SRM INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

Minor in Computer Science and Engineering Curriculum					
Course Code	**Course Title**	Hours/ Week			C
		L	T	P	
Foundation Courses					
21MCS003F	Introduction to Data Structures	3	0	0	3
21MCS004F	Fundamentals of Operating Systems	3	0	0	3
21MCS005F	Database Management Systems	3	0	2	4
Professional Electives (To choose any Three)					
21MCS005E	Networking Fundamentals	3	0	0	3
21MCS006E	Web Designing	3	0	0	3
21MCS007E	Internet of Things	3	0	0	3
21MCS008E	Cloud Computing	3	0	0	3
Total Learning Credits					19

Course Code	21MCS003F	Course Name	Introduction to Data Structures	Course Category	F	Foundation Course	L			C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	Data Book / Codes / Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Explore foundational concepts in C and data structures*
CLR-2 :	*Illustrate the operations and applications of arrays and linked lists*
CLR-3 :	*Demonstrate the use of stacks and queues, showcasing their implementations and applications to solve computational problems efficiently*
CLR-4 :	*Develop an understanding of trees and graphs, including their terminologies, traversals, and applications*
CLR-5 :	*Master searching and sorting algorithms, alongside hashing techniques, to apply efficient data retrieval and organization methods*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Understand the fundamentals of C programming and data structures*
CO-2:	*Illustrate practical skills in representing, manipulating, and applying arrays and linked lists structures*
CO-3:	*Demonstrate competence in utilizing stacks and queues, including their array and linked list representations, and applying them to solve problems*
CO-4:	*Comprehend and utilize trees and graphs structures to solve real world problems*
CO-5:	*Equip with the skills to implement and analyze searching and sorting algorithms*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Module-1 - Data Structures Introduction	***9 Hour***
Introduction to C - Basic data types- Functions, Pointers and Structures. Arrays - Initialization - Declaration - One-dimensional and Two-dimensional arrays. Basic programs using structures and Pointers – Data Structures introduction - Basic terminology – Classification of Data Structures – Operations on Data Structures - Abstract Data Type – Algorithms -Time and space complexity - Worst case, Average case and Best case	
Module-2 –Arrays and Linked Lists	***12 Hour***
Arrays and its representations - Operations on arrays – Insertion and Deletion. Linked lists and its types – Singly-linked lists, Doubly linked lists, Circular singly linked lists – its operations – insertion and deletion – Applications of linked lists.	

Module-3 –Stacks and Queues	***9 Hour***
Introduction to stacks – Operations on stacks – Array representation of stacks – Linked list representation of stacks – Applications of stacks – infix to postfix expression, evaluation of a postfix expression – Queues - Array representation of queues - Linked list representation of queues.	
Module-4 –Trees and Graphs	***6 Hour***
Trees - Basic terminology – Binary tree – Tree traversals – Pre-order, In-order and post-order traversals. Binary search tree – insertion and deletion. AVL Tree. Graph introduction – Graph traversals – Breadth-First Search and Depth-First Search – Minimum Spanning Trees – Prim's and Kruskal's.	
Module-5 –Searching and Sorting Algorithms	***9 Hour***
Searching - Linear Search and Binary Search. Sorting - Bubble Sort, Insertion sort, Merge sort and Quick sort - Hashing - Hash tables and Hash functions.	

Learning Resources	1. *Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson Education, 2015* 2. *Thomas H Cormen. Chales E Leiserson. Ronald L Revest. Clifford Stein, Introduction to Algorithms, 3rd ed., The MIT Press Cambridge, 2014* . 3. *Reema Thareja, Data Structures Using C, 1st ed., Oxford Higher Education, 2011*	4. *V.Jho, J. E Hopcroft, J.D.Ullman, Data structures and Algorithms, Pearson Education, 2003* 5. *Seymour Lipschutz, Data Structures with C, McGraw Hill, 2014*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	*15%*	-	*15%*	-
Level 2	*Understand*	*25%*	-	*20%*	-	*25%*	-
Level 3	*Apply*	*30%*	-	*25%*	-	*30%*	-
Level 4	*Analyze*	*30%*	-	*25%*	-	*30%*	-
Level 5	*Evaluate*	-	-	*10%*	-	-	-
Level 6	*Create*	-	-	*5%*	-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers

1. *S.S. Arun Kumar, Senior Software Engineer, Oracle, Bangalore, arunkumar.s.s@oracle.com*
2. *Dr. P. Saranya, SRMIST*

Course Code	21MCS004F	Course Name	FUNDAMENTALS OF OPERATING SYSTEMS	Course Category	F	FOUNDATIO N	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Outline the structure of OS and basic architectural components involved in OS design*
CLR-2 :	*Introduce the concept of deadlock and various memory management mechanism*
CLR-3 :	*Familiarize the scheduling algorithms, file systems, and I/O schemes*
CLR-4 :	*Identify and tell the various embedded operating systems and computer security concepts*
CLR-5 :	*Name the various computer security techniques in windows and Linux*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Use the appropriate concepts of operating system for resource utilization*
CO-2:	*Choose the relevant process and thread concepts for solving synchronization problems*
CO-3:	*Exemplify different types of scheduling algorithms and deadlock mechanism*
CO-4:	*Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one*
CO-5:	*Demonstrate different device and resource management techniques for memory utilization with security mechanisms*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Module-1 - OS Concepts and Structures	***9 Hour***
Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Operating-System Debugging, Operating-System Generation, System Boot.	
Module-2 –Process Management	***9 Hour***
Process Concept, Scheduling, Operations, Interprocess Communication, Communication in Client - Server Systems, Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors	

Module-3 – CPU Scheduling and Deadlocks	***9 Hour***
Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	
Module-4 –Memory Management	***9 Hour***
Main Memory, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory: Introduction, Demand Paging, Copy-on-Write, Page Replacement, Basic, Page Replacement Types, Allocation of Frames, Thrashing, Working-Set Model , Memory-Mapped Files, Allocating Kernel Memory.	
Module-5 –Storage Management	***9 Hour***
Introduction, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. File System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.	

Lab Experiments

Lab 1: Operating system Installation, Basic Linux commands *Lab 2: Process Creation using fork() and Usage of getpid(), getppid(), wait() functions* *Lab 3: Multithreading* *Lab 4: Mutual Exclusion using semaphore and monitor* *Lab 5: Reader-Writer problem*	*Lab 6: Dining Philosopher problem* *Lab 7: Bankers Algorithm for Deadlock avoidance* *Lab 8: FCFS and SJF Scheduling* *Lab 9: Priority and Round robin scheduling* *Lab 10: FIFO Page Replacement Algorithm*	*Lab 11: LRU and LFU Page Replacement Algorithm* *Lab 12: Best fit and Worst fit memory management policies* *Lab 13: Disk Scheduling algorithm*

Learning Resources

1. *Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Tenth Edition, 2018*
2. *RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach ", Tata McGraw Hill Edition, 2010*
3. *Dhananjay M. Dhamdhere, "Operating Systems – A Concept Based Approach", Third Edition, Tata McGraw Hill Edition, 2019*
4. *Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Global Edition, Pearson, 2015.*
5. *William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education,Sixth Edition, 2018*
6. *Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 2017*
8. *https://nptel.ac.in/courses/106/105/106105214/*
9. *https://nptel.ac.in/courses/106/106/106106144/*
10. *https://onlinecourses.nptel.ac.in/noc21_cs44/preview*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*20%*	-	-	-	*20%*	-
Level 2	*Understand*	*40%*	-	*40%*	-	*40%*	-
Level 3	*Apply*	*20%*	-	*40%*	-	*20%*	-
Level 4	*Analyze*	*20%*	-	*10%*	-	*10%*	-
Level 5	*Evaluate*	-	-	*10%*	-	*10%*	-
Level 6	*Create*	-	-	-	-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designer

1. *Dr.Niranjana, SRMIST*

Course Code	21MCS005F	Course Name	DATABASE MANAGEMENT SYSTEMS	Course Category	F	FOUNDATION	L	T	P	C
							3	0	2	4

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Understand the fundamentals of Database Management Systems, Architecture and Languages*
CLR-2 :	*Conceive the database design process through ER Model and Relational Model*
CLR-3 :	*Design Logical Database Schema and mapping it to implementation level schema through Database Language Features*
CLR-4 :	*Familiarize queries using Structure Query Language (SQL) and PL/SQL*
CLR-5 :	*Familiarize the Improvement of the database design using normalization criteria and optimize queries*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Acquire the knowledge on DBMS Architecture and Languages*
CO-2:	*Apply the fundamentals of data models to model an application's data requirements using conceptual modeling tools like ER diagrams*
CO-3:	*Apply the method to convert the ER model to a database schema based on the conceptual relational Model*
CO-4:	*Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL*
CO-5:	*Apply the knowledge to improve database design using various normalization criteria and optimize queries*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Module-1 –	***9 Hour***
What is Database Management System - Advantage of DBMS over File Processing System - Applications of DBMS - Purpose of database system, Views of data - Database system Architecture - Data Independence - The evolution of Data Models - Degrees of Data Abstraction - Database Users and DBA - Database Languages	
Module-2 –	***9 Hour***
Database Design - Design process - Entity Relation Model - ER diagram - Keys , Attributes and Constraints, Mapping Cardinality - Extended ER – Generalization - Specialization and Aggregation - ER Diagram Issues - Weak Entity - Relational Model - Conversion of ER to Relational Table	
Module-3 –	***9 Hour***
Basics of SQL - DDL,DML,DCL and TCL -Commands - Defining Constraints-Primary Key, Foreign Key, Unique, not null, check, IN operator - Functions-aggregation functions - Built-in Functions-	

numeric, date, string functions, string functions, Set operations, Sub Queries, correlated sub queries ,Nested Queries - Views and its Types, Transaction Control Commands - Commit, Rollback, Save point - PL/SQL Concepts- Cursors - Stored Procedure - Functions Triggers and Exceptional Handling, Query Processing
Module-4 – ***9 Hour***
Relational Algebra – Fundamental Operators and syntax, Relational algebra queries - Pitfalls in Relational database - Functional Dependency – definition - Trivial and non-trivial - FD Closure of FD set - Closure of attributes - Decomposition using FD- dependency - Transaction concepts, properties of transactions
Module-5 – ***9 Hour***
Normalization – Concepts - 1NF - 2NF - 3NF – BCNF - Multi- valued dependency - 4NF - 5NF Query Optimization
Lab 1: SQL Data Definition Language Commands on sample exercise *Lab 2: SQL Data Manipulation Language Commands* *Lab 3: SQL Data Control Language Commands and Transaction control commands* *Lab 4: Inbuilt functions in SQL* *Lab 5: Construct a ER Model for any Application* *Lab 6: Nested Queries* *Lab 7 : Join Queries* *Lab 8: Set Operators & Views* *Lab 9: PL/SQL Conditional Statements* *Lab10: PL/SQL Iterative Statements* *Lab 11: PL/SQL Procedures* *Lab 12: PL/SQL Functions*

Learning Resources	*1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts//, Sixth Edition, Tata McGraw Hill,2011.* *2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems//, Sixth Edition, Pearson Education,2011.* *3. CJ Date,A Kannan,S Swamynathan, An Introduction to Database Systems, Eight Edition, Pearson Education,2006.* *4. Rajesh Narang, Database Management Systems, 2nd ed., PHI Learning Private Limited,2011.*	*5. Martin Gruber, Understanding SQL, Sybex,1990* *6. Sharad Maheshwari, Introduction to SQL and PL/SQL,2ded., LaxmiPublications,2016.* *7. Raghurama Krishnan, Johannes Gehrke, Database Management Systems,3rdEdition, McGrawHill Education,2003.*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	-	*15%*	*15%*	-
Level 2	*Understand*	*25%*	-	-	*20%*	*25%*	-
Level 3	*Apply*	*30%*	-	-	*25%*	*30%*	-
Level 4	*Analyze*	*30%*	-	-	*25%*	*30%*	-

Level 5	*Evaluate*	-	-	-	*10%*	-	-
Level 6	*Create*	-	-	-	*5%*	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers
1. Dr.Niranjana, SRMIST

Course Code	21MCS005E	Course Name	NETWORKING FUNDAMENTALS	Course Category	E	ELECTIVE	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Provide knowledge in basics of networking concepts about topologies and network models*
CLR-2 :	*To learn various Data Link Services offered and its protocol implementation in intranet and internetworks*
CLR-3 :	*To acquire knowledge in switching and addressing schemes for internet*
CLR-4 :	*Examine and explain end to end connectivity to gain insights into the behavior of internet*
CLR-5 :	*To Implement client server models using application protocols to satisfy the need of society*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Gain knowledge about networking concepts for network design*
CO-2:	*Identify various Data Link Services for estimating reliability issues in intranet and internetworks.*
CO-3:	*Contrast different types of switching and addressing schemes to analyze the network performance*
CO-4:	*Analyze data flow between peer to peer in an IP network using Transport layer protocols*
CO-5:	*Build client server models using application protocols to satisfy the need of society*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
-	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Module-1 – Fundamentals	***9 Hour***
Introduction to basic networking concepts- Networking Topologies – Types of Networks: - LAN-WAN-MAN-PAN-CAN – Networking Model : OSI Model , TCP/IP Model – Introduction to various networking Devices : Routers, switches, Modems, Hubs- Basics of Wired and Wireless Technologies-Internet History- Standards and Administration	
Module-2 – Data Link Layer	***9 Hour***
Introduction – Nodes and Links- Services offered - Sub Layers : - Data Link Control(DLC) & Media Access Control(MAC); Data Link Control : - Framing-Flow and Error Control mechanisms – Protocols : - FSM – Stop & Wait – Sliding Window- Piggybacking – HDLC – PPP; Media Access Control : - Functions – Channel Allocation – Protocols : - ALOHA – CSMA-CSMA/CA; Legacy Standards :- IEEE 802.3 and Ethernet Standards : - Fast – Gigabit Ethernet.	

Module-3 – Network Layer	***9 Hour***
Functions & Services- Switching Techniques :- Circuit and Packet Switching; Logical Addressing : - IPV4 – IPV6 – Subnetting – CIDR Notations – Network Layer Performance Metrics –Network Layer Protocols : - IP- ICMP ; Routing Algorithms : - Distance Vector – Link State – Path Vector-Basics of Multicasting	
Module-4 – Transport Layer	***9 Hour***
Introduction – Transport Layer Services – Addressing- Connection Establishment – Release – Flow Control – Multiplexing ; TCP Congestion control and Traffic Management ; Protocols : - TCP – UDP - Real Time Support Protocols : - RTP- SCTP ; Quality of Service(QoS) – Differentiated Services	
Module-5 – Application Layer	***9 Hour***
Introduction – Address Resolution – DNS – World Wide Web : HTTP – HTTPS – Email Protocols : - SMTP –MIME- POP3-IMAP; File Transfer Protocols : - FTP –TFTP – DHCP ; Remote Access : - TELNET – SSH;	

Learning Resources	*1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw – Hill, 2012* *2. Andrew S. Tanenbaum, "Computer Networks",5th Edition, PHI, ISBN 81-203-2175-8.* *3. Kurose, Ross "Computer Networking a Top Down Approach Featuring the Internet", Pearson; 6th edition (March 5, 2012), ISBN-10: 0132856204*	*4. Douglas E. Comer, Internetworking with TCP/IP, Principles, protocols, and architecture, Vol 1 5th Edition,2006 ISBN: 0131876716, ISBN: 978-0131876712.* *5. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	*15%*	-	*15%*	-
Level 2	*Understand*	*25%*	-	*20%*	-	*25%*	-
Level 3	*Apply*	*30%*	-	*25%*	-	*30%*	-
Level 4	*Analyze*	*30%*	-	*25%*	-	*30%*	-
Level 5	*Evaluate*	-	-	*10%*	-	-	-
Level 6	*Create*	-	-	*5%*	-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers

1. *Mr. Manikandan. G, Service Operations Manager, Nokia Solutions & Networks India Private Limited, Chennai. Manikg2006@gmail.com*
2. *Prof. Kannimuthu Subramanian,Professor, Karpagam College of Engineering, drkannimuthu@gmail.com*
3. *Prof. Kanagachidambaresan G.R, Professor, Veltech Rangarajan Dr Sagunthala R&D Institute of science kanagachidambaresan@gmail.com*
4. *Dr. P. Madhavan, SRMIST*

Course Code	21MCS006E	Course Name	WEB DESIGNING	Course Category	E	ELECTIVE	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Design and build Modern, semantic and accessible HTML5*
CLR-2 :	*Understanding the layout feature and creating interactive web page*
CLR-3 :	*Learn JavaScript working and script is so important in web design*
CLR-4 :	*Understating the key duties and responsibilities of a UI/UX designer*
CLR-5 :	*Use Figma, the essential concepts of Figma, and its various features.*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Build HTML pages for creating static webpage*
CO-2:	*Creating dynamic web pages for more personalized experience*
CO-3:	*Develop javascript ,accessing web pages without reload*
CO-4:	*Explain design, UI/UX concepts, best practices of visual development*
CO-5:	*Creating user interface design using tool*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
-	3	3	-	3	-	-	-	-	-	-	-	-	-	-
-	3	3	-	3	-	-	-	-	-	-	-	-	-	-
-	3	3	-	3	-	-	-	-	-	-	-	-	-	-
-	3	3	-	3	-	-	-	-	-	-	-	-	-	-
-	3	3	-	3	-	-	-	-	-	-	-	-	-	-

Module-1 –Web design fundamentals	***9 Hour***
HTML5 tags-to format text, images, links, forms, tables, frames, creating static web page	
Module-2 –Dynamic web page	***9 Hour***
CSS- to build style sheets to adjust things like colour, background, layout- An interactive site consisting of a form with textboxes, radio buttons, checkboxes, a comment box, and a submit button.	
Module-3 – JavaScript basics	***9 Hour***
Introduction to javascript -objects, functions arrays, AJAX-JSON	
Module-4 – UX-UI design	***9 Hour***
UI/UX concepts- Progressive Web Application-responsive web design	
Module-5 – Web based design tool	***9 Hour***
Figma is a web-based design tool for creating user interfaces, icons, wireframes, and prototypes- vector shapes, images, icons, text, and plugins.	

Learning Resources	*1.Jennifer Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics 5th Edition 2021* *2.Shann,Visual Design : Creating Great UI/UX 2023*	*3. Deitel and Deitel Internet & World Wide Web How to Program, 5/e ,2023*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*20%*	-	*20%*	-	*20%*	-
Level 2	*Understand*	*20%*	-	*20%*	-	*20%*	-
Level 3	*Apply*	*30%*	-	*30%*	-	*30%*	-
Level 4	*Analyze*	*30%*	-	*30%*	-	*30%*	-
Level 5	*Evaluate*	-	-	-	-	-	-
Level 6	*Create*	-	-	-	-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers

1. *Dr.Akilandeswari.P,SRMIST*

Course Code	21MCS007E	Course Name	INTERNET OF THINGS	Course Category	E	ELECTIVE	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Familiarize about the fundamentals of IoT*
CLR-2 :	*Understand about IoT protocols for routing and data acquisition*
CLR-3 :	*Popularize the IoT concepts by interfacing devices like Raspberry Pi/Arduino using IDE.*
CLR-4 :	*Provide IoT concepts by utilizing cloud and Fog services*
CLR-5 :	*Understand the role of big data analytics in Real-time IoT applications*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Interpret the fundamental of IoT including architecture, functional blocks and connecting devices.*
CO-2:	*Express the various IoT protocols for routing and data acquisition.*
CO-3:	*Illustrate the IoT concepts by interfacing devices like Raspberry Pi/Arduino using IDE.*
CO-4:	*Articulate the IoT perceptions for cloud and Fog services.*
CO-5:	*Summarize the concepts of IoT to solve real time scenario for various smart applications.*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	2	-	-	-	-	-	-	-	-	-	-
2	3	3	-	2	-	-	-	-	-	-	-	-	-	-
-	3	3	-	2	-	-	-	-	-	-	-	-	-	-
-	3	3	-	2	-	-	-	-	-	-	-	-	-	-
-	3	3	-	2	-	-	-	-	-	-	-	-	-	-

Module-1 – Fundamentals of IoT	***9 Hour***
Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) – Simplified IoT Architecture and Core IoT Functional Stack– Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.	
Module-2 –IoT Communication Protocols	***9 Hour***
Introduction to Infrastructure Protocols, Discovery Protocols, Data Protocols- MQTT, CoAP, Web Socket. Identification Protocols, Device Management, Semantic Protocols.	
Module-3 –IoT Interfacing	***9 Hour***
Introduction to Arduino – Arduino IDE –Basic Commands –Interfacing with Arduino, Introduction to Raspberry Pi – Terminal Commands- Interfacing with Raspberry Pi.	
Module-4 –IoT Supporting Services	***9 Hour***
Introduction to Cloud Computing-Virtualization and its types-Cloud Models-Implementation- Open Stack-AWS, Fog Computing in IoT-Fog Nodes-Deployment Model-Applications.	
Module-5 –Smart Applications	***9 Hour***
Smart and Connected Cities: Smart Grids, Smart Lighting, Smart Parking Architecture and Smart Traffic Control, Healthcare, Industry and Automation.	
Learning Resources	*1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry—IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press,2017.* *2. Sudip Misra, Anandarup Mukherjee, Arijit Roy - Introduction to IoT , Cambridge University Press, 2021.* *3. Rajesh Singh,Anita Gehlot,Lovi Raj Gupta,Bhupendra Singh and Mahendra Swain- Internet of Things With Raspberry Pi and Arduino, CRC Press, 2020.* *4. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015.* *5. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012* *6. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machineto- Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.* *7. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.* *8. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	*10%*	-	*15%*	-
Level 2	*Understand*	*25%*	-	*25%*	-	*25%*	-
Level 3	*Apply*	*30%*	-	*30%.*	-	*30%*	-
Level 4	*Analyze*	*30%*	-	*35%*	-	*30%*	-
Level 5	*Evaluate*	-	-		-	-	-
Level 6	*Create*	-	-		-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers

1. *Dr. R. Subash, SRMIST*

Course Code	21MCS008E	Course Name	CLOUD COMPUTING	Course Category	E	ELECTIVE	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co- requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	**Data Book / Codes / Standards**		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Learn the basics of Cloud computing service and deployment models.*
CLR-2 :	*Gain knowledge on Virtualization in Cloud Computing*
CLR-3 :	*Understand security concerns in Cloud Computing*
CLR-4 :	*Understand AWS well architected framework.*
CLR-5 :	*Understand Microsoft Azure Cloud Concepts.*

Course Outcomes (CO):	*At the end of this course, learners will be able to:*
CO-1:	*Infer the knowledge on the service and deployment models of cloud computing.*
CO-2:	*Apply the concept of virtualization and its types.*
CO-3:	*Identify the challenges on security issues in cloud Computing*
CO-4:	*Design & build a well architected framework on AWS.*
CO-5:	*Architect, Design & Build identity, governance, and monitoring solutions on Azure*

Program Outcomes (PO)												Program Specific Outcomes		
1	2	3	4	5	6	7	8	9	10	11	12			
Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	-	-	-	-	-	-	-	-	-	-	-	-

Module-1 –Introduction to Cloud Computing and its Architecture	***9 Hour***
Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured services. Architecture-Cloud Service models- IaaS-PaaS-SaaS, Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds & multi-clouds.	
Module-2 –Cloud Virtualization	***9 Hour***
Basics of virtualization- Implementation levels of virtualization-Hypervisor- virtualization structures& Tools- Types of virtualizations- Virtualization of CPU- Memory-I/O Devices- Data center virtualization.	
Module-3 – Cloud Security	***9 Hour***
Cloud Security Challenges, Cloud Information Security Objectives, Cloud Security Services, Secure Cloud Software Requirements, Cloud Security Policy Implementation, Infrastructure Security, Data Security and Storage, Privacy in Cloud.	

Module-4 – AWS Cloud	***9 Hour***
Fundamentals of AWS- AWS compute- EC2 Instance and its components- AWS Storage- S3 Bucket- various storage tiers- AWS Networking- AWS virtual private cloud (VPC) and its components- AWS database-AWS Relational Database services (RDS)- AWS Security- IAM, Roles and policies.	
Module-5 – Azure Cloud	***9 Hour***
Introduction to azure- Azure Basic Concepts- Azure Networking Components-Azure VM-Network Security Group- Virtual Networking-Azure Load Balancer- Azure Application Gateway- Azure Traffic Manager.	

Learning Resources	*1. Kai Hwang, Geoffery C. Fox, and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.* *2. Thomas Erl, Ricardo Puttini, Zaigham Mahmood," Cloud Computing: Concepts, Technology &Architecture", First Edition, Prentice Hall,2013.* *3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.* *4. Tim Mather, Subra Kumaraswamy, and Shahed Latif", Cloud Security and Privacy", Published by O'Reilly Media, Inc., 2009.*	*5. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud 1st Edition by Mark Wilkins.* *6. AWS: The Ultimate Guide from Beginners To Advanced For The Amazon Web Services by Theo H. King, 2020.* *7. Learning Microsoft Azure by Jonah Carrio Andersson,2023.*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (50%)		*Life-Long Learning CLA-2 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	*15%*	-	*15%*	-
Level 2	*Understand*	*25%*	-	*20%*	-	*25%*	-
Level 3	*Apply*	*30%*	-	*25%*	-	*30%*	-
Level 4	*Analyze*	*30%*	-	*25%*	-	*30%*	-
Level 5	*Evaluate*	-	-	*10%*	-	-	-
Level 6	*Create*	-	-	*5%*	-	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers
1. Gunaselan P, Senior Technical Expert, MSC Technologies.chennai.
2. Dr. Ramana Kadiyala, Professor& Head, Artificial Intelligence, CBIT, Hyderabad.
3. Dr.V. Deepan Chakravarthi, SRMIST.