SARDAR PATEL UNIVERSITY
MASTERS OF COMPUTER APPLICATION
(Semester – II) (W.E.F. June, 2020)

COURSE NO: PS02CMCA31 *w.e.f. June 2020*

OBJECT ORIENTED PROGRAMMING USING JAVA

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To learn computer programming using the Java programming language and the Java Platform, Standard Edition (Java SE)
- To learn the fundamentals of object-oriented programming
- Learning to write object-oriented programs in Java
- Knowledge of important features of the Java SE platform
- Learning to develop graphical and database programs using Java

PREREQUISITES:

- Knowledge of computer fundamentals and basics of computer programming

OUTCOMES OF THE COURSE:

- Ability to develop computer programs using the Java programming language and the Java SE platform
- An understanding of fundamental object-oriented programming concepts
- Ability to develop object-oriented software in Java
- Knowledge of multithreading, file handling and network programming in Java
- Ability to develop GUI programs in Java
- Knowledge of database access in Java using JDBC

COURSE CONTENT

Unit No.	Course Content
1	**Introduction to Java** – The Java programming language: history, evolution, features – Introduction to the Java programming environment, JDK, JRE – Introduction to the IDE – Data types and wrapper classes, operators – Control structures

- String handling
- Basic Input-output

2 Introduction to Object-oriented Programming

- Basic concepts of object-oriented programming
- Classes, instances, methods
- Static and non-static members
- Packages
- Inheritance and polymorphism, method overriding
- Final and abstract classes, abstract methods
- Interfaces
- Generics, enumeration
- Inner classes and anonymous classes
- Class loaders, class path

3 More Features of the Java Platform

- Exception handling
- Input-output and file handling
- The collections framework and handling classes in it
- Introduction to the java.util package
- Multithreading
- Introduction to network programming
- Introduction to lambda expressions and serialization

4 Developing Graphical Programs and Database Access

- An introduction to graphics in Java
- Brief introduction to AWT
- The Swing library
- Writing graphical programs using Swing
- Using various Swing components
- Managing layout using Swing
- Event handling using Swing
- Introduction to JDBC
- Different types of JDBC drivers
- Programming database applications using JDBC

MAIN REFERENCE BOOKS:

1. Schildt H. : Java: The Complete Reference, 9th Edition, McGraw-Hill Education, 2017.
2. Deitel P., Deitel, H. : Java: How to Program: Early Objects, 11th Edition, Pearson Education, 2018.
3. Rao, R. N.: Core Java: An Integrated Approach, New Edition, Dreamtech Press, 2008.

ADDITIONAL REFERENCES:

1. Horstmann C. : Core Java Volume I – Fundamentals, 11th Edition, Prentice Hall, 2018.
2. Horstmann C. : Core Java, Volume II – Advanced Features, 11th Edition, Prentice Hall, 2018.

WEB REFERENCES:

1. Java SE API Documentation.
2. The Java™ Tutorials.

COURSE NO: PS02CMCA32 *w.e.f. June 2020*

SOFTWARE ENGINEERING

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To learn development of feasible and reliable software products for solving real life problems
- To learn process understanding and flow of process
- To acquire skills and knowledge for upgrading analytic, communication and technical skills
- To learn the methodology required for software development
- To learn the process of improving the quality of software work products

PREREQUISITES:

- Knowledge of process understanding, communication and problem solving concepts

OUTCOMES OF THE COURSE:

- An ability to apply engineering design to produce economical software solutions that satisfy needs of end users
- An ability to communicate effectively with stakeholders of software development
- An ability to develop and conduct appropriate experimentation, analyze and interpret data

COURSE CONTENT

Unit No.	Course Content
1	**Introduction** – Software – meaning and applications – Software Engineering – meaning, goal, challenges and approach – Software Process – Software Development Process Models – waterfall, prototyping, iterative, time boxing and spiral – Introduction to Agile Computing – Agile Software Development Approaches (Scrum, eXtreme – Programming, Feature Driven Development, Dynamic Driven Development) – Collaborative User Story Creation, Retrospectives, Continuous Integration, Release and Iteration Planning
2	**Software Requirement Analysis and Project Management** – Software Development Life Cycle (SDLC) – Software Requirements Specification (SRS) – Need, Process, Problem Analysis, Requirement Specifications, structure and components, Functional Specifications using Use Cases

- Software Project Management : Project Planning, various issues addressed in Project Planning, Effort Estimation
- Work Breakdown Structure (WBS)

3 Software Design

- Design – meaning, types
- Design approaches - function-oriented design (introduction), object-oriented design
- Design Concepts for Object-oriented design - information hiding, functional independence, refinement, refactoring and design classes
- Object Modeling using UML – Overview, Diagrams – class, sequence, collaboration, use-case, activity, state chart

4 Coding and Testing

- Coding – meaning, process, programming standards and guidelines, refactoring, verification, metrics
- Testing – meaning, importance and process
- Testing fundamentals – error, fault, bug, failure, test oracles, test cases and test criteria
- Introduction to Black-box (functional) testing and White-box (structural) testing
- Comparison of Black-box and White-box testing
- Alpha testing and Beta testing

MAIN REFERENCE BOOKS:

1. Jalote Pankaj : Pankaj Jalote's Software Engineering: A Precise Approach, Wiley India Pvt. Ltd. Reprint 2012.
2. Roger S. Pressman : Software Engineering, A Practice Approach, 6th Edition, Mc-Graw Hill International Edition, Fifth Reprint 2012.
3. Rajib Mall : Fundamentals of Software Engineering, 2nd Edition, Prentice-Hall of India, 2006.
4. "Head First Agile", Andrew Stellman & Jennifer Greene, O'Reilly Media Inc., 2017.

ADDITIONAL REFERENCES:

1. Ian Sommerville : Software Engineering, 9th edition, Pearson Education, 2011.
2. Waman S Jawadekar, Software Engineering Principles and Practice, 2nd Reprint,Tata McGraw Hill, 2008.

COURSE NO: PS02CMCA33 *w.e.f. June 2020*

WEB TECHNOLOGY

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To learn the fundamentals of how the World Wide Web works
- To learn the basic protocols and standards of the World Wide Web
- To learn design and development of websites and web-based applications using HTML5, CSS3 and JavaScript
- To learn to develop dynamic database-driven websites using PHP

PREREQUISITES:

- Fundamental knowledge of computer networks
- Knowledge of computer programming

OUTCOMES OF THE COURSE:

- Knowledge of the fundamentals of how the World Wide Web works
- Knowledge of the basic protocols and standards of the World Wide Web
- Ability to design and develop web pages using HTML5 and CSS3
- Knowledge of JavaScript and client-side web development
- Ability to create HTML forms
- Knowledge of PHP
- Ability to carry out server-side web development using PHP
- Ability to create dynamic website utilizing data from a database
- Knowledge of state management and implementation of basic security in a website or web application

COURSE CONTENT

Unit No.	Course Content
1	**Client-side Web Technologies - I** – Introduction to HTTP and HTML5 – URL format – HTML5 document structure – Headers, body, declarations – Elements, element ID, name, attributes, events – HTML5 media – Forms – HTTP Verbs – Introduction to the DOM – Introduction to CSS3

- CSS3 Syntax
- Different properties, values and units
- Specifying colors

2 Client-side Web Technologies - II

- CSS3 selectors, classes
- CSS3 precedence rules
- Introduction to media query
- Introduction to JavaScript
- JavaScript syntax
- Variables: declaration, data type
- Strings, numbers, arrays
- Operators
- Functions
- Variable scope
- Event handling
- Client-side form validation
- DOM access and manipulation from JavaScript
- Built-in objects

3 Server-side Web Development Using PHP – I

- Introduction to server-side scripting
- Introduction to PHP
- Data types, variables, constants, operators
- Flow Control and looping
- Strings, arrays, functions
- Regular expressions, server-side input validation
- Superglobals
- Headers
- Handling file uploads
- Maintaining state: sessions, cookies, query parameters, hidden fields
- File handling

4 Server Side Web Development Using PHP – II

- Introduction to MySQL
- Database Connectivity in PHP
- Exception handling
- Security - authentication and authorization
- Handling special characters in input
- SQL injection attacks and prevention
- Introduction to object-oriented programming with PHP

MAIN REFERENCE BOOKS:

1. John Dean, "Web Programming with HTML5, CSS, and JavaScript", Publisher(s): Jones & Bartlett Learning, 2018, ISBN: 9781284091809.
2. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, O'Reilly, 2014.
3. Time Converse and Joyce Park with Clark Morgan, PHP5 and MySQL Bible – Wiley Publishing Inc., First Edition, 2004, ISBN 81-265-0521-4.
4. Steve Suehring Tim Converse Joyce Park: PHP6 and MySQL Bible - Wiley Publication, 2009.

ADDITIONAL REFERENCES:

1. Elizabeth Naramore, Beginning PHP5, Apache, MYSQL web Development, Wiley Publishing Inc.
2. Danny Goodman, Machael Morrison , "JavaScript Bible", 3rd edition.

WEB REFERENCES:

1. HTML documentation.
2. CSS documentation.
3. JavaScript documentation.
4. PHP documentation.

COURSE NO: PS02CMCA34 *w.e.f. June 2020*

THE .NET TECHNOLOGY

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To learn .NET Environment and its technologies
- To learn development skill in Window-based Programming and Web-based programming
- To learn C#.NET and ASP.NET
- To learn OOPs concept using C#.NET
- To learn database programming and report generation

PREREQUISITES:

- Knowledge of Programming

OUTCOMES OF THE COURSE:

- An ability to understand and use .NET Framework
- An ability to use IDE
- An ability to develop various kinds of Window-based applications and web-based applications
- An ability to use ADO.NET and Reporting facility

COURSE CONTENT

Unit No.	Course Content
1	**The .NET Technology** – Introduction to .NET Framework – Architecture of .NET framework – BCL (Base Class Library), CLR (Common Language Runtime), etc. – .NET Languages – introduction, Types of applications supported by .NET Technology – Managed code, compilation to intermediate language, Just-In-Time compilation, garbage collection, assemblies and the GAC
2	**Language basics** – C#.NET – Introduction and features – General structure of C#.NET program – C#.NET – basic data types, variables, constants, type conversion - boxing and unboxing – C#.NET – statements (conditional and looping) – Console Applications, Windows Applications - Windows Forms and Life Cycle – User interface controls - Basic Controls, Dialog controls, Menu control

3 ASP.NET - I

- Introduction to ASP.NET
- ASP.NET Web Application Project – introduction, creation
- ASP.NET Web form - introduction, creating web forms
- ASP.NET Page – layout, lifecycle
- ASP.NET Controls - adding server controls to a Web Form, adding event procedures to Web Server Controls, Implementing code-behind pages
- Master Pages, themes and skins

4 ASP.NET - II

- Accessing Data with ADO.NET
- Validating user input – validation controls, page validation
- Site Navigation, Personalization
- State Management
- Reporting
- Web Services – overview, creation and calling
- Packaging and Deploying ASP.NET Applications

MAIN REFERENCE BOOKS:

1. Andrew Troelsen, Philip Japikse, : C# 6.0 and the .NET 4.6 Framework, Apress, 2017.
2. Black Book: .NET 4.5 Programming (6-in-1) covers .NET 4.5 Framework, Visual Studio 2012, C# 2012, ASP.NET 4.5, VB 2012, and F# 3.0, Dreamtech Press, 2013.
3. Bill Evjen, Scott Hanselman, Devin Rader: Professional ASP.NET 4.5, Wiley India Pvt. Ltd., 2010.
4. Matthew MacDonald: Beginning ASP.NET 4.5 in C#, Apress, 2013.

ADDITIONAL REFERENCES:

1. Joseph Albabari, Ben Albabari: C# 4.0 in a Nutshell, O'Reilly.
2. Documentation of relevant software packages.
3. G. Andrew Duthie, "ASP.NET programming with Microsoft Visual C#.NET Step by Step", version 2003, Prentice-Hall of India.

COURSE NO: PS02CMCA35 *w.e.f. June 2020*

PRACTICALS BASED ON PS02CMCA31 & PS02CMCA33

COURSE NO: PS02CMCA36 *w.e.f. June 2020*

PRACTICALS BASED ON PS02CMCA34

COURSE NO: PS02EMCA37 ***w.e.f. June 2020***

CYBER SECURITY

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- Understanding of the concepts of Cyber crimes, cyber security
- Learning how to avoid becoming victims of cyber crimes
- Preparing for a platform to the students who wish to seek career or research in cyber security
- Acquiring knowledge of security risk related to data and information
- Understanding of the tools and methods to protect systems from cyber attacks

PREREQUISITE:

- Basic knowledge of computer networking

OUTCOMES OF THE COURSE:

- Ability to understand cyber security concepts
- Knowledge of latest security issues and solutions
- Expertise in cyber security

COURSE CONTENT

Unit No.	Course Content
1	**Introduction to Cybercrime** – Cybercrime : Definition And Origins Of The World – Cybercrime And Information Security – Who Are Cybercriminals? – Classifications Of Cybercrimes – Cybercrime: The Legal Perspectives – Cybercrimes: An Indian Perspectives – Cybercrime And The Indian ITA-2000 – Cyber Offenses: How Criminals Plan The Attacks – Social Engineering – Cyberstalking – Botnets
2	**Tools and Methods Used in Cybercrime** – Password Cracking – Key Loggers And Spywares – Virus And Worms – Trojan Horses And Backdoors

- DoS And DDoS Attacks
- SQL Injection
- Buffer Overflow
- Phishing
- Identity Theft
- Networking Commands

3 Cryptography

- Security Services: Confidentiality, Authentication, Integrity,
- Non-repudiation, Access Control, Availability
- Symmetric Key Algorithms (DES & AES)
- Asymmetric Key Algorithms (RSA)
- Digital Signature & Message Digest
- Digital Certificate

4 Computer Forensics & Forensics of Hand-Held Devices

- The Need For Computer Forensics
- Digital Forensics Life Cycle
- Forensics And Social Networking Sites: The Security/Privacy
- Threats
- Technical Challenges In Computer Forensics
- Hand-Held Devices And Digital Forensics
- Forensic Tools

MAIN REFERENCE BOOKS:

1. Nina Godbole, SunitBelpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley, 1st Edition, 2011.
2. Andrew S Tanenbaum, David. J. Wetherall, "Computer Networks", Pearson Education, 5th Edition, 2011.

ADDITIONAL REFERENCES:

1. Bruce Schneier Applied Cryptography: Protocols, Algorithms, and Source Code in C, 20th Anniversary Edition, John Wiley & Sons, 2015.
2. Behrouz A. Forouzan, "Cryptography and Network Security", TMH, 2nd Edition, 2007.
3. WilliamStallings,Network Security Essentials Applications and Standards,Pearson, 5th Edition, 2014.
4. Charles P. Pfleeger; Shari LawrencePfleeger, Security in Computing, Prentice Hall,, Fifth Edition, 2015.
5. Mike Shema, Anti-Hacker Tool Kit (Indian Edition), Mc Graw Hill, 2014.

COURSE NO: PS02EMCA38 ***w.e.f. June 2020***

DATA MINING AND DATA WAREHOUSING

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To understand the need of Data Warehouses, and the difference between usage of operational and historical data stores
- To be able to differentiate between query tools & Data Mining tools
- To understand the architecture of a Data Warehouse and the need for preprocessing

PREREQUISITES:

- Knowledge of Database Management Systems

OUTCOMES OF THE COURSE:

- Ability to create a Starflake schema for a given Data Warehousing requirements
- Ability to apply pre-processing on existing operational & historical data for creation of Data warehouse
- Ability to perform data mining

COURSE CONTENT

Unit No. **Course Content**

1 Data Warehousing and Data Mining - Introduction

- Data warehouse introduction
- Characteristics of data warehouse
- Data warehouse delivery method
- Data mining introduction
- Introduction and comparison of OLTP and OLAP
- Three Data Warehouse Models:
  - Enterprise Warehouse
  - Data Mart
  - Virtual Warehouse

2 Data Warehouse Architecture

- System Process - Process flow within an data warehouse
  - Extract and Load Process
  - Clean and Transform data
  - Backup and Archive Process
  - Query Management Process
- Process Architecture

- Load and Warehouse Manager
- Query Manager
- Detailed and Summary Information
- Metadata

3 Database Design – Logical

- Database Schema – Starflake
- Partitioning strategy
- Aggregations
- Data Marting technique
- Metadata
- System and Data Warehouse Process Manager

4 Data mining rules

- Basics of Data Mining
- Operating Data Warehouse
- Data mining Vs Query tools
- Data Learning
- Benefits of data mining
- Basics of Supervised & Unsupervised Learning
- Difference between Classification & Prediction
- Introduction to Association Rule Mining
- Apriori Algorithm
- Examples of Enterprise Data Mining Applications

MAIN REFERENCE BOOKS:

1. S. Anahory & D. Murray: Data Warehousing in the real world – Addison Wesley, 2002.
2. R. Kinball: Data Warehouse Toolkit – John Wiley & Sons, 3rd edition.
3. R. Kinball, L.Reeves : The Data Warehouse Lifecycle Toolkit – John Wiley & Sons.
4. Pieter Adriaans, Dolf Zantinge, "Data Mining", Addison Wesley, 1996.

ADDITIONAL REFERENCE:

1. G.K. Gupta , " Introduction to Data Mining with Case Studies", PHI, 3rd edition.
2. Paulraj Ponniah, "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals", Wiley-India.
3. A B M Shawkat Ali, Saleh A. Wasimi, " Data Mining : Methods and Techniques", Cengage Learning.
4. Daniel T. Larose, "Data Mining Methods & Models", Wiley-India.

COURSE NO: PS02EMCA39 ***w.e.f. June 2020***

SOFTWARE TESTING

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To understand software testing process
- To perform testing activities using modern software tools
- To prepare test plans and schedules for testing software projects
- To understand the criteria for test case design
- To understand structural and functional testing and its types
- To understand the testing complexity

PREREQUISITES:

- Knowledge of computer software and its development process

OUTCOMES OF THE COURSE:

- An ability to perform effective software testing
- An ability to design effective test cases
- An ability to perform test management
- An ability to perform structural and functional testing
- An ability to reduce testing time and testing complexity

COURSE CONTENT

Unit No. **Course Content**

1 Basics of Software Testing

- Introduction and need of testing
- Basic concepts in testing
- Levels of testing
- Testing process
- Software Testing Life Cycle Model

2 Functional Testing and Structural Testing

- Introduction
- Functional (Black Box) testing : Meaning, Techniques - Boundary Value Analysis, Equivalence Class Partitioning, Decision Table Based Testing, Cause-Effect Graphing
- Structural (White Box) testing : Meaning, Techniques - Control Flow Testing, Data Flow Testing, Slice Based Testing, Mutation Testing
- Black-box Testing Vs. White-box Testing

3 Test Cases

- Test cases – meaning, typical test case parameters, examples
- Test case selection criteria
- Test case design techniques, Test suite
- Generating test cases
- Automated test data generation

4 Testing Tools

- Introduction to testing tools, examples of popular testing tools
- Advantages and disadvantages of using testing tools
- Types of testing tools
- Open source software testing tools

MAIN REFERENCE BOOKS:

1. Software Testing - A Craftsman's Approach Paul C. Jorgensen, Third Edition Auerbach Publications, 2013.
2. Software Testing YOGESH SINGH Cambridge University Press, First Paper Edition 2012.

ADDITIONAL REFERENCES:

1. Software Quality and Testing By S. A. Kelkar, Prentice Hall of India, 2012.
2. Software Testing : Principles, Techniques and Tools, M G LIMAYE Tata McGraw-Hill Education Pvt. Ltd., 2011.

COURSE NO: PS02EMCA40 *w.e.f. June 2020*

EMBEDDED SYSTEMS AND IoT

(3 Lectures & 1 Seminar/Tutorial per Week Total Marks: 100)

LEARNING OBJECTIVES:

- To learn the fundamentals of embedded systems
- To understand the concepts, techniques, characteristics and applications of Internet of Things
- To gain an understanding of developing small/medium sized IoT projects using AVR, Arduino and other components
- To gain an understanding of developing IoT projects using the Raspberry Pi

PREREQUISITES:

- Knowledge of computer programming
- Knowledge of the Python programming language

OUTCOMES OF THE COURSE:

- Understanding of the fundamentals of embedded systems
- Knowledge of the definition, characteristics and applications of Internet of Things
- Familiarity with the hardware elements of IoT and the communication protocols commonly used with IoT
- Understanding of working with sensors, actuators and other devices
- Appreciation of security and privacy issues with IoT
- Basic knowledge of developing AVR/Arduino based IoT projects
- Basic knowledge of developing Raspberry Pi based IoT projects

COURSE CONTENT

Unit No.	Course Content
1	**Introduction to Embedded Systems** – An introduction to embedded systems – Types and applications of embedded systems – The embedded system constraints: processing constraints, memory constraints, input/output constraints, response time constraints, predictability/reliability constraints – Processing units: microprocessors, microcontrollers, SoCs, ASICs, DSPs, FPGAs, etc. – Unique characteristics of embedded systems programming

2 Introduction to Internet of Things

- Definition and characteristics of Internet of Things (IoT)
- Applications of IoT in various domains
- Hardware elements of IoT and their characteristics
- Communication protocols commonly used with IoT
- Sensors, actuators and other devices employed in IoT
- Security and privacy concerns in IoT

3 Development of Small/Medium Sized IoT Projects

- Introduction to AVR microcontollers
- Introduction to the Arduino
- Interfacing with the Arduino
- Arduino shields
- Arduino programming and the Arduino IDE
- Wireless control and communications with the Arduino

4 Development of IoT projects using the Raspberry Pi

- Introduction to the Raspberry Pi
- Installing operating system and software on the Raspberry Pi
- Interfacing with the Raspberry Pi
- Raspberry Pi hats
- Developing projects using the Raspberry Pi

MAIN REFERENCE BOOKS:

1. Prasad, K. V. K. K.: Embedded / Real-Time Systems – Concepts, Design & Programming Black Book, New Edition, Dreamtech Press, 2009.
2. Bahga, A., Madisetti, V.: Internet of Things – A Hands-on Approach, Universities Press, 2014.
3. Hoile C., et al.: Make – Raspberry Pi and AVR Projects, MakerMedia, 2014.
4. Margolis, M.: Arduino Cookbook, O'Reilly, 2nd Edition, 2011.
5. Halfacree, G.: The Official Raspberry Pi Beginner's Guide, Raspberry Pi Press, 2018.

ADDITIONAL REFERENCES:

1. Hughes, J. M.: Arduino – A Technical reference, O'Reilly (SPD), 2017.
2. Monk, S.: Raspberry Pi Cookbook, O'Reilly (SPD), 2014.
3. Richardson, M., Wallace, S.: Make – Getting Started with Raspberry Pi, 2nd Edition, MakerMedia, 2015.

WEB REFERENCES:

1. Embedded Systems, Wikibook, https://en.wikibooks.org/wiki/Embedded_Systems .
2. The Official Raspberry Pi Beginner's Guide (online), https://www.raspberrypi.org/magpi-issues/Beginners_Guide_v1.pdf .
3. The Official Raspberry Pi Projects Book (online), https://www.raspberrypi.org/magpi-issues/Projects_Book_v1.pdf .