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 वर्षाचा खालील अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

1) M. Sc. II Information Technology (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/**९५०**
दिनांक १२.०७.२०२४

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

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुंल्यमापन 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



स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड.

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

## TWO YEAR MASTERS PROGRAMME IN SCIENCE

# Subject: Information Technology

**Under the Faculty of**

**_Science and Technology_**

Effective from Academic year 2023 – 2024

(As per NEP-2020)

# Swami Ramanand Teerth

# Marathwada UniversityNanded

# 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. Information Technology

(Affiliated colleges - 2 years full time PG Programs)

### *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 : M.Sc. Information Technology**
(2 years full time PG Programs in 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 Program for PG in affiliated Colleges | | | **Major / Mandatory /** | | **Electives/** | | **RM/Other** | **OJT/FP/** | **RP** | | |
| | | | **Theory** | **Practical** | **Theory** | **Practical** | | | | | |
| | | | **(04 credits)** | **(01credits)** | **(04 credits) (03+01)** | | **(02redits)** | **(03 Credits)** | **(04/06 Credits)** | | |
| | | | **SCMP** | | **SCMP** | | | | | | |
| M.Sc. IT | | Third Semester | SMITC-501 SMITC-502 SMITC-503 | SMITCP-501 SMITCP-502 | SMITE-501 | --------- | -------- | --------- | SMITSR-501 | 22 | 66 |
| M.Sc. IT | 6.5 | Fourth Semester | SMITC-551 SMITC-552 | SMITCP-551 SMITCP-552 | SMITE -551 | --------- | SVECP -551 | -------- | SMITSR-551 (06 Credits) | 22 | 88 |
| **Exit Option: After completion of First year as above with 44 credits, student will be awarded PG Diploma in Information Technology\*\*** **\*\*( for students who have done 03 years UG program)** **\*\*( available from AY 2024-2025)** | | | | | | | | | | | |

1. Abbreviations : **S- Science, MIT- M.Sc. Information Technology, D**iscipline **S**pecific **C**ore course  (C- Core Course)
2. Abbreviations : **SMITE- D**iscipline supportive **E**lective **C**ourse  (E- Elective Course)
3. Abbreviations : SVECP-Publication ethics
4. Abbreviations : SMITSR :  Research Project

**Syllabus Third Semester**

| Core Courses Code | Title | Remarks Credits |
|---|---|---|
| SMITC-501 | Database Programming with MS-ACCESS | 04 |
| SMITC-502 | Artificial Intelligence | 04 |
| SMITC-503 | Cloud Computing | 04 |
| SMITCP-501 | Lab 7: Database Programming with MS-ACCESS | 01 |
| SMITCP-502 | Lab 8: Artificial Intelligence | 01 |
| SMITE-501(A) SMITE-501(B) SMITE-501(C) | Chose any one<br>  A. Block chain Technology<br>  B. Computer System Security<br>  C. Advanced Computer Network | 03 Theory and 01 Lab |
| SMITSR-501 | **Research Project** | 04 |

**Syllabus Fourth Semester**

| Core Courses Code | Title | Remarks Credits |
|---|---|---|
| SMITC-551 | RDBMS with ORACLE | 04 |
| SMITC-552 | Computer Vision | 04 |
| SMITCP-551 | Lab 9: RDBMS with ORACLE | 01 |
| SMITCP-552 | Lab 10: Computer Vision | 01 |
| SMITE-551(A) SMITE-551(B) SMITE-551(C) | Chose any one<br>  A. R Programming<br>  B. Network Security<br>  C. Internet of Things (IOT) | 03 Theory and 01 Lab |
| SVECP -551 | Publication Ethics | 02 |
| SMITSR-551 | **Research Project** | 06 |

**Note : Contents of the common courses in campus and affiliated colleges shall be different**

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

| | Course Code | Course Name | Credits Assigned per course | | | Teaching Scheme (Hrs/ week) per course | |
|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Total | Theory | Practical |
| Major | SMITC-501 to SMITC-503 | All Core Course | 04 | -- | **04** | **04** | **--** |
| Elective | SMITE-501 | All Elective Courses | 03 | -- | **03** | **03** | **--** |
| Special Courses | SMITSR-501 | Research Project | -- | 04 | **04** | **--** | **02** |
| Major Practical | SMITP-501 to SMITP-502 | All Core labs | -- | 01 | **02** | **--** | **02** |
| Elective Practical | SMITEP-501 | Elective lab | -- | 01 | **01** | **--** | **01** |
| **Total Credits per semester** | | | **15** | **07** | **22** | **15** | **07** |

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

| | Course Code | Course Name | Credits Assigned per course | | | Teaching Scheme (Hrs/ week) per course | |
|---|---|---|---|---|---|---|---|
| | | | Theory | Practical | Total | Theory | Practical |
| Major | SMITC-551 to SMITC-552 | All Core Course | 04 | -- | **04** | **04** | **--** |
| Elective | SMITE-551 | All Elective Courses | 03 | -- | **03** | **03** | **--** |
| Special Courses | SMITSR-551 | Research Project | -- | 06 | **06** | | 04 |
| Special Courses | SVECP -551 | Publication Ethics | -- | 02 | **02** | **--** | 01 |
| Major Practical | SMITP-551 to SMITP-552 | All Core labs | -- | 02 | **02** | **--** | **02** |
| Elective Practical | SMITEP-551 | Elective lab | -- | 01 | **01** | **--** | **01** |
| **Total Credits per semester** | | | **11** | **13** | **22** | **11** | **10** |
| **Total credits per year** | | | **36** | **20** | **44** | **36** | **17** |

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

| Course Code (2) | Course Name (3) | Theory | | | | | Practical | | Total Col (6+7) / Col (8+9) (10) |
|---|---|---|---|---|---|---|---|---|---|
| | | Continuous Assessment (CA) | | | ESA | | CA (8) | ESA (9) | |
| | | Test I (4) | Test II (5) | Avg of (T1+T2)/2 (6) | Total (7) | | | | |
| SMITC501 to SMITC-503 and SMITC-551 to SMITC-552 | All core courses | 20 | 20 | 20 | 80 | -- | -- | 100 |
| SMITE-501 and SMITE-551 | All elective courses | 15 | 15 | 15 | 60 | -- | -- | 75 |
| Special Courses | SMITSR-501 | -- | -- | -- | -- | 25 | 75 | 100 |
| Special Courses | SMITSR-551 | -- | -- | -- | -- | 50 | 100 | 150 |
| Special Courses | SVECP -551 | -- | -- | -- | -- | 20 | 30 | 50 |
| SMITP-501 to SMITP-502 SMITP-551 to SMITP-552 | All Core Labs | -- | -- | -- | -- | 05 | 20 | 25 |
| SMITEP-501 and SMITEP-551 | All Elective labs | -- | -- | -- | -- | 05 | 20 | 25 |

**Third Semester**

<div align="center">

**Course Code: SMITC-501**

**Paper Title - Database Programming with MS-ACCESS**

</div>

**Course Objective:**

1. Give an introduction about DBMS, data models, a schema, E-R diagram, relational database and benefits of database.
2. To teach the different Types of Queries

**Course Outcome:**

1. Able to design a good database using normalization, decomposition and functional dependency.
2. Able to Create Database, Table, Query, Forms, Reports and Macros,
3. To learn the different Types of Queries.

**Unit I: Introduction to DBMS** 08

Basic Terminology, Data Processing, Traditional Environment, Advantage and Disadvantage of Traditional File Processing System, DBMS Environment/Facilities, Elements of DBMS, Component Of DBMS, Database User, Function, Objective and Benefits of the Database Approach, Characteristic of DBMS, Advantages and Disadvantages of DBMS

**Unit II: Architecture and Data Model** 08

The Three-Level Architecture Data Abstraction, DBA Role, Function and Responsibility

Data Model: Classification, Approaches to the Relational Model, Hierarchical Model and Network Model with an Example, Entity-Relationship Model.

**Unit III: Normalization** 08

Normalization,Normalforms,FunctionalDependency,1NF(First Normal Form), 2NF(Second Normal Form), 3NF(Third Normal Form), Relational Algebra, Codd's Rule, Entity, Entity set, Attributes, Type of Attribute's.

**Unit IV: Working With MS-Access** 14

Elements of an Access database - Tables, Queries, Forms, Reports and Macros. Introduction to MS-Access, Designing Database, Crating Database using Wizard, Working with Table. Field Types-Autonumber, Date/Time, Number, Text, Yes/No, Hyperlink. Creating Tables using Design View and using wizard, Editing Table, Editing Records.

**Unit V: Query and Form Designing Query** 12

Filtering Data, studying different types of queries, Specifying Criteria in Queries, Filter using multiple criteria. Forms, Report and Macro: Procedure to create a Form, Reports and Macros.

**References Books:**

1. Dr.S.B. Kishor,"Database Management System & MS-Access",
   Das Ganu,ISBN:978-93-81660-92-8
2. PhilipJ.Pratt,"DatabaseManagementSystem",CengageLearning,ISBN-81-315-0969-9
3. Panneerselvem,"DatabaseManagementSystems",PHI,ISBN-81-203-2028X.
4. Silberschatz,Korth,Sudarshan"DatabaseSystemConcepts", BPB,ISBN-0-07-120413-X.
5. CalesteRobinson,"Access 97", BPP,1998,ISBN: 81-7029-928-4

**Course Code: SMITC-502**

**Paper Title -   Artificial Intelligence**

**Course Objective:**

1.  To understand the basic concept of AI & ML.
2.  To understand strength and weakness of problem solving and search algorithms.
3.  To know about basic concepts of knowledge, and reasoning, Machine Learning.
4.  To optimize the different linear methods of regression and classification.
5.  To interpret the different supervised classification methods of support vector machine and tree based models

**Course Outcome:**

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

**Unit I:   Introduction to AI                                                                                           10**

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**

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**

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**

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**

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.

**References Books:**

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

**Paper Title -   Cloud Computing**

**Course Objective:**

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.

**Course Outcome:**

1. Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.
2. Analyze the performance of Cloud Computing.
3. Understand the concept of Cloud Security

**Unit I:   Introduction** **12**
Defining Cloud computing, essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Multi-tenancy, Cloud cube model, Cloud economics and benefits, Cloud types and service scalability over the cloud, challenges in cloud NIST guidelines, Virtualization concepts, types and uses of virtualization

**Unit II: Architecture** **08**
Architecture for federated cloud computing, SLA management in cloud computing: Service provider's perspective, performance prediction for HPC on Clouds, Monitoring Tools.

**Unit III: Security** **10**
Cloud Security risks, Security, Privacy, Trust, Operating system security, Security of virtualization, Security risks posed by shared images, Security risk posed by a management OS, Trusted virtual machine monitor

**Unit IV: Cloud Platforms** **10**
Cloud Platforms: Amazon EC2 and S3, Cloudstack, Intercloud, Google App Engine, Open Source cloud Eucalyptus, Open stack, Open Nebulla, etc., Applications

**Unit V: Applications** **10**
Basics and Vision, Applications and Requirements, Smart Devices and Services, Human Computer Interaction, Tagging, Sensing and controlling, Context-Aware Systems, Ubiquitous Communication, Management of Smart Devices, Ubiquitous System Challenge and outlook

**References Books:**
 1. Cloud Computing Principles and Paradigms- Rajkumar Buyya, J. Broberg, A. Goscinski,
Wiley Publishing
 2. Cloud Security: Comprehensive guide to Secure Cloud Computing- Ronald Krutz, Wiley
Publishing
 3. Cloud Computing: Practical Approach- Anthony T. Velte, McGraw Hill

 4. Cloud Security and Privacy- Tim Mather, O"REILLY Publication.

<div align="center">**Course Code: SMITCP-501**</div>
<div align="center">**Course Title: Lab 1: Database Programming with MS-ACCESS**</div>

- At least 15 practical based on syllabus.

<div align="center">**Course Code: SMITCP-502**</div>
<div align="center">**Course Title: Lab 2: Artificial Intelligence**</div>

- At least 15 practical based on syllabus.

## Course Code: SMITE-501(A)
## Paper Title - Block Chain Technology

**Course Objective:**

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

**Course Outcome:**

1. Understand and explore the working of Block chain technology
2. Analyze the working of Smart Contracts
3. Understand and analyze the working of Hyperledger
4. Apply the learning of solidity and de-centralized apps on Ethereum

**Unit I:  Introduction of Cryptography and Blockchain**                                  **10** 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** 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** 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** 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: Blockchain Security and Applications**                                              **06** Hyper ledger Aries, Blockchain Security, Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins

**References Books:**

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

## Block chain Technology LAB

- At least 15 practical based on syllabus.

## Paper Title - Computer System Security

**Course Objective:**

1. To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios

2. To articulate the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques.

**Course Outcome:**

1. To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats

2. To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats

3. To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.

**Unit I:   Computer System Security Introduction**                                                          **10**

Introduction, What is computer security and what to l earn? , Sample Attacks, The Marketplace for vulnerabilities, Error 404 Hacking digital India part 1 chase. Hijacking & Defense: Control Hijacking ,More Control Hijacking attacks integer overflow ,More Control Hijacking attacks format string vulnerabilities, Defense against Control Hijacking - Platform Defenses, Defense against Control Hijacking - Run-time Defenses, Advanced Control Hijacking attacks.

**Unit II: Confidentiality Policies**                                                                                            **10**

Confinement Principle ,Detour Unix user IDs process IDs and privileges , More on confinement techniques ,System call interposition ,Error 404 digital Hacking in India part 2 chase , VM based isolation ,Confinement principle ,Software fault isolation , Rootkits ,Intrusion Detection Systems

**Unit III: Secure architecture principles isolation and leas**                                                    **10**

Access Control Concepts , Unix and windows access control summary ,Other issues in access control ,Introduction to browser isolation . Web security landscape : Web security definitions goals and threat models , HTTP content rendering .Browser isolation .Security interface , Cookies frames and frame busting, Major web server threats ,Cross site request forgery ,Cross site scripting ,Defenses and protections against XSS , Finding vulnerabilities ,Secure development.

**Unit IV: Basic cryptography**                                                                                                  **10**

Public key cryptography ,RSA public key crypto ,Digital signature Hash functions ,Public key distribution ,Real world protocols ,Basic terminologies ,Email security certificates ,Transport Layer security TLS ,IP security , DNS security.

**Unit V: Internet Infrastructure**                                                                                              **10**

Basic security problems, Routing security ,DNS revisited ,Summary of weaknesses of internet security ,.Link layer connectivity and TCP IP connectivity , Packet filtering firewall ,Intrusion detection.

**References Books:**

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
 3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.
5. Cyber Security & Law, Dr. Mdhav M. Bokare, Dr.S.B. Kishor, Das Ganu Prakashan, Nagpur

## Computer System Security Lab

o   At least 15 practical based on syllabus.

**Paper Title -Advanced Computer Network**

**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: Routing Protocol Concepts** 08

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 II: BGP**

BGP characteristics, BGP functionality and message types, BGP message header, BGP – OPEN Message, UPDATE message, KEEPALIVE message, NOTIFICATION message **08**

**Unit III: OSPF and EIGRP** 15

Compare and contrast distance vector and link state routing protocols, OSPF Protocols and Operation, OSPF Neighbors, OSPF Topology Database Exchange, OSPF Configuration, EIGRP Concepts and Operation, Exchanging EIGRP Topology Information, EIGRP Configuring and Verification.

**Unit IV: WAN Technologies** 09

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

**Unit V: Troubleshooting IP Routing** 10

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
2. Data and Computer Communications, William Stallings, Pearson Education
3. Computer Networks, Andrew S. Tanenbaum, Prentice Hall
4. Internetworking with TCP/IP Principles, Protocols and Architecture, Fifth Edition, Douglas E. Comer

**Advance Computer Network Lab**
At least 15 practical based on syllabus.

**Fourth Semester**

<div align="center">

**Course Code: SMITC-551**

**Paper Title - RDBMS with ORACLE**

</div>

**Course Objective:**
1. To expose the students to the fundamentals & basic concepts in relational Data Base Management Systems and SQL.

**Course Outcome:**
1. Outline the fundamental concepts of relational database management systems.
2. Illustrate the transaction management and recovery management techniques adopted in relational database management systems.
3. Write queries, functions, triggers, cursors and views using PL/SQL.
4. Determine various methods of database security and access control techniques and validate the queries by implementing error and exception handling techniques.

**Unit I: Introduction**                                                                          **08**
RDBMS Concept, Introduction to Oracle, SQL Tools, Oracle as Multi-User System, SQL, SQL
*Plus, Getting Started with SQL, Writing SQL Commands, Components of SQL, Data Types, Database Users, Database Objects, Elements of SQL

**Unit II: SQL Languages**                                                                       **12**
**Data Definition Language**: Creation of Table, Viewing Table Structure, Data Integrity through Constraints, Altering Table, Dropping Table, Truncating Table. **Data Retrieval**: Select Command, SQL Operators, Text Search, Group Queries, Order by Clause. **DML Operation**: Insert Update and Delete. **Transaction Control Language**: Commit, Rollback, Save Point Data Control Language: Grant, Revoke.

**Unit III: SQL Function and Database Objects**                                                  **08**
Sql *Functions: Character Function, Case Manipulation, Numeric Functions, Date Function, Conversion Function, Conditional Functions, Nested Functions, Group Functions, and Database Objects: Views, Sequence, Synonym Joins, Set Operator and Sub query.

**Unit IV: PL/SQL**                                                                              **10**
Introduction of PL/SQL: Basic Elements of Programming, Control Statement, Exception Handling: Predefined and User defined Exception, Cursor: Implicit and Explicit Cursor, Implicit and Explicit Cursor Attributes

**Unit V: Subprogram, Package and Trigger**                                                      **12**
Advantages of Subprogram, Stored Subprogram: Creating Procedure, Understanding Parameters: Positional and Named Notation, Parameter mode: In, Out, In Out, Drop Procedure
Function: Creating Stored Function, Function Overloading, Recursion
Packages: Advantages of Packages, Creating Packages
Trigger: Advantages of trigger, Types of Trigger, Creating Tigger, Enabling and Disabling Trigger.

**References Books:**

1. Dr. S. B. Kishor, "ORACLE (SQL & PL/SQL Programming)", Das Ganu, ISBN : 978-81- 921757-5-1

2. Ivan Bayross,"Oracle Developer 2000", BPB, 2006, ISBN : 8/7029-899-7

3. Paul Hipsley, "Developing Client / Server Applications with oracle Developer/2000 TM", Techmedia, 1997, ISBN – 81-87150-02-X

4. Ivan Bayross," Commercial Application Development using Oracle Developer 2000 Forms 6i", BPB, 2003, ISBN : 81-7656-742-6

## Paper Title - Computer Vision

**Course Objective:**

1. Recognize and describe how mathematical and scientific concepts are applied in computer vision.

**Course Outcome:**

1. Identify and interpret appropriate sources of information relating to computer vision.
2. Apply knowledge of computer vision to real life scenarios.
3. Reflect on the relevance of current and future computer vision applications.

**Unit I:  Introduction to Computer Vision                                          10**
Overview of Computer Vision   ,Definition and Applications ,History and Evolution of Computer Vision ,  Basics of Image Formation   ,Camera Models and Parameters ,Image Formation Process ,  Digital Image Representation   ,Image Acquisition ,Image Sampling and Quantization

**Unit II: Image Processing Fundamentals                                          10**
Image Enhancement       ,Spatial Domain Techniques (Contrast Stretching, Histogram Equalization)   ,Frequency Domain Techniques (Fourier Transform, Filtering) ,Image Restoration    ,Noise Models ,Noise Reduction Techniques (Mean Filter, Median Filter) ,Image Segmentation, Thresholding Methods  ,Edge Detection Techniques (Sobel, Canny)  ,Region-Based Segmentation

**Unit III: Feature Extraction and Matching                                          10**
Feature Detection     ,Corner Detection (Harris Corner Detector)  ,Blob Detection (Difference of Gaussians, LOG) ,Feature Descriptors    ,SIFT (Scale-Invariant Feature Transform)  ,SURF (Speeded-Up Robust Features) ,Feature Matching    ,Brute-Force Matching  ,FLANN (Fast Library for Approximate Nearest Neighbors)

**Unit IV: Object Recognition and Classification                                          10**
Object Detection Techniques    ,Template Matching  ,HOG (Histogram of Oriented Gradients)  ,Viola-Jones Face Detector , Object Recognition     ,Bag of Words Model  ,Convolutional Neural Networks (CNNs) ,Classification Algorithms     ,K-Nearest Neighbors (KNN)  ,Support Vector Machines (SVM)  ,Deep Learning Models for Image Classification

**Unit V: Advanced Topics in Computer Vision                                          10**
3D Vision     ,Stereo Vision  ,Structure from Motion  ,Depth Estimation ,Motion Analysis    ,Optical Flow ,Background Subtraction  ,Tracking Algorithms (Kalman Filter, Mean-Shift) ,Applications of Computer Vision      ,Robotics and Autonomous Vehicles ,Augmented Reality and Virtual Reality  ,Medical Image Analysis

**References Books:**
1. "Digital Image Processing"   Authors: Rafael C. Gonzalez, Richard E. Woods    Publisher: Pearson    Year: 2017    ISBN: 978-9332570323
 2. "Computer Vision: Algorithms and Applications"   Author: Richard Szeliski    Publisher: Springer    Year: 2011    ISBN: 978-1848829343
 3. "Learning OpenCV 3: Computer Vision in C++ with the OpenCV Library"   Authors: Adrian Kaehler, Gary Bradski    Publisher: O'Reilly Media    Year: 2016    ISBN: 978-1491937990
 4. "Pattern Recognition and Machine Learning"   Author: Christopher M. Bishop    Publisher: Springer    Year: 2016    ISBN: 978-8132209065
 5. "Computer Vision: A Modern Approach"   Authors: David A. Forsyth, Jean Ponce    Publisher: Pearson   Year: 2015    ISBN: 978-9332550110

**Course Code: SMITCP-551**
**Course Title: Lab 4: RDBMS with ORACLE**

- At least 15 practical based on syllabus.

**Course Code: SMITCP-552**
**Course Title: Lab 5: Computer Vision**

- At least 15 practical based on syllabus.

**Course Code: SMITE-551(A)**
**Paper Title -   R Programming**

**Course Objective:**

1. The basics of statistical computing and data analysis
2. How to use R for analytical programming
3. How to implement data structure in R

**Course Outcome:**

1. Explain critical R programming concepts
2. Demonstrate how to install and configure RStudio
3. Analyse data and generate reports based on the data
4. Apply various concepts to write programs in R

**Unit I:   Introduction to R Programming                                                         10**

Overview of R , History and Features of R,  Installation and Setup,  RStudio IDE,  Basic R Syntax ,  Data Types and Structures,  Variables and Operators,  Basic Input/Output,  R as a Calculator,  Arithmetic Operations,  Logical and Relational Operators

**Unit II: Data Structures in R                                                                           10**

Vectors,  Creating and Manipulating Vectors,    Vectorized Operations,  Matrices ,  Creating Matrices,  Matrix Operations, Subsetting and Indexing,   Lists , Creating Lists, Accessing List Elements,  Data Frames ,   Creating Data Frames, Importing and Exporting Data,   Data Frame Operations,  Factors ,  Creating and Managing Factors, Factor Levels and Labels

**Unit III: Data Manipulation and Visualization                                                 10**

Data Manipulation with dplyr , Selecting, Filtering, and Arranging Data, Mutating and Summarizing Data,  Joining Data Sets, Data Visualization with ggplot2, Grammar of Graphics,   Creating Basic Plots (Histograms, Scatter Plots, Bar Plots), Customizing Plots (Themes, Labels, Colors), Faceting and Advanced Plotting Techniques, Exploratory Data Analysis (EDA), Descriptive Statistics, Correlation and Covariance, Data Cleaning and Transformation

**Unit IV: Statistical Analysis with R                                                                 10**

Basic Statistical Concepts ,  Probability Distributions, Hypothesis Testing, Confidence Intervals, Statistical Tests,
 t-tests and ANOVA, Chi-Square Test, Correlation and Regression Analysis, Advanced Statistical Techniques,   Multiple Regression, Logistic Regression, Time Series Analysis

**Unit V: Advanced R Programming                                                                     10**

Programming in R   ,Functions and Scope ,Control Structures (if-else, loops) , Apply Family of Functions ,  Debugging and Profiling   ,Error Handling ,Debugging Techniques ,Code Profiling and Optimization, Package Development   ,Creating R Packages ,Documenting and Sharing Packages -   R for Machine Learning   ,Introduction to Machine Learning ,Supervised Learning (Classification, Regression) ,Unsupervised Learning (Clustering, PCA) ,Using Caret and Other ML Packages

**References Books:**

1.  "The Art of R Programming: A Tour of Statistical Software Design"    Author: Norman Matloff     Publisher: No Starch Press     Year: 2011     ISBN: 978-1593273842
 2.  "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data"    Authors: Hadley Wickham, Garrett Grolemund    Publisher: O'Reilly Media    Year: 2016    ISBN: 978-1491910399

3. "R Programming for Data Science"   Author: Roger D. Peng   Publisher: Leanpub   Year: 2015   ISBN: 978-1365056825

4. "Hands-On Programming with R: Write Your Own Functions and Simulations"   Author: Garrett Grolemund   Publisher: O'Reilly Media   Year: 2014   ISBN: 978-1449359010

5. "Advanced R"   Author: Hadley Wickham   Publisher: Chapman and Hall/CRC   Year: 2014   ISBN: 978-1466586963

## R programming LAB

- At least 15 practical based on syllabus.

**Course Objective:**

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.

**Course Outcome:**

1. Understand the most common type of cryptographic algorithm
2. Understand the Public-Key Infrastructure
3. Understand security protocols for protecting data on
4. Understand Virtual Private Networks

**Unit I:   Introduction to Network Security                                                        10**

Overview of Network Security , Definition and Importance, Goals of Network Security (Confidentiality, Integrity, Availability) , Types of Network Attacks (Active vs. Passive Attacks), Fundamentals of Cryptography , Basic Terminology (Encryption, Decryption, Keys) , Symmetric and Asymmetric Encryption , Hash Functions and Digital Signatures,  Security Policies and Mechanisms, Security Policy Frameworks , Authentication, Authorization, and Accounting (AAA) ,  Security Models (Bell-LaPadula, Biba)

**Unit II: Network Security Protocols and Standards                                           10**

 Secure Sockets Layer (SSL) and Transport Layer Security (TLS) , IP Security (IPsec) , Secure Shell (SSH) , Wireless Network Security , Wireless Encryption Protocols (WEP, WPA, WPA2) , Securing Wi-Fi Networks , Bluetooth Security, Virtual Private Networks (VPNs) , Types of VPNs (Remote Access, Site-to-Site), VPN Protocols (PPTP, L2TP, OpenVPN) , Implementing and Configuring VPNs

**Unit III: Network Security Devices and Technologies                                        10**

Firewalls, Types of Firewalls (Packet Filtering, Stateful Inspection, Proxy) , Firewall Architectures and Configurations  , Implementing and Managing Firewalls,      Intrusion Detection and Prevention Systems (IDS/IPS)  , Types of IDS/IPS (Network-based, Host-based) , Detection Techniques (Signature-based, Anomaly-based)  , Deploying and Managing IDS/IPS ,  Other Security Devices , Security Information and Event Management (SIEM),  Honeypots and Honeynets, Network Access Control (NAC)

**Unit IV: Threats and Vulnerabilities                                                                  10**

Types of Threats , Malware (Viruses, Worms, Trojans, Ransomware), Denial of Service (DoS) and Distributed DoS (DDoS) Attacks ,  Phishing and Social Engineering ,  Network Vulnerabilities , Common Vulnerabilities (Buffer Overflow, SQL Injection), Vulnerability Assessment and Penetration Testing, Tools for Vulnerability Scanning (Nmap, Nessus), Incident Response,  Incident Response Lifecycle , Developing an Incident Response Plan,  Forensic Analysis

**Unit V: Advanced Network Security Concepts                                                    10**

Advanced Cryptographic Techniques,  Public Key Infrastructure (PKI) , Cryptographic Key Management,   Blockchain for Security, Secure Network Design , Network Segmentation and Zoning,  Designing DMZs (Demilitarized Zones), Security in Cloud Computing, Emerging Security Technologies ,    Artificial Intelligence in Network Security, Zero Trust Architecture

**References Books:**

1. "Network Security Essentials: Applications and Standards"  Author: William Stallings  Publisher: Pearson  Year: 2021  ISBN: 978-9353439381

2. "Cryptography and Network Security: Principles and Practice"  Author: William Stallings  Publisher: Pearson  Year: 2017  ISBN: 978-9332585228

3. "Network Security and Cryptography"  Author: Bernard Menezes  Publisher: Cengage Learning  Year: 2010  ISBN: 978-8131516218

4. "Computer Security: Principles and Practice"  Authors: William Stallings, Lawrie Brown  Publisher: Pearson  Year: 2018  ISBN: 978-9332585778

5. "Security in Computing"  Authors: Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies  Publisher: Pearson  Year: 2015  ISBN: 978-9332550141

## Network Security Lab

At least 15 practical based on syllabus.

**Course Objectives:**
1. To study the fundamentals about IoT
2. To study about IoT Access technologies
3. To study the design methodology and different IoT hardware platforms.
4. To study the basics of IoT supporting services.
5. To study about various IoT case studies and industrial applications.

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

**Unit I: Basics of IoT** 10
Overview of Internet of Things, Wireless Sensor Networks, Machine-to-Machine Communications Cyber Physical Systems Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT

**Unit II: IoT Sensors, Actuators and Microcontroller devices** 10
Sensors, Sensor Characteristics, Sensing Types, Actuators, Actuator Characteristics, Actuator Types, Arduino, Raspberry Pi

**Unit III: Processing in IoT**
Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations

**Unit IV: IoT Connectivity Technologies** 10
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 V: Application Areas and Futures of IoT** 10
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

**IOT Lab**

At least 15 practical based on syllabus.