							**24**			

* T - Theory, TT - Theory with Tutorial, TL - Theory with Laboratory, TP - Theory with Project, TLP - Theory with Laboratory with Project, L-Laboratory, LT - Laboratory with Theory, LP - Laboratory with Project.

Approved By

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Dr. T. Padma	**Dr. R. Shivakumar**	**Dr. J. Akilandeswari**	**Dr. S. R. R. Senthil Kumar**

Copy to:-
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MASTER OF COMPUTER APPLICATIONS						
SEMESTER – I	MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS	L	T	P	J	C
P23MAT101F		2	1	0	0	3

Course Outcomes

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

CO1:	check the validity of the arguments in the field of data base and artificial intelligence using the rules of logic.
CO2:	apply the concept of logical theory to validate the correctness of software specifications.
CO3:	apply the concepts of correlation and regression to the data and analyse the result.
CO4:	apply the concepts of random variable and mathematical expectations and their properties to solve the problems.
CO5:	test the hypothesis of the population using sample information.

Pre-requisites:

- Fundamentals of calculus
- Fundamentals of discrete mathematics
- Fundamentals of statistics
- Fundamentals of probability

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2								3	2
CO2	3	3	3	3	2								3	2
CO3	3	3	3	3	2								3	2
CO4	3	3	3	3	2								3	2
CO5	3	3	3	3	2								3	2

Course assessment methods [Theory]

Direct		Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) Assignment / Problem- solving / Seminar (10)	Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01	PROPOSITIONAL CALCULUS	9 Hours

Propositions – logical connectives – compound propositions – conditional and bi conditional propositions – truth tables – tautology and contradiction – contrapositive – logical equivalences and implications – De Morgan's laws – normal forms – principal conjunctive and disjunctive normal form - rules of inference – arguments – validity of arguments.

Unit 02	PREDICATE CALCULUS	9 Hours

Predicates – statement function – variables – free and bound variables – quantifiers – universe of discourse – logical equivalences and implications – implications for quantified statements – theory of inference – rules of universal specification and generalization – validity of arguments.

Unit 03	CORRELATION AND REGRESSION	9 Hours

Simple and rank correlations – multiple and partial correlations – linear regression.

Unit 04	ONE DIMENSIONAL RANDOM VARIABLE	9 Hours
Introduction to one dimensional random variable - discrete random variable – probability mass function – continuous random variable – probability density function – mathematical expectations and its properties.		
Unit 05	**TESTING OF HYPOTHESIS**	**9 Hours**
Sampling distributions – testing of hypothesis for mean and difference between means using normal distribution– t-test for single mean and difference between means (excluding paired t –test).		

Theory: 30 Hrs	Tutorial: 15 Hrs	Practical: -	Project:--	Total Hours: 45 Hrs

TEXT BOOKS:

1. T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 1st Edition, 21st Reprint, 2015.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.

REFERENCE BOOKS:

1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill Publishers, 1st Edition, 2017.
2. K. H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill Publishers, 8th Edition, 2019.
3. S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15th Edition, 2012.
4. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
5. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.

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HoD / Mathematics

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SALEM - 636 005.

BoS – Chairperson / Science and Humanities

P23MCA101	DATA STRUCTURES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Apply the linked list on the applications like polynomial addition and multiplication.
CO2:	Apply the stack and queue concepts for the real time scenarios.
CO3:	Design an algorithm for finding shortest path problem for the given graph.
CO4:	Design an algorithm to find the solution for applications of trees.
CO5:	Design an algorithm for searching and sorting techniques.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	3	2	2	1	2	2	3	3
CO2	3	3	3	3	3	1	3	2	2	1	2	2	3	3
CO3	3	3	3	3	3	1	3	2	2	1	2	2	3	3
CO4	3	3	3	3	3	1	3	2	1	1	2	2	3	3
CO5	3	3	3	3	3	1	3	2	1	1	2	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: LINEAR DATA STRUCTURES - LIST — **9 Hours**

List ADT – Array-based implementation – Linked list implementation – Singly linked lists - Circularly linked lists – Doubly-linked lists – Applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, and Traversal).

Unit 02: LINEAR DATA STRUCTURES – STACK AND QUEUE	9 Hours
Abstract Data Types (ADTs) - Stack ADT – Operations – Static and Dynamic Implementation – Applications – Evaluating arithmetic expressions – Conversion of Infix to postfix expression - Queue ADT – Circular Queue – Priority Queue – Applications of Queue.	
Unit 03: NON LINEAR DATA STRUCTURES – GRAPHS	**9 Hours**
Representation of Graph – Types of graph – Graph Traversals – Minimum Spanning Trees – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits –Applications of graphs – String Matching – Rabin-Karp Algorithm.	
Unit 04: NON LINEAR DATA STRUCTURES – TREES	**9 Hours**
Tree ADT – Tree Traversals – Binary Tree ADT – Expression Trees– Binary search tree ADT – AVL Trees – B-Tree – Red Black Trees – Applications of Trees – Heap – Applications of heap.	
Unit 05: SORTING AND SEARCHING	**9 Hours**
Searching- Linear Search - Binary Search. Sorting – Sorting: Straight Sorting Method – Quick Sort – Merge Sort – Radix Sort – Hashing : Hash Function – Collision – Clustering – Chaining – Open Addressing – Rehashing – Extendible Hashing – Priority Queue.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson, 2020 Units I – V.
2.	Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley; First edition, 2013.

REFERENCES

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to algorithms" PHI, 3rd Edition, 2010.
2.	T.Cormen, C.Lieserson, R.Rivest, and C.Stein, "Introductions to Algorithms", Prentice-Hall/India, 3rd edition, 2009.
3.	VijayalakshmiPai G.A, "Data Structures and Algorithms: Concepts Techniques and Applications", Mc Graw Hill, 2009.
4.	Reema Thareja, Data Structures, Oxford University Press, 2023.
5.	Manesh & Abraham , "C Programming and Data Structures: A Textbook of C programming and Data Structures with solved examples", Notion Press, 2017

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BOS-Chairman/MCA

P23MCA102	OPERATING SYSTEMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Analyze various scheduling algorithms and process synchronization.
CO2:	Explain deadlock prevention and avoidance algorithms.
CO3:	Compare and contrast various memory management schemes.
CO4:	Explain the functionality of file systems, I/O systems, and Virtualization.
CO5:	Compare iOS and Android Operating Systems.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	2	1	2	3	2	3	2
CO2	3	3	3	3	3	3	3	2	1	2	3	2	3	2
CO3	3	3	3	3	3	3	3	2	1	2	3	2	3	2
CO4	3	3	3	2	3	3	3	2	1	2	3	2	3	2
CO5	3	3	3	3	3	3	3	2	1	2	3	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: OPERATING SYSTEM OVERVIEW — **9 Hours**

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations–Process, memory, storage management–Protection and security– Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples.

Unit 02: PROCESS MANAGEMENT	9 Hours
Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling –Multiple processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson's solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock.	
Unit 03: MEMORY MANAGEMENT	**9 Hours**
Main Memory – Swapping – Contiguous memory allocation – Paging –Segmentation – Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.	
Unit 04: I/O SYSTEMS	**9 Hours**
Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure – Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.	
Unit 05: VIRTUAL MACHINES AND MOBILE OS	**9 Hours**
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts",10th Edition, John Wiley and Sons Inc., 2018.
2.	Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, Pearson - New Delhi, 2022.

REFERENCES

1.	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
2.	Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3.	G. Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts & Design", Fifth edition, Addison-Wesley, 2012.
4.	Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 1st Edition, 2001.
5.	Rajiv Chopra, "Operating Systems – A Practical Approach", 4th Edition, S Chand & Company, 2016.

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BOS-Chairman/MCA

P23MCA103	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Simplify and solve the equations using Boolean algebra
CO2:	Explain the functions of bus architecture
CO3:	Describe various processing design
CO4:	Describe the techniques and strategies used to improve cache performance in modern computer systems
CO5:	Evaluate the trade-offs between fine-grained and coarse-grained parallelism in terms of ease of programming, hardware complexity and performance scalability

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	2	2	2	2	3	2	3	2
CO2	3	3	3	3	3	2	2	1	1	2	3	2	3	2
CO3	3	3	3	3	3	2	2	1	1	2	3	2	3	2
CO4	3	3	3	3	3	2	2	1	1	2	3	2	3	2
CO5	3	3	3	3	3	2	2	1	1	2	3	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

Introduction to Computer Organization - I/O Storage Devices - CPU Processor - Data Representation - Number System – Complements – Fixed Point and Floating Point Representation - Logic Gates – Boolean Algebra – Map Simplification - Combinational Circuits – Half adder and Full adder - Flip Flops – S R - J K - T and D Flip Flops - Sequential Circuits.

Unit 02: BASIC STRUCTURE OF COMPUTER	9 Hours
Functional Units - Basic Operational Concepts – Bus Structures – Performance and Metrics Instruction and Instruction Sequencing – Hardware Software Interface – Instruction Set Architecture - Addressing modes – RISC and CISC – ALU Design.	
Unit 03: PROCESSOR DESIGN	**9 Hours**
Processor basics –CPU Organization – Data Path Design – Control Design – Hardwired control – Micro Programmed control – Pipelining – Basic Concepts – Hazards Super Scale Operations.	
Unit 04: MEMORY HIERARCHY	**9 Hours**
Basic Concepts – Semiconductor RAM – ROM – Speed – Size and Cost – Cache Memories – Improving Cache Performance – Virtual Memory – Memory Management Requirements – Associative Memories – Secondary Storage Devices.	
Unit 05: SIMD ARCHITECTURE	**9 Hours**
Introduction - Parallel Processing - Classification of Parallel Processing – Fine Grained SIMD Architecture – Coarse Grained SIMD Architecture - Basic Features of Current Architectural Trends - DSP Processor - Dual Core Technology.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	M. Morris Mano,"Computer System Architecture", revised 3rd Edition, Pearson, 2017. (Units 1,2,3,5).
2.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer organization and Embedded Systems", 6th Edition, Tata McGraw Hill, 2023 (Units 4,5).

REFERENCES

1.	William Stallings, "Computer Organization & Architecture – Designing for Performance" 9th Edition, Prentice Hall of India 2012.
2.	David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann, Elsevier, 2014.
3.	David Harris and Sarah Harris "Digital Design and Computer Architecture", 2nd Edition Morgan Kaufmann, 2012.
4.	Svetlana N. Yanushkevich, Vlad P. Shmerko, "Introduction to Logic Design", CRC Press, 2012.
5.	Linda Null, Julia Lobur, " The essentials of Computer Organization and Architecture", 5th Edition, Jones & Bartlett , 2019.

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BOS-Chairman/MCA

P23MCA104	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Identify use cases and develop the Use Case model.
CO2:	Document the Software Requirements Specification (SRS) for the identified system
CO3:	Create user interface design for an application using design engineering concepts.
CO4:	Apply the object oriented paradigm for designing a software
CO5:	Implement various software life cycle models

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	3	3	1	2	1	1	1	3	2
CO2	3	3	3	3	2	3	3	1	3	2	2	1	3	2
CO3	3	3	3	2	3	3	3	1	1	3	2	2	3	3
CO4	3	3	3	2	3	3	3	1	1	1	2	2	3	3
CO5	3	3	3	3	3	3	3	1	1	2	3	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10) Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

System Concepts – Software Engineering Concepts – Development Activities – Managing Software Development – Unified Modeling Language: Overview – Modeling Concepts – A deeper view into UML: Use Case Diagram – Class Diagram – Interaction Diagram – State Diagram – Activity Diagram - Project Organization Concepts– Project Communication Concepts.

Unit 02: SYSTEM ANALYSIS	9 Hours
Requirements Elicitation – Concepts: Functional Requirements – Non-Functional Requirements – Completeness – Consistency – Clarity – Correctness – Verifiability – Traceability – Requirement Elicitation Activities – Management - Analysis: Objects Models and Dynamic Models – Analysis Activities – Identify Entity Objects – Boundary Objects – Control Objects – Mapping Use cases to Objects – Modeling – Association – Aggregations – Attributes – Modeling State-Dependent Behavior – Modeling Inheritance – Managing Analysis.	
Unit 03: SYSTEM DESIGN	**9 Hours**
Decomposing the system – Overview of System Design Activities – Design Concepts: UML Deployment Diagrams – System Design Activities: Addressing Design Goals – Mapping Subsystems – Storing Persistent Data- Providing Access Control- Designing Global Control Flow Identifying Services and Boundary Conditions - Managing System Design: Documentation- Assigning Responsibilities - Communication – Iteration.	
Unit 04: OBJECT DESIGN AND IMPLEMENTATION ISSUES	**9 Hours**
Reusing Pattern Solutions – Reuse Concepts: Solution Objects – Inheritance - Design Patterns – Reuse Activities - Specifying Interfaces – Concepts – Activities - Mapping Models to Code – Mapping Concepts – Mapping Activities – Testing.	
Unit 05: MANAGING CHANGE	**9 Hours**
Rationale Management - Configuration Management – Project Management – Software Life Cycle: Standard for Developing Life Cycle Processes – Maturity of Life Cycle Models- Life Cycle Models	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1.	Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 3rd ed, Pearson Education, 2009. (Units 1-5)
2.	Ivar Jacobson. Magnus Christerson, Patrik Jonsson, Gunnar Overgaard, "Object Oriented Software Engineering, A Use Case Driven Approach", Pearson Education, Seventh Impression, 2009.

REFERENCES

1.	Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
2.	Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education ,2010.
3.	Michael R. Blaha and James R Rumbaugh, Object-Oriented Modeling and Design with UML, Prentice Hall.
4.	Yogesh Singh, Ruchika Malhotra, "Object – Oriented Software Engineering", PHI Learning Private Limited, First edition, 2012.
5.	Michael R. Blaha and James R Rumbaugh, Object-Oriented Modeling and Design with UML, Prentice Hall.

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BOS-Chairman/MCA

P23MCA105	WEB PROGRAMMING ESSENTIALS	L	T	P	J	C
		2	0	2	0	3

Course Outcomes

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

CO1:	Explore markup language features.
CO2:	Create interactive web pages using HTML elements
CO3:	Build user interface with style sheets.
CO4:	Design client side validations using scripting language.
CO5:	Construct document object and browser object model scripts.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	2	2	2	2	2	1	2	2
CO2	3	3	3	2	2	2	2	2	1	2	2	2	3	2
CO3	3	2	3	2	3	1	1	2	1	1	1	1	2	1
CO4	3	2	3	2	2	2	2	2	1	2	2	1	2	2
CO5	3	2	3	3	3	2	2	2	1	2	2	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (10)-T CIE test II (10)-T CIE test III (10)-T CIE test IV (10)-L Assignment/Quiz/Seminar/ Mini Project (10)	Total CIE: 50 marks Semester End Examination (50) – (Theory - 25 marks, Lab - 25 marks)	Course end survey

Unit 01: FUNDAMENTALS OF WWW & HTML5 BASICS — **6 Hours**

Brief History of Internet –History of WWW – Understanding how WWW works - History of HTML – Building blocks of HTML5 – HTML text editors - Exploring new features of HTML5 - Structure of HTML5 document – Understanding Comments, Line Breaks and Horizontal Rule- Working with Paragraph and Heading elements - Formatting Text in HTML5: Plain text, Bold, italic, Small, Subscripted, superscripted, abbreviations - Emphasizing text - Organizing text in HTML5: Word breaks - Preformatted text - Working with DIV element - SPAN element.

Unit 02: FORMS AND MULTIMEDIA	6 Hours
Working with Hyper Links: Syntax - target attribute - Absolute URLs - Relative URLs – Using Image as hyperlink. Creating Simple Lists: Unordered List – Ordered List – Description List. Working with Tables - Working with iFrames - Working with Images - HTML Colors and Canvas – HTML Audio and Video - HTML Forms: Form Attributes- Form Elements- Input Types- Input Attributes- Input Form Attributes.	
Unit 03: CASCADING STYLE SHEETS	**6 Hours**
Overview of CSS3, Basic syntax and structure - Inline Styles –Backgrounds and Color Gradients in CSS3 – Background Image – Background Repeat - Fonts and Text Styles – CSS3 Box Model - Creating Multiple Columns Using CSS3 – CSS Styling Links – CSS Z-index - Displaying, Positioning, and Floating an Element.	
Unit 04: JAVASCRIPT BASICS	**6 Hours**
Overview of JavaScript, Core features - Data types and Variables - Operators, Expressions, and Statements: IF-Else - Switch-case – While – For - For…In and Loop control statements. JavaScript Functions - Objects: Array- Date and Math related Objects. Creating a simple Document Object Model Script.	
Unit 05: JS HTML DOM AND BOM	**6 Hours**
JS HTML DOM: Introduction – Hierarchical structure of HTML DOM – Creating HTML DOM Document – HTML DOM Elements – Changing HTML Styles using DOM - methods - Creating a simple Document Object Model Script. JavaScript DOM Events: Introduction - OnClick – OnSubmit – OnMouseOver – OnMouseOut – OnChange - JS HTML Event Listener. JS BOM: Introduction – The Window Object – Window Size property– Window Methods – JS Location – JS Popup Alert.	
	Total Theory Hours: 30

LIST OF EXPERIMENTS :

1. Create a web page for the demonstration of Lists.
   a. Unordered List
   b. Ordered List
   c. Definition List
   d. Nested List
2. Create a web page for demonstrating Hyperlinks.
   a. Navigation from one web page to another.
   b. Navigation within the same web page.
3. Create a web page for generating student time table.
4. Create a web page with the following using HTML5:
   a. Embed an image map in your web page using iFrame.
   b. Fix at least 2 hot spots.
   c. Show all the related information when the hot spots are clicked.
5. Create web pages with all types of cascading style sheets.
6. Implement a client-side script for validating web form controls using JavaScript.
7. Write a JavaScript code for Loan Calculation.
8. Develop and demonstrate a HTML file that use JS user-defined functions for the following problem:
   a. Parameter: A string
   Output: The position in the string of the left-most vowel
   b. Parameter: A number
   Output: The number with its digits in the reverse order
9. Draw a rectangle, circle, line and text with color gradients on a canvas using HTML and JavaScript.

10.	Design a responsive web site for an online book store using HTML and JavaScript.			
				Total Practical Hours : 30
Theory: 30 Hrs	**Tutorial: --**	**Practical: 30 Hrs**	**Project:--**	**Total Hours: 60 Hrs**

TEXT BOOKS

1.	Kogent Learning Solutions Inc., "HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and JQuery", Second Edition, Paperback, 2016. (UNITS I-V)
2.	Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World WideWeb - How to Program", 5thEdition, Pearson Education, 2011.

REFERENCES

1.	Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", 3rdEdition, TataMcGraw Hill, 2013.
2.	David Flanagan, "JavaScript: The Definitive Guide, 6th Edition", O'Reilly Media, 2011.
3.	Achyut S Godbole and AtulKahate, "Web Technologies", 2nd Edition, Tata McGraw Hill, 2012.
4.	Thomas A Powell, HTML & CSS: The Complete Reference, 5th Edition, Tata McGraw Hill, 2017
5.	Julie C.Meloni, Jennifer Kyrnin, "HTML, CSS & JavaScript All in One", 3rd Edition, Pearson Education, 2020.

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P23MCA106	DATA STRUCTURES LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

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

CO1:	Apply Linked List for performing polynomial addition and multiplication.
CO2:	Design an algorithm for implementing infix and postfix conversion using Stack.
CO3:	Design an algorithm allocating resources from the server using Queue.
CO4:	Apply Non-linear Data Structure concepts for the real time applications.
CO5:	Design an algorithm for searching and sorting techniques.

Pre-requisite: P23MCA101 – Data Structures

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO2	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO3	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO4	3	3	3	2	3	1	2	2	1	1	2	2	3	2
CO5	3	3	3	2	3	1	2	2	1	1	2	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz-1 (5) CIE test II (20) Quiz-2 (5) Real Time Problem Solving (10)	Total CIE: 60 marks Semester End Examination (40)	Course end survey

LIST OF EXPERIMENTS :

1. Apply linked list for performing polynomial addition.
2. Apply linked list for performing polynomial multiplication.
3. Apply stack for finding solution infix to postfix conversion.
4. Apply Queue for allocation of resources from the server.
5. Apply Breadth First Search and Depth First Search for the given Network.
6. Apply Prims' Algorithm and Kruskals' Algorithm for finding the Shortest Spanning tree for the given network.
7. Sort the given sequence using Quick sort and Merge Sort.
8. Search the given sequence using sequential search and binary Search.

Theory: --	Tutorial: --	Practical: 60 Hrs	Project:--	Total Hours: 60 Hrs

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P23MCA107	SOFT SKILLS, APTITUDE AND CAREER ENHANCEMENT LABORATORY-I	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

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

CO1:	Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches.
CO2:	Solve fundamental problems in specific areas of Quantitative aptitude & Logical Reasoning.
CO3:	Demonstrate higher level of verbal aptitude skills in English with regard to specific topics.
CO4:	Read and interpret timetables, graphs, etc. and also introduce themselves in a formal situation.
CO5:	Introduce themselves in a formal situation, do presentations and participate in Group Discussion.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	1	1	1	1	1	1	3	1	2	3	2	3	3	3
CO4	1	1	1	1	1	1	3	1	2	3	2	3	3	3
CO5	1	1	1	1	1	1	3	1	2	3	2	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz-1 (5) CIE test II (20) Quiz-2 (5) Real Time Problem Solving (10)	Total CIE: 60 marks Semester End Examination (40)	Course end survey

LIST OF EXPERIMENTS :

Soft Skills	Demonstrating soft-skill capabilities with reference to the following topics: a. SWOT Analysis b. Goal Setting c. Attitude Building and Etiquettes d. Career Planning e. Resume building f. Problem Solving and Decision Making g. Presentation Skills h. Group Discussion

Quantitative Aptitude and Logical Reasoning	Solving simple problems with reference to the following topics: a. Vedic Maths b. Number properties c. Ratio and proportion d. Mixtures and Solutions e. Averages and Ages f. Percentage g. Profit Loss Discount h. Time & Work and Pipes & Cisterns i. Partnership j. Interest Calculation k. Equations l. Logical Reasoning m. Data Arrangement
Focus on language	Demonstrating plain English language skills with reference to the following topics: a. Synonyms b. Antonyms c. Tenses d. Prefixes and suffixes e. Collocations f. Phrasal verb g. Verbal analogy h. Sentence filler words i. Jumbled sentences j. Reconstructions of sentences (PQRS) k. Sentence fillers two words l. Select the best alternative for the underlined part of the sentence m. Writing a quote for the given picture n. Writing story on a given picture
Speaking	Reading comprehension, understanding notices, messages, timetables, etc. reading passages for specific information transfer.
Writing	Essay writing and story writing, Report writing and proposal writing
Reading	Self-introduction, personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town and introduction to articulation skills

Theory: --	Tutorial: --	Practical: 30 Hrs	Project:--	Total Hours: 30 Hrs

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P23MCA108	PYTHON PROGRAMMING LABORATORY	L	T	P	J	C
		1	0	4	0	3

Course Outcomes

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

CO1:	Create simple programs in python programming.
CO2:	Develop programs to implement control statements and functions.
CO3:	Create programs using sequence types.
CO4:	Develop file handling programs in python.
CO5:	Develop applications to implement exceptions handling in python.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	3	1	1	3	3	3	3	3
CO2	3	3	3	3	3	2	3	1	1	3	3	3	3	3
CO3	3	3	3	3	3	2	3	1	1	3	3	2	3	3
CO4	3	3	3	3	3	2	3	1	1	3	3	2	3	3
CO5	3	3	3	3	3	2	3	1	1	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) - L Quiz-1 (5) CIE test II (10) - L Quiz-2 (5) CIE test III (10) - T Record (10)	Total CIE: 50 marks Semester End Examination (50) (SEE-Laboratory)	Course end survey

Unit 01: INTRODUCTION — **3 Hours**

OOPS Concepts: Programming Paradigm- Procedure Oriented Programming - Object Oriented Programming - Concepts of OOP - Features of Python- History of Python – The Future of Python – Python Interpreter and Interactive Mode – Writing and Executing First Python Program –Statements- Data types –Variables and Identifiers – Type Conversion - Operators and Expressions - Comments.

Unit 02: CONTROL FLOW AND FUNCTIONS	3 Hours
Introduction to Decision Control Statements – Selection/Conditional Branching Statements – Basic Loop Structures/Iterative Statements - Nested Loops – The break Statement – The continue Statement – The pass Statement – The else Statement Used with Loops– Functions : Defining a Function–Function Call - Variable Scope and Lifetime – Lambda Functions or Anonymous Functions – Function Composition in Python – Documentation Strings - Recursive Functions.	
Unit 03: SEQUENCE	**3 Hours**
String: Concatenating, Appending, and Multiplying Strings – Strings are Immutable – String Formatting Operator – Built-in-String Methods and Functions – Slice Operation - Comparing Strings – Iterating String – The String Module-Metacharacters in Regular Expression - Sequence-Lists – Tuple –Set – Dictionaries.	
Unit 04: FILE HANDLING AND MODULES	**3 Hours**
Introduction – File Path – Types of Files – Opening and Closing Files – Reading and Writing Files- File Positions - Renaming and Deleting Files –Directory Methods - Modules – Packages in Python – Standard Library Modules.	
Unit 05: EXCEPTION HANDLING	**3 Hours**
Introduction to Errors and Exceptions – Handling Exceptions - Multiple Except Blocks– Multiple Exceptions in a Single Block – Except Block Without Exception – The else cause – Raising Exceptions – Handling Exceptions in Invoked Functions – Built – in and User Defined Exceptions- The try…finally Block – Pre-defined Clean – up Action .	
	Total Theory Hours: 15

LIST OF EXPERIMENTS :

1. Develop programs to learn data types and type conversions using python.
2. Develop programs to learn operators and expressions using python.
3. Develop programs to understand the control statements – for loop in python.
4. Develop programs to understand the control statements – while loop in python.
5. Develop programs to learn concept of functions scoping and function call.
6. Develop programs to learn concept of function recursion
7. Develop programs to implement built-in string methods and functions.
8. Develop programs to implement slicing operations on strings
9. Develop programs to implement the basic operations on strings (concatenation, appending, multiplying)
10. Develop programs to implement Comparison and iteration on strings
11. Develop programs to learn sequence types (list and set) in Python.
12. Develop programs to learn sequence types (tuples and dictionary) in Python.
13. Develop programs to implement modules and packages in python.
14. Develop programs to use file handling in python.
15. Develop programs to implement exception handling in python

Total Practical Hours: 60

Theory: 15 Hrs	Tutorial: --	Practical: 60 Hrs	Project:--	Total Hours: 75 Hrs

TEXT BOOKS	
1.	ReemaThareja, "Problem Solving and Programming with Python ", Second Edition, Oxford University Press2019. (Unit I – V).
2.	Martin C Brown, "Python: The Complete Referenec", Mc Graw Hill Education, 4th Edition, 2018.
REFERENCES	
1.	Dimitrios Xanthidis,Christos Manolas, Ourania K. Xanthidou, Han-I Wang," Handbook of Computer Programming with Python", Chapman and Hall/CRC, 1st Edition, 2022.
2.	Rob Mastrodomenico," The Python Book", Wiley, 1st Edition, 2022.
3.	Yashvant Kanetkar, Aditya Kanetkar,"Let Us Python", Botanical Survey of India, 5th Edition, 2022.
4.	Dr.R.Nageswara Rao, "Core Python Programming", Dreamtech Press, 3rd Edition. 2021.
5.	April Speight," Bite-Size Python: An Introduction to Python Programming", Wiley, 1st Edition, 2020.

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Bridge Course – I under Regulations 2023
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Contact Hours	Marks
Theory				
1.	P23BRC101	Fundamentals of Computer Programming	24	100
2.	P23BRC102	Object Oriented Programming	24	100
3.	P23BRC103	Database Management Systems	24	100
		Total Hours	72	

Approved By

Chairperson, MCA BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr. T. Padma	Dr.R.Shivakumar	Dr.J.Akilandeswari	Dr.S.R.R.Senthil Kumar

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MCA – Bridge Course – I Sem
2023-Batch

P23BRC101	FUNDAMENTALS OF COMPUTER PROGRAMMING		Marks
			100

Course Outcomes

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

CO1:	Explain the fundamental concepts of programming.
CO2:	Formulate the basic problems using pseudo code..
CO3:	Write simple programs in C language..
CO4:	Implement programs on arrays, functions, structures and unions.
CO5:	Describe the concepts of pointers and data structures.

UNIT 01: INTRODUCTION TO PROGRAMMING	**5**

Programs and programming – building blocks for simple programs – pseudo code representation – flow charts – programming languages – compiler – interpreter, loader and linker – program execution – classification of programming language – structured programming concepts – illustrated problems – algorithm to check whether a given number is Armstrong number or not.

UNIT 02: INTRODUCTION TO PROBLEM SOLVING	**5**

Introduction – The Problem solving aspect – Top down/Bottom up design – Exchanging the values - Counting – Summation of a set of numbers – Factorial computation – Generation of the Fibonacci Series – Reversing the digits of an integer – SINE computation – Base Conversion – Factoring Methods – Array techniques.

UNIT 03: INTRODUCTION TO C LANGUAGE	**5**

Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input/Output Operations – Formatted I/O – Decision Making – Branching – IF, Nested IF – Switch – Goto – Looping – While, Do while, For Statements.

UNIT 04: ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS	**5**

Arrays – dynamic and multi-dimensional arrays – Character arrays and Strings – String handling functions – User defined functions – Categories of functions – Recursion – Structures and Unions – Array of Structures – Structures and Functions.

UNIT 05: BASICS OF DATASTRUCTURES	**4**

Pointers: Declaration, Accessing a pointer variable, character strings, Pointers to Functions and Structures. Introduction to Data Structures: Definition – Abstract Data Types.

TOTAL = 24 Hours

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REFERENCES
1. R.G.Dromey, "How to Solve it by Computer", Pearson Education, India, 2007. (Unit-1)
2. Yashavant Kanetkar, "Let Us C", BPB Publications, 2011. (Units-2,3,4)
3. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson, Second Edition, 2010. (Unit-5)
5. Robert L Kruse, "Data Structures and Program Design", Prentice Hall of India, Third Edition, 1999.

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P23BRC102	OBJECT ORIENTED PROGRAMMING	Marks 100

Course Outcomes

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

CO1:	Implement the fundamental concepts of object oriented programming in real time applications.
CO2:	Develop programs using classes and objects.
CO3:	Use function overloading in real time scenarios.
CO4:	Implement the concepts on inheritance in real time scenarios.

UNIT I - INTRODUCTION	**6**

Programming paradigm, Procedure oriented programming, Object oriented programming, Concepts of OOP, Concrete types, Abstract types, Modularity, Expressions, Statements, Namespaces, Functions, Structures, Unions, Enumerations and User-defined types.

UNIT II –CLASSES AND OBJECTS	**6**

Classes and objects, Constructors and destructors, Friend functions, Friend classes, Inline function, Static members, Arrays and Null Terminated Strings, Pointers, References, Pre-processor and Comments, Dynamic Allocation.

UNIT III - OVERLOADING	**6**

Function Overloading: Overloading Constructors, Copy constructors, Default function arguments, Operator Overloading: Member Operator overloading, Operator overloading using friend function, Overloading new and delete, Overloading special operators.

UNIT IV - INHERITANCE	**6**

Inheritance: Base and Derived Class, Access Control, Types of Inheritance, Virtual base class, Abstract class, Virtual Functions, Pure Virtual functions.

TOTAL = 24 Hours

REFERENCES

1. E Balagurusamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 4th Edition, 2005. (Units 1-5)
2. Herbert Schildt, "The Complete reference – C++", 4th Edition, TMH, 2003.
3. Bjarne Stroustrup, "The C++ Programming Language", Addition Wesley, 3rd Edition, 2000.
4. Paul Deital and Harvey Deital, "C++ How to program", Pearson Education, 7th Edition, 2010.
5. Bruce Eckel and Chuck Allison, "Thinking in C++: Practical Programming", Prentice Hall, 2nd Edition, 2004.

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P23BRC103	DATABASE MANAGEMENT SYSTEMS	Marks
		100

Course Outcomes

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

CO1:	Explain the fundamental concepts on database systems.
CO2:	Decompose the database using first, second and third normal forms.
CO3:	Write the SQL queries using DDL, DML commands.
CO4:	Describe the concepts on database transactions.

UNIT I - INTRODUCTION	**6**
File Systems versus Database Systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationalship Model.	
UNIT II – DATABASE DESIGN	**6**
Functional Dependencies - Non-loss Decomposition – First Normal Form – Functional Dependencies - Second - Third Normal Forms. Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison.	
UNIT III – SQL	**6**
SQL: Create Table, Types of Data Languages - data definition, data manipulation - aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	
UNIT IV – TRANSACTIONS	**6**
Transaction Concepts - ACID Properties – Serializability – Concurrency control – Lock-Based Protocols – Two Phase Locking – Deadlock Handling – Recovery System – Failure Classification – Recovery and Atomicity – Recovery algorithms – Transaction Rollback – Recovery after a System Crash – Early lock release and logical Undo operations.	
	TOTAL = 24 Hours

REFERENCES

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", McGraw Hill, 7th Edition, 2017. (Units 1-5)
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson, 7th Edition, 2017.
3. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata McGraw Hill, 2016.
4. G. K. Gupta,"Database Management Systems", Tata McGraw Hill, 2011.
5. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Semester II under Regulations 2023 (CBCS)
Branch: Master of Computer Applications

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MCA201	Design and Analysis of Algorithms	3	0	0	0	3	PC	45	T
2.	P23MCA202	Relational Database Management Systems	3	0	0	0	3	PC	45	T
3.	P23MCA203	Computer Networks	3	0	0	0	3	PC	45	T
4.	P23MCA204	Cloud Computing Technologies	2	0	0	2	3	PC	60	TP
5.	P23MCA205	Data Science	2	0	2	0	3	PC	60	TL
6.	noc24-cs43	**Elective: NPTEL Course:** Programming in Java	3	0	0	0	3	PE	45	T
Practical courses										
7.	P23MCA206	Design and Analysis of Algorithms Laboratory	0	0	4	0	2	PC	60	L
8.	P23MCA207	Relational Database Management Systems Laboratory	0	0	4	0	2	PC	60	L
9.	P23MCA208	Soft Skills, Aptitude and Career Enhancement Laboratory - II	0	0	2	0	1	EEC	30	L
						Total Credits	**23**			

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory,TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

	Shivakumar 12.2.24		
Chairperson, MCA- BoS	**Member Secretary/ Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr. T. Padma	**Dr. R. Shivakumar**	**Dr. J. Akilandeswari**	**Dr. S. R. R. Senthil Kumar**

Copy to:-

HOD/ MCA, Second Semester MCA Students and Staff, COE

P23MCA201	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Recognize the basic notations for analysing the performance of algorithms.
CO2:	Use divide-and-conquer and brute force techniques for solving suitable problems.
CO3:	Apply greedy approach to solve an appropriate problem for optimal solution.
CO4:	Become familiar with dynamic programming approach for problem solving.
CO5:	Know NP completeness and identify different NP complete problems.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	3	2	2	2	2	2	2	2	2	1	2	2
CO2	3	3	3	2	2	2	2	2	1	2	2	2	3	2
CO3	3	2	3	2	3	1	1	2	1	1	1	1	2	1
CO4	3	2	3	2	2	2	2	2	1	2	2	1	2	2
CO5	3	2	3	3	3	2	2	2	1	2	2	2	3	2

Course Assessment methods

Direct		Indirect
CIE Test I (10) - T CIE Test II (10) - T CIE Test III (10) - T Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: INTRODUCTION — **9 Hours**

Introduction: Algorithm Definition, Practical Applications of Algorithms, Analyzing an algorithm, Need of analyzing algorithms, Method of analyzing an algorithm. Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Measuring an Input's Size, Units for Measuring Running Time, Orders of Growth, Worst-Case, Best-Case, and Average-Case Efficiencies, Asymptotic Notations and Basic Efficiency Classes: Big O-notation, Big theta-notation, Big Omega-notation, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of Recursive Algorithms.

Unit 02: DIVIDE AND CONQUER	9 Hours
Divide and Conquer: The Divide and Conquer Template, Binary Search, Merge Sort, Quicksort, Binary Tree Traversals and Related Properties, Matrix Multiplication. BRUTE FORCE: Selection Sort, Sequential Search, Closest-pair problem, String Matching.	
Unit 03: GREEDY METHOD	**9 Hours**
Greedy Method: Optimal Substructure, Sorting Using Greedy Method, Merging Sorted Lists, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm. DECREASE-AND-CONQUER: Insertion Sort, Algorithms for Generating Combinatorial Objects: generating permutations.	
Unit 04: DYNAMIC PROGRAMMING	**9 Hours**
Dynamic Programming: Optimal Substructure, Overlapping Sub-problems, Dynamic Programming Template, The Knapsack Problem and Memory Functions, Optimal Binary Search Trees, Warshall's and Floyd's Algorithms.	
Unit 05: NP COMPLETENESS	**9 Hours**
NP COMPLETENESS: Classes P, NP and NP-Complete, Optimization Problems as Decision Problems, Reducibility or Reductions, NP-COMPLETE PROBLEMS: Backtracking: n-Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. Branch-and- Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. Levitin, Anany, "Introduction to the design and analysis of algorithms", 3rd edition, Pearson, Boston, 2019.
2. Arora, Amrinder, Analysis and design of algorithms, 3rd edition, Cognella Academic Publishing, 2017.

REFERENCES

1. Sandeep Sen, Amit Kumar, Design and Analysis of Algorithms. A contemporary Perspective, Cambridge University Press, 2019.
2. Lekh Raj Vermani, Shalini Vermani, An Elementary Approach To Design And Analysis Of Algorithms, World Scientific Europe, 2019.
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford Publications, 2014.

BOS-Chairman/MCA

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P23MCA202	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Illustrate database design and execute various DDL and DML queries.
CO2:	Retrieve data using sub queries and combine tables using Joins.
CO3:	Executive SQL queries related to data control language to enforce security in a multi-user database environment.
CO4:	Create simple and advanced PL/SQL code blocks for stored procedures and cursors.
CO5:	Construct PL/SQL triggers and to access records from database.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	2	2	2	2	2	1	2	2
CO2	3	3	3	2	2	2	2	2	1	2	2	2	3	2
CO3	3	2	3	2	3	1	1	2	1	1	1	1	2	1
CO4	3	2	3	2	2	2	2	2	1	2	2	1	2	2
CO5	3	2	3	3	3	2	2	2	1	2	2	2	3	2

Course Assessment methods

Direct		Indirect
CIE Test I (10) - Theory CIE Test II (10) - Theory CIE Test III (10) - Theory Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: DESIGNING AND CONSTRUCTING A DATABASE — **9 Hours**

Database Design: Database structure, Design process, Pre-design phase of design, Organizing your data - Functional dependency and candidate keys - Entity-Relational modeling – Normalization - Working with DDL commands: Create, Alter, Drop and Truncate - Relational data types - Specifying keys - SQL column constraints: Primary Key, Foreign Key, Unique, Check, Default Values, Indexes - Working with DML commands: Insert, Update and Delete - Working with TCL commands: Commit, Rollback and Savepoint.

Unit 02: RETRIEVING DATA FROM DATABASE	9 Hours
SELECT statement: Syntax – SELECT clause – SELECT DISTINCT – AS clause - Null values – Select Insert Into Clause - Sorting query results – Aggregating query results - Using WHERE Clause: Matching parts of strings using LIKE operator - Using logical operators in the WHERE clause, IN clause, BETWEEN clause - Useful functions for WHERE clauses - Filtering query results using GROUPBY and HAVING - Combining Tables using SQL Joins: Types of joins, Joining More than two tables, UNION Joins – Subqueries: Types of subqueries, Subqueries that return a list of values, Subqueries that return a single value, Writing complex queries, Using subqueries in UPDATE and DELETE statement, Using subqueries with INSERT.	
Unit 03: DATABASE MANAGEMENT	**9 Hours**
Using Views: Creating Views, Advantages of Using Views, Creating Column Aliases, Single Table Views, Views that Use Joins, Creating Views with Subqueries, Using Other Join Operations in views, Nesting Views, Updating Views, tasks you can accomplish with views - The SQL Security Model: Overview of Database Security, Creating Database Users, Database elements, Using GRANT and REVOKE, Security Roles and Views - Real World Issues Handling Specific Types of Data: Numeric Data Types, String Data Types, Dealing with Date operations – Dealing with string operations - Converting Data Between Types - Database Performance and Integrity: Improving Database Performance, Performance Measurement Tools, Indexes, The Query Optimizer, Data Integrity, Integrity Versus Performance.	
Unit 04: STORED PROCEDURES	**9 Hours**
PL/SQL Cursor: Implicit cursor, Explicit cursor - Stored Procedures: Stored Procedure, working with Variables, Defining Blocks of Code, Conditional Statements Using IF, Using CASE, Using Loops, Loop over a Cursor - More on Transact – Writing SQL Stored Procedures: General Transact - SQL Programming Information, Global Variables, Using RETURN to Leave Stored Procedures, Using Temporary Objects, WAITFOR - Writing Oracle PL/SQL Stored Procedures: The Declaration Section, The Executable Section, Writing Stored Procedures.	
Unit 05: TRIGGERS AND DATABASE CONNECTIVITY	**9 Hours**
PL/SQL Functions: Creating and using custom functions – PL/SQL Packages: Bundling Procedures and Functions in packages - PL/SQL Exception handling - PL/SQL Triggers: Creating a trigger – Advantages – Types of triggers - Loop over a Trigger – Retrieving data from front end application to Oracle database - A case study: Register the driver class, Get the connection object, Create the statement object, Execute the query, Close the connection object.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project:--	Total Hours: 45 Hrs

TEXT BOOKS

1. Ivan Bayross, "SQL, PL/SQL – The Programming Language of ORACLE", Fourth Edition, BPB Publications, December 2010.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan "Database System Concepts", Sixth Edition, Mc Graw Hill Education, December 2013.

REFERENCES	
1.	Elmasri Ramez, Navathe Shamkant, "Fundamentals of Database System", Seventh Edition, Pearson Education, June 2017.
2.	Donald J Bales, "Beginning Oracle PL/SQL", Second Edition, Springer Nature Publications, May 2015.
3.	Alan Beaulieu , "Learning SQL", O'Reilly Media Publications, 2014.
4.	P. S. Deshpande, SQL and PL/SQL for Oracle 11g – Black Book, Dreamtech Press Publishers, July 2011.

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P23MCA203	COMPUTER NETWORKS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

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

CO1:	Describe the organization of network protocols, the TCP/IP protocol suite, and the OSI model.
CO2:	Analyze the performance and operations of the MAC protocols.
CO3:	Comprehend the transition from IPv4 to IPv6 ensures adaptability to evolving networking technologies.
CO4:	Differentiate between various transport layer protocols and their respective functionalities.
CO5:	Examine the functions and protocols of the Application layer.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	3	1	1	1	2	2	2	2
CO2	2	2	2	3	3	2	3	2	2	2	3	2	3	3
CO3	3	3	3	3	3	2	3	3	2	3	3	2	3	3
CO4	3	3	3	3	3	2	3	3	2	3	3	2	3	3
CO5	3	3	3	3	3	2	3	3	2	3	3	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) - Theory CIE test II (10) - Theory CIE test III (10) - Theory Assignment/Problem-solving/ Seminar (10)	Total weightage for CIE : 40 marks Semester End Examination : 60 marks	Course end survey

Unit 01: INTRODUCTION AND PHYSICAL LAYER — **9 Hours**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

Unit 02: DATA-LINK LAYER AND MEDIA ACCESS	9 Hours
Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – IEEE Standards - Wired LANs: Ethernet - Wireless LANs : Introduction – Bluetooth, WiFi – Connecting Devices, Access Points.	
Unit 03: NETWORK LAYER	**9 Hours**
Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.	
Unit 04: TRANSPORT LAYER	**9 Hours**
Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – Connection establishment and release – Flow Control – Retransmission Strategies – Congestion Control - Stream Control Transmission Protocol.	
Unit 05: APPLICATION LAYER	**9 Hours**
WWW and HTTP- HTTPS – FTP – Email Protocols: SMTP- POP3- IMAP –Telnet – SSH – DNS – SNMP- OAuth protocol- JSON Web Token – Basics of Cryptography: Encryption and Decryption - Conventional Cryptography - Public and Private Key Cryptography- Basics of Firewall - Case study.	

Theory: 45 Hrs	Tutorial: --	Practical: --	Project: --	Total Hours: 45 Hrs

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2017. (Unit 1 to 5)
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition Morgan Kaufmann Publishers Inc., 2012.

REFERENCES

1. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2017.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

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P23MCA204	CLOUD COMPUTING TECHNOLOGIES	L	T	P	J	C
		2	0	0	2	3

Course Outcomes

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

CO1:	Apply the service models and deployment models of cloud computing in real time.
CO2:	Analyze the techniques of virtualization and load balancing.
CO3:	Appraise the databases and security mechanism of cloud.
CO4:	Implement the storage and testing mechanisms of Cloud Computing in real time.
CO5:	Analyze the best practices of implementing cloud and the integration of latest technologies with cloud computing.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2	2	2	2	3	3	3	3	3
CO2	2	3	3	3	3	2	2	2	2	3	3	3	3	3
CO3	2	3	3	3	3	2	2	2	2	3	3	3	3	3
CO4	2	3	3	3	3	2	2	2	2	3	3	3	3	3
CO5	2	3	3	3	3	2	2	2	2	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE Test I (10) - Theory CIE Test II (10) - Theory CIE Test III (10) - Theory CIE Test IV (10) – Project Review Assignment/Quiz/Seminar (10)	Total CIE: 50 marks Semester End Examination: 50 marks (SEE – Theory: 25 Marks, Project: 25 Marks)	Course end survey

Unit 01: OVERVIEW OF CLOUD COMPUTING — **6 Hours**

Introduction to Cloud Computing –Cloud service models: SaaS, PaaS, IaaS – Cloud computing sub service models: Storage as a Service, Networking as a Service – Cloud deployment models – Cloud architecture – Characteristics of cloud computing - Economics of choosing a cloud platform for an organization.

Unit 02: VIRTUALIZATION AND VPC	6 Hours
Virtualization Techniques – Virtualization Technology – Overview of x86 virtualization - Types of Virtualization – CPU – Containers – Kubernetes - VPC – VPN - Load balancing – case study.	
Unit 03: DATABASE AND SECURITY	**6 Hours**
Cloud databases and File systems – Cloud database: RDS, Assure SQL, Cloud SQL - Cloud File system – HDFS - Cloud Programming model - Map Reduce – Cloud Disaster Recovery - Cloud Security Architecture - VM Security challenges - Vulnerability Assessment tools for cloud – AquaSec – Snyk – SonarQube – Open source security assessment tools – ScoutSuite, CloudSploit Scans.	
Unit 04: CLOUD STORAGE AND CLOUD TESTING	**6 Hours**
Cloud Middleware – Concept and Need of Cloud Middleware. Cloud optimized storage: scalability – Replications options – Data archiving methods – Cloud testing – Secure cloud software testing – Postman, Cucumber, RESTAPI tools.	
Unit 05: REAL TIME APPLICATIONS AND BEST PRACTICES	**6 Hours**
Role of Cloud in Big data and IoT – Cloud Providers and their products – Amazon , Microsoft, VMware - Working with Google app engine and Hosting the application- Best practices– Cloud Computing Consumer case studies.	
	Total Theory Hours : 30

List of Functionalities/domain to be implemented in the project :

1. Develop Software as a service applications in Salesforce that covers any of the following functionalities
   - Data Modeling.
   - Automation Process.
   - Triggers and Controllers.
   - Data Management.
   - Reports and Dashboards.
   - Sales and Services in cloud.
   - LWS.
   - Einstein Analytics.
   - Experience Cloud.
   - API and Integration.
2. Develop a simple project that utilizes the services of Cloud providers (eg: Azure, Redis tool and other tools of AWS, Google cloud).
3. Develop simple cloud based projects in different domains such as Agriculture/Healthcare/Pharmacy/ E-commerce/Education/Transport.
4. Build a personal cloud storage solution.

Total Project Hours : 30

Theory: 30 Hrs	Tutorial: --	Practical: --	Project: 30 Hrs	Total Hours: 60 Hrs

TEXT BOOKS

1.	Rishabh Sharma, "Cloud Computing - Fundamentals , Industry approach and trends", Wiley Publicatons, 1st Edition 2015. (Unit 1,2,3,4,5).
2.	Shailendra Singh, "Cloud Computing", Oxford university press, 1st Edition, 2018 (Unit 1,2,3).

REFERENCES	
1.	Dr. Logan Song,Yu Meng, "The Self-Taught Cloud Computing Engineer: A comprehensive professional study guide to AWS, Azure, and GCP", Packt Publishing, 1st Edition, 2023
2.	Dan C. Marinescu, "Cloud `Computing: Theory and Practice", Morgan Kaufmann, 3rd Edition 2022.
3.	Dr. Tony Ayoola, "CLOUD COMPUTING THEORY AND PRACTICE: A Guide for Data Engineers", Independently published, 1st Edition, 2022.
4.	Gerardus Blokdyk, "Cloud Computing – A complete guide", 5STARCooks, 1st Edition , 2021.
5.	Frank H.P. Fitzek, Fabrizio Granelli, Patrick Seeling, "Computing in Communication Networks: From Theory to Practice", Academic Press, 1st Edition, 2020.

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P23MCA205	DATA SCIENCE	L	T	P	J	C
		2	0	2	0	3

Course Outcomes

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

CO1:	Apply modern analytical tools on Big Data.
CO2:	Experiment with statistical concepts using R language.
CO3:	Experiment various data analysis using R language.
CO4:	Construct a data model using Hadoop Framework.
CO5:	Experiment the data analytics framework and visualize using ggplot.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	2	3	1	3	2	3	3
CO2	3	3	3	3	3	3	3	2	1	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	1	3	1	2	3	3
CO4	3	3	3	3	3	3	3	2	1	3	1	2	3	3
CO5	3	3	3	3	3	3	3	2	1	3	1	2	3	3

Course Assessment methods

Direct		Indirect
CIE Test I (10) - Theory CIE Test II (10) - Theory CIE Test III (10) - Theory CIE Test IV (10) – Laboratory Assignment/Quiz/Seminar/ Mini Project (10)	Total CIE: 50 marks Semester End Examination: 50 marks (Theory – 25 Marks, Lab – 25 Marks)	Course end survey

Unit 01: INTRODUCTION TO DATA SCIENCE AND BIG DATA — **6 Hours**

Introduction to Data Science – Data Science Process – Exploratory Data analysis –Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data - Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics – Modern Data Analytic Tools.

Unit 02: DATA ANALYSIS	6 Hours
Univariate Analysis: Frequency. Mean. Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis –Bivariate Analysis: Correlation – Regression – Multivariate Analysis – Principal Component Analysis - Graphical representation of Univariate, Bivariate and Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Regression Line, Two-way Cross Tabulation.	
Unit 03: DATA MODELING	**6 Hours**
Bayesian Modeling – Support Vector Machine - Kernel Methods: Linear Kernel - Polynomial Kernel - Gaussian Kernel - Exponential Kernel - Laplacian Kernel - Sigmoid Kernel - Anova Radial Basis - Neuro-Fuzzy Modeling.	
Unit 04: Introduction to Unstructured Database	**6 Hours**
Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema –CRUD Operations.	
Unit 05: DATA ANALYTICAL FRAMEWORKS AND VISUALIZATION	**6 Hours**
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Components and Block Replication - Case Study – Medical Datasets. Data Visualization: Using the ggplot2 package to visualize data -Applying themes from ggthemes to refine and customize charts and graphs -Building data graphics for dynamic reporting, Data Visualization Tool: Apache Kafka.	
	Total Theory Hours : 30

List of Experiments:

1. Working with Vectors, Matrix, Lists, Data Frame, Factors, Tables and its operations.
2. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
3. Use the Diabetes data set from UCI and Pima Indians Diabetes data set for per forming the following:
    a. Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
    b. Bivariate Analysis: Linear and logistic regression modeling.
    c. Multiple Regression Analysis
    d. Also compare the results of the above analysis for the two data sets.
4. Apply and explore various plotting functions on UCI data sets.
    a. Normal curves
    b. Density and contour plots
    c. Correlation and scatter plots
    d. Histograms.
    e. Three dimensional plotting
5. Apply and explore various plotting functions on UCI data sets.
   Datasets can be used from
    - www.kaggle.com
    - www.uci.edu

Total Practical Hours : 30

Theory: 30 Hrs	Tutorial: --	Practical: 30 Hrs	Project: --	Total Hours: 60 Hrs

TEXT BOOKS	
1.	Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, First Edition, 2013.
2.	Umesh R Hodeghatta, Umesh Nayak, "Business Analytics Using in R – A Practical Approach", Apress, First Edition, 2017.
REFERENCES	
1.	G Sudhamathy, "R Programming An Approach to Data Analytics", Mjp Publisher, 2021.
2.	Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley, Eleventh Edition 2013.
3.	J. Leskowac, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets",Cambridge University Press, Second Edition, 2014.
4.	Nishant Gerg, "Hbase Essentials", Packt, First Edition, 2014.
5.	Rachel Schutt, Cathy O'Nell, "Doing Data Science",O'Reilly, First Edition, 2013.
6.	Foster Provost, Tom Fawcet, "Data Science for Business",O'Reilly, First Edition, 2013.
7.	Bert Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, First Edition, 2014.

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noc24-cs43	**PROGRAMMING IN JAVA**	**L**	**T**	**P**	**J**	**C**
		3	**0**	**0**	**0**	**3**

COURSE INSTRUCTOR :

Prof. Debasis Samanta
Department of Computer Science & Engineering
IIT Kharagpur

ABOUT THE COURSE :

With the growth of Information and Communication Technology, there is a need to develop large and complex software. Further, those software should be platform independent, Internet enabled, easy to modify, secure, and robust. To meet this requirement object-oriented paradigm has been developed and based on this paradigm the Java programming language emerges as the best programming environment. Now, Java programming language is being used for mobile programming, Internet programming, and many other applications compatible to distributed systems. This course aims to cover the essential topics of Java programming so that the participants can improve their skills to cope with the current demand of IT industries and solve many problems in their own filed of studies.

INTENDED AUDIENCE:

The undergraduate students from the engineering disciplines namely CSE, IT, EE, ECE, etc. might be interested for this course.

PRE-REQUISITES:

This course requires that the students are familiar with programming language such as C/C++ and data structures, algorithms.

INDUSTRY SUPPORT: All IT companies.

COURSE LAYOUT

Week 1 : Overview of Object-Oriented Programming and Java
Week 2 : Java Programming Elements
Week 3 : Input-Output Handling in Java
Week 4 : Encapsulation
Week 5 : Inheritance
Week 6 : Exception Handling
Week 7 : Multithreaded Programming
Week 8 : Java Applets and Servlets
Week 9 : Java Swing and Abstract Windowing Toolkit (AWT)
Week 10 : Networking with Java
Week 11 : Java Object Database Connectivity (ODBC)
Week 12 : Interface and Packages for Software Development

SUMMARY		
Course Status	:	Ongoing
Course Type	:	Elective
Duration	:	12 weeks
Category	:	o Computer Science and Engineering o Programming
Credit Points	:	3
Level	:	Undergraduate
Start Date	:	22 Jan 2024
End Date	:	12 Apr 2024
Exam Date	:	27 Apr 2024 IST
Enrollment Ends	:	05 Feb 2024
Exam Registration Ends	:	16 Feb 2024

This is an AICTE approved FDP course

BOOKS AND REFERENCES

1. Java: The Complete Reference Hebert Schildt, Mc Graw Hill
2. Object-Oriented Programming with C++ and Java Debasis Samanta, Prentice Hall India.

INSTRUCTOR BIO

Prof. Debasis Samanta
Department of Computer Science & Engineering
IIT Kharagpur

Debasis Samanta holds a Ph.D. in Computer Science and Engineering from Indian Institute of Technology Kharagpur. His research interests and work experience spans the areas of Computational Intelligence, Data Analytics, Human Computer Interaction, Brain Computing and Biometric Systems. Dr. Samanta currently works as a faculty member at the Department of Computer Science & Engineering at IIT Kharagpur.

COURSE CERTIFICATE

The course is free to enroll and learn from. But if you want a certificate, you have to register and write the proctored exam conducted by us in person at any of the designated exam centres.

The exam is optional for a fee of Rs 1000/- (Rupees one thousand only).

Date and Time of Exams: 27 April 2024 Morning session 9am to 12 noon; Afternoon Session 2pm to 5pm.

Registration url: Announcements will be made when the registration form is open for registrations.
The online registration form has to be filled and the certification exam fee needs to be paid. More details will be made

available when the exam registration form is published. If there are any changes, it will be mentioned then.

Please check the form for more details on the cities where the exams will be held, the conditions you agree to when you fill the form etc.

CRITERIA TO GET A CERTIFICATE

Average assignment score = 25% of average of best 8 assignments out of the total 12 assignments given in the course.
Exam score = 75% of the proctored certification exam score out of 100.
Final score = Average assignment score + Exam score.

YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE >=10/25 AND EXAM SCORE >= 30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score >= 40/100.

Certificate will have your name, photograph and the score in the final exam with the breakup. It will have the logos of NPTEL and IIT Kharagpur. It will be e-verifiable at nptel.ac.in/noc.
Only the e-certificate will be made available. Hard copies will not be dispatched.
Once again, thanks for your interest in our online courses and certification. Happy learning.

- NPTEL team

Ministry of Education
Government of India

swayam

Initiative by : Ministry of Education (Govt of India)

Total Hours:45 Hrs

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P23MCA206	DESIGN AND ANALYSIS OF ALGORTHIMS LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

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

CO1:	Solve the problem using Divide and Conquer method, Decrease and Conquer method.
CO2:	Find the solution using dynamic programming method
CO3:	Develop an application using branch and bound and backtracking.

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO2	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO3	3	3	3	3	3	1	2	2	1	1	2	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz-1 (5) CIE test II (20) Quiz-2 (5) Real Time Problem Solving (10)	Total CIE: 60 marks Semester End Examination: 40 marks	Course end survey

LIST OF EXPERIMENTS :

1. Apply Divide and Conquer technique to sort a sequence of values using Quick Sort.
2. Apply Brute Force approach for matching the strings.
3. Apply Greedy Method for finding the single source shortest path using Dijkatra's Algorithm.
4. Apply Decrease and Conquer method to generating the combinatorial objects.
5. Find the maximum profit for the given knapsack using dynamic programming.
6. Find the transitivity matrix using Warshall's Algorihtm.
7. Find the All pairs shortest path from given graph using Floyd's Algorithm.
8. Apply backtracking algorithm for finding the solution for N Queens Problem.
9. Apply branch and bound method to find the solution for Assignment Problem.

Theory: --	Tutorial: --	Practical: 60 Hrs	Project:--	Total Hours: 60 Hrs

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P23MCA207	RELATIONAL DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	J	C
		0	0	4	0	2

Course Outcomes

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

CO1:	Write SQL queries using DDL, DML, DCL and TCL commands
CO2:	Write SQL sub queries and complex queries
CO3:	Develop application programs using PL/SQL code blocks

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO2	3	3	3	3	3	1	2	2	1	1	2	2	3	3
CO3	3	3	3	3	3	1	2	2	1	1	2	2	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz-1 (5) CIE test II (20) Quiz-2 (5) Real Time Problem Solving (10)	Total CIE: 60 marks Semester End Examination: 40 marks	Course end survey

LIST OF EXPERIMENTS :

1. Consider the following Order Table:
   SALESMAN (Salesman_id, Name, City, Commission, Customer_name, Customer_City, Purchase_amt, Purchase_date).
   Perform the following DDL commands in SQL:
   a. Creating a database
   b. Viewing all tables in a database
   c. Creating tables (with and without constraints)
   d. Altering tables (with ADD/MODIFY keywords)
   e. Dropping a table/database
   f. Truncating a table/database
   g. Renaming a table/database
2. Consider the following College database:
   STUDENT (Stud_id, Name, Age, Address, Phone_no, Email_ID);
   SEMESTER (Stud_id, Sem_id, Degree, Year_of_Adm)
   SUBJECT (Stud_id, Subject_code, Sub_title,Semester,Credits)
   Perform the following DCL and TCL commands in SQL:

a. Commit
b. Rollback
c. Save Point
d. Grant
e. Revoke

3. Consider the following Book Table:
   BOOK (Book_id, Title, Author_Name, Publisher_Name, Pub_Year, No_of_Copies)
   Perform the following DML commands in SQL:
   a. Inserting records
   b. Updating the existing records
   c. Deleting the specific records
   d. Selecting records from the existing table

4. For a given set of relational database, create tables and perform the following SQL queries:
   SALESMAN (Salesman_id, Name, City, Commission)
   CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
   ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
   a. Simple Queries with Select - Where – Between – Like – Distinct clauses.
   b. Simple Queries with Aggregate functions
   c. Queries with group by and having clause
   d. Queries involving - Date Functions, String Functions, Math Functions
   e. Sort records with Order by clause

5. For a given set of relational database for Movie information, create tables and perform the following SQL queries:
   ACTOR (Act_id, Act_Name, Act_Gender)
   DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
   MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Act_id, Dir_id)
   MOVIE_CAST (Act_id, Actor_name, Mov_id, Role)
   RATING (Mov_id, Rev_Stars)
   a. Subqueries- With ANY, SOME and ALL clauses.
   b. Subqueries With IN and NOT IN clause, With EXISTS and NOT EXISTS clause.
   c. Join Queries- Inner Join, Outer Join, Left Join, Right Join, Self-Join
   d. Create a simple view that shows all movie records of a particular director.
   e. Create a complex view that shows all movie records of a particular film with highest rating and
   f. actor name.
   g. Update/Drop the existing views.

6. Create a PL/SQL Cursor to generate student grade calculation.
   Consider the following Bank table:
   BANK (cid, cname, add, accno, acctype, bankname, dep_amt, bal_amt)
   a. Write a PL/SQL procedure which accept the account number of a customer and retrieve the balance.
   b. Write an PL/SQL updated trigger on Bank table. The system should keep track of the records that are being updated.

7. Write SQL queries for the following questions:
   a. Retrieve the first date of the current month.
   b. Retrieve the last date of the current month.
   c. Retrieve number of days between two given dates.

d. Get the last day of the current year.
e. Determine how many days are left in the current month
f. Display the current date in the following formats:
   - 2024-01-02
   - January 2, 2024
   - Tuesday 2 January 2024 00:0:00
   - 12:00 AM January 2, 2024

Consider the following Bank table:

BANK (cid, cname, add, accno, acctype, bankname, dep_amt, bal_amt)

8. Create a stored procedure in PL/SQL which is used to perform the following requirements:
   - Before inserting, check the detail about the product name. If the product name is available, update the existing product price with the new product price.

   Consider the following product table for the above scenario:

   PRODUCT (pid, pname, qty, price)

9. Create a User Registration Form using Java Swing with MySQL database connectivity to store user data via JDBC API.

Theory: --	Tutorial: --	Practical: 60 Hrs	Project:--	Total Hours: 60 Hrs

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P23MCA208	SOFT SKILLS, APTITUDE AND CAREER ENHANCEMENT LABORATORY - II	L	T	P	J	C
		0	0	2	0	1

Course Outcomes

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

CO1:	Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
CO2:	Solve fundamental problems in specific areas of Quantitative aptitude & Logical Reasoning
CO3:	Demonstrate higher level of verbal aptitude skills in English with regard to specific topics

Pre-requisite:

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	1	1	1	1	1	1	3	1	2	3	2	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (20) Quiz-1 (5) CIE test II (20) Quiz-2 (5) Real Time Problem Solving (10)	Total CIE: 60 marks Semester End Examination: 40 marks	Course end survey

Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. Leadership skills b. Teamwork c. Critical thinking d. Dealing with criticism e. Interview skills f. Psychometric analysis/assessments g. Mock GDs h. Mock Interview

Quantitative Aptitude and Logical Reasoning	**Solving simple problems with reference to the following topics:** a. Time Speed Distance b. Permutation and Combination c. Probability d. Logarithm e. Geometry and Mensuration f. Functions & Polynomials g. Syllogism h. Data Sufficiency i. Clocks & Calendars j. Cubes & Dice k. Visual Reasoning l. Non -verbal Reasoning m. Inequalities n. Data Interpretation
Focus on language	Demonstrating plain English language skills with reference to the following topics: a. Subject verb agreement b. Modal verbs c. Reading comprehension d. Spotting errors e. Choosing the correct / incorrect sentences f. Describing the picture g. Critical Reasoning h. Theme Detection i. Cloze test
Speaking	Mini presentation and group discussion, Interviews and presentation
Writing	Paragraph writing, e-mail, letter to editors and memos
Reading	Reading advertisements and graphs, reading passages for specific information transfer

Theory: --	**Tutorial: --**	**Practical: 30 Hrs**	**Project: --**	**Total Hours: 30 Hrs**

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA Bridge Course – II Semester under Regulations 2023
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Contact Hours	Marks
Theory				
1.	P23BRC201	FUNDAMENTALS OF PROBABILITY AND STATISTICS	24	100
2.	P23BRC202	INTRODUCTION TO LINUX AND SHELL SCRIPTING	24	100
3.	P23BRC203	BASICS OF ALGORITHM DESIGN TECHNIQUES	24	100
		Total Hours	72	

Approved By

Chairperson, MCA BoS	**Member Secretary, Academic Council**	**Dean-Academics**	**Chairperson, Academic Council & Principal**
Dr. T. Padma	**Dr.R.Shivakumar**	**Dr.J.Akilandeswari**	**Dr.S.R.R.Senthil Kumar**

Copy to:-
HOD/ Second Semester MCA Students and Staff, COE

P23BRC201	FUNDAMENTALS OF PROBABILITY AND STATISTICS	Marks 100

Course Outcomes	
At the end of the course, the student will be able to	
CO1:	Explain the concept of probability
CO2:	Comprehend the concept of random variables
CO3:	Calculate and interpret measures of dispersion
CO4:	Interpret relationships between two variables.
CO5:	Define and distinguish between null and alternative hypotheses

UNIT 01: INTRODUCTION TO PROBABILITY	5
Introduction – Terminology of Probability – Marginal Probability – Joint Probability – Events: Disjoint – Non-Disjoint – Independent – Dependent – Bayes Theorem – Sample Space.	
UNIT 02: DISTRIBUTION FUNCTION	**5**
Continuous and Discrete Random Variables – Distribution Function of a Random Variable – Probability Mass Functions and Probability Density Functions – Characteristic Functions.	
UNIT 03: DESCRIPTIVE STATISTICS	**5**
Sampling Techniques – Data Classification – Measures of Central Tendency – Measures of Variation – Quartiles and Percentiles – Moments - Skewness and Kurtosis.	
UNIT 04: CORRELATION AND REGRESSION	**5**
Scatter Diagram – Karl Pearson's Correlation Coefficient – Rank Correlation - Correlation Coefficient for Bivariate Frequency Distribution – Regression Coefficients – Fitting of Regression Lines.	
UNIT 05: HYPOTHESIS TESTING	**4**
Fundaments of Hypothesis Testing – T-Test – Z-Test – Chi Squared Test – Anova Test.	
TOTAL = 24 Hours	

REFERENCES

1. Gupta, S.C. and Kapoor, V.K.: "Fundamentals of Mathematical Statistics", Sultan & Chand & Sons, New Delhi, 11th Ed, 2002.
2. Hastie, Trevor, et al. "The elements of Statistical Learning", Springer, 2009.
3. Practical Statistics for Data Scientists, 2nd Edition, Peter Bruce, Andrew Bruce and Peter Gedeck, May 2020.
4. Statistics for Machine Learning, By Pratap Dangeti, July 2017.

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P23BRC202	INTRODUCTION TO LINUX AND SHELL SCRIPTING	Marks 100

Course Outcomes	
At the end of the course, the student will be able to	
CO1:	Explain the distributions of Linux and the reason for open source.
CO2:	Apply Linux commands to manage files and file systems.
CO3:	Explore different types of shells in Linux environment.
CO4:	Apply the concept of programming constructs to create shell scripts. with Linux and apply them to create, compile and execute C programs in Linux terminal
CO5:	Create and execute BASH shell scripts.

UNIT 01: INTRODUCTION TO LINUX	5
Free Vs Open Source Software - History of Open Source Software - Brief history of LINUX, architecture of LINUX, Features of LINUX, Unix Vs Linux, Linux Vs Windows, Linux Distributions - Introduction to vi editor.	

UNIT 02: SHELL COMMANDS IN LINUX	7
Displaying the File Contents on the Terminal: cat, more, less, head, tail commands – File and Directory Manipulation Commands: mkdir, cp, mv, rm, touch, grep, grep with regular expressions – sort, wc, cut commands – Basic Terminal Navigation Commands: ls, ls-l, ls-a, cd, du, pwd, man, rmdir, ln, ln –s, locate, echo, df, tar commands – File Permission Commands: chown, chrgrp, chmod commands – Linux directory structure – Input/Output Redirection in Linux: Overwrite redirection, Append redirection, Merge redirection.	

UNIT 03: INTRODUCTION TO SHELL SCRIPT	7
Introduction to Kernel, Shell, Command line shell, Graphic Shell, Terminal and Shell scripting, Benefits of Shell scripting - Types of Shells: C Shell (csh), Bourne Shell (sh), Korn Shell (ksh), GNU Bourne-Again Shell (bash), T Shell (tsh), Z Shell (zsh), – Creating the first Shell script in Linux - Shell Comments – Shell Variables – Rules for variable definition – Defining variables – Accessing variables – Unsetting variables – Read only variables – Variable types: local, environment and shell variables – Storing and displaying the output of commands - Defining the Shell script interpreter – Operators – Exiting from Shell script – Determining the Shell - Shell sourcing a file – Troubleshooting a shell script.	

UNIT 04: EXECUTING BASH SHELL SCRIPT	5
– Understanding arrays in Shell scripting: Conditional statements: Shell if then else, Shell if then elif, Shell case – Control statements: Shell while loop, Shell until loop, Shell for loop– Shell eval command – Shell let command - Shell Script Positional Parameters: Variable parameters, Special parameters – Advantages of Shell script parameters – Shell Functions – Command line arguments.	

TOTAL = 24 Hours

REFERENCES
1. Emmett Dulaney, "Linux All-in-One Dummies", Wiley Publications, Sixth Edition, January 2018.
2. Jason Cannon, "SHELL Scripting", Kindle Edition, September 2015.
3. Chris Johnson, Jayant Varma, "Pro Bash Programming", Second Edition, Apress Publications, June 2015.
4. Cameron Newham, "Learning the Bash Shell", Third Edition, O'Reilly Publications, April 2005.
5. Yashavant Kanetkar, "UNIX Shell Programming", BPB Publicaitons, August 2003.

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P23BRC203	BASICS OF ALGORITHM DESIGN TECHNIQUES	Marks
		100

Course Outcomes

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

CO1:	Describe the running time of an algorithm by applying various asymptotic notations.
CO2:	Apply backtracking technique to solve optimization problems.
CO3:	Relate brute force technique to find solutions to the problem.
CO4:	Analyze and manipulate data that can be represented as networks of nodes and edges.
CO5:	Find optimal solution for combinatory, discrete and mathematical optimization problems.

UNIT 01: INTRODUCTION	**5**

Introduction: What is an algorithm?, Practical Applications of Algorithms, What is meant by "Analyzing an Algorithm"?, Why Should We Analyze Algorithms?, How to Analyze a Given Algorithm?, ASYMPTOTIC NOTATION: O-Notation (Big Oh Notation), Ω-Notation (Big Omega Notation), Small Oh (0) Notation, Small Omega (w) Notation, θ-Notation (Big Theta Notation).

UNIT 02: BACKTRACKING	**5**

Backtracking: Backtracking Procedure, Graph Coloring. Divide and Conquer: Divide and Conquer General Algorithm, Max–Min Problem, Round-Robin Tennis Tournament.

UNIT 03: GREEDY ALGORITHMS	**5**

Greedy Algorithms: Optimal Substructure, Sorting Using Greedy Method, Job Sequencing with Deadlines. Dynamic Programming: Matrix-Chain Multiplication, Largest Common Subsequence.

UNIT 04: ELEMENTRY GRAPH ALGORITHMS	**5**

Elementary Graph Algorithms: Representations of Graphs, Classification of Edges, Depth First Search (DFS), Application of DFS: Connectivity, Minimum Spanning Trees in Uniformly Weighted Graphs, Biconnectivity, Breadth First Search (BFS).

UNIT 05: BRANCH AND BOUND	**4**

Branch and Bound: Branch and Bound Template, Applying B&B to O/l Knapsack Problem, Applying B&B to Job Assignment Problem.

TOTAL = 24 Hours

REFERENCES

1. Sandeep Sen, Amit Kumar, Design and Analysis of Algorithms. A contemporary Perspective, Cambridge University Press, 2019
2. Lekh Raj Vermani, Shalini Vermani, An Elementary Approach To Design And Analysis Of Algorithms, World Scientific Europe, 2019.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford Publications, 2014.

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