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

DEPARTMENT OF COMPUTING TECHNOLOGIES, SCHOOL OF COMPUTING

MINOR IN FULL STACK DEVELOPMENT

Curriculum for Minor in Full Stack Development					
Course Code	Course Title	Hours/ Week			C
		L	T	P	
Foundation Courses					
21MCSF001	*Principles of Web Programming*	*3*	*0*	*2*	*4*
21MCSF002	*Programming with Java*	*2*	*0*	*2*	*3*
21MCSF006	*Object Oriented Programming*	*2*	*0*	*0*	*2*
Professional Electives (To choose any Three)					
21MCSE001	*DevOps Methodology for Application Development*	*2*	*0*	*2*	*3*
21MCSE002	*Data Structures and Algorithms using Python*	*2*	*0*	*2*	*3*
21MCSE003	*Basics of Spring Framework*	*2*	*0*	*2*	*3*
21MCSE004	*Front End Development using React*	*3*	*0*	*0*	*3*
Total Learning Credits					**18**

Course Code	21MCSF001	Course Name	Principles of Web Programming	Course Category	C	Professional Core	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 :	*Recognize the basics of web programming*
CLR-2 :	*Illustrate the major components of internet and associated protocols.*
CLR-3 :	*Identify the innovative application for web.*
CLR-4 :	*Express the functioning of web oriented applications*
CLR-5 :	*Demonstrate the working web applications to solve real world problems*

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		Program Learning Outcomes (PLO)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Formulate the web applications with basic protocols*	*3*	*2*	-	-	-	-	-	-	-	-	-	-	-	*2*	-
CLO-2 :	*Apply the major components of acquainted with client side and server side programming languages for web.*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO-3 :	*Apply web based to solve the real-world problems*	*3*	*3*	-	-	*2*	-	-	-	-	-	-	-	-	2	-
CLO-4 :	*Analyze the working of web based applications with recent techniques*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO-5 :	*Implement web based application to solve real world problems*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	2	-

Module-1

Internet Principles and Components: History of the Internet and World Wide Web- – HTML - protocols – HTTP, SMTP, POP3, MIME, and IMAP. Domain Name Server, Web Browsers and Web Servers. HTML-Style Sheets-CSS-Introduction to Cascading Style Sheets-Rule-Features- Selectors- Attributes. Client-Side Programming: The JavaScript Language- JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers and Regular Expression.

Module-2

Server Side Programming: servlet- strengths-Architecture-Life cycle- Generic and HTTP servlet- Passing parameters- Server Side Include- Cookies- Filters. JSP- Engines-Syntax- Components- Scriplets-JSP Objects-Actions-Tag Extensions- Session Tracking- Database connectivity- SQL statements-J2EE - Introduction - Beans- EJB-PHP.

Module -3

XML: Introduction- Revolutions of XML-XML Basics – Defining XML Documents: DTD-XML Schema-Namespaces – XFiles: XLink – XPointer - XPath - XML with XSL – XSL-FO-Parsing XML using DOM-SAX-Integrating XML with database – Formatting XML on the web.

Module -4

Multimedia and Web Application: Multimedia in web design, Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E-Marketing – Online Payments and Security – N-tier Architecture. Search and Design: Working of search engines -optimization- Search interface.

Module -5

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services.

LAB EXPERIMENTS:

1. Creation of HTML Files
2. Working with Client Side Scripting
5.3 File System Management
6. Working with other Server Side Scripting
6.1 Active Server Pages

3. Configuration of web servers using Apache Web Server 4. Working with ActiveX Controls in web documents. 5. Experiments in Java Server Pages 5.1 Data Access Programming (using ADO) 5.2 Session and Application objects	6.2 Java Servlets 7. Working with PHP 8. Developing Web Services 9. Developing any E-commerce application (Mini Project)

Learning Resources	1. Deitel and Deitel, Goldberg, "Internet and World Wide Web – How to Program", Pearson Education Asia, 2001. (MODULE I) 2. Raj Kamal, "Web Technology", Tata McGraw-Hill, 2001. (MODULEs II & IV) 3. John Paul Mueller, "Active X from the Ground Up", Tata McGraw-Hill, 1997. (MODULE III) 4. Eric Newcomer, "Understanding Web Services: XML, WSDL, SOAP, and UDDI", Addison-Wesley, 2002. (MODULE V)	1 Phillip Hanna, "JSP 2.0 - The Complete Reference", McGraw-Hill, 2003. 2. Mathew Eernisse, "Build Your Own AJAX Web Applications", Site Point, 2006.

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	%	15%	-
Level 2	Understand	20%	-	-	30%	20%	-
Level 3	Apply	35%	-	-	35%	35%	-
Level 4	Analyze	30%	-	-	35%	30%	-
Level 5	Evaluate	%	-	-	%	%	-
Level 6	Create	%	-	-	%	%	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1.Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	Dr. J.Prasanna, Associate professor,School of computing,VIT Chennai	1Dr..G.Balamurugan, Asst Prof, C. Tech, SRMIST
2. Arunkumar V, Accenture,Advanced Technology Centers in India, Coimbatore	Dr. S. Geetha, Assistant professor, Dept of Banking Technology, Pondicherry university	2.Dr. T. SenthilKumar, Asso Prof, C. Tech SRMIST

Course Code	21MCSF002	Course Name	*Programming with Java*	Course Category	C	Professional Core	L	T	P	C
							2	0	2	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 :	*Recognize the basics of java programs.*
CLR-2 :	*Design classes and efficiently use the IO streams*
CLR-3 :	*Implement object oriented concepts like inheritance, reusability, and encapsulation.*
CLR-4 :	*Express the custom exceptions and employ annotations.*
CLR-5 :	*Demonstrate the File operations and collection set in java*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*
CLO-1 :	Write a basic java program
CLO-2 :	Design classes and efficiently use the IO streams
CLO-3 :	*Apply object oriented concepts like inheritance, reusability, and encapsulation.*
CLO-4 :	Create *custom exceptions and employ annotations.*
CLO-5 :	*Implement the File operations and collection set in java*

Program Learning Outcomes (PLO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
3	*2*	-	-	-	-	-	-	-	-	-	-	-	2	-
3	*3*	-	-	-	-	-	-	-	-	-	-	-	2	-
3	*3*	-	-	*2*	-	-	-	-	-	-	-	-	2	-
3	*3*	*2*	-	-	-	-	-	-	-	-	-	-	2	-
3	*3*	*2*	-	*2*	-	-	-	-	-	-	-	-	2	-

Module -1

Java platform features, Java technologies-JSR, JCP ,Data types, Key words, Scoping rules, Automatic Type Conversion ,Type Casting and Arrays, Operators Precedence & Associativity, Expression. Flow control, new features from Java7 to Java 8,Enhanced for loop, switch statements, handling Strings, Entry Point for Java Program

Module -2

Class fundamentals: Declaring objects, Assigning object reference variable, Methods & Method Signatures, Method retuning Values, Method with parameters, Variable arguments in Java 5,I/O Basics: Byte stream& Character Stream, Getting user input: Reading console input & Writing console output, Reading and Writing files-new file system API, Constructors: Default Constructor, Parameterized constructor,this keyword, Garbage Collector, finalize() method, Overloading methods and constructors,Using object as parameters, returning object in methods,recursion, Access control, static and final keyword, Nested and Inner classes , Command Line argument,String and String Buffer class, Java Bean standards, Naming conventions

Module -3

Inheritance basics. Using super, Method Overriding,Constructor call,Dynamic method dispatch,Abstract class, Using final with inheritance, Default Package,Path & Class Path Environment Variables,Package level access ,Importing Packages, Interface: Multiple Inheritance in Java,Extending interface, Wrapper Class, Auto Boxing

Module -4

Exception handling mechanism, new look try/catch mechanism in Java 8,Thread class & Runnable Interface,Inter Thread Communication, Synchronization of threads using Synchronized keyword and lock method,Thread pool and Executors framework, Futures and callable, Deadlock conditions, Enumeration in Java 8 - usage. Annotations: basics of annotation, The Annotated element Interface. Using Default Values,Marker Annotations. Single-Member Annotations. The Built-In Annotations-Some Restrictions.

Module -5

File Operations in Java,Collections Interfaces – Collection, Set, List, Queue,Collections Classes – Array List, Hash Set, Tree Set,Accessing a Collection via Iterators. Map Interfaces,Map Classes – Abstract Map, Hash Map, Tree Map.

LAB EXPERIMENTS: 1. Program to implement Operators,Flow Controls concepts 2. Program to implement Classes, Constructors, Overloading and Access Control 3. Program using Nested & Inner Classes, Static and Final 4. Program using File Streams and IO Streams 5. Program to implement Strings, String Buffer Concept	6. Program using Interfaces, Abstract Classes 7. Program to implements Exceptions Concepts 8. Program using Threads 9. Program using Collections, Generics concepts 10. Program to implement File Operation in java

Learning Resources	1. Herbert Schildt, "The Complete Reference (Fully updated for jdk7)", Oracle press Ninth Edition,2017. 2. *Mahavir Rathore,"Learn Java 8 In a Week:A Beginner's Guide to Java Programming",CreateSpace Independent Publishing Platform,2019* 3. *Prem Kumar,"Getting Inside Java - Beginners Guide",F5 Developers,2019* 4. *Deitel&Deitel, "Java How to Program", Prentice Hall, 10th Edition, 2016.*	

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	%	15%	-
Level 2	Understand	20%	-	-	30%	20%	-
Level 3	Apply	35%	-	-	35%	35%	-
Level 4	Analyze	30%	-	-	35%	30%	-
Level 5	Evaluate	%	-	-	%	%	-
Level 6	Create	%	-	-	%	%	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1.Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	1. Dr. J.Thangakumar, Professor, Hindustan Institute of science and technology,Chennai.	Dr. N. Arunachalam, Asst Prof, C. Tech, SRMIST
2.V. Girisayan, Technology Lead, LTI Mine Tree, Chennai	2. Dr.J.Prasana ,Associate Professor, VIT- AP.	2.Dr. T. SenthilKumar, Asso Prof, C. Tech SRMIST

Course Code	21MCSF006	Course Name	Object Oriented Programming	Course Category	F	Foundation Course	L	T	P	C
							2	0	0	2

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 :	*Recognize the fundamentals of the C programming language, including its history and significance*
CLR-2 :	*Comprehend the concept of functions in C programming and arrays*
CLR-3 :	*Grasp the concept of pointers*
CLR-4 :	*Understand the principles of object-oriented programming and be able to apply them using C++*
CLR-5 :	*Demonstrate advanced C++ features such as templates and generic programming to write efficient and flexible code*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Program Learning Outcomes (PLO)**														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Write a basic C program*	*3*	*2*	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO-2 :	*Design functions in C and arrays*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO-3 :	*Apply the concept of pointers*	*3*	*3*	-	-	*2*	-	-	-	-	-	-	-	-	2	-
CLO-4 :	*Create a programs using C++*	*3*	*3*	*2*	-	-	-	-	-	-	-	-	-	-	2	-
CLO-5 :	*Implement the C++ features such as templates and generic programming*	*3*	*3*	*2*	-	*2*	-	-	-	-	-	-	-	-	2	-

Module -1

Overview of C programming language,History and significance of C,Basic structure of a C program,Data types, variables and constants, Input and output functions,Operators and expressions,Control structures: if, else, switch, loops (while, do-while, for),Basic debugging techniques

Module -2

Introduction to functions,Function declaration, definition, and calling,Parameters and return values,Scope and lifetime of variables,Introduction to arrays, Array declaration and initialization,Accessing array elements,Passing arrays to functions,Multi-dimensional arrays,String handling in C.

Module -3

Introduction to pointers,Pointer declaration and initialization,Pointer arithmetic,Dynamic memory allocation (malloc, calloc, realloc, free),Pointers and arrays,Pointers and functions,Understanding memory leaks and segmentation faults,Best practices for memory management.

Module -4

Introduction to C++,Object-oriented programming concepts,Classes and objects,Constructors and destructors,Encapsulation, inheritance, and polymorphism, Operator overloading,Introduction to Standard Template Library (STL),Basic input/output streams in C++

Module -5

Templates and generic programming,Exception handling,Smart pointers and resource management,Standard Template Library (STL) containers (vectors, lists, maps, etc.),Iterators and algorithms,File handling in C++,Introduction to namespaces and standard library,Best practices and coding conventions in C++ programming

Learning Resources	*1. K.N. King,"C Programming: A Modern Approach",W. W. Norton & Company,2020* *2. Scott Meyers,"Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14",O'Reilly Media, 2014* *3. Jens Gustedt,"Modern C",Pragmatic Bookshelf, 2019.*	

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	-	15%	-
Level 2	Understand	20%	-	30%	-	20%	-
Level 3	Apply	35%	-	35%	-	35%	-
Level 4	Analyze	30%	-	35%	-	30%	-
Level 5	Evaluate	%	-	-	-	-	-
Level 6	Create	%	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	Dr. J.Thangakumar, Professor, Hindustan Institute of science and technology,Chennai.	Dr. N. Arunachalam, Asst Prof, C. Tech, SRMIST
V. Girisayan, Technology Lead, LTI Mine Tree, Chennai	Dr.J.Prasana ,Associate Professor, VIT- AP.	Dr. T. SenthilKumar, Asso Prof, C. Tech SRMIST

Course Code	21MCSE001	Course Name	DevOps Methodology for Application Development	Course Category	C	Professional Elective	L	T	P	C
							2	0	2	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 :	Understanding the concepts of scripting and cloud services for development lifecycle
CLR-2 :	To study the various configuration management tools for DevOps
CLR-3 :	To study the various container orchestration tools for DevOps
CLR-4 :	Understanding the use of version control tools for project management
CLR-5 :	To introduce students to the source code management tools for DevOps

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*
CLO-1 :	Understand to leverage the importance of scripting and cloud-based service for project development.
CLO-2 :	Perform automated resource creation for deployments using Terraform
CLO-3 :	Ability to do configuration management using Ansible
CLO-4 :	Ability to perform container-based orchestration using Docker & Kubernetes.
CLO-5 :	Understand different actions performed through version control tools like Git and source code management tools like Jenkins.

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
3	*2*	-	-	-	-	-	-	-	-	-	-	-	-	-
3	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-
3	*3*	-	-	*2*	-	-	-	-	-	-	-	-	-	-
3	*3*	*2*	-	-	-	-	-	-	-	-	-	-	-	-
3	*3*	*2*	-	-	-	-	-	-	-	-	-	-	-	-

Module -1

Basics of Linux and Linux Essential Commands, Shell Scripting- Basics, String operation, I/O& Cron, Introduction to AWS Fundamentals, IAM & User Groups, S3 Storage, Elastic Compute Cloud (EC2) basics, Virtual private cloud (VPC), Monitoring, logging&Auditing.

Module -2

Introduction to IaC, Understanding Terraform with other IaC, Terraform basics, Terraform Configuration, Input variables and outputs, Updating configuration with more resources, working with various terraform providers.

Module -3

Introduction to Configuration management, Ansible basics, Ansible architecture, Understanding YAML, Ansible Playbook Concepts, Ansible Inventory, and configuration, Ansible Modules, Ansible roles.

Module -4

Introduction to Containers and Container Orchestration, Docker basics, Docker Image Management, Docker Engine- security, Networking, Docker compose, Docker swarm, Kubernetes basics & Architecture, Kubernetes cluster maintenance, Kubernetes- Security, Storage, Design& Install a Kubernetes cluster, Helm for Kubernetes.

Module -5

Introduction to DevOps, Role of Continuous Integration/Continuous Deployment (CI/CD) in DevOps, Version control system basics, Git-Installation, configuration & operation,Introduction to source code management (SCM), Jenkins- Installation, Building CD pipelines, Pipeline concepts & Build triggers.

LAB EXPERIMENTS: 1. Creation of IAM user and IAM Admin User 2. Creating Access Key for IAM user using AWS CLI and Cloud shell. 3. EC2 Instance (VM) creation and S3 Lifecycle configuration. 4. Linux Bash Scripting 5. Configuring Network Services on Boot. 6. Installation of Terraform 7. Creating/Deploying VM's in AWS using Terraform	8. Working with Various Terraform Providers 9. Installation of Ansible & Working with Ansible playbook 10. Installation of Dockers& Working with Docker Images 11. Installation of Kubernetes & Deploying Kubeadm 12. Installation of git & Working with Git 13. Installation of Jenkins and running code pipelines using jenkins

Learning Resources	1.Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015. 2. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016. 3. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer, Second Edition, 2019. 4. The DevOps Handbook, Gene Kim, Jez Humble, Patrick Debois, John Allspaw and John WillisJason Bell, IT revolutionPress,2016.	5.The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multi-Speed IT Enterprise. Sanjeev Sharma 1st Edition, Wiley,2017. 6. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, Andrew Mallett Mokhtar Ebrahim, Ingram short title, Second Edition,2018. 7.https://www.jenkins.io/user-handbook.pdf

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	%	15%	-
Level 2	Understand	20%	-	-	30%	20%	-
Level 3	Apply	35%	-	-	35%	35%	-
Level 4	Analyze	30%	-	-	35%	30%	-
Level 5	Evaluate	%	-	-	%	%	-
Level 6	Create	%	-	-	%	%	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	Dr. C. Punitha Devi, Associate professor, Dept of Banking Technology, Pondicherry university	1. Dr.V.Deeban Chakravarthy, SRMIST
V. Girisayan, Technology Lead, LTI Mine Tree, Chennai	Dr. S. Geetha, Assistant professor, Dept of Banking Technology, Pondicherry university	2. .Dr. T. SenthilKumar, Asso Prof, C. Tech SRMIST

Course Code	21MCSE002	Course Name	Data Structures and Algorithms Using Python	Course Category	C	Professional Elective	L	T	P	C
							2	0	2	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 :	*To understand abstraction and the role it plays in the problem-solving process*
CLR-2 :	*To understand and implement the notion of an abstract data type*
CLR-3 :	*To understand Tree structure with its applications and hashing methods*
CLR-4 :	*To understand Graph traversal for implementation of various algorithms*
CLR-5 :	*To understand various sorting algorithms and analyze its complexity*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*
CLO-1 :	*Implement basic OO concept with Python*
CLO-2 :	*Implement linear data structure such as stacks, queues, linked lists and their applications*
CLO-3 :	*Implement basic operations on Trees and its variations*
CLO-4 :	*Implement traversal techniques of graphs*
CLO-5 :	*Apply Algorithm for solving problems like sorting, searching, Spanning tree and shortest path*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
3	3	2	-	-	-	-	-	-	-	-	-	-	2	-
3	3	-	-	2	-	-	-	-	-	-	-	-	2	-
3	3	-	-	-	-	-	-	-	-	-	-	-	2	-
3	3	-	-	2	-	-	-	-	-	-	-	-	2	-

Module -1

Objects in Python - Expressions, Operators, and Precedence - Control Flow - Object-Oriented Design Goals and Principles - Class Definitions - Operator Overloading and Python's Special Methods - Inheritance - Abstract Base Classes - Namespaces and Object Orientation

Module -2

Array-Based Sequences - Python's Sequence Types - Low-Level Arrays - Dynamic Arrays and Amortization - Implementing a Dynamic Array - Amortized Analysis of Dynamic Arrays Python's List Class - Efficiency of Python's Sequence Types - Multidimensional Data Sets

Module -3

Stacks - Queue – Double Ended Queue - Singly Linked Lists - Implementing a Stack and a Queue with a Singly Linked List - Circularly Linked Lists - Implementing a Queue with a Circularly Linked List. - Doubly Linked Lists - Basic Implementation and Implementing a Deque with a Doubly Linked List - Positional List ADT

Module -4

Trees - Binary Trees - Tree Traversal Algorithms – Maps - Hash Tables - Skip Lists - Binary Search Trees - Balanced Search Trees - AVL Trees - Splay Trees - Red-Black Trees – B Trees - Graphs - Data Structures for Graphs - Graph Traversals - Directed Acyclic Graphs

Module -5

Algorithm Analysis - Asymptotic Analysis - Analysing Recursive Algorithms – Sorting Algorithms – Merge Sort – Randomized Quick Sort – Bucket Sort – Radix Sort - Shortest Paths - Dijkstra's Algorithm - Minimum Spanning Trees - Kruskal's Algorithm - Dynamic Programming - Matrix Chain Product - Text Compression - Huffman Coding Algorithm

LAB EXPERIMENTS: 1. Class and Objects 2. Inheritance 3. Operator Overloading 4. Dynamic Array Implementation 5. Stack and Queue 6. Positional List ADT 7. Tree Traversal Algorithms	8. Binary Search Trees 9. AVL Trees 10. Graph Traversal 11. Merge Sort 12. Randomized Quick Sort 13. Dijkstra's Algorithm 14. Kruskal's Algorithm

Learning Resources	1. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley 2013 2. Data Structures and Algorithms with Python, Kent D. Lee, Steve Hubbard, Springer, 2015	1. Data Structures and Algorithms using Python, Subrata Saha, Cambridge University Press, 2023

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	%	15%	-
Level 2	Understand	20%	-	-	30%	20%	-
Level 3	Apply	35%	-	-	35%	35%	-
Level 4	Analyze	30%	-	-	35%	30%	-
Level 5	Evaluate	%	-	-	%	%	-
Level 6	Create	%	-	-	%	%	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	1. Dr. C. Punitha Devi, Associate professor, Dept of Banking Technology, Pondicherry university	1. Dr. Gnanavel S, Asso Prof, C. Tech, SRMIST
2. V. Girisayan, Technology Lead, LTI Mine Tree, Chennai	2. Dr. S. Geetha, Assistant professor, Dept of Banking Technology, Pondicherry university	2.Dr. T. SenthilKumar, Asso Prof, C. Tech SRMIST

Course Code	21MCSE003	Course Name	Basics of Spring Framework	Course Category	C	Professional Elective	L	T	P	C
							2	0	2	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 :	*Recognize the basics of Spring Boot and Web developement*
CLR-2 :	*Identify the methods to connect the front end with back end data*
CLR-3 :	Illustrates the basics of RESTFUL API
CLR-4 :	*Express the usage of Reactive Programming*
CLR-5 :	*Demonstrates how to use deployed spring.*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*
CLO-1 :	*Formulate the basics of Spring Boot and Web developement*
CLO-2 :	*Apply suitable method to connect the front end with back end data*
CLO-3 :	Know the RESTFUL API basics.
CLO-4 :	Get the knowledge about Reactive Programming.
CLO-5 :	*Implement deployed spring and actuator.*

Program Learning Outcomes (PLO)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
3	*2*	-	-	-	-	-	-	-	-	-	-	-	*2*	-
3	*3*	*3*	-	-	-	-	-	-	-	-	-	-	2	-
3	*3*	*2*	-	*2*	-	-	-	-	-	-	-	-	2	-
3	*3*	*1*	-	*2*	-	-	-	-	-	-	-	-	2	-
3	*3*	-	-	*2*	-	-	-	*2*	-	-	-	-	2	-

Module -1

Introduction,Initializing a Spring project with Spring Tool Suite,Examining the Spring project structure,Handling web requests,Defining the view,Testing the controller,Building and running the application,Getting to know Spring Boot DevTools, The core Spring Framework,Spring Boot, Establishing the domain,Creating a controller class,Designing the view, Processing form submission, Declaring validation rules, Performing validation at form binding,Displaying validation errors

Module -2

Adapting the domain for persistence,Working with JdbcTemplate,Defining a schema and preloadingdata,Inserting data,Adding Spring Data JDBC to the build,Defining repository interfaces,Annotating the domain for persistence,Preloading data with CommandLineRunner,Adding Spring Data JPA to the project

Module -3

Writing RESTful controllers,Enabling data-backed services,Consuming REST services,Retrieving data from the server,Sending data to the server, Updating data on the server, Deleting data from the server,Consuming REST services,Securing REST

Module -4

Introduction to reactive programming,Getting started with Reactor,Applying common reactive operations,Working with Spring WebFlux,Defining functional request handlers,Consuming REST APIs reactively,Working with R2DBC

Module -5

Introduction to Actuator,Consuming Actuator endpoints,Consuming Actuator endpoints,Exploring the Admin server,Working with Actuator MBeans,Weighing deployment options,Building executable JAR files

LAB EXPERIMENTS:

1.Study of Spring project structure.
2.Create a basic program using spring.
3.Write a java program to connect the database using JDBC.
4.Perform CRUD operations using Spring.
5.Implement the RESTful controllers to retrieve the data.
6.Implement the RESTful controllers to delete the data.
7.Implement the RESTful controllers to update the data.
8.Implement Reactive programming.
9. Implement Deployed spring
10.Build an executable JAR file.

Learning Resources	1. Craig Walls,"Spring in Action",6th Edition,Manning Publications Co,2022 2. K. Siva Prasad Reddy," Beginning Spring Boot 2",Apress Publishers,2017 3. Moises Macero ,"Learn Microservices with Spring Boot",Apress Publishers,2017	4. Felipe Gutierrez,"Pro Spring Boot 2:An Authoritative Guide to Building Microservices, Web and Enterprise Applications, and Best Practices",Apress Publishers,2018

	Bloom's Level of Thinking	Formative CLA – 1 Average of MODULE test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	%	15%	-
Level 2	Understand	20%	-	-	30%	20%	-
Level 3	Apply	35%	-	-	35%	35%	-
Level 4	Analyze	30%	-	-	35%	30%	-
Level 5	Evaluate	%	-	-	%	%	-
Level 6	Create	%	-	-	%	%	-
	Total	100 %		100 %		100 %	

Course Designers

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Santhosh Muniswami, AI Cloud Engineer – AI Cloud Platform, Cisco Systems, Inc.	Dr. C. Punitha Devi, Associate professor, Dept of Banking Technology, Pondicherry university	Dr. N. Arunachalam, Asst Prof, C. Tech, SRMIST
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Course Code	21MCSE004	Course Name	Front End Development using React	Course Category	C	Professional 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 :	*To Understand the Fundamentals of React.js*
CLR-2 :	*To Implement and Manage Component Patterns*
CLR-3 :	Demonstrates how Performance in React Applications is Optimized
CLR-4 :	*Illustrates to interact with External services*
CLR-5 :	*Demonstrates how to deploy the application*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*
CLO-1 :	*Understand the Fundamentals of React.js*
CLO-2 :	*Apply suitable Component Patterns*
CLO-3 :	Know about the performance optimization in react application
CLO-4 :	Get the knowledge about External services
CLO-5 :	*Deployment of application*

	Program Learning Outcomes (PLO)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*3*	*2*	-	-	-	-	-	-	-	-	-	-	-	*2*	-
CLO-2 :	*3*	*3*	*3*	-	-	-	-	-	-	-	-	-	-	2	-
CLO-3 :	*3*	*3*	*2*	-	*2*	-	-	-	-	-	-	-	-	2	-
CLO-4 :	*3*	*3*	*1*	-	*2*	-	-	-	-	-	-	-	-	2	-
CLO-5 :	*3*	*3*	-	-	*2*	-	-	-	*2*	-	-	-	-	2	-

Module 1:

Introduction to React.js-What is React?-Virtual DOM and its benefits-JSX syntax and its role in React development-Setting Up Development Environment-Installing Node.js and npm-Creating a new React application using create react app-Basic Building Blocks-Components and props-State and lifecycle methods-Handling events in React

Module 2:

Intermediate React Development-Advanced Component Patterns-Higher order components (HOCs)-Render props pattern State Management-Introduction to React Context API-Managing global state with Context API-Routing in React-Introduction to React Router-Setting up routes and navigation in a React application.

Module 3:

Advanced React Concepts-Optimizing Performance-Memoization and useMemo hook-Virtualized lists for handling large datasets-Testing React Applications-Introduction to testing frameworks like Jest-Testing React components using Jest and React Testing Library.

Module 4:

Integrating with External Services-API Integration-Making HTTP requests with Axios or Fetch API-Handling asynchronous operations with async/await-Authentication and Authorization-Implementing authentication using JWT-Securing routes based on user roles.

Module 5:

Deployment and Advanced Topics-Deployment Strategies-Optimizing React builds for production-Deploying React applications to hosting platforms (e.g., Netlify, Vercel, AWS)-Advanced State Management-Using Redux for managing complex application state-Integrating Redux with React applications Final Project-Capstone project to consolidate learning-Implement a full-scale React application incorporating all learned concepts

Learning Resources	*1.Michele Bertoli,"React Design Patterns and Best Practices", Packt Publishing,2017* . *2.Anthony Accomazzo, Nathaniel Murray, Ari Lerner, Clay Allsopp, and David Guttman,"Fullstack React: The Complete Guide to ReactJS and Friends",Fullstack.io,2017*	*3.Alessandro Pierini,"React Performance",Packt Publishing,2021* *4.Zac Gordon,"React Explained: Your Step-by-Step Guide to React (2020 Edition)",Amazon Digital Services LLC,2020*

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

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