

**SONA COLLEGE OF TECHNOLOGY, SALEM-5**

**(An Autonomous Institution)**

**Master of Computer Applications**

**CURRICULUM and SYLLABI**

**[For students admitted in 2024-2025]**

**PG Regulations 2023**

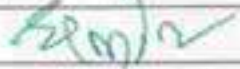


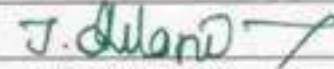
**Approved by BOS and Academic Council meetings**

**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*	
<b>Theory Courses</b>											
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	
<b>Practical Courses</b>											
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	
<b>Total Credits</b>							<b>24</b>				

\* 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

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HOD-MCA/ First Semester MCA Students and Staff, COE

MCA  
23

**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*	
<b>Theory courses</b>											
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.	noc25-es57	<b>Elective: NPTEL Course: Programming in Java</b>	3	0	0	0	3	PE	45	T	
<b>Practical courses</b>											
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	
<b>Total Credits</b>							<b>23</b>				

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**Approved By**

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

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



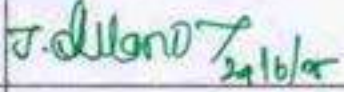

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**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for MCA III Semester under Regulations 2023**  
**Branch: Master of Computer Applications**

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
<b>Theory courses</b>										
1.	P23MCA301	Machine Learning	3	0	0	0	3	PC	45	T
2.	P23MCA302	Embedded Systems and Internet of Things	3	0	0	0	3	PC	45	T
3.	P23MCA303	Advanced Web Programming	2	0	0	2	3	PC	60	TP
4.	P23MCA501	<b>Elective:</b> Agile Methodologies	3	0	0	0	3	PE	45	T
5.	P23MCA503	<b>Elective:</b> Data Mining and Warehousing	3	0	0	0	3	PE	45	T
6.	P23MCA506	<b>Elective:</b> Microservices and DevOps	3	0	0	0	3	PE	45	T
<b>Practical courses</b>										
8.	P23MCA304	Machine Learning Laboratory	0	0	4	0	2	PC	60	L
9.	P23MCA305	Embedded Systems and Internet of Things Laboratory	0	0	4	0	2	PC	60	L
10.	P23MCA306	Mini Project	0	0	0	4	2	PC	60	P
							<b>Total Credits</b>	<b>24</b>		

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Approved By

	 20/6/25	 20/6/25	 20/6/25
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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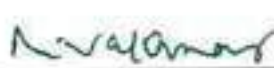
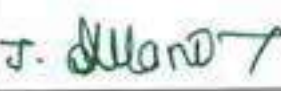

HOD/MCA, Third Semester MCA Students and Staff, COE

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for MCA Semester IV 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*
<b>Practical courses</b>										
1.	P23MCA401	Project Work	0	0	0	28	14	PC	420	P
<b>Total Credits</b>							<b>14</b>			

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**Approved By**

			
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<b>Dr.T. Padma</b>	<b>Dr. R. Shivakumar</b>	<b>Dr. J. Akilandeswari</b>	<b>Dr. S. R. R. Senthil Kumar</b>

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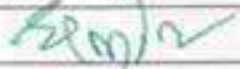


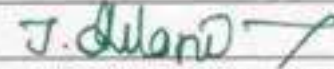
HOD / MCA, Fourth Semester MCA Students and Staff, COE

**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*	
<b>Theory Courses</b>											
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	
<b>Practical Courses</b>											
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	
<b>Total Credits</b>							<b>24</b>				

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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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HOD-MCA/ First Semester MCA Students and Staff, COE

MASTER OF COMPUTER APPLICATIONS															
SEMESTER – I	MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS										L	T	P	J	C
P23MAT101F											2	1	0	0	3
<b>Course Outcomes</b>															
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.														
<b>Pre-requisites:</b>															
<ul style="list-style-type: none"> <li>Fundamentals of calculus</li> <li>Fundamentals of discrete mathematics</li> </ul>					<ul style="list-style-type: none"> <li>Fundamentals of statistics</li> <li>Fundamentals of probability</li> </ul>										
<b>CO/PO, PSO Mapping</b>															
(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	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	
<b>Course assessment methods [Theory]</b>															
<b>Direct</b>										<b>Indirect</b>					
CIE test I (10) (Theory)					Total CIE: 40 marks Semester End Examination: 60 marks					Course end survey					
CIE test II (10) (Theory)															
CIE test III (10) (Theory)															
Assignment / Problem- solving / Seminar (10)															
Unit 01	<b>PROPOSITIONAL CALCULUS</b>										<b>9 Hours</b>				
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	<b>PREDICATE CALCULUS</b>										<b>9 Hours</b>				
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	<b>CORRELATION AND REGRESSION</b>										<b>9 Hours</b>				
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
<b>TEXT BOOKS:</b>		
1.	T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 1 <sup>st</sup> Edition, 21 <sup>st</sup> Reprint, 2015.	
2.	S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11 <sup>th</sup> Edition, Reprint, 2019.	
<b>REFERENCE BOOKS:</b>		
1.	J. P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill Publishers, 1 <sup>st</sup> Edition, 2017.	
2.	K. H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill Publishers, 8 <sup>th</sup> Edition, 2019.	
3.	S. P. Gupta, "Statistical Methods", Sultan Chand and Sons Publishers, 15 <sup>th</sup> Edition, 2012.	
4.	R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9 <sup>th</sup> Edition, 2018.	
5.	P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.	
 <b>Dr. S. JAYABHARATHI</b> ASSOCIATE PROFESSOR & HEAD DEPARTMENT OF MATHEMATICS, SONA COLLEGE OF TECHNOLOGY, SALEM-636 005. Tamilnadu. Ph: 0427 - 4099999.		 <b>Dr. M. RENUGA,</b> Professor & Head, Department of Humanities & Languages, Sona College of Technology, SALEM - 636 005.
HoD / Mathematics		BoS – Chairperson / Science and Humanities

<b>P23MCA101</b>	<b>DATA STRUCTURES</b>											<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
												<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Outcomes</b>																
<b>At the end of the course, the student will be able to</b>																
<b>CO1:</b>	Apply the linked list on the applications like polynomial addition and multiplication.															
<b>CO2:</b>	Apply the stack and queue concepts for the real time scenarios.															
<b>CO3:</b>	Design an algorithm for finding shortest path problem for the given graph.															
<b>CO4:</b>	Design an algorithm to find the solution for applications of trees.															
<b>CO5:</b>	Design an algorithm for searching and sorting techniques.															
<b>Pre-requisite:</b>																
-----																
<b>CO/PO, PSO Mapping</b>																
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak																
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>		
<b>CO1</b>	3	3	3	3	3	1	3	2	2	1	2	2	3	3		
<b>CO2</b>	3	3	3	3	3	1	3	2	2	1	2	2	3	3		
<b>CO3</b>	3	3	3	3	3	1	3	2	2	1	2	2	3	3		
<b>CO4</b>	3	3	3	3	3	1	3	2	1	1	2	2	3	3		
<b>CO5</b>	3	3	3	3	3	1	3	2	1	1	2	2	3	3		
<b>Course Assessment methods</b>																
<b>Direct</b>												<b>Indirect</b>				
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				
<b>Unit 01: LINEAR DATA STRUCTURES - LIST</b>												<b>9 Hours</b>				
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).																

<b>Unit 02: LINEAR DATA STRUCTURES – STACK AND QUEUE</b>				<b>9 Hours</b>
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.				
<b>Unit 03: NON LINEAR DATA STRUCTURES – GRAPHS</b>				<b>9 Hours</b>
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.				
<b>Unit 04: NON LINEAR DATA STRUCTURES – TREES</b>				<b>9 Hours</b>
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.				
<b>Unit 05: SORTING AND SEARCHING</b>				<b>9 Hours</b>
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.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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.			
<b>REFERENCES</b>				
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			
 <b>Professor and Head</b> <b>Dept. of Master of Computer Applications</b> <b>Sona College of Technology</b> <b>SALEM-636 005.</b> <b>BOS-Chairman/MCA</b>				

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:														
-----														
<b>CO/PO, PSO Mapping</b>														
(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
<b>Course Assessment methods</b>														
<b>Direct</b>											<b>Indirect</b>			
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			
<b>Unit 01: OPERATING SYSTEM OVERVIEW</b>											<b>9 Hours</b>			
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.														

<b>Unit 02: PROCESS MANAGEMENT</b>					<b>9 Hours</b>
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.					
<b>Unit 03: MEMORY MANAGEMENT</b>					<b>9 Hours</b>
Main Memory – Swapping – Contiguous memory allocation – Paging –Segmentation – Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.					
<b>Unit 04: I/O SYSTEMS</b>					<b>9 Hours</b>
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.					
<b>Unit 05: VIRTUAL MACHINES AND MOBILE OS</b>					<b>9 Hours</b>
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.					
<b>Theory: 45 Hrs</b>		<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>					
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10 <sup>th</sup> Edition, John Wiley and Sons Inc., 2018.				
2.	Andrew S Tanenbaum, "Modern Operating Systems", 5 <sup>th</sup> Edition, Pearson - New Delhi, 2022.				
<b>REFERENCES</b>					
1.	William Stallings, "Operating Systems: Internals and Design Principles", 7 <sup>th</sup> 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, 1 <sup>st</sup> Edition, 2001.				
5.	Rajiv Chopra, "Operating Systems – A Practical Approach", 4th Edition, S Chand & Company, 2016.				
 <b>Professor and Head</b> Dept. of Master of Computer Applications Sona College of Technology SALEM-636 005. BOS-Chairman/MCA					

P23MCA103	COMPUTER ORGANIZATION AND ARCHITECTURE				L	T	P	J	C					
					3	0	0	0	3					
<b>Course Outcomes</b>														
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													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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	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
<b>Course Assessment methods</b>														
<b>Direct</b>					<b>Indirect</b>									
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				
<b>Unit 01: INTRODUCTION</b>										<b>9 Hours</b>				
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 - SR - JK - T and D Flip Flops - Sequential Circuits.														

<b>Unit 02: BASIC STRUCTURE OF COMPUTER</b>				<b>9 Hours</b>
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.				
<b>Unit 03: PROCESSOR DESIGN</b>				<b>9 Hours</b>
Processor basics –CPU Organization – Data Path Design – Control Design – Hardwired control – Micro Programmed control – Pipelining – Basic Concepts – Hazards Super Scale Operations.				
<b>Unit 04: MEMORY HIERARCHY</b>				<b>9 Hours</b>
Basic Concepts – Semiconductor RAM – ROM – Speed – Size and Cost – Cache Memories – Improving Cache Performance – Virtual Memory – Memory Management Requirements – Associative Memories – Secondary Storage Devices.				
<b>Unit 05: SIMD ARCHITECTURE</b>				<b>9 Hours</b>
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.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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).			
<b>REFERENCES</b>				
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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<b>P23MCA104</b>	<b>OBJECT ORIENTED SOFTWARE ENGINEERING</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>										
			<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>										
<b>Course Outcomes</b>																	
<b>At the end of the course, the student will be able to</b>																	
<b>CO1:</b>	Identify use cases and develop the Use Case model.																
<b>CO2:</b>	Document the Software Requirements Specification (SRS) for the identified system																
<b>CO3:</b>	Create user interface design for an application using design engineering concepts.																
<b>CO4:</b>	Apply the object oriented paradigm for designing a software																
<b>CO5:</b>	Implement various software life cycle models																
<b>Pre-requisite:</b>																	
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<b>CO/PO, PSO Mapping</b>																	
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak																	
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)</b>																
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>			
<b>CO1</b>	3	3	3	2	2	3	3	1	2	1	1	1	3	2			
<b>CO2</b>	3	3	3	3	2	3	3	1	3	2	2	1	3	2			
<b>CO3</b>	3	3	3	2	3	3	3	1	1	3	2	2	3	3			
<b>CO4</b>	3	3	3	2	3	3	3	1	1	1	2	2	3	3			
<b>CO5</b>	3	3	3	3	3	3	3	1	1	2	3	2	3	3			
<b>Course Assessment methods</b>																	
<b>Direct</b>						<b>Indirect</b>											
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					
<b>Unit 01: INTRODUCTION</b>												<b>9 Hours</b>					
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.																	

<b>Unit 02: SYSTEM ANALYSIS</b>				<b>9 Hours</b>
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.				
<b>Unit 03: SYSTEM DESIGN</b>				<b>9 Hours</b>
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.				
<b>Unit 04: OBJECT DESIGN AND IMPLEMENTATION ISSUES</b>				<b>9 Hours</b>
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.				
<b>Unit 05: MANAGING CHANGE</b>				<b>9 Hours</b>
Rationale Management - Configuration Management – Project Management – Software Life Cycle: Standard for Developing Life Cycle Processes – Maturity of Life Cycle Models- Life Cycle Models				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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.			
<b>REFERENCES</b>				
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.			
 <b>Professor and Head</b> <b>Dept. of Master of Computer Applications</b> <b>Sona College of Technology</b> <b>SAIFU-636-2023</b> <b>BOS-Chairman/MCA</b>				


P23MCA105	WEB PROGRAMMING ESSENTIALS					L	T	P	J	C				
						2	0	2	0	3				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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
<b>Course Assessment methods</b>														
<b>Direct</b>										<b>Indirect</b>				
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				
<b>Unit 01: FUNDAMENTALS OF WWW &amp; HTML5 BASICS</b>												<b>6 Hours</b>		
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.														

<b>Unit 02: FORMS AND MULTIMEDIA</b>	<b>6 Hours</b>
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.	
<b>Unit 03: CASCADING STYLE SHEETS</b>	<b>6 Hours</b>
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.	
<b>Unit 04: JAVASCRIPT BASICS</b>	<b>6 Hours</b>
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.	
<b>Unit 05: JS HTML DOM AND BOM</b>	<b>6 Hours</b>
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.				
<b>Total Practical Hours : 30</b>				
<b>Theory: 30 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: 30 Hrs</b>	<b>Project:--</b>	<b>Total Hours: 60 Hrs</b>
<b>TEXT BOOKS</b>				
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 Wide Web - How to Program", 5th Edition, Pearson Education, 2011.			
<b>REFERENCES</b>				
1.	Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013.			
2.	David Flanagan, "JavaScript: The Definitive Guide, 6th Edition", O'Reilly Media, 2011.			
3.	Achyut S Godbole and Atul Kahate, "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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<b>P23MCA106</b>	<b>DATA STRUCTURES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>2</b>

**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	PO9	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 :**

- Apply linked list for performing polynomial addition.
- Apply linked list for performing polynomial multiplication.
- Apply stack for finding solution infix to postfix conversion.
- Apply Queue for allocation of resources from the server.
- Apply Breadth First Search and Depth First Search for the given Network.
- Apply Prim's Algorithm and Kruskal's Algorithm for finding the Shortest Spanning tree for the given network.
- Sort the given sequence using Quick sort and Merge Sort.
- 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					
<b>Course Outcomes</b>															
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.														
<b>Pre-requisite:</b>															
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<b>CO/PO, PSO Mapping</b>															
(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	
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	
<b>Course Assessment methods</b>															
<b>Direct</b>							<b>Indirect</b>								
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				
<b>LIST OF EXPERIMENTS :</b>															
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
 <b>Professor and Head</b> <b>Dept. of Master of Computer Applica<sup>n</sup></b> <b>Sona College of Technology</b> <b>SALFM-636 005.</b> BOS-Chairman/MCA				

P23MCA108	PYTHON PROGRAMMING LABORATORY				L	T	P	J	C					
					1	0	4	0	3					
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b> (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	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
<b>Course Assessment methods</b>														
<b>Direct</b>					<b>Indirect</b>									
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				
<b>Unit 01: INTRODUCTION</b>										<b>3 Hours</b>				
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.														

<b>Unit 02: CONTROL FLOW AND FUNCTIONS</b>	<b>3 Hours</b>
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.	
<b>Unit 03: SEQUENCE</b>	<b>3 Hours</b>
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.	
<b>Unit 04: FILE HANDLING AND MODULES</b>	<b>3 Hours</b>
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.	
<b>Unit 05: EXCEPTION HANDLING</b>	<b>3 Hours</b>
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 .	
<b>Total Theory Hours: 15</b>	
<b>LIST OF EXPERIMENTS :</b>	
<ol style="list-style-type: none"> <li>1. Develop programs to learn data types and type conversions using python.</li> <li>2. Develop programs to learn operators and expressions using python.</li> <li>3. Develop programs to understand the control statements – for loop in python.</li> <li>4. Develop programs to understand the control statements – while loop in python.</li> <li>5. Develop programs to learn concept of functions scoping and function call.</li> <li>6. Develop programs to learn concept of function recursion</li> <li>7. Develop programs to implement built-in string methods and functions.</li> <li>8. Develop programs to implement slicing operations on strings</li> <li>9. Develop programs to implement the basic operations on strings (concatenation, appending, multiplying)</li> <li>10. Develop programs to implement Comparison and iteration on strings</li> <li>11. Develop programs to learn sequence types (list and set) in Python.</li> <li>12. Develop programs to learn sequence types (tuples and dictionary) in Python.</li> <li>13. Develop programs to implement modules and packages in python.</li> <li>14. Develop programs to use file handling in python.</li> <li>15. Develop programs to implement exception handling in python</li> </ol>	
<b>Total Practical Hours: 60</b>	
<b>Theory: 15 Hrs</b>	<b>Tutorial: –</b>
<b>Practical: 60 Hrs</b>	<b>Project:--</b>
<b>Total Hours: 75 Hrs</b>	

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.
 <b>Professor and Head</b> <b>Dept. of Master of Computer Applications</b> <b>Sona College of Technology</b> <b>SALEM-636 005.</b> <b>BOS-Chairman/MCA</b>	

**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
<b>Theory</b>				
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

Dr. T. Padma

  
Member Secretary,  
Academic Council

Dr. R. Shivakumar

  
Dean-Academics


Dr. J. Akilandeswari

  
Chairperson, Academic Council  
& Principal

Dr. S. R. R. Senthil Kumar

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

P23BRC101	FUNDAMENTALS OF COMPUTER PROGRAMMING	Marks
		100
<b>Course Outcomes</b>		
<b>At the end of the course, the student will be able to</b>		
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.	
<b>UNIT 01: INTRODUCTION TO PROGRAMMING</b>		<b>5</b>
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.		
<b>UNIT 02: INTRODUCTION TO PROBLEM SOLVING</b>		<b>5</b>
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.		
<b>UNIT 03: INTRODUCTION TO C LANGUAGE</b>		<b>5</b>
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.		
<b>UNIT 04: ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS</b>		<b>5</b>
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.		
<b>UNIT 05: BASICS OF DATASTRUCTURES</b>		<b>4</b>
Pointers: Declaration, Accessing a pointer variable, character strings, Pointers to Functions and Structures. Introduction to Data Structures: Definition – Abstract Data Types.		
<b>TOTAL = 24 Hours</b>		

  
**Professor and Head**  
 Dept. of Master of Computer Application  
 Sona College of Technology  
 SALEM-636 005.

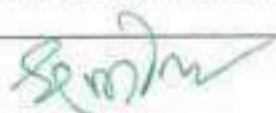
## REFERENCES

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.



**Professor and Head**  
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**Sona College of Technology**  
**SALFM-636 005.**

P23BRC102	OBJECT ORIENTED PROGRAMMING	Marks 100
<b>Course Outcomes</b>		
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.	
<b>UNIT I - INTRODUCTION</b>		<b>6</b>
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.		
<b>UNIT II - CLASSES AND OBJECTS</b>		<b>6</b>
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.		
<b>UNIT III - OVERLOADING</b>		<b>6</b>
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.		
<b>UNIT IV - INHERITANCE</b>		<b>6</b>
Inheritance: Base and Derived Class, Access Control, Types of Inheritance, Virtual base class, Abstract class, Virtual Functions, Pure Virtual functions.		
<b>TOTAL = 24 Hours</b>		
<b>REFERENCES</b>		
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", Addison 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.		



P23BRC103	DATABASE MANAGEMENT SYSTEMS	Marks 100
<b>Course Outcomes</b>		
<b>At the end of the course, the student will be able to</b>		
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.	
<b>UNIT I - INTRODUCTION</b>		<b>6</b>
File Systems versus Database Systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model.		
<b>UNIT II – DATABASE DESIGN</b>		<b>6</b>
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.		
<b>UNIT III – SQL</b>		<b>6</b>
SQL: Create Table, Types of Data Languages - data definition, data manipulation - aggregate function, Null Values, nested sub queries, Joined relations, Triggers.		
<b>UNIT IV – TRANSACTIONS</b>		<b>6</b>
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.		
<b>TOTAL = 24 Hours</b>		
<b>REFERENCES</b>		
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. Kanran, S. Swamynathan, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.		

*Srinivas*

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(An Autonomous Institution)**


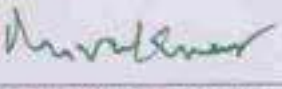
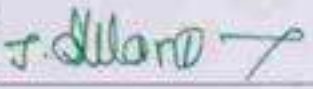

**Courses of Study for MCA Semester II under Regulations 2023 (CBCS)**

**Branch: Master of Computer Applications**

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*	
<b>Theory courses</b>											
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.	noc25-cs57	Elective: NPTEL Course: Programming in Java	3	0	0	0	3	PE	45	T	
<b>Practical courses</b>											
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	
<b>Total Credits</b>							<b>23</b>				

\*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**

			
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				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)												PSO 1	PSO 2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
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
<b>Course Assessment methods</b>														
<b>Direct</b>											<b>Indirect</b>			
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			
<b>Unit 01: INTRODUCTION</b>											<b>9 Hours</b>			
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.														

<b>Unit 02: DIVIDE AND CONQUER</b>				<b>9 Hours</b>
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.				
<b>Unit 03: GREEDY METHOD</b>				<b>9 Hours</b>
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.				
<b>Unit 04: DYNAMIC PROGRAMMING</b>				<b>9 Hours</b>
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.				
<b>Unit 05: NP COMPLETENESS</b>				<b>9 Hours</b>
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.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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.			
<b>REFERENCES</b>				
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.			
<b>BOS-Chairman/MCA</b>				

P23MCA202	RELATIONAL DATABASE MANAGEMENT SYSTEMS					L	T	P	J	C				
						3	0	0	0	3				
<b>Course Outcomes</b>														
<b>At the end of the course, the student will be able to</b>														
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.													
<b>Pre-requisite:</b>														
----														
<b>CO/PO, PSO Mapping</b>														
(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
<b>Course Assessment methods</b>														
<b>Direct</b>										<b>Indirect</b>				
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				
<b>Unit 01: DESIGNING AND CONSTRUCTING A DATABASE</b>												<b>9 Hours</b>		
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.														

<b>Unit 02: RETRIEVING DATA FROM DATABASE</b>				<b>9 Hours</b>
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.				
<b>Unit 03: DATABASE MANAGEMENT</b>				<b>9 Hours</b>
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.				
<b>Unit 04: STORED PROCEDURES</b>				<b>9 Hours</b>
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.				
<b>Unit 05: TRIGGERS AND DATABASE CONNECTIVITY</b>				<b>9 Hours</b>
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.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: –</b>	<b>Practical: –</b>	<b>Project:–</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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**

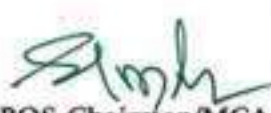
1. Elmasri Ramez, Navathe Shamkant, "Fundamentals of Database System", Seventh Edition, Pearson Education, June 2017.
2. Donald J Bales, "Beginning Oracle PL/SQL", Second Edition, Springer Nature Publications, May 2015.
3. Alan Beaulieu, "Learning SQL", O'Reilly Media Publications, 2014.
4. P. S. Deshpande,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



BOS-Chairman/MCA

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P23MCA203	COMPUTER NETWORKS					L	T	P	J	C				
						3	0	0	0	3				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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	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
<b>Course Assessment methods</b>														
<b>Direct</b>						<b>Indirect</b>								
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			
<b>Unit 01: INTRODUCTION AND PHYSICAL LAYER</b>											<b>9 Hours</b>			
Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.														
<b>Unit 02: DATA-LINK LAYER AND MEDIA ACCESS</b>											<b>9 Hours</b>			
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.														

<b>Unit 03: NETWORK LAYER</b>				<b>9 Hours</b>
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.				
<b>Unit 04: TRANSPORT LAYER</b>				<b>9 Hours</b>
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.				
<b>Unit 05: APPLICATION LAYER</b>				<b>9 Hours</b>
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.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project: --</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
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.			
<b>REFERENCES</b>				
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.			
 <b>BOS-Chairman/MCA</b>				

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P23MCA204	CLOUD COMPUTING TECHNOLOGIES					L	T	P	J	C				
						2	0	0	2	3				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	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
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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				
<b>Unit 01: OVERVIEW OF CLOUD COMPUTING</b>											<b>6 Hours</b>			
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.														

<b>Unit 02: VIRTUALIZATION AND VPC</b>				<b>6 Hours</b>	
Virtualization Techniques – Virtualization Technology – Overview of x86 virtualization - Types of Virtualization – CPU – Containers – Kubernetes - VPC – VPN - Load balancing – case study.					
<b>Unit 03: DATABASE AND SECURITY</b>				<b>6 Hours</b>	
Cloud databases and File systems – Cloud database: RDS, Azure 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.					
<b>Unit 04: CLOUD STORAGE AND CLOUD TESTING</b>				<b>6 Hours</b>	
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.					
<b>Unit 05: REAL TIME APPLICATIONS AND BEST PRACTICES</b>				<b>6 Hours</b>	
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.					
<b>Total Theory Hours : 30</b>					
<b>List of Functionalities/domain to be implemented in the project :</b>					
1. Develop Software as a service applications in Salesforce that covers any of the following functionalities					
<ul style="list-style-type: none"> <li>• Data Modeling.</li> <li>• Automation Process.</li> <li>• Triggers and Controllers.</li> <li>• Data Management.</li> <li>• Reports and Dashboards.</li> <li>• Sales and Services in cloud.</li> <li>• LWS.</li> <li>• Einstein Analytics.</li> <li>• Experience Cloud.</li> <li>• API and Integration.</li> </ul>					
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.					
<b>Total Project Hours : 30</b>					
<b>Theory: 30 Hrs</b>		<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project: 30 Hrs</b>	<b>Total Hours: 60 Hrs</b>
<b>TEXT BOOKS</b>					
1.	Rishabh Sharma, "Cloud Computing - Fundamentals , Industry approach and trends", Wiley Publications, 1 <sup>st</sup> Edition 2015. (Unit 1,2,3,4,5).				
2.	Shailendra Singh, "Cloud Computing", Oxford university press, 1 <sup>st</sup> 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, 1<sup>st</sup> Edition, 2023.
2. Dan C. Marinescu, "Cloud Computing: Theory and Practice", Morgan Kaufmann, 3<sup>rd</sup> Edition 2022.
3. Dr. Tony Ayoola, "CLOUD COMPUTING THEORY AND PRACTICE: A Guide for Data Engineers", Independently published, 1<sup>st</sup> Edition, 2022.
4. Gerardus Blokdyk, "Cloud Computing - A complete guide", 5STARCOOKS, 1<sup>st</sup> Edition, 2021.
5. Frank H.P. Fitzek, Fabrizio Granelli, Patrick Seefing, "Computing in Communication Networks: From Theory to Practice", Academic Press, 1<sup>st</sup> Edition, 2020.



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P23MCA205	DATA SCIENCE					L	T	P	J	C				
						2	0	2	0	3				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	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
<b>Course Assessment methods</b>														
<b>Direct</b>										<b>Indirect</b>				
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				
<b>Unit 01: INTRODUCTION TO DATA SCIENCE AND BIG DATA</b>												<b>6 Hours</b>		
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.														

<b>Unit 02: DATA ANALYSIS</b>				<b>6 Hours</b>
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.				
<b>Unit 03: DATA MODELING</b>				<b>6 Hours</b>
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.				
<b>Unit 04: Introduction to Unstructured Database</b>				<b>6 Hours</b>
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.				
<b>Unit 05: DATA ANALYTICAL FRAMEWORKS AND VISUALIZATION</b>				<b>6 Hours</b>
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.				
				<b>Total Theory Hours : 30</b>
<b>List of Experiments:</b>				
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				
• <a href="http://www.kaggle.com">www.kaggle.com</a>				
• <a href="http://www.uci.edu">www.uci.edu</a>				
				<b>Total Practical Hours : 30</b>
<b>Theory: 30 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: 30 Hrs</b>	<b>Project: --</b>	<b>Total Hours: 60 Hrs</b>

**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**

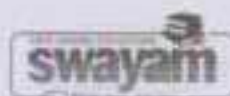
1. C. Sudharsathy, "R Programming An Approach to Data Analytics", Mjp Publisher, 2021.
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley, Eleventh Edition 2013.
3. J. Leskowac, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.
4. Nishant Gerg, "Hbase Essentials", Packt, First Edition, 2014.
5. Rachel Schutt, Cathy O'Neill, "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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# ELECTIVE-I

**noc25-cs57****PROGRAMMING IN JAVA**

L	T	P	J	C
3	0	0	0	3

**COURSE INSTRUCTOR :**

Prof. Debasis Samanta

Department of Computer Science &amp; 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 field 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	: <ul style="list-style-type: none"><li>o Computer Science and Engineering</li><li>o Programming</li></ul>
Credit Points	: 3
Level	: Undergraduate
Start Date	: 20 Jan 2025
End Date	: 11 Apr 2025
Exam Date	: 04 May 2025 IST
Enrollment Ends	: 03 Feb 2025
Exam Registration Ends	: 14 Feb 2025

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

Prof. 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: 4 May 2025 Morning session 9 am to 12 noon; Afternoon Session 2 pm to 5 pm.

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.

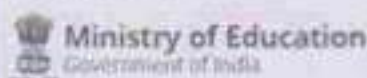
**YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE  $\geq$  10/25 AND EXAM SCORE  $\geq$  30/75. If one of the 2 criteria is not met, you will not get the certificate even if the Final score  $\geq$  40/100.**

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](http://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



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Initiative by: Ministry of Education (Govt of India)

Total Hours: 45 Hrs

BOS-Chairman/MCA

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P23MCA206	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY					L	T	P	J	C				
						0	0	4	0	2				
<b>Course Outcomes</b>														
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.													
<b>Pre-requisite:</b>														
---														
<b>CO/PO, PSO Mapping</b>														
(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	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
<b>Course Assessment methods</b>														
<b>Direct</b>											<b>Indirect</b>			
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			
<b>LIST OF EXPERIMENTS :</b>														
<ol style="list-style-type: none"> <li>1. Apply Divide and Conquer technique to sort a sequence of values using Quick Sort.</li> <li>2. Apply Brute Force approach for matching the strings.</li> <li>3. Apply Greedy Method for finding the single source shortest path using Dijkstra's Algorithm.</li> <li>4. Apply Decrease and Conquer method to generating the combinatorial objects.</li> <li>5. Find the maximum profit for the given knapsack using dynamic programming.</li> <li>6. Find the transitivity matrix using Warshall's Algorithm.</li> <li>7. Find the All pairs shortest path from given graph using Floyd's Algorithm.</li> <li>8. Apply backtracking algorithm for finding the solution for N Queens Problem.</li> <li>9. Apply branch and bound method to find the solution for Assignment Problem.</li> </ol>														
Theory: --			Tutorial: --			Practical: 60 Hrs		Project:--		Total Hours: 60 Hrs				
 <b>BOS-Chairman/MCA</b> <b>Dr. T. PADMA</b>														

<b>P23MCA207</b>	<b>RELATIONAL DATABASE MANAGEMENT SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>2</b>

**Course Outcomes**

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

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

Pre-requisite:

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**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	2	2	1	1	2	2	3	3
CO2	3	2	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 :**

- 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:
  - Creating a database
  - Viewing all tables in a database
  - Creating tables (with and without constraints)
  - Altering tables (with ADD/MODIFY keywords)
  - Dropping a table/database
  - Truncating a table/database
  - Renaming a table/database
- 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)*

*MOVIF\_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 00:00:00
    - 12:00 AM January 2, 2024
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.

<b>Theory: --</b>	<b>Tutorial: --</b>	<b>Practical: 60 Hrs</b>	<b>Project:--</b>	<b>Total Hours: 60 Hrs</b>
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 SALEM-636 005.

P23MCA208	SOFT SKILLS, APTITUDE AND CAREER ENHANCEMENT LABORATORY - II					L	T	P	J	C				
						0	0	2	0	1				
<b>Course Outcomes</b>														
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													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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			
<b>Soft Skills</b>							<b>Demonstrating soft-skill capabilities with reference to the following topics:</b>							
							<ul style="list-style-type: none"> <li>a. Leadership skills</li> <li>b. Teamwork</li> <li>c. Critical thinking</li> <li>d. Dealing with criticism</li> <li>e. Interview skills</li> <li>f. Psychometric analysis/assessments</li> <li>g. Mock GDs</li> <li>h. Mock Interview</li> </ul>							


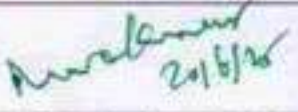
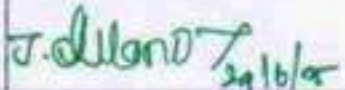

<p align="center"><b>Quantitative Aptitude and Logical Reasoning</b></p>	<p><b>Solving simple problems with reference to the following topics:</b></p> <ol style="list-style-type: none"> <li>Time Speed Distance</li> <li>Permutation and Combination</li> <li>Probability</li> <li>Logarithm</li> <li>Geometry and Mensuration</li> <li>Functions &amp; Polynomials</li> <li>Syilogism</li> <li>Data Sufficiency</li> <li>Clocks &amp; Calendars</li> <li>Cubes &amp; Dice</li> <li>Visual Reasoning</li> <li>Non -verbal Reasoning</li> <li>Inequalities</li> <li>Data Interpretation</li> </ol>			
<p align="center"><b>Focus on language</b></p>	<p><b>Demonstrating plain English language skills with reference to the following topics:</b></p> <ol style="list-style-type: none"> <li>Subject verb agreement</li> <li>Modal verbs</li> <li>Reading comprehension</li> <li>Spotting errors</li> <li>Choosing the correct / incorrect sentences</li> <li>Describing the picture</li> <li>Critical Reasoning</li> <li>Theme Detection</li> <li>Cloze test</li> </ol>			
<p align="center"><b>Speaking</b></p>	<p>Mini presentation and group discussion, Interviews and presentation</p>			
<p align="center"><b>Writing</b></p>	<p>Paragraph writing, e-mail, letter to editors and memos</p>			
<p align="center"><b>Reading</b></p>	<p>Reading advertisements and graphs, reading passages for specific information transfer</p>			
<p><b>Theory: –</b></p>	<p><b>Tutorial: –</b></p>	<p><b>Practical: 30 Hrs</b></p>	<p><b>Project: –</b></p>	<p><b>Total Hours: 30 Hrs</b></p>
<div style="text-align: right; margin-top: 100px;">   <b>BOS-Chairman/MCA</b> </div>				

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

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*	
<b>Theory courses</b>											
1.	P23MCA301	Machine Learning	3	0	0	0	3	PC	45	T	
2.	P23MCA302	Embedded Systems and Internet of Things	3	0	0	0	3	PC	45	T	
3.	P23MCA303	Advanced Web Programming	2	0	0	2	3	PC	60	TP	
4.	P23MCA501	<b>Elective:</b> Agile Methodologies	3	0	0	0	3	PE	45	T	
5.	P23MCA503	<b>Elective:</b> Data Mining and Warehousing	3	0	0	0	3	PE	45	T	
6.	P23MCA506	<b>Elective:</b> Microservices and DevOps	3	0	0	0	3	PE	45	T	
<b>Practical courses</b>											
8.	P23MCA304	Machine Learning Laboratory	0	0	4	0	2	PC	60	L	
9.	P23MCA305	Embedded Systems and Internet of Things Laboratory	0	0	4	0	2	PC	60	L	
10.	P23MCA306	Mini Project	0	0	0	4	2	PC	60	P	
<b>Total Credits</b>							<b>24</b>				

\*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, P-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, Third Semester MCA Students and Staff, COE

P23MCA301	MACHINE LEARNING				L	T	P	J	C					
					3	0	0	0	3					
<b>Course Outcomes</b>														
<b>At the end of the course, the student will be able to</b>														
CO1:	Explain the principles of Artificial Intelligence and Problem Solving.													
CO2:	Identify appropriate supervised learning techniques for different types of data.													
CO3:	Develop ensemble models to solve complex real-world problems.													
CO4:	Implement and apply clustering algorithm to partition datasets into meaningful clusters.													
CO5:	Explain the biological inspiration behind artificial neural networks.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	2	2	1	1	1	2	1	2	3
CO2	3	3	3	3	3	2	2	1	1	2	2	1	2	3
CO3	3	3	3	3	3	2	2	1	1	2	2	1	2	3
CO4	3	3	3	3	3	2	2	1	1	2	2	1	2	3
CO5	3	3	3	3	3	3	3	1	1	2	2	1	2	3
<b>Course Assessment methods</b>														
<b>Direct</b>										<b>Indirect</b>				
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				
<b>Unit 01: INTRODUCTION TO ARTIFICIAL INTELLIGENCE</b>										<b>9 Hours</b>				
Definition - History of Artificial Intelligence - Intelligent Agents - Nature of Environment - Problem Solving and Search Algorithms: Problem Solving Agents - Uniformed Search - Heuristic Search - Local Search - Adversarial Search.														

<b>Unit 02: FUNDAMENTALS OF MACHINE LEARNING AND SUPERVISED LEARNING</b>				<b>9 Hours</b>
Introduction to Machine Learning – Why Use Machine Learning – Types of Machine Learning: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning – Supervised Learning: Linear Regression-Polynomial Regression- Regularization Techniques: Ridge and Lasso Regression- Classification: Logistic Regression – K-Nearest Neighbors (KNN)- Support Vector Machine- Decision Trees- Bayes Rule- Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis.				
<b>Unit 03: ENSEMBLE LEARNING</b>				<b>9 Hours</b>
Ensemble Methods-Boosting: AdaBoost Algorithm- Bagging: Two Ensemble Paradigm-Bagging Algorithm-Random Tree Ensembles: Random Forest-Combination Methods: Benefits of Combination- Averaging-Voting: Majority Voting-Plurality Voting- Weighted Voting- Soft Voting- Combining by Learning: Stacking.				
<b>Unit 04: UNSUPERVISED AND REINFORCEMENT LEARNING</b>				<b>9 Hours</b>
Introduction - Clustering Algorithms: K-Means-Hierarchical Clustering – DBSCAN – Cluster Validity-Reinforcement Learning: Introduction- The Learning Task – Q Learning- Nondeterministic Rewards and Actions- Temporal Difference Learning.				
<b>Unit 05: NEURAL NETWORK</b>				<b>9 Hours</b>
Introduction: Biological Motivation- Neural Network Representation- Perceptron: The Perceptron Training Rule- Gradient Descent and Delta Rule-Multilayer Networks and Back Propagation Algorithm-Convergence and Local Minima- Representation Power of Feedforward Networks – Hypothesis Space Search and Inductive Bias- Hidden Layer Representations - Generalization, Overfitting and Stopping Criterion.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
1.	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition Pearson Education Limited, 2015 (Unit I).			
2.	Ethem Alpaydin, Introduction to Machine Learning, Second Edition, MIT Press, 2010 (Unit II-III).			
3.	Tom M. Mitchell, "Machine Learning", India Edition, 1 st Edition, McGraw-Hill Education Private Limited, 2013 (Unit IV- V).			
<b>REFERENCES</b>				
1.	Zhi-Hua Zhou, "Ensemble Methods Foundation and Algorithms", CRC Press 2012.			
2.	Christopher M Bishop, "Pattern Recognition and Machine Learning", Spring 2011 Edition.			
3.	Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.			
4.	Aurélien Géron , Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition, o'reilly, (2017).			
 <b>BOS-Chairman/MCA</b>				

P23MCA302	EMBEDDED SYSTEMS AND INTERNET OF THINGS					L	T	P	J	C				
						3	0	0	0	3				
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Acquire knowledge and understand fundamental embedded system design paradigms and architecture.													
CO2:	Illustrate the design, communication model and enabling technologies for IoT.													
CO3:	Analyze the system management and domain for various applications of IoT.													
CO4:	Classify the various protocols that are used for developing IoT applications.													
CO5:	Identify the cloud services for various applications of IoT.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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	2	3	3	2	2	2	2	1	2	3	3	2	3
CO2	3	3	3	3	3	2	2	2	1	3	3	3	2	3
CO3	3	2	3	3	3	2	2	2	2	2	3	3	2	3
CO4	3	2	3	3	3	2	2	2	1	2	3	3	2	3
CO5	3	2	3	3	3	3	2	2	2	2	3	3	2	3
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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			
<b>Unit 01: INTRODUCTION TO EMBEDDED SYSTEM</b>										<b>9 Hours</b>				
Introduction - Definition - General Computing Systems - Classification - Application areas, Purpose - Characteristics and Quality attributes. The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators: types, characteristics and purpose, Communication Interface, Embedded Firmware, Other System components-Embedded System development environment - IDE- Embedded product development life-cycle.														
<b>Unit 02: DESIGN OF IOT</b>										<b>9 Hours</b>				
Concepts and Definitions of The Internet of Things - Characteristics of IoT - Physical design of IoT- Things in IoT and IoT protocols-Logical design of IoT-IoT functional blocks-IoT communication model and IoT communication APIs-IoT enabling technologies-IoT Challenges - Wireless Sensor Networks-Role of Cloud Computing and Big Data Analytics, IIOT, Industry 4.0-Communication protocols-IoT levels. A Case study on any one IoT based data acquisition from sensors.														

<b>Unit 03: DOMAIN, M2M AND SYSTEM MANAGEMENT</b>				<b>9 Hours</b>
Introduction - M2M - SDN and NFV for IoT - Software Defined Networking - Network Function Virtualization - IoT system management - Need for IoT system management - Simple Network Management protocol. Protocols: IEEE 802.15.4 - The IEEE 802 Committee Family protocols-The physical layer-The Media Access Control Layer-Uses of 802.15-BACNet Protocol-Modbus-KNX-Zigbee Architecture-Network Layer-APS layer-Security. Case Study on M2M Applications like Environmental monitoring, civil protection and public safety.				
<b>Unit 04: DEVELOPING INTERNET OF THINGS</b>				<b>9 Hours</b>
IoT Platforms Design Methodology-IoT System for Weather Monitoring-IoT System for Agriculture. Introduction to Cloud Storage Models & Communication APIs-WAMP-AutoBahn for IoT -Xively Cloud for IoT-Python Web Application Framework-Django Architecture - Development with Django Toolkit-Arduino - Raspberry Pi.				
<b>Unit 05: CLOUD SERVICES FOR IOT</b>				<b>9 Hours</b>
Designing a RESTFUL Web API-Amazon Web Services for IoT - EC2-Autoscaling-S3-RDS-Dynamo DB-Kinesis-SkyNet IoT Messaging Platform. Case Studies - Environment-IoT systems for weather reporting Bot-Air Pollution Monitoring system-Forest Fire Detection-IoT system for Energy-Smart grid - Renewable Energy Systems.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
1.	Shibu K V, "Introduction to Embedded Systems", 2nd Edition, Mc Graw Hill, January 2020 (Unit 1).			
2.	Arshdeep Bahga and Vijay Madisetti, "Internet of Things, A Hands-on Approach", Universities Press, 2015 (Units 2, 3 & 5).			
3.	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things-Key applications and Protocols", Wiley, 2012. (Unit 4).			
<b>REFERENCES</b>				
1.	Mayur Ramgir, "Internet of Things-Architecture, Implementation and Security", Pearson, August 2019.			
2.	Adrian McEwen, "Designing the Internet of Things", Wiley, 2014.			
3.	Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, October 2015.			
4.	Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, "Internet of Things", 2nd Edition, Wiley Publisher, September 2020.			
 <b>BOS-Chairman/MCA</b>				

**Dr. T. PADMA**, MCA., M.Phil., Ph.D.

Professor and Head

Dept. of Master of Computer Applications

PG Regulations 2023 (MCA) 1010

SALEM-636 005

P23MCA303	ADVANCED WEB PROGRAMMING					L	T	P	J	C				
						2	0	0	2	3				
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Build a responsive, mobile-first website using CSS framework.													
CO2:	Apply asynchronous JavaScript to manipulate HTML elements.													
CO3:	Create resourceful dynamic web pages using server-side script.													
CO4:	Develop a responsive web application in Angular framework and deploy it in the cloud or local server.													
CO5:	Apply Angular routers and guards in navigating web pages.													
<b>Pre-requisite:</b>														
P23MCA105 – WEB PROGRAMMING ESSENTIALS														
<b>CO/PO, PSO Mapping</b>														
(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	3	2	2	1	2	2	3	2	3	2
CO2	3	3	3	2	3	2	2	1	2	2	3	2	3	2
CO3	3	3	3	2	3	2	2	1	2	2	3	2	3	2
CO4	3	3	3	2	3	2	2	1	2	2	3	2	3	2
CO5	3	3	3	2	3	2	2	1	2	2	3	2	3	2
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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			
<b>Unit 01: WEB DEVELOPMENT</b>											<b>6 Hours</b>			
Introduction to Bootstrap BS5: Containers –Grid System - Typography - Colors – Tables – Images - Jumbotron - Alerts – Buttons – Button Groups – List Groups – Cards – Dropdowns – Collapsibles - Badges – Progress Bars – Spinners – Pagination - Modals – Tab – Toasts – Tooltip – Forms - Responsive Web Design.														
<b>Unit 02: CLIENT-SIDE SCRIPTING</b>											<b>6 Hours</b>			
JavaScript: Introduction to ECMA Script - History - Features - JS Callbacks – JS Asynchronous - JS Async/Await – JS Promises – JS Regular Expressions: Performing text search operations, Performing text replace operations, regular expression modifiers, regular expression patterns, Using Regular Expression Object – JS JSON: Definition, Syntax, JSON Vs XML, JSON Data Types, Parsing JSON, Stringify a JSON Object, JSON Arrays - Calling Web API from JavaScript: Web Forms API, Web History API, Web Storage API, Web Geolocation API - JavaScript Security – JavaScript Performance Optimization.														


<b>Unit 03: SERVER SIDE SCRIPTING</b>				<b>6 Hours</b>
PHP Basics: Installation – Syntax – Comments – Variables – Data types – Strings – Constants – Operators - If -..Else...If – Switch Case – Loops – Functions - Arrays – Superglobals – Regular Expressions - PHP FORMS – PHP MySQL: CRUD operations using stored procedures – PHP Cookies - PHP Sessions – PHP Filters – PHP Call-back functions.				
<b>Unit 04: INTRODUCTION TO ANGULAR</b>				<b>6 Hours</b>
MVC architecture – Popular Front End Frameworks for web development – Introduction to Angular – History - Single Page Application (SPA) - Angular CLI - Creating an Angular Project – Modules - Components – Angular Lifecycle – Communication between components - Dynamic Components - Angular Elements - Angular Forms - Angular Tables - Property, Style, Class and Event Binding - Form Group - Form Controls.				
<b>Unit 05: ROUTERS AND GUARDS</b>				<b>6 Hours</b>
Angular Router - Router Configuration - Router State - Navigation Pages - Router Link - Query Parameters - URL matching - Matching Strategies – Services - Dependency Injection – HttpClient - Read Data from the Server – Angular Route Guards - CRUD operations.				
<b>Total Theory Hours : 30</b>				
<b>List of Functionalities to be used (but not limited to) in the project :</b>				
<ol style="list-style-type: none"> <li>1. Bootstrap 5</li> <li>2. Node.js 20</li> <li>3. Angular 14</li> <li>4. PHP 8</li> <li>5. MySQL Server 8 (or) any other SQL/NOSQL cloud databases</li> <li>6. Xampp (or) Any web server</li> <li>7. Visual Studio Code (or) any Integrated Development Environment</li> </ol>				
<b>Total Project Hours : 30</b>				
<b>Theory: 30 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project: 30 Hrs</b>	<b>Total Hours: 60 Hrs</b>
<b>TEXT BOOKS</b>				
1.	Jorg Krause, "Introducing Bootstrap 4: Create Powerful Web Applications Using Bootstrap 4.5", Apress, Second edition, 2020 (Unit-1).			
2.	DT Editorial Services, "HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQUERY, Second edition, Drea,tech Press Publisher, 2016 (Units-2, 3, 4).			
3.	Shyam Seshadri, "Angular Up & Running Learning Angular Step by Step", O'Reilly Publisher, First Edition, 2018 (Unit-5).			

**REFERENCES**

1. Laurence Lars Svekis, Maaïke Van Putten, Rob Percival, "JavaScript from Beginner to Professional", Packt Publisher, December 2021.
2. Joseph Edmonds, "The Art of Modern PHP 8", Packt Publishing, 2021.
3. Richard Blum, "PHP, MySQL & JavaScript All-in-One for Dummies", Wiley Publisher, 2018.
4. Jennifer Kyrnin, "Bootstrap in 24 Hours", Sams Publishing, First edition, 2015.

**BOS-Chairman/MCA**

**Dr. T. PADMA**, MCA., M.Phil., Ph.D  
Professor and Head  
Dept. of Master of Computer Applications  
Sona College of Technology  
SALEM-636 005.

P23MCA304		MACHINE LEARNING LABORATORY				L	T	P	J	C				
						0	0	4	0	2				
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Demonstrate AI algorithms and techniques.													
CO2:	Recognize and apply supervised learning algorithms to practical situations.													
CO3:	Apply unsupervised learning techniques to real-world datasets.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	2	1	1	3	2	1	1	3
CO2	3	3	3	3	3	1	2	1	1	3	2	1	1	3
CO3	3	3	3	3	3	1	2	1	1	3	2	1	1	3
<b>Course Assessment methods</b>														
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			
<b>LIST OF EXPERIMENTS:</b>														
1. Write a program to demonstrate logical agents.														
2. Write a program to illustrate problem solving as a search and apply local search algorithms.														
3. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.														
4. a) Apply Linear Regression on Real Time Dataset. b) Apply Logistic Regression on Real Time Dataset.														
5. Write a program to implement a decision tree classifier, train it on a dataset, and evaluate its performance.														
6. Implement support vector machine (SVM) classifier on a given dataset and evaluate its performance.														
7. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data.														
8. Implement and evaluate ensemble techniques such as Bagging, Random Forests, and Boosting.														
9. Apply K-Means algorithm to cluster a set of data stored in a .CSV file														
10. Establish an artificial neural network by implementing the Backpropagation algorithm, then test it with suitable datasets.														
Theory: --			Tutorial: --			Practical: 60 Hrs			Project:--		Total Hours: 60 Hrs			
 <b>BOS-Chairman/MCA</b>														
<b>Dr. T. PADMA</b> , MCA., M.Phil., Ph.D. Professor and Head Dept. of Master of Computer Applications														

<b>P23MCA305</b>	<b>EMBEDDED SYSTEMS AND INTERNET OF THINGS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>2</b>

**Course Outcomes**

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

<b>CO1:</b>	Develop embedded systems individually or in a group.
<b>CO2:</b>	Apply skills to conduct interfacing of Arduino board with components, actuators and sensors.
<b>CO3:</b>	Design and work with Raspberry Pi controller circuits.

**Pre-requisite:**

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**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	2	3	3	3	2	2	1	1	3	3	3	2	3
CO2	3	3	3	3	3	2	2	1	1	3	3	3	2	3
CO3	3	2	3	3	3	2	2	1	2	3	3	3	2	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. Write a Script for basic functionalities of Arduino platform and programming.
2. Write a Script to Interface Arduino Nano with Joystick.
3. Write a Script to Interface Arduino to Zigbee module.
4. Write a Script program to interface Arduino to GSM module.
5. Write a Interfacing Scripts to connect Bluetooth module with Arduino.
6. Write a Script program for basic functionalities of Raspberry PI platform and python programming.
7. Create an Interface program for connecting sensors using Raspberry PI.
8. Write a Script program to create a communication between Arduino and Raspberry PI using any wireless medium.
9. Create a Log Data using Raspberry PI and upload to the cloud platform.
10. Design an IoT based system.

<b>Theory: --</b>	<b>Tutorial: --</b>	<b>Practical: 60 Hrs</b>	<b>Project:--</b>	<b>Total Hours: 60 Hrs</b>
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BOS-Chairman/MCA

**Dr. T. PADMA**, MCA., M.Phil., Ph.D  
Professor and Head  
Dept. of Master of Computer Application  
Tona College of Technology

P23MCA306	MINI PROJECT							L	T	P	J	C		
								0	0	0	4	2		
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Utilize software engineering concepts to execute the project with expected outcome.													
CO2:	Develop leadership skills to lead the team and maintain good relationship with clients.													
CO3:	Create projects with latest technologies.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b> (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	3	2	3	3	3	3	3
CO2	1	2	1	3	1	3	2	3	2	3	3	3	2	2
CO3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
<b>Course Assessment methods</b>														
							<b>Direct</b>			<b>Indirect</b>				
Review I (5) Review II (10) Review III (15) Final Project Report (10)							Total Internal Assessment : 40 marks Semester End Examination : 60 marks			Course end survey				
<b>PROJECT GUIDELINES:</b>														
<p>Every student is required to carry out in-house Mini Project work under the supervision of a faculty member of the department. The students can do a project in a group of size 3 or individual. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work once in a month during the semester at an appropriate time decided by the Department. There will a final presentation of the Mini Project work at the end of the semester. It is recommended that Mini Project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution.</p> <p>The purpose of the project is to apply the latest technologies and concepts in the required fields, help the student to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories, this project will helps the student make ease and provides enough experience to carry out the larger project in the IV Semester.</p>														

**AIM:**

Students should identify society-needs problems that analyze/plan the requirements, schedule, cost estimation & methodologies/technologies to be proposed, design and implement into IT outlook software solution. The domain of the problem may be identified from the emerging area of an application and deploy using latest technologies.

The evaluation of the project would be based on the need of the hour and request from stakeholders, usefulness of the problem statement, formulation of the problem, stakeholders need and the usage statistics of the solution and the technical merit of the solution.

The project design, development and testing phases can be as shown below:

**PHASES:****1. Requirements Engineering Phase:**

- Problem identification.
- Feasibility study of domain.
- Requirement elicitation and analysis.

The above mentioned topic should document the Software Requirements Specification (SRS) for the identified development, operations and micro services along with the following.

- Timeline chart/Project schedule
- Cost Estimation

**2. Team Formation Phase:**

- A team comprises of individual or maximum of 3 members. The team members will choose their roles and responsibilities to develop and implement the project.

**3. Design Phase:**

- Architectural design.
  - Case studies in sample application for each type of architecture, popular enterprise applications, cloud computing platforms comparison, DevOPs solution fundamentals, applications of SOA and MSA (Microservice, Architecture), OOAD and SOAD comparison, Identifying simple services based on SOA and MSA.
  - UML Diagram (Use case, Conceptual classes, process flow diagram, sequence & activity diagram, etc.,)
  - System architecture
- Front-End Design
  - UI design
- Component Design
  - API Design
- Back-end design.
  - E-R model
  - Database Design

- Description of Data Set

#### 4. Implementation Phase:

- Development, operations and micro services proposal scheme
- Front-end and Back-end Coding in a suitable language using necessary platforms and tools.

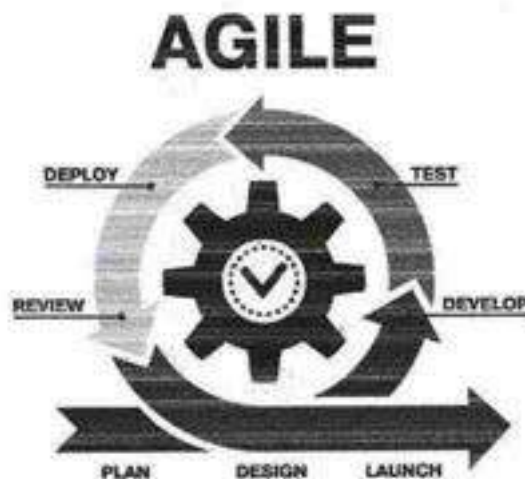
#### 5. Testing And Validation Phase:

- Develop test cases-
- Component Testing
- System Testing
- Acceptance Testing
- Testing reports

#### 6. Deployment & Feedback Phase:

- Web services and micro services
  - Implementing XML, DOM and SAX
  - Creation of web services in Java/.NET/Python environment, RESTful web services.
- Implementation of Microservices architecture with python.
- Creation of container services.
- Cloud deployment.
- Case Study of middleware services for IoT, mobile services
- Reviews & Feedback Collection

Project Development Should be based on Agile methodology,



#### MINI PROJECT PROPOSAL (SYNOPSIS) STRUCTURE

Mini Project proposal should be prepared in consultation with the guide. It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis.

Mini Project synopsis may contain 15-25 pages and sequence of contents strictly should be in the following order:

1. Cover and Title page
2. Synopsis Approval Performa duly filled and signed by the student
3. Index
4. Acknowledgement
5. Introduction and objective of the Mini Project
6. System Study (Literature Survey, Proposed Methodology)
7. Feasibility Study
8. System Requirements
9. System Design
10. Development & Feedback
11. Deployment & Conclusion
12. Scope of future application
13. References

#### **COMMUNICATION OF SYNOPSIS APPROVAL**

A list of approved synopsis will be put on the notice board of the Institute as per the dates mentioned in the activity schedule. In case of non-approval, the suggestions for reformulating the Mini Project will be communicated to the student. Students can resubmit the modified synopsis to Project In-Charge of the Department of Master of Computer Applications as per the specified time given in activity schedule.

#### **MINI PROJECT REPORT STRUCTURE**

The Mini Project should be prepared in consultation with the guide and may contain 100-150 pages (including coding). Mini Project Report should strictly follow the points given below:

**Details**

1. Cover and Title page	12. System Design (DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure, etc.)
2. Synopsis Approval Certificate	13. UI Design/Development
3. Index	14. Coding
4. Acknowledgement	15. Validation & Verification
5. Certificate of Originality	16. Testing (Testing techniques, Testing strategies, Use Cases)
6. Introduction, Aims / Objectives	17. Implementation and Maintenance
7. System Study Problem Identification Literature Study The scope of problem	18. System Security & Performance measurements
8. Feasibility Study 8.1. Technical Feasibility 8.2. Economic Feasibility 8.3. Operational Feasibility	20. Reports, Pert Chart/Gantt Chart, Summary / Conclusion
9. Proposed Methodology	21. Future scope of the Mini Project
10. S/W Engineering Paradigm applied	22. Bibliography/References/Glossary
11. System Specification	23. Document Approval

### SYNOPSIS SUBMISSION OF A MINI PROJECT REPORT

Three copies of the Mini Project report in bound form is to be submitted to the Project In-Charge of the Department of Master of Computer Applications.

### MINI PROJECT EVALUATION

The following assessment procedures shall be followed for evaluation of mini project:

- Mini Project(s) is/are included in curriculum as a practical component with maximum credits of 3.
- Mini project may be allotted to a single student or to a group of students not exceeding 3 per group.
- During review 1, the students' group shall present their chosen problem statement and justify their selection.
- During review 2, they shall present their solution methodology to the chosen problem statement and also present the requirement (software / hardware).
- During review 3, the groups shall present the progress made on the prototype development.

### LIST OF BROAD AREAS OF APPLICATIONS AND RELATED TOOLS

- **Technology:** Visual studio 2008, .NET framework, J2EE, Spring, AngularJS.
- **Front-End Development:** UI Design Tools, PHP, ReactJS, jQuery, etc.,
- **Back-End Development:** NoSQL, SQL Server, Oracle 10g, MySQL, MongoDB, Django, Sybase
- **Languages:** C, C++, C#, Java, VC++, Python
- **Internet Technologies:** HTML, DHTML, XML, CSS, JavaScript, DOM, JQuery, AJAX, node.js, ASP, JSP, Java Servlet, Perl & CGI script, VBscript, Swing, XSL, Java Beans, UML, EDA, Broadvision, ATG, NET Dynamics, Silver Stream, Cold Fusion, etc.,
- **Web Server:** IIS, APACHE, TOMCAT, GlassFish, etc.,
- **Networking Technologies:** ATM, Frame Relay, TCP/IP, SNMP, GSM, VOIP, PPP, IP-PTN, SONET/SDH
- **Wireless Technologies:** 2G, 3G, 4G, Bluetooth, Wi-Fi, ISDN, Edge, etc.,
- **Real-time OS/ Embedded Skills:** QNX, LINUX, OSEK, DSP, VRTX, RTXC, Nucleus, etc.,
- **Operating System:** Windows XP/VISTA/7, Windows Server 2008, MS-DOS, LINUX SUN, VRTX, SOLARIS, HP/UX, PSOS, IRIX, Ubuntu, Mac OS, Fedora, Debian, etc.,
- **Project Management Tools:** JIRA, Kanban, GitHub, Smartsheet, Zoho Sprint, pivotal Tracker, etc.,

Theory: --

Tutorial: --

Practical: --


Project:60 Hrs

Total Hours: 60 Hrs


  
BOS-Chairman/MCA

**Dr. T. PADMA**, MCA., M.Phil., Ph.L.  
Professor and Head  
Dept. of Master of Computer Applications  
Sona College of Technology  
SALEM-636 005.

P23MCA501		AGILE METHODOLOGIES					L	T	P	J	C			
							3	0	0	0	3			
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Demonstrate a systematic understanding of current agile techniques and practices used in industry.													
CO2:	Apply industry standard agile techniques in develop software in a team.													
CO3:	Evaluate the improvements in developing software in a professional context using knowledge management.													
CO4:	Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems.													
CO5:	Investigate the purpose of different testing techniques.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	3	2	2	2	3	3	1	2	2	3	2	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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					
<b>Unit 01:INTRODUCTION</b>										<b>9 Hours</b>				
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.														

<b>Unit 02: AGILE PROCESS</b>					<b>9 Hours</b>
Lean Production – Scrum, Roles and Responsibilities, Crystal, Kanban, Feature Driven Development – Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.					
<b>Unit 03: AGILE AND KNOWLEDGE MANAGEMENT</b>					<b>9 Hours</b>
Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story Cards - Story Card Maturity Model (SMM).					
<b>Unit 04: AGILE AND REQUIREMENTS ENGINEERING</b>					<b>9 Hours</b>
Impact of Agile Processes in RE-Current Agile Practices – Variance – Overview of Re using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.					
<b>Unit 05: AGILE AND QUALITY ASSURANCE</b>					<b>9 Hours</b>
Agile Product Development – Agile Metrics – Test Driven Development – Agile Approach in Global Software Development – Agile Scrum – Scrum Master – Scaling Projects using Scrum – Agile Management Tool- Jira.					
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>	
<b>TEXT BOOKS</b>					
1.	Konnor Cluster, "Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban and Extreme Programming", 2019 (Units 1, 2, 3, 5).				
2.	Craig Larman "Agile and Iterative Development – A Manager's Guide" Pearson Education, Third Edition, 2012 (Unit 4).				
<b>REFERENCES</b>					
1.	Mark Merkow, "Secure, Resilient, and Agile Software Development", Auerbach Publications; First edition, 2019.				
2.	Thomas Stober, Uwe Hansmann , Agile Software Development: Best Practices for Large Software Development Projects, Springer-Verlag Berlin Heidelberg Publication, 2010.				
3.	Learning Microsoft Project 2019: Streamline project, resource, and schedule management with Microsoft's project management software Packt Publishing, 2020.				
4.	Geoff Watts, "Scrum Mastery: From Good To Great Servant-Leadership", Inspect & Adapt Ltd, First edition, 2013.				
5.	Rama Bedarkar, "Agile Scrum: Improving Practices for Business Gains", Wiley Emerging Technology Series, January 2020.				
 <b>BOS-Chairman/MCA</b>					

P23MCA503	DATA MINING AND WAREHOUSING					L	T	P	J	C				
						3	0	0	0	3				
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Explain the concepts of data warehousing and its various models.													
CO2:	Describe data mining techniques for data analysis.													
CO3:	Analyze various pattern mining and pattern evolution methods.													
CO4:	Develop simple models using clustering techniques.													
CO5:	Apply data warehousing and data mining techniques in real time.													
<b>Pre-requisite:</b>														
-----														
<b>CO/PO, PSO Mapping</b>														
(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	1	2	1	1	3	1	2	2	2
CO2	2	2	2	2	2	1	2	1	1	3	1	2	2	2
CO3	3	3	3	3	3	1	2	1	1	3	1	2	3	3
CO4	3	3	3	3	3	1	2	1	1	3	1	2	3	3
CO5	3	3	3	3	3	1	2	1	1	3	1	2	3	3
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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			
<b>Unit 01: DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP)</b>											<b>9 Hours</b>			
Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations - OLAP and OLTP.														

<b>Unit 02: DATA MINING – INTRODUCTION</b>				<b>9 Hours</b>
Introduction to Data Mining Systems – Knowledge Discovery in Databases Process – Data Mining Techniques – Issues – Applications- Data Objects and attribute types - Statistical Description of Data - Data Pre-processing – Cleaning - Integration - Reduction - Transformation and Discretization - Data Visualization - Data Similarity and Dissimilarity Measures.				
<b>Unit 03: DATA MINING – FREQUENT PATTERN ANALYSIS</b>				<b>9 Hours</b>
Mining Frequent Patterns - Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel – Multi-Dimensional Space – Constraint-Based Frequent Pattern Mining – Association Rule Mining - Classification using Frequent Patterns.				
<b>Unit 04: CLASSIFICATION AND CLUSTERING</b>				<b>9 Hours</b>
Classification & Regression tree - General approach - C4.5 – C5.0 – CART algorithm – Model Evaluation techniques- Cost Benefit analysis – Graphical evaluation of classification models Clustering Techniques – Cluster analysis - Partitioning Methods - K-Medoids – Hierarchical Methods - Agglomerative – Density-Based Methods – DENCLUE - Evaluation of clustering – Outlier analysis.				
<b>Unit 05: APPLICATIONS</b>				<b>9 Hours</b>
Application of Data Warehousing & Data Mining - National Data Warehouses - Census Data - Orange Data mining tool, Data Melt Data mining tool -Areas for Data Warehousing and Data Mining with Case Studies-Case Study: Data Mining in Healthcare – Data Mining in Education – Data Mining in Financial sector - Data Warehousing in Agriculture - Data Warehousing for E-commerce - Data Warehousing in Retail - Data Warehousing in Banking.				
<b>Theory: 45 Hrs</b>	<b>Tutorial:--</b>	<b>Practical:--</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
1. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, 3rd Edition, Elsevier, Reprinted 2014 (Unit 1, 2, 3, 4, 5).				
2. Daniel T Larose, Chantal D Larose, “Data Mining and Predictive Analytics”, 2 <sup>nd</sup> Edition, Wiley,2015 (Unit 4).				
<b>REFERENCES</b>				
1. Prof. (Dr.) Sumit Kumar, Ms. Niranchana Rajamanickam, P Aparna, Dr. J.Avanija , “Concepts And Techniques Of Data Mining”, AG PUBLISHING HOUSE (AGPH Books), 2023.				
2. Dr. Jugnesh Kumar, “Data Warehouse and Data Mining Concepts, Techniques and Real Life Applications” , BPB Publications, 2024.				
3. Mike Benson, “Data Mining: Concepts and Algorithms”, Murphy & Moore Publishing, 2022.				
4. Dr. Suneel Pappala,“ DATA MINING Association Rule Mining, Classification”, Blue Rose Publishers, 2022.				
5. Khusboo Saxena/Sandeep Saxena/Akash Saxena,“ DATA MINING AND WAREHOUSING”, BPB Publications, 1st Edition, 2015.				
 <b>BOS-Chairman/MCA</b>				

P23MCA506	MICROSERVICES AND DEVOPS					L	T	P	J	C				
						3	0	0	0	3				
<b>Course Outcomes</b>														
At the end of the course, the student will be able to														
CO1:	Apply the concept of micro services and containers.													
CO2:	Explain the architecture of micro services.													
CO3:	Illustrate the common tools used in DevOps.													
CO4:	Combine DevOps and Micro services concepts.													
CO5:	Test and deploy projects in DevOps environment.													
<b>Pre-requisite:</b>														
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<b>CO/PO, PSO Mapping</b>														
(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	3	2	2	3	2	2	3	2	3	1
CO2	3	2	3	2	3	2	2	3	2	2	3	2	3	1
CO3	3	3	3	2	3	2	2	3	2	2	3	2	3	1
CO4	3	3	3	2	3	2	2	3	2	2	3	2	3	1
CO5	3	3	3	2	3	2	2	3	2	2	3	2	3	1
<b>Course Assessment methods</b>														
<b>Direct</b>							<b>Indirect</b>							
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				
<b>Unit 01: INTRODUCTION TO MICROSERVICES</b>										<b>9 Hours</b>				
Definition of Microservices – Characteristics – Microservices and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud – Principles of Microservices.														




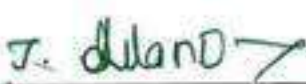
<b>Unit 02: MICROSERVICES ARCHITECTURE</b>				<b>9 Hours</b>
Monolithic architecture- Microservice architectural style- Benefits - Drawbacks of Microservice architectural style - decomposing monolithic applications into Microservices.				
<b>Unit 03: BASICS OF DEVOPS</b>				<b>9 Hours</b>
History of DevOps- Basics of shell script - DevOps and software development life cycle- water fall model - agile model -DevOps life cycle - DevOps tools: distributed version control tool -Git- automation testing tools - reports generation - TestNG - User Acceptance Testing - Jenkins.				
<b>Unit 04: MICROSERVICES IN DEVOPS ENVIRONMENT</b>				<b>9 Hours</b>
Evolution of Micro services and DevOps - Benefits of combining DevOps and Micro services - Working of DevOps and Micro services in Cloud environment - DevOps Pipeline representation: code commit, code build, code test and code deploy.				
<b>Unit 05: VELOCITY AND CONTINUOUS INTEGRATION/DELIVERY</b>				<b>9 Hours</b>
Velocity - Continuous Integration - Delivery Pipeline- test stack - Small/Unit Test - medium /integration testing - system testing- Job of Development and DevOps - Job of Test and DevOps - Job of Ops and DevOps- Infrastructure and the job of Ops - SecOps.				
<b>Theory: 45 Hrs</b>	<b>Tutorial: --</b>	<b>Practical: --</b>	<b>Project:--</b>	<b>Total Hours: 45 Hrs</b>
<b>TEXT BOOKS</b>				
1.	NamtTanasseri, RahulRai, "Microservices with Azure", 1st Edition, Packt Publishing, UK, 2017. (Units 1, 2).			
2.	Hitesh Kumar Sharma, Anuj Kumar, "DevOps: A Journey from Microservice to Cloud Based Containerization", River Publishers, First Edition, 2024. (Units 3, 4, 5).			
<b>REFERENCES</b>				
1.	Eberhard Wolff, "Microservices: Flexible Software Architecture", 1st Edition, Pearson Education, 2017.			
2.	Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, 5th Edition, IT Revolution Press, 2018.			
3.	James A Scott, "A Practical Guide to Microservices and Containers", MapR Data Technologies 2016, e-book:( <a href="https://www.academia.edu/41522528/A_Practical_Guide_to_Microservices_and_Containers_Mastering_the_Cloud_Data_and_Digital_Transformation">https://www.academia.edu/41522528/A_Practical_Guide_to_Microservices_and_Containers_Mastering_the_Cloud_Data_and_Digital_Transformation</a> ).			
4.	Joyner Joseph, Devops for Beginners, First Edition, MihailsKonoplovs publisher, 2015.			
5.	Michael Hüttermann, DevOps for Developers, 1st Edition, APress, e-book, 2012.			
 <b>BOS-Chairman/MCA</b>				

**Sona College of Technology, Salem**  
**(An Autonomous Institution)**  
**Courses of Study for MCA Semester IV 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*
<b>Practical courses</b>										
1.	P23MCA401	Project Work	0	0	0	28	14	PC	420	P
<b>Total Credits</b>							<b>14</b>			

\*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, P-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, Fourth Semester MCA Students and Staff, COE

MCA  
TV

<b>P23MCA401</b>	<b>PROJECT WORK</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>J</b>	<b>C</b>
											0	0	0	28	14
<b>Course Outcomes</b>															
At the end of the course, the student will be able to															
<b>CO1:</b>	Apply new technologies and frameworks for devising a solution to a given problem statement.														
<b>CO2:</b>	Apply project management skills and work within the confined deadline.														
<b>CO3:</b>	Present the project to the audience, demonstrate technical expertise, explain the functionality, and highlight the challenges and solutions.														
<b>Pre-requisite:</b>															
-----															
<b>CO/PO, PSO Mapping</b>															
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak															
<b>COs</b>	<b>Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)</b>														
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	
<b>CO1</b>	3	3	3	2	3	2	2	2	3	3	3	2	3	3	
<b>CO2</b>	2	2	2	3	2	2	3	3	3	3	3	3	3	3	
<b>CU3</b>	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
<b>Course Assessment methods</b>															
<b>Direct</b>										<b>Indirect</b>					
Review I - 5 Marks					Total CIE: 40 marks Semester End Examination (60)					Course end survey					
Review II -10 Marks															
Review III-15 Marks															
Final Project Report- 10 Marks															
<b>Project work instructions:</b>															
1. The student should take up an individual project work as the part of the curriculum in 4 <sup>th</sup> semester. It can be an internship/consultancy/research project.															
2. The student can apply internships through online platforms or they might approach IT or any other relevant industries.															
3. Every student will be assigned with a project guide who is the faculty of the department.															
4. The student should submit a copy of offer letter/confirmation letter to the project guide.															
5. The student should be under continuous assessment of the project guide.															
6. The internal reviews shall be done by a committee of internal faculty members duly appointed by the Head of the Department.															
7. The student is required to present the progress of the project work to the review committee during the reviews as per the schedule and the attendance to all reviews is mandatory.															
8. The project report has to be submitted by each student for his/her project work.															
9. All the students are encouraged to publish at least 1 paper on their work in the WoS/Scopus indexed Conferences/Journals.															
10. The final viva-voce shall be conducted by a committee duly appointed by the office of Controller of Examinations.															
<b>Theory: --</b>			<b>Tutorial: --</b>			<b>Practical: --</b>			<b>Project: 420</b>			<b>Total Hours: 420 Hrs</b>			

  
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