॥ 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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

Established on 17th September, 1994. Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून राष्ट्रीय शैक्षणिक धोरणानुसार पदव्यूत्तर द्वितीय वर्षाचे अभ्यासक्रम लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदव्यूत्तर 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 संबधित 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 Science

Under the Faculty of

Science and Technology

Effective from Academic year 2023 – 2024

(As per NEP-2020)

Swami RamanandTeerthMarathwada 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)

(Second Year)

Introduced from Academic Year 2024-2025

Swami RamanandTeerthMarathwada University, Nanded

Faculty of Science and Technology

NEP-2020 oriented Structure of Two Years Post Graduate Program

Subject: Computer Science (Affiliated Colleges) Second Year

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

Program Specific Syllabus: Third Semester
Computer Science

Core Courses Code	Title	Remarks Credits
SCMPSC-501	Image Processing using Python	04
SCMPSC-502	Hibernate and Spring Framework	04
SCMPSC-503	Block Chain Technology	04
SCMPSCP-501	Lab 7:IP Using Python Lab	01
SCMPSCP-502	Lab 8: Hibernate and Spring Lab	01
SCMPSE-501	**Chose any one** A. Data Science with Python B. Network and Linux Administration C. Advanced Computer Networks D. Internet of Things E. Subject relevant MOOC (NPTEL / SWAYAM / RUSA sponsored Future Oriented Courses / Other recognized	03 Theory and 01 Lab
SCMPSR-501	Research Project	04

Program Specific Syllabus: Fourth Semester
Computer Science

Core Courses Code	Title	Remarks Credits
SCMPSC-551	Web Application with MVC Core	04
SCMPSC-552	Introduction to AI and ML	04
SCMPSCP-551	Lab 9: MVC Lab	01
SCMPSCP-552	Lab 10: ML Lab	01
SCMPSE-551	**Chose any one** A. Database Administration B. Data Mining and Data Warehousing C. DevOps Fundamental	03 Theory and 01 Lab
SVECP -551	Publication Ethics	02
SCMPSR-551	Research Project	06

M. Sc. 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	SCMPS-501 to SCMPSC-503	All Core Course	12	--	12	12	--
Elective	SCMPSE-501 and SCMPSE-551	All Elective Courses	03	--	03	03	--
Special Courses	SCMPSR-501	Research Project	--	04	04	--	02
Major Practical	SCMPSCP-501 to SCMPSCP-502	All Core labs	--	02	02	--	02
Elective Practical	SCMPSE-501	Elective lab	--	01	01	--	01
Total Credits per semester			**15**	**07**	**22**	**15**	**05**

M. Sc. 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	SCMPSC-551 to SCMPSC-552	All Core Course	08	--	08	08	--
Elective	SCMPSE-551	All Elective Courses	03	--	03	03	--
Special Courses	SCMPSR-551	Research Project	--	06	06	--	04
Special Courses	SVECP -C551	Publication ethics	--	02	02		01
Major Practical	SCMPSCP -551 and SCMPSCP -552	All Core labs	--	02	02	--	02
Elective Practical	SCMPSE-551	Elective lab	--	01	01	--	01
Total Credits per semester			**11**	**11**	**22**	**11**	**08**

M. Sc. 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)	
SCMPSC-501 to SCMPSC-503 andSCMPSC-551 to SCMPSC-552	All core courses	20	20	20	80	--	--	100
SCMPSE-501 and SCMPSE-551	All elective courses	15	15	15	60	--	--	75
Special Courses	SCMPSR-501	--	--	--	--	25	75	100
Special Courses	SCMPSR-551	--	--	--	--	50	100	150
Special Courses	SVECP -C551	--	--	--	--	20	30	50
SCMPSCP-501 to SCMPSCP-502SCMPSCP -551 and SCMPSCP -552	All Core Labs	--	--	--	--	05	20	25
SCMPSE-501and SCMPSE-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.**

%%%%%

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSC-501Image Processing using Python

Learning Objectives:

i. To understand digital image processing principles.
ii. To apply image processing techniques and to implement image enhancement and restoration.
iii. Perform image segmentation and object detection.
iv. To extract features for analysis and classification.
v. To develop Python applications for image processing tasks

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Acquire proficiency in digital image processing fundamentals.
- Demonstrate competence in utilizing Python for image processing.
- Execute techniques for image enhancement and restoration effectively.
- Successfully perform image segmentation and object detection.
- Employ feature extraction methods for analysis and classification tasks.
- Create functional Python applications tailored for image processing purposes.

Unit I: Introduction to Digital Image Processing 8 Hrs.

Basics of digital images, Image representation (grayscale, RGB, etc.), Image acquisition and sampling, Histogram equalization, Spatial domain methods (e.g., filtering), Frequency domain methods (e.g., Fourier transform)

Unit II: Image Restoration 8 Hrs.

Image degradation models, Noise reduction techniques, Image Blurring and sharpening, Thresholding techniques, Edge detection of Image, Region-based segmentation, Texture analysis, Shape descriptors, Corner detection

Unit III: Introduction to Python Libraries for Image Processing 8 Hrs.

Overview of OpenCV, scikit-image, and NumPy, Installation and setup

Unit IV: Image Processing with OpenCV and scikit-image 8 Hrs.

Loading and displaying images, Basic image operations, Filtering and convolution, Image manipulation and transformation, Segmentation algorithms, Feature extraction

Unit V: Feature Extraction 8 Hrs.

Introduction to feature extraction, Texture analysis using gray-level co-occurrence matrix (GLCM), Shape descriptors: Hu moments, Fourier descriptors

Unit VI: Applications of Image Processing 8 Hrs.

Medical image processing: MRI and CT image analysis, Remote sensing applications: satellite image processing, Computer vision applications: object detection and recognition

References:

1. Gonzalez, R.C., Woods, R.E., &Eddins, S.L. (2018). Digital Image Processing Using MATLAB.
2. Szeliski, R. (2010). Computer Vision: Algorithms and Applications.
3. Burger, W., & Burge, M.J. (2016). Digital Image Processing: An Algorithmic Approach with MATLAB.
4. Sonka, M., Hlavac, V., & Boyle, R. (2014). Image Processing, Analysis, and Machine Vision.

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSCP-501Image Processing using Python

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSC-502- Hibernate and Spring Framework

Learning Objectives:

i. To Access databases with JDBC and Hibernate.
ii. To Acquire knowledge on creation of software components using Spring Framework.
iii. To Learn safe and maintainable techniques for programming with AOP.
iv. To Understand REST, and use Spring MVC to build RESTful services.
v. To learn the creation of pure Dynamic Web Application using Spring MVC.
vi. To understand how to build complex UIs using Spring Boot.
vii. To be familiar with using Spring Boot starters and start.spring.io to easily create new applications.

Course Outcomes:

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

- Implement the web based applications using JDBC and Hibernate.
- Implement web based applications using features of Spring Framework.
- Apply the concepts of server side technologies for dynamic web applications using Spring MVC.
- Use the core principles of Spring, and of Dependency Injection (DI) / Inversion of Control.
- Integrate Spring MVC with technologies such as Hibernate.
- Learn how to build a simple MVC application using Spring Boot
- Configure database connectivity via Spring Boot

Unit I: ORM and Hibernate **10 Hrs.**

Introduction to ORM Framework, ORM advantages, Hibernate Introduction, Hibernate Architecture, Hibernate Session, Hibernate SessionFactory, Hibernate Configuration, Mapping, Mapping with Annotations, Hibernate Aggregation, Hibernate Named Queries, Hibernate Native SQL, HQL- Hibernate Query Language

Unit II: Working with Hibernate Objects **12 Hrs.**

Hibernate Object States, Insert Object, Retrieve Object, CURD Operations, hibernate with annotations, Hibernate Query Language, Criteria Query, Native SQL, Hibernate Mapping

Unit III: Introduction to Spring **8 Hrs**.

Spring Features, Spring Architecture, Spring Core, Bean Configuration file,
Inversion of Control, Dependency Injection, Auto Wiring

Unit IV: Spring MVC **8 Hrs.**

MVC Overview, Introduction to Spring MVC, Work flow in Spring MVC, Components of Spring MVC, Spring Annotations, First Spring MVC Application

Unit V: Spring MVC and Hibernate **6 Hrs**.

Spring MVC Form Handling, Spring MVC Application with Form Handling, Spring-Hibernate Application

Unit VI: Introduction to Spring Boot **12 Hrs**.

Overview of Spring Boot, Spring Boot Layers, Spring Boot Flow Architecture, Hello World example, Spring Boot Dependency Injection, Singleton Scope, Prototype Scope, Auto wiring, Spring Boot Web App, Spring Boot MVC and JPA H2

References:

1. Beginning Hibernate: For Hibernate 5, Fourth Edition, Joseph B. Ottinger Jeff Linwood Dave Minter, APress Publication
2. Spring Framework Cookbook, Java Code Geeks.
3. Introducing Spring Framework, Felipe Gutierrez, APress Publication
4. Spring MVC: A Tutorial, Second Edition, Paul Deck, Brainy Software.
5. Spring MVC Beginner's Guide, Second Edition, AmuthanGaneshan, Packt Publishing Ltd

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSCP-502- Hibernate and Spring Framework

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSC-503- Block Chain Technology

Learning Objectives:

i. This course is intended to study the basics of Block chain technology.
ii. During this course student will explore various aspects of Block chain technology like application in various domains.
iii. Students will able to understands Bitcoin, Ethereum, Hyper ledger, Solidity Programming
iv. By implementing learner will have idea about private and public Blockchain, and smart contract.

Course Outcomes:

After the completion of this course, student will be able to

- Understand and explore the working of Block chain technology (Understanding)
- Analyze the working of Smart Contracts (Analyze)
- Understand and analyze the working of Hyperledger (Analyze).
- Apply the learning of solidity and de-centralized apps on Ethereum (Apply).

Unit I: Introduction of Cryptography and Blockchain 10 Hrs.

Model of decentralization, What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions And Blocks, P2P Systems, Basics of Cryptography, Keys As Identity, Digital Signatures, Hashing, and public key cryptosystems, Private vs. public Blockchain.

Unit II: BitCoin and Cryptocurrency 12 Hrs.

What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, BlockchainAnd Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency

Unit III: Introduction to Ethereum 10 Hrs.

What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Metamask Setup, Ethereum Accounts, Receiving Ether's What is a Transaction? Smart Contracts.

Unit IV Introduction to Hyperledger 12 Hrs.

Permission less model and Open Consensus, Proof or Work(PoW) and its Limitation, Beyond PoW, Introduction to Hyperledger: What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger& Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer, Enterprise Block-Chain

Unit V: Solidity Programming: **08 Hrs.**

Solidity - Language of Smart Contracts, Installing Solidity &Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address)

Unit VI: Blockchain Security and Applications **08 Hrs.**

Hyper ledger Aries, Blockchain Security, Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins

References:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction Antonopoulos and G. Wood, Mastering Ethereum.
2. D. Drescher, Blockchain Basics. Apress, 2017.
3. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials
4. Ethereum Development Resources - https://ethereum.org/en/developers

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501- A. Data Science with Python

Objectives:

i. This course's goal is to expose undergraduate students to data science using Python.
ii. To develop the abilities necessary to manage, examine, and visualize data, use fundamental machine learning strategies, and comprehend real-world data science applications.

Outcomes:

- Students are able to Use Python for data processing, analysis, and visualization.
- Use exploratory data analysis to uncover new information in datasets.
- Students understand to Utilize scikit-learn to implement core machine learning algorithms.
- Real-world case studies can help Student better comprehend the actual use of data science in many fields.

Unit I: Introduction to Data Science and Python 8Hrs.

What is data science and its applications?Introduction to Python and Jupyter Notebooks. Basic Python data types, variables, and operators**.**

Unit II: Data Handling with Python 10Hrs.

Working with data structures: lists, dictionaries, and tuples.Data manipulation using NumPy and Pandas.Data cleaning, handling missing values, and data transformation.

Unit III: Data Visualization with Matplotlib and Seaborn 8Hrs.

Introduction to data visualization. Creating basic and advanced plots using Matplotlib and Seaborn.Data presentation and storytelling through visualizations.

Unit IV: Exploratory Data Analysis (EDA) 8Hrs.

Conducting EDA to understand datasets.Descriptive statistics and data profiling. Data distribution, outliers, and correlation analysis.

Unit V: Introduction to Machine Learning with Python 8Hrs.

Understanding supervised and unsupervised learning. Building and evaluating machine learning models in scikit-learn, Linear regression and logistic regression for predictive modeling.

Unit VI: Data Science Applications and Case Studies 8Hrs.

Introduction to Data Science Applications, Case Studies and Use Cases, Hands-On Analysis

Ethical Considerations

References:

1. "Python for Data Analysis" by Wes McKinney
2. "Data Science for Dummies" by Lillian Pierson and Jake VanderPlas
3. "Introduction to Machine Learning with Python" by Andreas C. Müller & Sarah Guido
4. "Python Data Science Handbook" by Jake VanderPlas

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501- A. Data Science with Python

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501 B.Linux Administration

Course Objectives:

i. To describe the relationship between GNU and Linux
ii. To describe various operating system concepts such as multitasking, virtual memory and multiuser environments as they apply to Linux.

Course Outcome:

- Students will be able carry the duties of a Unix system administer.
- Students will learn to do file processing, process management, IO management, queues management, networking, storage backup, account management, proper system start-up and shutting down, as well as other tasks.

Unit I:Introduction to RED Hat LINUX **8 Hrs.**

Hardware Requirements, Red Hat LINUX Installation, Advantages of LINUX, Other LINUX distributions, Concept of Linux loader

Unit II: Working with Linux **8 Hrs.**

LINUX file system, Shells, Text editors, Changing User Information, File Permissions, Virtual Consoles

Unit III: The X Window System **8 Hrs.**

Basic X window system, Configuring X window systems, Starting X, Selecting & using X window.

Unit IV:Managing Services, Software & System Resources **8 Hrs.**

LINUX Boot Process, System services and run levels, controlling services at boot with administrative tools, Starting and stopping services manually

Unit V: Managing Software & System Resources **8 Hrs.**

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 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 Reference Books:

References:

1. Red Hat Linux Unleashed, Edition illustrated reprint, “Bill Ball, David Pitts”, Sams, 2001, ISBN 0672319853, 9780672319853.
2. Red Hat Fedora 2 Unleashed, Edition illustrated, “Bill Ball, David Pitts”, Sams, 2005, ISBN 067232721X, 9780672327216.

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501B. Linux Administration

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501 C.Advanced Computer Networks

Course Objectives:

i. Describe the role of dynamic routing protocols and place these protocols in the context of
ii. modern network design
iii. Understand N/W protocols like RIP, OSPF & EIGRP according to industry requirement
iv. Study of reference models.

Course Outcome:

- Practical hands-on will help to interconnect the N/W components & design industrial N/w
- Best Practices for configuring dynamic routing protocols
- Best Practices for network troubleshooting.

Unit I: Network Fundamentals **8 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 **8 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 thePacket Forwarding Process, Host Troubleshooting Tips Interface Status, Extended Ping.

Reference Books

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501C. Advanced Computer Networks

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501- D. Internet of Things (IoT)

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 **8 Hrs.**

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

Unit II: Introduction to Internet of Things **8 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.
2. The Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and BeagleBone Black | ISBN: 978-0-07-183521-3
3. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.| ISBN 978-1-11999435-0

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester III)

SCMPSE-501 D.Internet of Things (IoT)

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSC-551Web Application with MVC Core

Learning Objectives:

i. UnderstandthebenefitsofMVCdesignovertraditionalASP.NETWebForms.

ii. AcquiringsufficientknowledgeonroleofModel,ViewandControllerinintegratingthemtodev elopcompleteweb application

iii. UnderstandhowRoutingAPImapsrequeststoactionmethodsincontroller.

iv. LearnhowtoreusecoderenderingHTMLusingcustomHTMLHelpermethodsandTag Helpers.

v. BuildingCustomModelBindersfortypicalconditionsinwhichbuilt-indefaultbindersarenotusable

Course Outcomes:

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

- Understandingandapplyingvalidationframeworkforbothclientandservervalidations.
- AccessdatabasesandperformingCRUDoperationsusingLINQandEntityFramework
- Implementsecurityin ASP.NetCoreapplications.
- DevelopServiceOrientedRESTfulservicesusingWebAPIfeatureofASP.NETCore.
- BuildanddeployASP.NETCoreapplicationtotheproductionserver.

Unit I: Introduction to ASP.NET Core **8 Hrs.**

Introduction What is ASP.NET Core? ASP.NET Core Features Advantages of ASP.NET Core MVC Pattern Understanding ASP.NET Core MVC ASP.NET Core vs. ASP.NET MVC vs. ASP.NET Web Forms ASP.NET Core Environment Setup ASP .NET Core First Application Project Layout Understanding Life Cycle of ASP.Net Core Request

Unit II: Controllers Action Methods and View **8 Hrs**

Controllers Overview Action Methods and IActionResult object Passing data from Controller to View Understanding Action Selectors Action Filters Building Custom Action Filters Middleware Asynchronous Action Methods Introducing Razor View Advantages of Razor View Razor Syntax Types of Views Partial Views Layout Pages Special Views View Categorization based on Model

Unit III: Helpers and Model Binding **8 Hrs**

Html Helpers Built-In Html Helpers URL helpers Tag Helpers Custom Tag Helpers Html Form Behavior Model Binder Overview DefaultModelBinder Binding to Complex Classes IFormCollection Model Binding IFormFile Model Binder Bind Attribute TryUpdateModelAsync

Unit IV: Validations & Data Annotations, State management Techniques **8 Hrs**

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

Unit V: Security, MVC and Entity Framework Core, Web Caching 8 Hrs

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

Unit VI: Routing, Module Development, Web API and JQuery Ajax 8 Hrs

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 using EF

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSCP-551Web Application with MVC Core

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSC-552Introduction to AI and ML

Learning Objectives:

i. To understand the basic concept of AI & ML.
ii. To understand strength and weakness of problem solving and search algorithms.
iii. To know about basic concepts of knowledge, and reasoning, Machine Learning.
iv. To optimize the different linear methods of regression and classification.
v. To interpret the different supervised classification methods of support vector machine and tree based models

Course Outcomes:

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

- Evaluate Artificial Intelligence (AI) methods and describe their foundations.
- Analyse and illustrate how search algorithms play vital role in problem solving, inference, perception, knowledge representation and learning.
- Demonstrate knowledge of reasoning and knowledge representation for solving real world problems
- Recognize the characteristics of machine learning that makes it useful to real-world problems
- Apply the different supervised learning methods of support vector machine and tree based models.
- Use different linear methods for regression and classification with their optimization through different regularization techniques.

Unit I: Introduction to AI **10 Hrs**

Basic Definitions and terminology, Foundation and History of AI, Overview of AI problems, Evolution of AI, Applications of AI, Classification/Types of AI. Artificial Intelligence vs Machine learning. Intelligent Agent: Types of AI Agent, Concept of Rationality, nature of environment, structure of agents. Turing Test in AI.

Unit II: Problem Solving **10 Hrs**

Search Algorithms in Artificial Intelligence: Terminologies, Properties of search Algorithms, Types of search algorithms: uninformed search and informed search, State Space search Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best-first Search;Beyond Classical Search: Local search algorithms and optimization problem, local search in continuous spaces, online search agent

Unit III: Knowledge and Reasoning **10 Hrs**

Knowledge-Based Agent in Artificial intelligence: Architecture, Approaches to designing a knowledge-based agent, knowledge representation: Techniques of knowledge representation, Propositional logic, Rules of Inference, First-Order Logic, Forward Chaining and backward chaining in AI, Reasoning in Artificial intelligence: Types of Reasoning and Probabilistic reasoning, Uncertainty.

Unit IV: Introduction to ML **10 Hrs**

Introduction to Machine Learning: History of ML Examples of Machine Learning Applications, Learning Types, ML Life cycle, AI & ML, dataset for ML, Data Pre-processing, Training versus Testing, Positive and Negative Class, Cross-validation.

Unit V: Learning **10 Hrs**

Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. Supervised: Learning a Class from Examples, Types of supervised Machine learning Algorithms, Unsupervised: Types of Unsupervised Learning Algorithm, Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection, and Introduction to Principal Component Analysis.

Unit VI: Classification & Regression **10 Hrs**

Classification: Binary and Multiclass Classification: Assessing Classification Performance, Handling more than two classes, Multiclass Classification-One vs One, One vs Rest. Regression: Assessing performance of Regression – Error measures, Overfitting and Underfitting

References:

1. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall
2. J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2016
3. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
4. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI., 2010 S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011.
5. Ric, E., Knight, K and Shankar, B. 2009. Artificial Intelligence, 3rd edition, Tata McGraw Hill.
6. Luger, G.F. 2008. Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson.
7. Alpaydin, E. 2010. Introduction to Machine Learning. 2nd edition, MIT.
8. EthemAlpaydin: Introduction to Machine Learning, PHI 2nd Edition-2013.
9. Nilsson Nils J, “Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSCP-552Introduction to AI and ML

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551A. Database Administration

Learning Objectives:

i. To Introduce the students physical and Logical Structure of database
ii. To aware the students the role of the database administrator

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

- Explain and evaluate the fundamental theories and requirements that influence the design of modern database systems.
- Analyze the background processes involved in queries and transactions, andexplain how these impact on database operation and design

Unit I: Database Architecture **8 Hrs.**

Overview of database, pfile, spfile, Instance, Tablespaces, Datafiles, Other files, Oracle managed Files, Users, Schemas, Indexes, View, Sequences, Synonyms, Privileges, Roles, Clusters, Hash Clusters, Internal memory structure, SGA, PGA, Background processes, External structure, Redo logs, Control files, Trace files, Alert logs, Creating database manually.

Unit II: Hardware configuration and consideration **8 Hrs.**

Architectural overview, Standalone hosts, Standalone hosts with disk array, Standalone, Hosts with disk shadowing, Multiple databases, Networked hosts, Networks of databases, Remote updates, Remote application options, Real application, Clusters, Multiple processors, The parallel query and parallel load options, Client/server databases application, Standby databases

UnitIII: Physical databases layouts **10 Hrs.**

Database file layouts, I/O connections among data files, I/O bottlenecks among all data files, Concurrent I/O among background processes, Defining recoverability and performance goals for the system, Defining the system hardware and mirroring architecture, Database space using overview, Implementation of the storage clause, Locally managed Tablespaces, Dictionary managed Tablespaces, Table segments, Index segments, Rollback segments, Temporary, Free space, Resizing Datafiles, Control files, Online redo log Files Deallocate space from segments, Shrinking Datafiles, Shrinking Tables, Clusters and indexes, Oracle managed files(OFA)

Unit IV: Logical Database Layouts **10 Hrs.**

Describe logical structure of a database, Different types of Tablespaces, Changing the Tablespaces size, allocating segments for temporary segments, Temporary segments in permanents Tablespaces, changing tablespace status, changing tablespace storage settings, Oracle Managed Files (OMFs), Oracle Flexible Architecture (OFA), Different segments types and relationships, Extent usages, Block space utilization.

Unit V: Backup and Recovery **8 Hrs.**

Types of Logical and Physical backups, Implementations, Integrations of backup procedures,NOARCHIVELOG Mode, ARCHIVELOG Mode, Backup Methods –Closed Database Backup, Open Database Backup, Recovery in NOARCHIVELOG Mode, Recovery in ARCHIVELOG Mode, Recovery manager architecture, Recovery Manager Features, Using Recovery manager & RMAN, Using OEM backup manager, Generating lists and reports.

Unit V: Networked ORACLE **8 Hrs.**

Overview of SQL *Net and Net8, connect descriptors, Service names and Listeners, Net8 assistants, the multi-protocol interchange, Dedicated Server Processes, Oracle Shared Server, Benefits of Oracle Shared Server, Client Server application, Database links.

Reference Books:

1. Oracle 9i DBA Handbook, Eighth Reprint - Kevin Lonely, Marlene Theriault Oracle Press, Tata McGraw Hill Publication ISBN-0- 07-048674-3.
2. OCA Oracle 9i Associate DBA Certification Exam Guide, Sixth Reprint, Jason Couchman, Sudheer N. Marish Oracle Press,Tata McGraw Hill Publication,2005, ISBN-0-07-049893-8

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551A. Database Administration

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551B. Data Mining and Data Warehousing

Learning Objectives:

i. To understand the principles of Data warehousing and Data Mining.
ii. To be familiar with the Data warehouse architecture and its Implementation.
iii. To know the Architecture of a Data Mining system.
iv. To understand the various Data Preprocessing Methods.
v. To perform classification and prediction of data.

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

- Understand the usage, need and cost of Data Warehouse
- Learn various techniques for Data Warehouse and Data Mining
- Understand Market Basket Analysis

Unit I: Introduction
Basic Data Mining task, Data Mining Vs Knowledge discovery in databases, Data mining metrics, Social Implication of Data Mining.

Unit II:Related Concepts and Data Mining Techniques
Database/OLTP systems, Information Retrieval, Decision Support Systems, Dimensional Modelling, OLAP, Web Search Engines, Statistical perspective on Data Mining, Decision Tree, Neural networks

Unit III:Classification
Introduction, Statistical based algorithms, Distance based algorithms, Decision tree-based algorithms, Neural network-based algorithm.

Unit IV:Clustering andAssociation Rules
Introduction, Hierarchical algorithms, Partitioned algorithms, clustering large databases, Basic algorithms, Parallel and distributed algorithms

Unit V:Web Mining
Introduction, Web content mining, Web structure mining, Web usage mining

Unit VI:Data Warehousing
Data warehousing Components, building a Data warehouse, Data Warehouse Architecture, DBMS Schemas for Decision Support, Data Extraction, Clean-up, and Transformation Tools

Reference Books:

1. Data Mining Introductory and Advanced Topics, 2008, Margaret H.Dunham and S. Sridhar, Pearson Education, ISBN 81-7758-785-4
2. Data Warehousing Fundamentals, 2009, PaulrajPonniah, Wiley India Publication, ISBN 978-81-265-0919-5

3. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

4. K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.

5. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.

6. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551B. Data Mining and Data Warehousing

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

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551 C.DevOps Fundamental

Learning Objectives:

vi. DevOps Fundamental course would enable the students in understanding Basics of DevOps, Its Life Cycle, Integration and Deployments.
vii. To Introduces Cloud Infrastructure with Terraform and Deployment with Packer
viii. Understanding DevOps CI/DI Pipeline Version Control with Git, Git, Jenkins & Maven Integration
ix. To Introduce the process of Continuous Integration and Continuous Delivery
x. To Introduces the tools Docker and Kubernetes
xi. Understands the tools for testing applications

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

- Understand the basics of DevOps and its Operations
- Learn Terraform and Deployment with Packer
- Understand the different Tools: Git, Jenkins &Mave
- Learn NuGet, Docker and Kubernetes
- Understand the use of Postmans

Unit I: Introduction to Devops
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
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 Pipeline Version Control with Git, Git, Jenkins & Maven Integration
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

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

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 Pipeline, Managing Containers Effectively with Kubernetes- Installing Kubernetes, Kubernetes Architecture Overview, Installing Kubernetes Dashboard, First Example of Kubernetes Application Deployments

Unit VI: Testing Your Applications

Creating Postman Collection with Requests, Installing Postman, Creating Collections, Creating Our First Request, Using Environments and Variables to Dynamize requests, 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.

Reference Books:

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
4. Volume 1 of 1 Series, Jim Lewis, Publisher: Independently Published, 2019, ISBN 1673259146, 9781673259148
5. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale 1st Edition, Kindle Edition

M.Sc. Computer Science

M.Sc.(CS) S. Y. (Semester IV)

SCMPSE-551C. DevOps Fundamental

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