॥ 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.ac. |
| Phone: (02462)215542 | | E-mail: bos@srtmun.ac. |

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदव्युत्तर द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून राष्ट्रीय शैक्षणिक धोरणानुसार पदव्युत्तर द्वितीय वर्षाचे अभ्यासक्रम लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदव्युत्तर द्वितीय वर्षाच्या अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील एम. एस्सी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

1) M. Sc. II year - Analytical Chemistry (Affiliated College)
2) M. Sc. II year - Biochemistry (Affiliated College)
3) M. Sc. II year - Organic Chemistry (Affiliated College)
4) M. Sc. II year - Physical Chemistry (Affiliated College)
5) M. Sc. II year - Inorganic Chemistry (Affiliated College)
6) M. Sc. II year - Analytical Chemistry (Campus)
7) M. Sc. II year - Industrial Chemistry (Campus)
8) M. Sc. II year - Medicinal Chemistry (Campus)
9) M. Sc. II year - Organic Chemistry (Campus)
10) M. Sc. II year - Physical Chemistry (Campus)
11) M. Sc. II year - Polymer Chemistry (Campus)
12) M. Sc. II year - Computer Management (Affiliated College)
13) M. Sc. II year - Computer Sciene (Affiliated College)
14) M. Sc. II year - Software Engineering (Affiliated College)
15) M. Sc. II year - System Administration & Networking (Affiliated College)
16) M. Sc. II year - Computer Application (Campus)
17) M. Sc. II year - Computer Network (Campus)
18) M. Sc. II year - Computer Science (Campus)
19) M. Sc. II year - Zoology (Campus)
20) M. Sc. II year - Zoology (Affiliated College)
21) M. Sc. II year - Physics (Campus)
22) M. Sc. II year – Physics (Affiliated College)

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/एनइपी/विवत्रंविपदवी/२०२४–२५/993
दिनांक १३.०६.२०२४

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

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 Management

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 Management Second Year
(Affiliated Colleges)

(Second Year)

Introduced from Academic Year 2024-2025

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology
NEP-2020 oriented Structure of Two Years Post Graduate Program
Subject:Computer Management(Affiliated Colleges)
Introduced from Academic Year 2024-2025**(as per Govt of Maha GR dated 16-05-2023)**

Program Year and Sem	Level	Semester		Faculty			Other courses				Total Sem. credits	Cumu. Credits
Second Year is program for PG programs in the affiliated colleges			**Major / Mandatory / SDSC**		**Electives / SDSC**		**RM /others**	**OJT/FP /**	**RP**			
			Theory	**Practical**	**Theory**	**Practical**						
			(04 credits)	**(01credits)**	**(04 credits) (03+01)**		**(02 credits)**	**(04 credits)**	**(04 credits)**			
M.Sc. CM	6.5	Third Semester	SCMPMC-501 SCMPMC-502 SCMPMC-503	SCMPMCP -501 SCMPMCP-502	SCMPME -501 (FROM SAME SCHOOL/DEPT)	---------	---------	---------	SCMPMR-551		**22**	**66**
M.Sc. CM	6.5	Fourth Semester	SCMPMC-551 SCMPMC-552	SCMPMCP-551 SCMPMCP-552	SCMPME-551 (FROM SAME SCHOOL/DEPT)	--------	SVECP -551 Publication ethics	---------	SCMPMR -552 (06 credits)		**22**	**88**
Exit Option: After completion of Second year as above with cumulative 88 credits, student will be awarded M.Sc. in Software Engineering Degree depending upon enrollment and completion of program specific core and electives courses ** **(for students who have done 03 years UG program)												

Core Courses Code	Title	Remarks Credits
SCMPMC-501	Programming in C#	04
SCMPMC-502	Software Testing	04
SCMPMC-503	Operating System	04
SCMPMCP-501	Lab 7: C# Lab	01
SCMPMCP-502	Lab 8: Software Testing Lab	01

SCMPME-501	**Chose any one**
	  A. Linux OS
	  B. Advanced Computer Networks
	  C. Internet of Things
	  D. Subject relevant MOOC (NPTEL / SWAYAM / RUSA sponsored Future Oriented Courses / Other recognized [$$]
		03 Theory and 01 Lab

SCMPMR-501	Research Project	04

Program Specific Syllabus: Fourth Semester
M.Sc. Computer Management

Core Courses Code	Title	Remarks Credits
SCMPMC-551	Python Programming	04
SCMPMC-552	Advanced Java Programming	04
SCMPMCP-551	Lab 9: Python Lab	01
SCMPMCP-552	Lab 10: Advanced Java Lab	01

SCMPME-551	**Chose any one**
	  A. NoSQL and MongoDB
	  B. Web Application with MVC Core
	  C. DevOps Fundamental
		03 Theory and 01 Lab

SVECP -551	Publication Ethics	02
SCMPMR-551	Research Project	06

M. Sc. CM Second Year, Semester III (*Level 6.5*):Teaching Scheme

	Course Code	CourseName	CreditsAssigned per course			TeachingScheme (Hrs./ week) per course	
			Theory	Practical	Total	Theory	Practical
Major	SCMPMC-501 to SCMPMC-503	All Core Course	12	--	12	12	--
Elective	SCMPME-501 and SCMPME-551	All Elective Courses	03	--	03	03	--
Special Courses	SCMPMR-501	Research Project	--	04	04	--	02
Major Practical	SCMPMCP-501 to SCMPMCP-502	All Core labs	--	02	02	--	02
Elective Practical	SCMPME-501	Elective lab	--	01	01	--	01
Total Credits per semester			**15**	**07**	**22**	**15**	**05**

M. Sc. CM Second Year, Semester IV (*Level 6.5*):Teaching Scheme

	Course Code	CourseName	CreditsAssigned per course			TeachingScheme (Hrs./ week) per course	
			Theory	Practical	Total	Theory	Practical
Major	SCMPMC-551 to SCMPMC-552	All Core Course	08	--	08	08	--
Elective	SCMPME-551	All Elective Courses	03	--	03	03	--
Special Courses	SCMPMR-551	Research Project	--	06	06	--	04
Special Courses	SVECP -551	Publication ethics	--	02	02		01
Major Practical	SCMPMCP -551 and SCMPMCP -552	All Core labs	--	02	02	--	02
Elective Practical	SCMPME-551	Elective lab	--	01	01	--	01
Total Credits per semester			**11**	**11**	**22**	**11**	**08**

M. Sc. CM Second Year, Semester III and IV (Level 6.5): Examination Scheme

| Course Code (2) | CourseName (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)	
SCMPMC-501 to SCMPMC-503 and SCMPMC-551 to SCMPMC-552	All core courses	20	20	20	80	--	--	100
SCMPME-501 and SCMPME-551	All elective courses	15	15	15	60	--	--	75
Special Courses	SCMPMR-501	--	--	--	--	25	75	100
Special Courses	SCMPMR-551	--	--	--	--	50	100	150
Special Courses	SVECP -C551	--	--	--	--	20	30	50
SCMPMCP-501 to SCMPMCP-502SCMPMCP -551 and SCMPMCP -552	All Core Labs	--	--	--	--	05	20	25
SCMPME-501and SCMPME-551	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 consist 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 of campus and affiliated colleges shall 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 45lectures.

%%%%%

SCMPMC-501Programming in C#

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Programming in C#
Subject Code	SCMPMC-501
Marks	80 Marks
Lectures	50 Lectures

Course Objectives

i. To learn the concept of .NET architecture
ii. To understand the concepts of The Common Language Runtime(CLR) & Visual Studio
iii. To understand the applications of C#.

Course Outcome

- Learn the distinction between programming language Vs .NET.
- Learn different programming representation techniques.

UNIT I: Introducing C#   9Hrs

What is c#, Why C# & Evolution of C#, Character tics of C#, How C# differs from C++ &
Java,Introduction to .Net Technology & Framework, Exploring Some Key Benefits of the .NET
Platform,Understanding the .NET Support Lifecycle, The Common Language Runtime(CLR),
Overview of .NET, Integrated Development environment, Building .NET Core Applications
with Visual Studio.

UNIT II: Languages Basics   9Hrs

Breaking Down a Simple C# Program,Using the System.Console Class, Working with System,
Data, Types and Corresponding C# Keywords, Data Types, Operators, Control Statements,
Looping, Statements, Arrays, Jagged Arrays, Array List class, String class, and String
Manipulations,Understanding Method Parameters, Understanding the enum Type,
Understanding Value Types andReference Types, Boxing & Unboxing variable.

UNIT III: Lambda Expressions, Namespace, Exception handling

8Hrs Understanding Lambda Expressions, Processing Arguments Within Multiple Statements, LambdaExpressions with Multiple (or Zero) Parameters, using static with Lambda Expressions, Discards withLambda Expressions, Creating & using Namespace (DLL library), Exception

UNIT IV Multithreading   8Hrs

Understanding System. Threading Namespace, Creating & starting Thread, Threading synchronization &Pooling

UNIT V Windows Application   8Hrs

Event Driven Programming Model, Important classes used in windows application, TextBox& LabelControl, Button, CheckBox, RadioButton&GroupBox Control, ListBox&ComboBox control, MonthCalendar Control, Docking Control, Tree View Control, Menu & Toolbar control, Dialog Boxes

UNIT VI Database Connectivity   8Hrs

Advantages of ADO.NET, Managed Data providers, developing a Simple ADO.NET Based Application, Retrieving & Updating Data from Tables

References: -

1. Programming in C#, E Balagurusamy, McGraw Hill

2. Visual C#.Net, C Muthu, McGraw Hill

SCMPMCP-501 Programming in C#

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Programming in C#
Subject Code	SCMPMCP-501
Marks	25 Marks
Practical	15 Lab

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

SCMPMC-502 Software Testing

Nameof Course	M.Sc.(CM)SY
Semester	III
NameofSubject	Software Testing
SubjectCode	SCMPMC-502
Marks	80Marks
Lectures	50Lectures

Course Objectives:

i. To learn detection of bugs and performance issues in software.

ii. Understanding to develop and run test plans.

iii. Learn testing tools to detecting quickly bugs and error to smarter testing.

iv. To work with various software testing methods.

Course Outcomes:

• Determines the correctness, completeness and quality of software being developed.

• Technical documentation is well organized using testing.

Unit-I Quality concepts   8 Hrs

Quality, Software Quality, McCall"s Quality Factors, ISO 9126 Quality Factors,

Targeted Quality Factors, The Cost of Quality, Quality and Security,

Quality Control, Quality Assurance

Unit-II Software Quality Assurance   8 Hrs

Software Quality Assurance, Software Reviews, Formal Technical Reviews, Software

Reliability, The SQA Plan

Unit-III Software Testing Strategies   **8** Hrs

A Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing,
System Testing, The Art Of Debugging

Unit-IV TESTING APPLICATION   **11** Hrs

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

Unit-V WebappsFor Testing   **10**Hrs

Testing Concepts for WebApps, The Testing Process-An Overview,
Content Testing, User interface Testing, Navigation Testing, Security Testing

Unit-VIProduct Metrics   **5** Hrs

A frame work for product metrics, Metrics for the requirements model,
Metrics for design model, Metrics for source code, Metrics for testing

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 NageswaraRooDreamtech Publication

SCMPMCP-502 Software Testing Lab

Nameof Course	M.Sc.(CM)SY
Semester	III
NameofSubject	Software Testing Lab
SubjectCode	SCMPMCP-502
Marks	25Marks
Practical	15 Lab

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

SCMPMC-503Operating System

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Operating System
Subject Code	SCMPMC-503
Marks	80 Marks
Lectures	50 Lectures

Course Objectives

i. Through this paper Student should learn basic principles of computer.
ii. The paper is designed to aim at importing basic level of Computer.

Course Outcome

- To learn Basic Function of Devices like I/O, HDD etc.
- To Understand the Fundamental of Software and Hardware.
- Understand the Concept of Operating System and Network.

UNITI Introduction   10Hrs

What Operating System Do – User View, System View, Defining OS**,** Computer System Organization,

Computer System Architecture – Single Processor System, Multiprocessor System, Extended Machine Concept, Operating System Structure, An Operating System Resource Manager.

UNIT II: System Structure: *9Hrs*

Operating System Services, User Operating System Interface – Command Interpreter, GUI, System Boot, System Calls,

Types of System Calls – Process Control, File Management, Device Management, Information Maintenance, Communication, Protection

UNIT III: Process Management **8***Hrs*

Process Concept – The Process, Process States, Process Control Block, Process Scheduling – Scheduling Queues, Schedulers, Context Switching,

Scheduling Criteria, Scheduling Algorithms – FCFS, SJF, Priority Scheduling, Round-Robin Scheduling

UNIT IV:Multithreaded Programming: **8***Hrs*

Overview,Multithreading Models,Thread Libraries – pthreads

UNIT VMemory Management: **8***Hrs*

Contiguous Memory Allocation - Memory Allocation, Fragmentation

Paging - Basic Method, Hardware Support Segmentation

UNIT VI File System **8***Hrs*

:File concept, Access Methods – Sequential, Direct,

Directory and Disk Structure - Directory Overview, Single Level Directory, Two Level Directory, Tree Structure Directory.

Allocation Methods - Contiguous Allocation, Linked Allocation, Indexed allocation,

Free Space Management - Bit Vector, Linked List, Grouping, Counting

References: -

1. Operating System Concepts - WILEY India Edition 8th Edition , Abraham , Silberschatz Peter Galvin, Greg Gagne
2. Operating Systems - McGraw Hill Education Third Edition ,AchyutGodbole, AtulKahate

SCMPME-501 A-Linux OS

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Linux OS
Subject Code	SCMPME – 501 A
Marks	60 Marks
Lectures	50 Lectures

Course Objectives

i. To learn basic concept of Linux and the skills needed to effectively use and manage Linux system and Fedora.

ii. To understands basic concept of Linux Administration

Course Outcome

- Able to perform System administration tasks, File system and storage management tasks

UNIT I: Introduction to Linux and Fedora   9 Hrs

What is Linux, Features of Linux, Installation steps of Linux, Features of Fedora, Hardware Requirements, Fedora Installation, working with Linux file system, logging to & working with Linux, Changing User Information, Reading Documentation, Using the shell, Using the text editors, Working with File Permissions

UNIT II: The X Window System   9 Hrs

Basic X concept, Configuring X window systems, Starting X, Selecting & using X window

UNIT III: Introduction to RED Hat LINUX   8 Hrs

Hardware Requirements, Red Hat LINUX Installation, Advantages of LINUX, Other LINUX distributions, Concept of Linux loader, LINUX file system, Shells, Text editors, Changing User Information, File Permissions, Virtual Consoles

UNIT IV:Managing Services, Software & System Resources   8 Hrs

User Accounts, managing users, Managing Groups, managing passwords, User login process, Fedora core Linux Boot Process, Starting and stopping services manually, Using RPM for software management, Using RPM on the command line, extracting a single file from & RPM file, Graphical Package Management, System monitoring tools

UNIT V:Backing up, Restoring & recovery   8 Hrs

Choosing Backup strategy, choosing backup hardware & media, Using Backup software, Copying files

UNIT VI:Printing with Linux   8 Hrs

Configuring & managing print services, Local printer installation, Network printer installation, LINUX printing commands, Using the Common UNIX Printing System (CUPS), Console print control, Introduction to Network Connectivity Networking with TCP/IP

References: -

1. Red Hat Linux Unleashed, Edition illustrated reprint, "Bill Ball, David Pitts", Sams, 2001, ISBN 0672319853, 9780672319853.

 2. Fedora Unleashed by Bill Ball ISBN: 8129705087

SCMPME-501 A-Linux OS

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Linux OS
Subject Code	SCMPME – 501 A

Marks	25 Marks
Practical	15 Lab

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

SCMPME-501 B -Advanced Computer Networks

Name of Course	M.Sc. (CM) FY
Semester	III
Name of Subject	Advanced Computer Networks
Subject Code	SCMPME-501 B
Marks	60 Marks
Lectures	50 Lectures

Course Objectives:

1. Describe the role of dynamic routing protocols and place these protocols in the context of modern network design

2. Understand N/W protocols like RIP, OSPF & EIGRP according to industry requirement

3. Study of reference models.

Course Outcome:

1. Practical hands-on will help to interconnect the N/W components & design industrial N/w

2. Best Practices for configuring dynamic routing protocols

3. Best Practices for network troubleshooting.

Unit-I: Network Fundamentals **9 Hrs**

Compare network topologies, Networking cables, LAN vs VPN, OSI Model, TCP/IP Model, Compare OSI and TCP/IP models, Configure IP, verify and troubleshoot IPv4, addressing, Need for private IPv4 addressing, IPv4 vs IPv6

Unit-II: Routing Protocol Concepts **9 Hrs**

Interior and Exterior Routing Protocols, Connected Routes, Static Routes, Extended ping Command, Default Routes, RIP Protocol, RIP-2 Basic Concepts, Comparing and Contrasting IP Routing Protocols.

Unit-III: OSPF   8 Hrs

Compare and contrast distance vector and link state routing protocols, OSPF Protocols and Operation, OSPF Neighbors, OSPF Topology Database Exchange, OSPF Configuration

Unit-IV: EIGRP   8 Hrs

EIGRP Concepts and Operation, Exchanging EIGRP Topology Information,
EIGRP Configuring and Verification.

Unit-V: WAN Technologies   8 Hrs

Satellite communication, VSAT, PPP Concepts, PPP Protocol Field, PPP Link Control Protocol, PPP Configuration

Unit-VI: Troubleshooting IP Routing   8 Hrs

The Ping and trace route Commands, Internet Control Message Protocol, Troubleshooting the Packet Forwarding Process, Host Troubleshooting Tips Interface Status, Extended Ping.

Reference Books
1. CCENT/CCNA ICND1 (Second Edition) - Wendell Odom

SCMPME-501 B-Advanced Computer Networks

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Advanced Computer Networks
Subject Code	SCMPME – 501 B
Marks	25 Marks
Practical	15 Lab

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

SCMPME-501 C - Internet of Things (IoT)

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Internet of Things (IoT)
Subject Code	SCMPME-501 C
Marks	60 Marks
Lectures	50 Lectures

Learning Objectives:
   i.   To study the fundamentals about IoT
  ii.   To study about IoT Access technologies
 iii.   To study the design methodology and different IoT hardware platforms.
  iv.   To study the basics of IoT supporting services.
   v.   To study about various IoT case studies and industrial applications.

Course Outcomes:
After successful completion of this course, students should be able to:
- Understand the basics of IoT.
- Implement the state of the Architecture of an IoT.
- Understand design methodology and hardware platforms involved in IoT.

Unit I: Basics of IoT Networking   **9Hrs**

Overview of Internet of Things, Wireless Sensor Networks, Machine-to-Machine
Communications Cyber Physical Systems

Unit II: Introduction to Internet of Things   **9 Hrs**
        Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT
Networking Components, Addressing Strategies in IoT

Unit III: IoT Sensors, Actuators and Microcontroller devices   8 Hrs

Sensors, Sensor Characteristics, Sensing Types, Actuators, Actuator Characteristics, Actuator Types, Arduino, Raspberry Pi

Unit IV: Processing in IoT   8 Hrs

Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations

Unit V: IoT Connectivity Technologies   8 Hrs

IEEE 802.15.4, Zigbee, RFID, DASH7, NFC, Z-Wave, Cloud Computing, Virtualization, Cloud Models, Sensor-Cloud: Sensors-as-a-Service, Fog Computing and Its Applications

Unit VI: Application Areas and Futures of IoT   8 Hrs

Agricultural IoT, Components of an agricultural IoT, Advantages of IoT in agriculture, Smart irrigation management system, Vehicular IoT, Components of vehicular IoT, Advantages of vehicular IoT, Healthcare IoT, Components of healthcare IoT, Advantages and risk of healthcare IoT, Evolution of New IoT Paradigms, Challenges Associated with IoT, Emerging Pillars of IoT

References:

1. Introduction to IoT by SudipMisra, Anandarup Mukherjee, Arijit Roy | Publication Cambridge University Press | ISBN 9781108842952, ISBN 9781108959742.

SCMPME-501 C - Internet of Things (IoT)

Name of Course	M.Sc. (CM) S Y
Semester	III
Name of Subject	Internet of Things (IoT)
Subject Code	SCMPME-501 C
Marks	25 Marks
Practical	15 Lab

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

M. Sc. CM SY

Name of Course	M.Sc. (CM) SY
Semester	IV
Name of Subject	Python Programming
Subject Code	SCMPMC-551
Marks	80 Marks
Lectures	50 Lectures

SCMPMC-551Python 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 Outcome

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   10Hrs

1.1 Introduction to Python

1.2 Features of python

1.3 Installing python on windows

1.4 Python Interpreter

1.5 Data types, Variables, Comments,

Operators, expressions; input, processing and output statements

UNIT II:Control Structures: loops and decision   8Hrs

2.1 If Statement

2.2 elif statement

2.3 For

2.4 While

2.5 Break and Continue

UNIT III:String Handling, Classes, Modules and Package   10Hrs

3.1 Strings, String operations and String Slicing

3.2 Defining Classes

3.3 Defining and calling functions passing arguments to functions

3.4 Python and OOP – Inheritance, polymorphism

3.5 Modules – datetime, math

3.6 Packages-NumPy, SciPy, Pandas, Matplotlib

UNIT IVException Handling and Collections   10Hrs

4.1 Exception in python

4.2 Exception roles

4.3 Exception Handling

4.4 Collections in Python – List, Tuples, Dictionaries, Sets

UNIT VGUI Programming   6Hrs

5.1 Graphical User Interfaces

5.2 Using the tkinter Module

5.3 Creating Label, Text, Button, info Dialog Boxes, Radiobutton, Checkbutton

5.4 Getting Input

UNIT VIDatabase Connectivity Using Python **6Hrs**

6.1 Importing MySQL for Python

6.2 Connecting with a database

6.3 Forming a query in MySQL

6.4 Passing a query to MySQL

References: -

1. Mark Lutz, Learning Python, 5th Ed. O"REILLY

2. Tony Gaddis, STARTING OUT WITH Python, Addison-Wesley

3. John Paul Mueller, Beginning Programming with Python for Dummies

4. Albert Lukaszewski, MySQL for Python, Packet Publishing

SCMPMCP-551Python Programming

Name of Course	M.Sc. (CM) SY
Semester	IV
Name of Subject	Python Programming
Subject Code	SCMPMCP-551
Marks	25 Marks
Practical	15 Lab

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

SCMPMC-552 Advanced Java Programming

Name of Course	M.Sc. (CM) SY
Semester	IV
Name of Subject	Advanced Java Programming
Subject Code	SCMPMC-552
Marks	80 Marks
Lectures	50 Lectures

Course 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   9 Hrs

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

Unit II: Collection Framework 9 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 8 Hrs

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

Unit VI JSP 8 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.

3. SCMPMCP-552 Advanced Java Programming

Name of Course	M.Sc. (CM) SY
Semester	IV
Name of Subject	Advanced Java Programming
Subject Code	SCMPMCP-552
Marks	25 Marks
Practical	15 Lab

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

SCMPME-A 551NoSQL and MongoDB

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	NoSQL and MongoDB
Subject Code	SCMPME-A 551
Marks	60 Marks
Lectures	50 Lectures

Course Objectives
1. Understand the fundamentals of NoSQL databases and MongoDB.
2. Learn basic operations and commands in MongoDB.
3. Understand data modeling techniques specific to MongoDB.

Course Outcome
1. Students will learn how to configure sharding in MongoDB, including choosing appropriate shard keys and setting up shard clusters.
2. Students will understand MongoDB's consistency models, including eventual consistency and strong consistency, and their implications on data operations.

Unit I: Introduction to NoSQL and MongoDB 6 Hrs.
Introduction to NoSQL databases, Overview of MongoDB, MongoDB data model and document-oriented storage

Unit II: MongoDB Basics **8 Hrs.**
CRUD operations in MongoDB, Querying documents, Indexing and aggregation framework

Unit III: Data Modeling in MongoDB **8 Hrs.**
 Schema design principles: Normalization vs. Denormalization, Use of Embedded Documents, Data Access Patterns, Scalability, Embedded documents and arrays, Referencing and demoralization.

Unit IV: Polynomial Regression and Interaction Models **8 Hrs**.
Polynomial Regression Models, Interaction Between Variables, Centering and Scaling Predictors, Regression Models with Categorical Predictors

Unit V: Advanced MongoDB Features   **10 Hrs.**

Sharding and Replication: Sharding, Replication, Transactions and Consistency: Transactions, Consistency

Security and Authentication, Authentication, Authorization, Encryption:

Unit VI: Application Development with MongoDB   **10 Hrs.**

MongoDB drivers and APIs, Integration with programming languages, Building sample applications

TextBooks:

MongoDB: The Definitive Guide" (3rd Edition) by Shannon Bradshaw, Kristina Chodorow

ReferenceBooks:
1. "MongoDB Applied Design Patterns" by Rick Copeland
2. "MongoDB Security Guide" by Saurabh Jain"
3. "MongoDB Performance Tuning" by Michael Harrison

SCMPME-A 551NoSQL and MongoDB

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	NoSQL and MongoDB
Subject Code	SCMPME-A 551
Marks	25 Marks
Practical	15 Lab

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

SCMPME-B 551Web Application with MVC Core

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	Web Application with MVC Core
Subject Code	SCMPME-B 551
Marks	60 Marks
Lectures	50 Lectures

Course Objectives

1. UnderstandthebenefitsofMVCdesignovertraditionalASP.NETWeb Forms.

2. AcquiringsufficientknowledgeonroleofModel,ViewandControllerin integratingthemto

Developcompleteweb application

3. UnderstandhowRoutingAPImapsrequeststoactionmethodsincontroller.

Course Outcome

1. Understandingandapplyingvalidationframeworkforbothclientandservervalidations.

2. AccessdatabasesandperformingCRUDoperationsusingLINQandEntityFramework

3. Implementsecurityin ASP.NetCoreapplications.

UNIT I: IntroductiontoASP.NETCore   9

Introduction, what is ASP.NET Core?,ASP.NET Core Features, Advantages of
ASP.NETCore,MVCPattern,Understanding ASP.NET Core MVC,ASP.NET Core vs.ASP.NET
MVC vs ASP.NET WebForms,ASP.NETCore Environment Setup,ASP.NETCore First
Application Project Layout,Understanding LifeCycle of ASP.Net Core Request.

UNIT II: Controllers Action Methods and View   9

Controllers Overview,Action Methods and IActionResultobject,passing data from Controller to
View,Understanding Action Selectors,ActionFilters,Building Custom
ActionFilters,Asynchronous ActionMethods,Introducing Razor View,Advantages of
RazorView,Razor

Syntax,Types of Views, Partial Views

UNIT III: Helpers and Model Binding   8

Html Helpers,Built-In Html Helpers,URLhelpers,TagHelpers,CustomTagHelpers,Html Form behavior,Model Binder Overview,Default Model Binder

UNIT IV Validations&DataAnnotations, StatemanagementTechniques8

Data Annotations and Validations Overview,Validations with Data Annotation,Server Side and Client Side Validation,Custom Server side validation,Model level validation using IValidatable Object,Custom unobstrive Client side Validation,Cookies,Sessions

UNIT V Security, MVCandEntityFrameworkCore, WebCaching 8

Authentication and Authorization, Implementing Security using ASP.NET Core Identity, Basic CRUD Operations using Entity Framework,Writing Generic Class /Caching in Repository, Cache Tag Helpers, Memory Caching Introduction, In-Memory Caching, Response Cache, Distributed Cache

UNIT VI Routing, ModuleDevelopment, WebAPIandJQueryAjax 8

Url Routing Overview, Custom Routes, Attribute Routing, Routing Constraints, Understanding Areas, Adding Areas, Defining Area Routes, linking between Areas, Introduction to Web API, AJAX implementation using jQuery, Calling the Web API with jQuery Ajax, creating a Web API that Supports CRUD Operations.

References: -

1. PROGRAMMING ASP.NET CORE Paperback – 1 January 2019 by Dino Esposito (Author)

2. ASP.NET Core in Action, Second Edition, Andrew Lock, March 2021

SCMPME-B 551Web Application with MVC Core

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	Web Application with MVC Core
Subject Code	SCMPME-B 551
Marks	25 Marks
Practical	15 Lab

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

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	Web Application with MVC Core
Subject Code	SCMPME-C 551
Marks	60 Marks
Lectures	50 Lectures

SCMPME-C551DevOps Fundamental

Learning Objectives:

1.DevOps Fundamental course would enable the students in understanding
   Basics of DevOps, Its Life Cycle, Integration and Deployments.
2.To Introduces Cloud Infrastructure with Terraform and Deployment with Packer
3.Understanding DevOps CI/DI PilelineVersion Control with Git, Git, Jenkins & Maven
   Integration
4.To Introduce the process of Continuous Integration and Continuous Delivery
5.To Introduces the tools Docker and Kubernetes
6.Understands the tools for testing applications

Course Outcomes:

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

1.Understands the basics of DevOps and its Operations
2.Learns Terraform and Deployment with Packer
3.Understands the different Tools: Git, Jenkins &Mave
4.Learns NuGet, Docker and Kubernetes
5.Understands the use of Postmans

Unit I: Introduction to Devops   9

What Is Devops, Benefits of working in a DevOps environment, History of Devops, DevOps
Main Objectives, DevOps and Software Development Life Cycle: Waterfall Model, Agile Model

DevOps Stages, Continuous Integration & Deployment: Jenkins Containers and Virtual,
Development: Docker, Vagrant, Configuration Management Tools: Ansible, Puppet, Chef,
DevOps Delivery Pipeline, Understanding IAC Practices

Unit II: Provisioning Cloud Infrastructure with Terraform and Deployment with Packer   9

Technical Requirements, Installing Terraform, Configuring Terraform for Azure, Writing a
Terraform scripts to deploy Azure Infrastructure, Deploying the Insfracture with Terraform,

Terraform Command Line and Life Cycle, Overview of Packer, Creating packer Template for Azure VMs with Scripts, Executing Packer

Unit III: DevOps CI/DI PilelineVersion Control with Git, Git, Jenkins & Maven Integration   8

Version Control Preview, Git Introduction Preview, Git Installation, Commonly used commands in Git, Working with Remote repository, Branching and merging in Git Preview, Merge Conflicts, Stashing, Rebasing, Reverting and Resetting, Git Workflows

UNIT IV Continuous Integration and Continuous Delivery   8

CI/CD Principles, Using Package Manger- NuGet and npm, Introduction to Maven, Maven Architecture, Introduction to Continuous Integration, Introduction to Jenkin, Jenkins Architecture, Plugin Management in Jenkins Preview, Jenkins Security Management, Notification in Jenkins, Jenkins Master-slave architecture, Jenkins Delivery Pipeline, Jenkins Declarative pipeline, Using Azure Pipelines

Unit V: Containerized Application with Docker and Kubernetes   8

Installing Docker, Creating Dockerfile, Building and Running Container on a Local Machine, Pushing an Image to Docker Hub, Deploying a Container to ACI with a CI/CD Pineline, Managing Containers Effectively with Kubernetes- Installing Kubernetes, Kubernetes Architecture Overview, Installing Kubernetes Dashboard, First Example of Kubernetes Application Deployments,

Unit VI: Testing Your Applications   8

Creating Postman Collection with Requests, Installing Postman, Creating Collections, Creating Our First Request, Using Environments and Variables to Dynamizerequests ,Writing postman tests, Executing's Postman request tests locally, Understanding the Newman Concepts, Preparing Postman Collection for Newman, Running the Newman Command Line, Integration of Newman in the CI/CD pipeline process.

References:
1. Learning DevOps: The complete guide to accelerate collaboration with Jenkins By Mikael Krief
2. The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations Kindle Edition
3. DevOps: A Complete Beginner's Guide to DevOps Best Practices
   Volume 1 of 1 Series, Jim Lewis, Publisher: Independently Published, 2019, ISBN 1673259146, 9781673259148
4. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale 1st Edition, Kindle Edition

SCMPME-C 551DevOps Fundamental

Name of Course	M.Sc. (CM) S Y
Semester	IV
Name of Subject	DevOps Fundamental
Subject Code	SCMPME-C 551
Marks	25 Marks
Practical	15 Lab

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