|| सा विद्या या विमुक्तये ||

# स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

## SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA
Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

| Fax : (02462) 215572 | **Academic-1 (BOS) Section** | website: srtmun |
|---|---|---|
| Phone: (02462)215542 | | E-mail: bos@srtmun |

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० च्या अनुषंगाने शैक्षणिक वर्ष २०२३–२४ पासून संलग्न महाविद्यालये व विद्यापीठ संकुलांत पदव्युत्तर पदवी प्रथम वर्ष आणि विद्यापीठ संकुले व न्यू मॉडेल डिग्री कॉलेज मध्ये पदवी प्रथमवर्ष अभ्यासक्रम लागू करण्याबाबत.

# प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, शासन निर्णय क्र. एनईपी २०२०/प. क्र. ०९/विशि–३/शिकाना, दिनांक २० एप्रिल २०२३ व शासन पत्र. क्र एनईपी २०२०/प. क्र. ०९/विशि–३, दिनांक १६ जून २०२३ अन्वये सूचित केल्यानुसार राष्ट्रीय शैक्षणिक धोरण २०२०च्या अनुषंगाने दिलेल्या आराखडया नुसार दिनांक १६ जून २०२३ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीत ऐनवेळचा विषय क्र. ०५/५६–२०२३ अन्वये मान्यता दिल्यानुसार प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखा अंतर्गत खालील पदव्युत्तर पदवी अभ्यासक्रम (AICTE, PCL, BCI, CoA, NCTE इ. सारख्या नियमक संस्थाची मान्यता आवश्यक असलेले अभ्यासक्रम वगळून) संलग्न महाविद्यालये, विद्यापीठ परिसर व उपपरिसर संकुलांमध्ये आणि पदवी प्रथम वर्ष अभ्यासक्रम विद्यापीठ परिसर व उपपरिसर संकुले व विद्यापीठ संचलित न्यू मॉडेल डिग्री कॉलेज, हिंगोली येथे शैक्षणिक वर्ष २०२३–२४ पासून लागू करण्यात येत आहे.

1) M.Sc. Biotechnology (1st Year) - Campus School
2) M.Sc. Biotechnology (1st Year) – Affiliated colleges
3) B.Sc. Biotechnology (1st Year) – New Model Degree College, Hingoli
4) M.Sc. Botany (1st Year) - Campus School
5) M.Sc. Botany (1st Year) – Affiliated colleges
6) M.Sc. Herbal Medicine (1st Year) - Affiliated colleges
7) M.Sc. Chemistry (1st Year) - Campus School
8) M.Sc. Chemistry (1st Year) - Affiliated colleges
9) M.Sc. Computer Science / Computer Network / Computer Applications (1st Year) University campus, sub campus Latur
10) M.Sc. System Administration & Networking (1st Year) – Affiliated colleges
11) M.Sc. Computer Management (1st Year) – Affiliated Colleges
12) M.Sc. Computer Science (1st Year) – Affiliated Colleges
13) M.Sc. Dairy Science (1st Year) - Affiliated colleges
14) M.Sc. Electronic (1st Year) - Affiliated colleges
15) M.Sc. Geology (1st Year) – University Campus
16) M.Sc. Geography (1st Year) – University Campus
17) M.Sc. Applied Mathematics (1st Year) – Affiliated Colleges
18) M.Sc. Mathematics (1st Year) – Affiliated Colleges
19) M.Sc. Microbiology (1st Year) - University Campus
20) M.Sc. Microbiology (1st Year) – Affiliated colleges

21) M.Sc. Physics (1st Year) - University Campus
22) M.Sc. Physics (1st Year) – Affiliated Colleges
23) M.Sc. Statistics (1st Year) - University Campus
24) M.Sc. Statistics (1st Year) – Affiliated colleges
25) M.Sc. Biochemistry (1st Year) – Affiliated Colleges
26) M.Sc. Zoology (1st Year) – Affiliated Colleges

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी२०२०/S&T/अक्र/२०२३–२४/ १३०

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

दिनांक : ३०.०६.२०२३.
प्रत : १) मा. प्राचार्य, सर्व संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
२) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
३) मा. प्राचार्य, न्यु मॉडेल डिग्री कॉलेज हिंगोली.
४) मा. समन्वयक, कै. श्री उत्तमराव राठोड आदिवासी विकास व संशोधन केंद्र, किनवट.
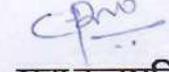प्रत माहितीस्तव :
१) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. कुलसचिव, प्रस्तुत विद्यापीठ.
३) मा. सर्व आधिष्ठाता, प्रस्तुत विद्यापीठ.
४) सर्व प्रशासकीय विभाग प्रमुख साहाय्यक, प्रस्तुत विद्यापीठ.
५) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

# SWAMI RAMANAND TEERTH

# MARATHWADA UNIVERSITY, NANDED - 431 606



(**Structure and Syllabus of Two Years PG Degree Program with Multiple Entry and Exit Option**)

# TWO YEAR MASTERS PROGRAMME IN SCIENCE

# Subject Computer Science

**Under the Faculty of**

*Science and Technology*

Effective from Academic year 2023 – 2024

(As per NEP-2020)

# Swami Ramanand Teerth Marathwada University

# Nanded

# Affiliated Colleges
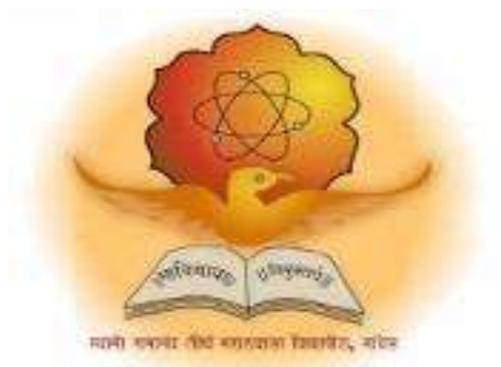


Faculty of Science and Technology

NEP-2020 Oriented Structure of Post Graduate Programs

(as per Govt of Maharashtra GR dated 16-05-2023)

## M.Sc. Computer Science (affiliated colleges) (2 years full time PG Programs)

### *Introduced from Academic Year 2023-2024*

# Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology
NEP-2020 oriented Structure of Two years Post Graduate Program
**Subject:** M.Sc. Computer Science (affiliated colleges)
(2 years' full time PG Programs in Affiliated Colleges)
Introduced from Academic Year 2023-2024 **(as per Govt. of Maha GR dated 16-05-2023)**

| Program Year and Sem | Level | Semester | | Faculty | | | Other courses | | | Total Sem. credits | Cumu. Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Major / Mandatory / | | Electives/ | | RM | OJT/FP/ | RP | | |
| | | | Theory | Practical | Theory | Practical | | | | | |
| | | | (04 credits) | (01credits) | (04 credits) (03+01) | | (03credits) | (03 Credits) | (04 Credits) | | |
| | | | SCMP | | SCMP | | | | | | |
| M.Sc. CS | | First Semester | SCMPSC-401 SCMPSC-402 SCMPSC-403 | SCMPSCP-401 SCMPSCP-402 SCMPCP-403 | SCMPSE-401 | --------- | SVECR-401 Research Methodology Compulsory | --------- | --------- | 22 | 22 |
| M.Sc. CS | 6.0 | Second Semester | SCMPSC-451 SCMPSC-452 SCMPSC-453 | SCMPSCP-451 SCMPSCP-452 SCMPSCP-453 | SCMPSE -451 | --------- | --------- | SCMPSOJ-451 | ---------- | 22 | 44 |
| PG Diploma | | | 24credits  + 06 Credits | | 06 credits +02 Credits | | 03credits | 03credits | ---------- | 44 credits | |
| **Exit Option: After completion of First year as above with 44 credits, student will be awarded PG Diploma in Computer Science and Applications**<br>**\*\*( for  students who have done 03 years UG program)**<br>**\*\*( available from AY 2024-2025)** | | | | | | | | | | | |

1. Abbreviations: **S- Science, CMPS- COMPUTER SCI,** Discipline **S**pecific **C**ore course (C- Core Course)
2. Abbreviations: **SCMPSE- D**iscipline Supportive **E**lective **C**ourse (E- Elective Course)
3. Abbreviations : SVECR:  Research Methodology  course
4. Abbreviations: SCMPSOJ: On Job Training, Internship/ Apprenticeship or Field Project
5. Abbreviations : SCMPR :  Research Project

**Syllabus First Semester**

| Core Courses Code | Title | Remarks Credits |
|---|---|---|
| SCMPSC-401 | Computer Architecture and Microprocessor | 04 |
| SCMPSC-402 | Python Programming | 04 |
| SCMPSC-403 | Advanced Java | 04 |
| SCMPSCP-401 | Lab 1: Comp. Arch. and Microp. Lab | 01 |
| SCMPSCP-402 | Lab 2: Python Lab | 01 |
| SCMPSCP-403 | Lab 3: Java Lab | 01 |
| SCMPSE-401 | **Chose any one**<br>  A. Data Analysis using Power BI<br>  B. Statistical Method<br>  C. Web Technology | 03 Theory and 01 Lab |
| SVECR-401 | Research Methodology | 03 |

**Syllabus Second Semester**

| Core Courses Code | Title | Remarks Credits |
|---|---|---|
| SCMPSC-451 | Mobile Application Development with Kotlin | 04 |
| SCMPSC-452 | Cloud Computing | 04 |
| SCMPSC-453 | NoSQL with MongoDB | 04 |
| SCMPSCP-451 | Lab 4: Kotlin Lab | 01 |
| SCMPSCP-452 | Lab 5: Cloud Computing Lab | 01 |
| SCMPSCP-453 | Lab 6: NoSQL Lab | 01 |
| SCMPSE-451 | Chose any one<br>  A. Data Structure<br>  B. Software Testing<br>  C. PHP and MySQL | 03 Theory and 01 Lab |
| SCMPSOJ-451 | On Job Training , Internship/ Apprenticeship or Field Project | 03 |
| | | |

**Note $^{\$\$}$: Contents of the common courses in campus and affiliated colleges shall be different**

## M. Sc. First Year, Semester I and II (*Level 6.0): Teaching Scheme*

| | Course Code | Course Name | Credits Assigned per course | | | Teaching Scheme (Hrs/ week) per course | |
|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Total | Theory | Practical |
| Major | SCMPSC-401 to SCMPSC-403 and SCMPSC-451 to SCMPSC-453 | All Core Course | 04 | -- | **04** | **04** | **--** |
| Elective | SCMPSE-401and SCMPSE-451 | All Elective Courses | 03 | -- | **03** | **03** | **--** |
| Special Courses | SVECR-401 and SCMPSOJ-451 | Research Methodology and On Job Training | 03 | -- | **03** | **03** | |
| Major Practical | SCMPSCP-401 to SCMPSCP-403 and SCMPSCP-451 to SCMPSCP-453 | All Core labs | -- | 01 | **01** | **--** | **02** |
| Elective Practical | SCMPSEP-401 and SCMPSEP-451 | Elective lab | -- | 01 | **01** | **--** | **02** |
| **Total Credits per semester** | | | **18** | **04** | **22** | **18** | **04** |
| **Total credits per year** | | | **36** | **08** | **44** | **36** | **08** |

## M. Sc. First Year, Semester I and II (Level 6.0): Examination Scheme

| Course Code (2) | Course Name (3) | Theory | | | | Practical | | Total Col (6+7) / Col (8+9) (10) |
|---|---|---|---|---|---|---|---|---|
| | | Continuous Assessment (CA) | | | ESA | | | |
| | | Test I (4) | Test II (5) | Avg of (T1+T2)/2 (6) | Total (7) | CA (8) | ESA (9) | |
| SCMPSC401 to SCMPSC-403 and SCMPSC-451 to SCMPSC-453 | All core courses | 20 | 20 | `20 | 80 | -- | -- | 100 |
| SCMPSE-401 and SCMPSE-451 | All elective courses | 15 | 15 | 15 | 60 | -- | -- | 75 |
| SVECR-401 and SCMPSOJ-451 | Research Methodology | 15 | 15 | 15 | 60 | -- | -- | 75 |
| SCMPSCP-401 to SCMPSCP-403 and SCMPSCP-451 to SCMPSCP-451 | All Core Labs | -- | -- | -- | -- | 05 | 20 | 25 |
| SCMPSEP-401 and SCMPSEP-451 | All Elective labs | -- | -- | -- | -- | 05 | 20 | 25 |

# Guidelines for Course Assessment:

A. **Continuous Assessment (CA) (20% of the Maximum Marks):** This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col. 6).

B. **End Semester Assessment (80% of the Maximum Marks):** *(For illustration we have considered a paper of 04 credits, 100 marks and need to be modified depending upon credits of an individual paper)*

  1. ESA Question paper will consists of 6 questions, each of 20 marks.
  2. Students are required to solve a total of 4 Questions.
  3. Question No.1 will be compulsory and shall be based on entire syllabus.
  4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

C. **Question paper for campus PG and PG in affiliated colleges will be different**

**Note:** Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

%%%%%

# M.Sc. Computer Science

**Learning Objectives:**

i. To develop Understanding of Internal Architecture of Computer.
ii. To aware students about Basics of Microprocessor & Assembly Language Programming

**Course Outcomes:**

After successful completion of this course, students should be able to:

i. Students will acquire skill of Assembly Language programming using 8086 Microprocessor
ii. Student will be familiar with Internal Processing of Computers.

**Unit I: Design Methodology** 10 Hrs.

Evolution of Computers, Introduction to system modeling, Design Methodology of Combinational and Sequential circuits-Gate level, Register level and Processor level.

**Unit II: Binary Arithmetic** 12 Hrs.

Fixed point arithmetic's and algorithms for addition, subtraction, multiplication and division, Floating point arithmetic's and algorithms for addition, subtraction.

**Unit III Processors Design & Control Units** 8 Hrs.

CPU organization, Data representation, Instruction Sets –Format, types, Implementation, CICS and RISC, Control Unit-Hardwired control and design examples, Micro programmed control unit, pipeline control, Interrupt and their types and Branch Instruction processing.

**Unit IV Memory Organization** 8 Hrs.

Memory Technologies, Memory System, Virtual memory, Memory hierarchies, Main memory -allocation, Segmentation, High speed-Cache Memory, interleaved and associative memories.

**Unit V: 8085 Microprocessor** 10 Hrs.

Architecture of 8085 Microprocessor, Features of 8085, Timing diagram of Memory read , memory write, Op code fetch and execute cycle.

**Unit VI 8086 Microprocessor** 12 Hrs.

Architecture of 8086 Microprocessor-EU and BIU, features of 8086, Pin diagram of 8086, Addressing modes, Instruction set classification, Assembly language programming of 8086.

**References:**

1. Computer Architecture & Organization by J.P Hays.
2. Fundamentals of Microprocessors by Gaonkar
3. Computer System Architecture by M. Morris Mano (PHI)
4. Microprocessor and Interfacing: Programming and Hardware by Douglas Hall (McGraw-Hill/Glencoe)

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSC-402 Python Programming

**Course Objectives:**

1. To understand why Python is a useful scripting language for developers.
2. To define the structure and components of a Python program.
3. To understand programming constructs in Python.
4. To acquire Object Oriented Skills in Python
5. To develop the ability to write database applications in Python

**Course Outcomes:**

After successful completion of this course, learner will be able to

1. Write programs using Python programming constructs.
2. Design and Develop applications using Python programming.
3. Design object oriented programs with Python classes.
4. Use exception handling in Python applications for error handling.
5. Design and Develop applications connecting with database.

**UNIT I: Introduction and basic control structure of Python**          **10** Hrs

Introduction and Features of Python, Data Types, Variables, Operators, Control Structures: Loops and Decision.

**UNIT II: Data Types and Classes**          **10** Hrs

Data Types: Numerical, String, Set, Dictionary, List, Tuple, Classes and Objects, Functions and Arguments, Inheritance, Polymorphism.

**UNIT III: Classes**          **10** Hrs

Classes and Objects, Functions and Arguments, Inheritance, Polymorphism.

**UNIT IV: Modularization and Exceptions**          **10** Hrs

Standard Modules, Packages, Exception raising, Exception Handling, Error Processing.

**UNIT V: Database Connectivity with MySQL, GUI Programming and Database Connectivity Using Python**          **10** Hrs

Getting MySQL for Python, connecting with database, Passing Query to MySQL. GUI using Tkinter Module, Creating Label, Text, Button, Info Dialog Boxes, Radio button, Check button, Importing MySQL for Python, connecting with database, Passing a query to MySQL.

**UNIT VI: Web Development using Python**                              **10** Hrs

Django Installation, Creating Project, Creating Application, Templates and Models, Data Manipulation, Django Admin, Django Syntax- variables, tags, if-else, loops, Database Connection with MySQL.

**Reference Books: -**

1. Learning Python-Mark Lutz-O"Reilly 5th edition
2. MySQL for Python-Albert Lukaszcwskc-Packet publication 1st edition
3. Django 2 by Example (Build powerful and reliable Python web applications from scratch)-Antonio Mele

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)

SCMPSC-403 Advanced Java

**Learning Objectives:**

i       To Design and build robust and maintainable web applications.

ii      To create dynamic HTML content with Servlets and Java Server Pages, using the JSP Standard Tag Library (JSTL).

iii     To Make Servlets and JSP work together cleanly.

**Course Outcomes:**

After successful completion of this course, students should be able to:

i.      Create dynamic and interactive web sites and interaction with client and server.

ii.     Do server side programming with java Servlets and JSP.

iii.    Implement different data structure using collection framework.

| | |
|---|---|
| **Unit I: Multithreading** | 10 Hrs. |

Introduction to multithreading, Creating Threads, Thread Life Cycle, Thread Priorities, Thread Synchronization

| | |
|---|---|
| **Unit II: Collection Framework** | 12 Hrs. |

Collection interface, ArrayList, Vector, Generics, Iterator, Comparable, TreeSet, HashSet, HashMap, HashTable, TreeMap

| | |
|---|---|
| **Unit III Java Database Connectivity** | 8 Hrs. |

JDBC Introduction, JDBC Architecture, JDBC Drivers, Establishing Connection, Executing Query and Processing Results, Metadata, Prepared Statement, Callable Statement

| | |
|---|---|
| **Unit IV Introduction to Servlets** | 8 Hrs. |

Introduction to Servlets, Deploying Simple Servlet, Servlet Life Cycle, Get and Post Requests, Request Object

| | |
|---|---|
| **Unit V: Handling Form Data** | 10 Hrs. |

Accessing Data from HTML Form, Using JDBC in Servlet, Servlet Chaining, Cookies and Sessions

| | |
|---|---|
| **Unit VI JSP** | 12 Hrs. |

Introduction to JSP, Scripting Elements- Expressions, Scriptlets, Declarations, Directives, Sessions in JSP, Using JDBC in JSP, JavaBeans in JSP

**References:**

1. Java The Complete Reference 9th Edition, Herbert Schildt, McGraw Hill Education (India) Private Limited, New Delhi.
2. Java Servlet & JSP Cookbook, Bruce W. Perry, O'Reilly Publication.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSCP-401 Computer Architecture and Microprocessor Lab

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)

SCMPSCP-402 Python Programming

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)

SCMPSCP-403 Advanced Java

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSE-401A Data Analytic with Power BI

**Learning Objectives:**

  i.  Identify the primary components of the Power BI interface: reports, data, and model views
 ii.  Import Excel data and build basic visuals

**Course Outcomes:**

After successful completion of this course, students should be able to:

  i.  Publish a desktop report to the Power BI Service
 ii.  Identify common challenges in Power BI data models, implement smart solutions, and avoid common mistakes

## UNIT I: Introducing Power BI and Importing Data into Power BI Desktop

Why Use Power BI? The xVelocity In-Memory Analytics Engine, Setting Up the Power BI Environment, Exploring the Power BI Desktop Interface, Importing Data from Relational Databases, Importing Data, from Text Files, Importing Data from a Data Feed, Importing Data from Analysis Services

## UNIT II: Data Munging with Power Query

Discovering and Importing Data, Transforming, Cleansing, and Filtering Data, Merging Data, Appending Data, Splitting Data, Unpivoting Data, Inserting Calculated Columns

## UNIT III: Creating the Data Model

What Is a Data Model? Creating Table Relations, Creating a Star Schema, Understanding When to Denormalize the Data, Making a User-Friendly Model

## UNIT IV: Creating Calculations with DAX

What Is DAX? Implementing DAX Operators, Working with Text Functions, Using DAX Date and Time Functions, Using Informational and Logical Functions, Getting Data from Related Tables, Using Math, Trig, and Statistical Functions, Tips for Creating Calculations in Power BI

## UNIT V: Visualizations

Why Visualizations, Visualization types, Create and Format Bar and Column Charts, Create and Format Stacked Bar Chart Stacked Column Chart Create and Format Clustered Bar Chart, Clustered Column Chart, Create and Format 100% Stacked Bar Chart, 100% Stacked Column Chart Createand, Format Pie and Donut Charts, Create and Format Scatter Charts, Create and Format Table Visual, Matrix, Visualization, Line and Area Charts, Create and Format Line Chart, Area Chart, Stacked Area Chart Combo Charts, Create and Format Line and Stacked Column

Chart, Line and Clustered ColumnChart Create and Format Ribbon Chart, Waterfall Chart, Funnel Chart

**UNIT VI: Power BI Service and Creating Dashboards**

Power BI Service Introduction, Power BI Cloud Architecture Creating Power BI Service Account, SIGN IN to Power BI Service Account, Publishing Reports to the Power BI service, Import / Getting the Report to PBI ServiceMy, Workspace / App Workspaces Tabs, DATASETS, WORKBOOKS, REPORTS, DASHBOARDS, Working with Datasets, Creating Reports in Cloud using Published Datasets, Creating Dashboards, Pin Visuals and Pin LIVE Report Pages to Dashboard, Advantages of Dashboards, Interacting with Dashboards, Formatting Dashboard, Sharing Dashboard

**References:**
1. Mastering Microsoft Power BI by Brett Powell.
2. Beginning Power BI by Dan Clark

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSE-401B Statistical Method

**Learning Objectives:**
i. To inspire knowledge across different areas in Statistics and Actuarial Science.
ii. To impart knowledge on Statistical concepts like Data Collection, Measures of Central Tendency and Dispersion, Probability and Distributions, Statistical Methods, Inference, Sampling methods, Experimental Designs, Economical and Vital Statistics, SQC, reliability and Operations Research.
iii. To impart knowledge on Actuarial Science concepts like basics of Economics, Financial Accounting and Mathematics, Surviving models, life contingences, Business communication, Actuarial Statistics , Mortality and Insurance,

**Course Outcomes:**
i. Understand the have the basic knowledge on data collection and various statistical elementary tools.
ii. Have the critical thinking in the theory of probability and its applications in real life problems

**UNIT I: Introduction**                                                                  **8 Lectures**

Definition of Statistics, Importance of Statistics, Limitation of Statistics, Scope of Statistics (Computer Science, Industry, Economics, Social Science)

**UNIT II: Fundamental of Statistics**                                          **8 Lectures**
Collection of Data, Types of Data, Construction of Frequency, Cumulative and Relative Frequency distributions. Graphical representation of Frequency distribution: Histogram, Frequency Polygon, Frequency Curve and Cumulative Frequency curves, Diagrammatic representations: Simple bar, Subdivided bar and Pie diagrams

**UNIT III: Measures of Central Tendency**                               **8 Lectures**

Concept of central tendency, Arithmetic Mean: Definition, Formulae and computation for ungrouped and grouped data, Merits and Demerits. Weighted Arithmetic Mean, Median: Definition, Formulae and Computation for ungrouped and grouped data, Merits and Demerits Mode: Definition, Formulae and Computation for ungrouped and grouped data, Merits and Demerits.

**UNIT IV: Measures of Dispersion:**                                          **8 Lectures**
Concept of Dispersion. Range: Definition, Formulae and Computation for ungrouped and grouped data. Standard Deviation: Definition, Formulae and Computation for ungrouped and grouped data. Variance: Definition, Formulae and Computation for ungrouped and grouped data Coefficient of variance: Definition, Formulae and Computation for ungrouped and grouped data.

**UNIT V: Probability**                                                      **8 Lectures**

Permutation and combination, Sample space, Events and Types of events. Classical definition of probability and axioms of probability, Theorems on Probability: i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A') = 1$ iii) $P(A \cup B) = P(A) + P(B)$ iv) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

**UNIT VI: Correlations and regressions**                                    **8 Lectures**

Definition of Correlation & Types, Karl Pearson's coefficient of correlations for ungrouped data and problems, Definition of Regression.

References:
1) Fundamental of Statistics S. C. Gupta Himalaya Publication (6th revised & Enlarged Edition)

2) Statistical Methods S. P. Gupta Sultan Chand & Sons Publication (37th Revised Edition)

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSE-401C Web Technology

**Learning Objectives:**

i.   To impart basic Web Designing skills.
ii.  To provide the in-depth knowledge about Static and Dynamic Web Designing and make them ready for designing such websites
iii. Develop the modern Web applications using the client and server side technologies and the web design fundamentals

**Course Outcomes:**

i.   Describe the concepts of WWW including browser and HTTP protocol.
ii.  List the various HTML tags and use them to develop the user friendly web pages.
iii. Define the CSS with its types and use them to provide the styles to the web pages at various levels.
iv.  Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
v.   Use the JavaScript to develop the dynamic web pages.
vi.  Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.

**UNIT I: Introduction of HTML Documents**                                8 Lectures
Historical Roots of HTML, Web page, Website, Structure of HTML documents and Basic Tags: HTML, HEAD, TITLE, BODY, Formatting Tags: Paragraph Tags, List tags, HR Tag., Headings Tags, PRE tag, DIV tag, SPAN tag., FONT Tag, ADDRESS tag, MARQUEE tag., Text-Level Elements & other different formatting tags.

**UNIT II: Technologies for Web Application**                             8 Lectures

WWW, Web browser, U.R.L. concept, Web server, Web protocols: HTTP, FTP, Telnet, Hyperlink (Anchor) Tag & it's all attributes, Creating Email Hyperlinks (using mail to anchor)

**UNIT III: Use of Image and Table**                                      8 Lectures

The Role of Images on the Web, tag & it's all attributes, Using Images create a links., Tables in HTML: - TABLE, TR, TH, TD tag with example, table with all Attributes

**UNIT IV: Basic Interactivity and DHTML**                                8 Lectures

Frames in HTML: FRAMESET & FRAME tags & its attributes, Simple Frame Example,

Forms in HTML: Introduction to forms, FORM element & it's attributes (Action, Method (GET, POST), Name), Form controls: Text Controls, Password Field, Multiline Text Input, Pull-Down Menus, Check Box, Radio Buttons, Scrolled List, Reset Button and Submit button.

**UNIT V: DHTML, CSS & JavaScript**                                          8 Lectures

Introduction of DHTML, Ramifications of DHTML, Rollover Buttons, Introduction to Cascading Style Sheets, Types of CSS.

Introduction of JAVA Script, Adding script to documents with example, Variables, Use of different variable, Input and Output statements of JAVA Script , Validating form

**UNIT VI. Web Publishing and Advanced HTML Concepts**            8 Lectures

Publishing the Site, The Realities of Publishing and Maintaining a Web Site, introduction of Search engine optimization, Meta –Information, Overview of Client/Server Programming on the Web.

**Reference Books:**
1. HTML The complete Reference (2nd Edition Thomas A Powel Tata McGraw Hill publication)
2. The complete Reference (HTML & XHTML)- 5th Edition Thomas A Powel Tata McGraw Hill publication

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSE-401A Data Analytic with Power BI

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)

SCMPSE-401B Statistical Method
**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SCMPSE-401C Web Technology

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester I)
SVECR-401 Research Methodology

**Learning Objectives**
The main objective of this course is to introduce the basic concepts in research methodology in Social science. This course addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project. This will also enable the students to prepare report writing and framing Research proposals.

**Course Outcomes**
- Students who complete this course will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.
- This course will help them to select an appropriate research design.
- With the help of this course, students will be able to take up and implement a research project/ study.
- The course will also enable them to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate students' prosperity in higher education.
- The Students will develop skills in qualitative and quantitative data analysis and presentation.
- Students will be able to demonstrate the ability to choose methods appropriate to research objectives.

**UNIT I: Introduction, the Purpose and Product of Research** 8 Hrs.
What is research?, Evaluating Research, The 6Ps of research, Reasons for doing Research, possible products, Finding and choosing research topics, evaluating the purpose and product of research.

**UNIT II: Overview of the Research Process, Internet Research** 8 Hrs.

A model of the research process, Alternative models of the research process, evaluating the research process, Background of the Internet and WWW, Internet research topics, The Internet and a literature review, The Internet and research strategies and methods, Internet research, the law and ethics.

**UNIT III: Reviewing the literature, Surveys and Design Creation** 8 Hrs.
Purpose of literature review, literature resources, The Internet and literature reviews, conducting literature reviews, evaluating literature reviews, Define Surveys, Planning and Designing surveys, the internet and surveys, Example of Surveys, Defining design and creation, Planning and conducting design and creation research, Creative computing and digital art.

**UNIT IV: Experiments, Case studies, Action Research** 8 Hrs.

Defining experiments, Planning and conducting experiments, The internet and experiments, Defining case studies, Planning and conducting case studies, The internet case studies,

Defining Action research, Planning and conducting Action research, The internet and Action research

**UNIT V: Interviews, Observations, Questionnaires** 8 Hrs.

Defining Interviews, Planning and conducting Interviews, Group Interviews Internet based Interviews, Defining Observations, Planning and conducting systematic Observations, Planning and conducting participant Observations, The internet and Observations.

**UNIT VI: Quantitative data analysis, Qualitative data analysis and Presentation of Research** 8 Hrs.

Defining Quantitative data analysis, Types of Quantitative data analysis, Data coding, Visual aids for Quantitative data analysis, Using statistics for Quantitative data analysis, Qualitative data analysis-Introduction, Analysis textual data, Analysing non-textual qualitative data, Grounded theory, Presentation of Research- writing up the research, conference paper presentations, Posters and exhibitions, software demonstrations, Presenting yourself, PhD vivas, Research Ethics, Plagiarism, software to detect plagiarism

**References:**

1. Researching Information System and Computing by Briony J Oates, SAGE Publications, ISBN 978-81-7829-759-0

M.Sc.(CS) F. Y. (Semester II)
SCMPSC-451 Mobile Application Development with Kotlin

**Learning Objective :**

Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle

**Course Outcomes:**

By the end of the course, student will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

**UNIT I Introduction to Kotlin and Its Features:**                          8 Hrs.

Introduction to Kotlin and Its Features,Program Structure,Variables, Data Types, Type Conversion, Operators, Input /Output, Control Statements, When Expression, Looping Statements, Break, Continue and Return Enum, Nullable Non Nullable Types, Smart cast, Unsafe and Safe Cast, Elvis Operator.

**UNIT II Functions, Array, String and Object Oriented Programming**

Functions, Recursion, Default and Named Arguments, Arrays, String, Object Oriented Concepts Classes and Objects, Constructor, Visibility Modifiers, Inheritance, Abstract Class, Interface, Data Classes, Basic Lambdas, Inline Functions.

**UNIT III Exception Handling and Collections Framework**                          8 Hrs.

Exception Handling. ,Try Catch, Multiple Try BlockFinally, BlockKotlin ,Throw Keyword Collections,List -> ArrayList, Vector, LinkedList,Set -> HashSet, Map -> HashMap.

**UNIT IV. Introduction to Android Programming**                          8 Hrs.

Android Its Features, API Levels and Versions, Android Architecture ,JVM, DVM, ART, DEX,Creating First Android Application,Android Project Structure,AndroidManifest.XM,Activity and Activity Life Cycle.

**UNIT V. User Interface Design**                          8 Hrs.

LinearLayout, RelativeLayout, ContraintLayout, TextView, EditText, Button, Switch, RadioButton, and RadioGroup Views, Progress Bar View, CheckBox, ImageView, Spinner and Adapter, TimePicker View, DatePicker View, WebView, Toast, ScollView, CardView, List View Custom List View and RecyclerView.

**UNIT VI. Intents, Fragments, Dialog, Menus, and Storage Media**       8 Hrs.

Implicit Intent, Explicit Intents, Fragments (Navigation Drawer),Alert Dialog, Custom Dialog, Menus, Shared Preferences, Internal Storage, SQLite Database, Notifications, Publishing to the Android Market.

**References:**
1. Kotlin in Action Paperback – 19 February 2017 by Dmitry Jemerov (Author), Svetlana Isakova (Author)
2. Kotlin Programming Paperback – 6 September 2018 by Josh Skeen (Author), David Greenhalgh (Author)
3. Head First Kotlin: A Brain-Friendly Guide 1st Edition, Kindle Edition by Dawn Griffiths (Author), David Griffiths (Author)

M.Sc.(CS) F. Y. (Semester II)
SCMPSC-452 Cloud Computing

**LEARNING OBJECTIVES**
1.  To provide students with the fundamentals and essentials of Cloud Computing.
2.  To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3.  To enable students exploring some important cloud computing driven commercial systems and applications.
4.  To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

**COURSE OUTCOMES**
1.  After successful completion of this course, student will be able to Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2.  Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
3.  Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
4.  Analyze various cloud programming models and apply them to solve problems on the cloud.

**UNIT I: INTRODUCTION AND CLOUD APPLICATION DEVELOPMENT**
Introduction: Definition, Characteristics, Benefits, challenges of cloud computing, cloud models: service IaaS(infrastructure as service),PaaS (platform as a service),SaaS(software as a service), deployment models-public, private, hybrid, community; Types of cloud computing: Grid computing utility computing, cluster; computing Cloud services: Amazon, Google, Azure, online services, open source private clouds, SLA; Applications of cloud computing: Healthcare, energy systems, transportation, manufacturing, education, government, mobile communication, application development

**UNIT II: CLOUD ARCHITECTURE, PROGRAMMING MODEL**
Cloud Architecture, programming model: NIST reference architecture, architectural styles of cloud applications, single, multi, hybrid cloud site, redundant, non redundant, 3 tier, multi tier architectures; Programming model: Compute and data intensive.

**UNIT III:CLOUD RESOURCE VIRTUALIZATION**
Cloud resource virtualization: Basics of virtualization, types of virtualization techniques, merits and demerits of virtualization, Full vs Para - virtualization, virtual machine monitor/hypervisor. 2 Page Virtual machine basics, taxonomy of virtual machines, process vs system virtual machines

**UNIT IV CLOUD RESOURCE MANAGEMENT AND SCHEDULING**

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Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, resource bundling, combinatorial, fair queuing, start time fair queuing, borrowed virtual time, cloud scheduling subject to deadlines, scheduling map reduce applications subject to deadlines, resource management and application scaling.

**UNIT V: CLOUD SECURITY**
Cloud Security: Risks, privacy and privacy impacts assessments; Multi-tenancy issues, security in VM, OS, virtualization system security issues and vulnerabilities; Virtualization system-specific attacks: Technologies for virtualization-based security enhancement, legal.

**UNIT VI AWS Platform**
Introduction to AWS Elastic computing, Introduction to the AWS products, Regions and Availability Zones, Signing up for AWS, AWS Free usage tier, Introduction AWS management console, Understanding AMI, Launching your first AWS instance, On-demand Instance pricing Reserved Instance pricing, Spot instance pricing, Setting up security, Security groups, Choosing & Creating a new AMI, Public and Private IP's

**References:**

1. "Cloud Computing: Concepts, Technology and Architecture" by Thomas Erl and Ricardo Puttini
2. "Cloud Computing For Dummies" by Judith Hurwitz

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSC-453 NoSQL with MongoDB

**Learning Objectives:**
This course will enable students to:
1. Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).
2. Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
3. Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

**Course Outcomes**

Upon completion of this course, learners should be able to:

1. Define, compare and use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).
2. Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
3. Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.
4. Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Key-Value Pair NoSQL databases.
5. Explain the detailed architecture, define objects, load data, query data and performance tune Graph NoSQL databases.
6. Evaluate NoSQL database development tools and programming languages.
7. Perform hands-on NoSql database lab assignments that will allow students to use the four NoSQL database types via products such as Cassandra, Hadoop Hbase, MongoDB, Neo4J and Riak.

## UNIT I: Introduction to NoSQL                                    8 Hrs.

Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL,  Aggregate Data  Models; Aggregates, Example of Relations and  Aggregates, Consequences of Aggregate Orientation, Key-Value  and  Document Data Models, Column-Family  Stores, Summarizing Aggregate-Oriented Databases. More  Details  on  Data  Models;  Relationships,  Graph  Databases, Schemaless  Databases, Materialized Views, Modeling for Data Access,

## UNIT II: Models of NoSQL                                    8 Hrs.

Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes

## UNIT III: Map Reduce and Partitioning                    8 Hrs.

Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets

## UNIT IV Document Data base:                             8 Hrs.

Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Dif erent Operations, Queries against Varying Aggregate Structure

## UNIT V: Graph Databases                                  8 Hrs.

Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use

## UNIT VI: Example Databases                               8 Hrs.

Apache HBASE, Apache Cassandra, MongoDB, Riak, Neo4J

**References:**

1. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" by Pramod J Sadalage and Martin Fowler
2. "NoSQL For Mere Mortals" by Sullivan

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSCP-451 Mobile Application Development with Kotlin

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)

SCMPSCP-452 Cloud Computing

**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)

SCMPSCP-453 NoSQL and MongoDB
**Note:** Conduct at least 15 practical based on given syllabus.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSE-451A Data Structure

**Learning Objectives:**

  i.   To teach the basic concepts of data structures and algorithms

  ii.  To understand concepts about searching and sorting techniques

  iii. To understand basic concepts about stacks, queues, lists, trees and graphs

  iv.  To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Course Outcomes:**

After successful completion of this course, students should be able to:

  i.   Ability to analyze algorithms and algorithm correctness.

  ii.  Ability to summarize searching and sorting techniques

  iii. Ability to describe stack, queue and linked list operation.

       Ability to have knowledge of tree and graphs concepts.

**Unit -I Introduction to Data Structures:**                          8 Hrs.

Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion. Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multidimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings

**Unit-II Stacks and Queue**                                         8 Hrs.

Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.

**Unit-III Linked Lists**                                            8 Hrs.

Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List

**UNIT IV: Trees**                                                   8 Hrs.

Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.

**UNIT V: Graphs** 8 Hrs.

Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.

**UNIT VI: Searching and Sorting** 8 Hrs.
Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, selection sort. Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing

**References:**

1. Data Structure, By Seymour Lipschutz (Schaum's Ouline Series Incomputers) – Mcgraw Hill.
2. An Introduction To Data Structurewith Application By Jeanpaul, Tremblay Paul, G. Sorenson (Tatamcgraw Hill)

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSE-451B Software Testing

**Learning Objectives:**
1. The student should be made to expose the criteria for test cases.
2. Learn the design of test cases and be familiar with test management and test automation techniques.

**Course Outcomes:**
1. At the end of the course the students will be able to Design test cases suitable for a software development for different domains.
2. Identify suitable tests to be carried out and prepare test planning based on the document.
3. Document test plans and test cases designed and Use of automatic testing tools.

**Unit-I Quality concepts and Testing Strategies**                                    8 Hrs.

Quality, Software Quality , McCall''s Quality Factors, The Cost of Quality, Quality and Security, Quality Control, A Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing.
The Art Of Debugging.

**Unit-II TESTING APPLICATION**                                    8 Hrs.

Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basic Path, Testing
Control Structural Testing, Black Box Testing.

**Unit-III Test Automation and STLC**                                    8 Hrs.

What is Automation testing, Advantages of Automation testing, skill needed for automation, scope of automation, design and architecture for automation, requirements for a test tool, challenges in automation, STLC Phases, Static and Dynamic Testing.

**Unit-IV Test Management**                                    8 Hrs.

Test Plan Template, Usecase Testing, Scenario Testing, Testcases & Test Data, Testcases Template, Test Design Technique.

**Unit-V Defect Management:**                                    8 Hrs.

What is Defect/Bug?, Reason for Defects in Software, Defect Tracking System, Defect Life Cycle, Attributes of Defect .

**Unit-VI Introduction to Selenium**                                    8 Hrs.

History of Selenium ,Why Selenium tool ,Differences between Selenium and other Tools ,Different components in Selenium, Installation and Introduction to IDE ,Creating first script,Web Elements/HTML Elements ,Inspecting Web Elements (Using a Browser) ,Element Locators – To locate/recognize/identify elements in web pages (Using HTML Locators), Performing actions on elements (Using WebDriver Commands/Methods).

References:
1. Software Engineering -A Practitioner's approach, Sixth Edition, Roger S. Pressman, McGraw-Hill Higher Education; (1 August 2007),ISBN-10: 0077227808

2. Software Engineering -A Practitioner's approach, Fifth Edition, Roger S. Pressman,McGraw-Hill Higher Education; (1 August 2005)
3. Software Testing Concepts and Tools NageswaraRoo Dreamtech Publication.

4. Software Testing Concepts and Tools, Nageswara Rao Dreamtech Publication ISBN 8177227122, 9788177227123

5. Software Testing by Ron Patton, Second Edition, BPB Publication, ISBN-9780672327988
6. Selenium WebDriver Recipes in Java by Zhimin Zhan.

# M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSE-451C PHP and MySQL

Objectives:
- Learn Core-PHP, Server Side Scripting Language.
- Learn to design dynamic and interactive Web pages.
- Learn PHP-Database handling.

Outcomes:
- Able to design dynamic and interactive web pages, websites.
- Able to run PHP scripts on server and retrieve results.
- Able to handle databases like MySQL using PHP in web sites.

## UNIT I Introduction to PHP                                    8 Hrs.

Introduction to PHP , History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages ,Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP ,Expressions in PHP, Operators in PHP.

## UNIT II. Programming with PHP                                 8 Hrs.

Conditional statements: if, if-else, switch, The ? Operator Looping statements: while Loop, do...while Loop, for Loop, Arrays in PHP: Introduction- What is Array?, Types of Arrays: Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.

## UNIT III: Using Functions, Forms in PHP                       8 Hrs.
User define Functions in PHP, Strings in PHP: String Functions, Creating HTML Form, Handling HTML Form data in PHP.

## UNIT IV: Using OOPs Concept                                   8 Hrs.
What is Class & Object? Creating and accessing a Class & Object, Object properties, and object methods, Function Overloading, Constructor and Destructor, inheritances.

## UNIT V: Database Handling Using PHP with MySQL                8 Hrs.
Introduction to MySQL: Database terms, Data Types, Accessing MySQL –Using MySQL Client and Using phpMyAdmin, MySQL Commands      , Using PHP with MySQL: PHP MySQL Functions, connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results, Counting Returned Records, Updating Records with PHP.

## UNIT VI Web Application Security                              8 Hrs.
Using Cookies, Using Sessions, Sessions and Cookies, Improving Session Security, Form Validation, Handling HTML, Validating Data by Type, Form Validation with JavaScript.

**References:**

1. PHP &MySQL for Dynamic Web Sites- Fourth Edition By Larry ULLman

2. Learning PHP, MySQL and JavaScript By Robin Nixon -O‟REILLY Publications
3. Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre
4. SAMS Teach yourself PHP in 24 hours, Author: Matt Zandstra, Sams Publishing.

## M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSE-451A Data Structure

**Note:** Conduct at least 15 practical based on given syllabus.

## M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)

SCMPSE-451B Software Testing
**Note:** Conduct at least 15 practical based on given syllabus.

## M.Sc. Computer Science

M.Sc.(CS) F. Y. (Semester II)
SCMPSE-451C PHP and MySQL
**Note:** Conduct at least 15 practical based on given syllabus.