।। सा विद्या या विमुक्तये ।।

# स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED**

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

25 1994 - 2019 SILVER JUBILEE YEAR

## ACADEMIC (1-BOARD OF STUDIES) SECTION

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**प्रस्तुत विद्यापीठाच्या संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.**

# प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **प्रस्तुत विद्यापीठाच्या संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील प्रथम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहेत.

1. Botany
2. Certificate Course in Industrial Safety, Health and Environmental Management (SHM)
3. Chemistry
4. Computer Application
5. Computer Network
6. Computer Science
7. Geophysics
8. Mathematics
9. M.C.A.
10. Microbiology
11. Physics
12. Zoology

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
**जा.क्र.:** शैक्षणिक–१/परिपत्रक/संकुले/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/२०१९–२०/**४६५**

**दिनांक :** ११.०७.२०१९.

स्वाक्षरित/–
**उपकुलसचिव**
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. संचालक, सर्व संबंधित संकुले, विद्यापीठ परिसर, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

# Swami Ramanand Teerth Marathwada University, Nanded

**(NAAC Re-accredited with 'A' Grade)**

## Syllabus of

# M.Sc. (Computer Network) (Campus)

## (2 years) (Revised CBCS pattern)

## Introduced from Academic Year 2019-2020

## Program code: SCS-S-MCN-PG (13-2-3-01)

# M.Sc. Computer Network (Campus)

**M.Sc. Computer Network** (2years) program / degree is a specialized program in latest advances in computer networking issues. It builds the student on higher studies and research awareness in overall networking issues in IT and ICT fields so as to become competent in the current race and development of new computational sciences. The duration of the study is of four semesters, which is normally completed in two years.

**CBCS pattern**

**The M.Sc. Computer Network** program as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

**Eligibility and Fees**

The eligibility of a candidate to take admission to **M.Sc. Computer Network** program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

**Credit Pattern**

Every course has corresponding grades marked in the syllabus structure. There are 25 credits per semester. A total of 100 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 02 external credits and 02 internal credits. The university shall conduct the end semester examination for 02 external credits. For theory internal credit, student has to appear for 02 class test (15 marks) and 01 assignment (20 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations. There is a special skill based activity of 01 internal credits per semester which shall inculcate awareness regarding the domain of computers, IT, and ICT.

The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective, then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CBCS pattern, students would graduate **M.Sc. Computer Network** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. M.Sc. Computer Network Degree / program would be of 100 Credits. Total credits per semester= 25
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses ( core+elective) = 16 Credits. Two practical / Lab courses= 4 Credits in total (02 credits each) , One Open elective= 4 credit, One skill
3. enhancement activity of 01 credits.
4. One Credit = 25 marks , Two Credits = 50 Marks, Four Credits = 100 Marks

## PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(CN) Campus { SCS-S-MCS-PG (13-2-3-01)}

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

| | |
|---|---|
| PEO I :Technical Expertise | Implement fundamental domain knowledge of core courses for developing effective computer netwrok by incorporating creativity and logical reasoning. |
| PEO II : Successful Career | Deliver professional services with updated technologies in computational science based career. |
| PEO III :Hands on Technology and Professional experience | Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession. |
| PEO IV :Interdisciplinary and Life Long Learning | Undergo higher studies, certifications and research programs as per market needs. |

3. **Program Outcome(s):** Students / graduates will be able to
**PO1:** Apply knowledge of mathematics, science and algorithm in solving Computer problems.
**PO2:** Generate solutions by understanding underlying computer netwrok environment
**PO3:** Design component, or processes to meet the needs within realistic constraints.
**PO4:** Identify, formulate, and solve problems using computational temperaments.
**PO5:** Comprehend professional and ethical responsibility in computing profession.
**PO6:** Express effective communication skills.
**PO7:** Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
**PO8:** Actual hands on technology to understand it's working.
**PO9:** Knowledge of contemporary issues and emerging developments in computing profession.
**PO10:** Utilize the techniques, skills and modern tools, for actual development process
**PO11:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
**PO12:** Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

5. **Mapping of PEO& PO and CO**

| Program Educational Objectives | Thrust Area | **Program Outcome** | Course Outcome |
|---|---|---|---|
| PEO I | Technical Expertise | PO1,PO2,PO3,PO6 | All core courses |
| PEO II | Successful Career | PO4,PO5,PO11, | All discipline specific electives courses |
| PEO III | Hands on Technology and Professional experience | PO8,PO10 | All Lab courses |
| PEO IV | Interdisciplinary and Life Long Learning | PO7,PO9,PO12 | All open electives and discipline specific electives |

**The detailed syllabus is as below,**

**CBCS Revised Syllabus w.e.f AY:2019-2020**
**Program: M.Sc.( Computer Network) – Campus School**
**Program code: SCS-S-MCN-PG (13-2-3-01)**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **First Semester** | | | | | | |
| 1. | **Core Subjects** | NCN-101 | Computer System Organization | 2 | 2 | 4 |
| 2 | | NCN-102 | Computer Network | 2 | 2 | 4 |
| 3 | | NCN-103 | Database Management System | 2 | 2 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | NCN-104 A | Programming Language Concepts | 2 | 2 | 4 |
| | | NCN-104 B | System Analysis and Design | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | NCN-105 | Lab-1: Computer Network | 1 | 1 | 2 |
| | | NCN-106 | Lab-2: DBMS | 1 | 1 | 2 |
| 6 | **Open Elective** | NCN-107A | University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | NCN-107 B | Data Communications | | | |
| 7 | **Skill based Activity** | NCN-108 | SK-01 | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

***NCN- Nanded Campus Computer Network**

**CBCS Revised Syllabus w.e.f AY:2019-2020**
**Program: M.Sc.( Computer Network) – Campus School**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **Second Semester** | | | | | | |
| 1. | **Core Subjects** | NCN-201 | Operating System Concepts | 2 | 2 | 4 |
| 2 | | NCN-202 | Elementary Data Structures and Algorithms | 2 | 2 | 4 |
| 3 | | NCN-203 | Programming in Java | 2 | 2 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | NCN-204 A | Wireless Networking | 2 | 2 | 4 |
| | | NCN-204 B | Distributed Systems | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | NCN-205 | Lab-3: Data Structures | 1 | 1 | 2 |
| | | NCN-206 | Lab-4: Java programming | 1 | 1 | 2 |
| 6 | **Open Elective** | NCN-207A | University recognized MOOC (NPTEL / SWAYAM / Others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | NCN-207 B | Cyber Forensics and Information Security | | | |
| 7 | **Skill based Activity** | NCN-208 | SK-02 | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

**CBCS Revised Syllabus w.e.f AY:2019-2020**
**Program: M.Sc.( Computer Network) – Campus School**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **Third Semester** | | | | | | |
| 1. | **Core Subjects** | NCN-301 | Network Design and Analysis | 2 | 2 | 4 |
| 2 | | NCN-302 | Internetworking Protocols | 2 | 2 | 4 |
| 3 | | NCN-303 | Cloud Computing | 2 | 2 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | NCN-304 A | Switching and Routing | 2 | 2 | 4 |
| | | NCN-304 B | Linux and Network Administration | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | NCN-305 | Lab-5: Network Design and Analysis | 1 | 1 | 2 |
| | | NCN-306 | Lab-6: Linux Administration | 1 | 1 | 2 |
| 6 | **Open Elective** | NCN-307A | University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | NCN-307 B | Mobile Communications | | | |
| 7 | **Skill based Activity** | NCN-308 | SK-03 : Seminar Presentation Activity | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

**CBCS Revised Syllabus w.e.f AY:2019-2020**
**Program: M.Sc.( Computer Network) – Campus School**

| Sr. No | Course category | Course Code | Course Title | Internal credits | External credits | Total credits |
|---|---|---|---|---|---|---|
| **Fourth Semester** | | | | | | |
| 1. | **Core Subjects** | NCN-401 | Mobile Application Development | 2 | 2 | 4 |
| 2 | | NCN-402 | Introduction to Web Technologies | 2 | 2 | 4 |
| 3 | | NCN-403 | Major Project development Activity | 0 | 4 | 4 |
| **Choose any one from below elective subjects** | | | | | | |
| 4 | **Elective Subject** | NCN-404 A | Internet of Things (IoT) | 2 | 2 | 4 |
| | | NCN-404 B | Advanced Operating Systems | | | |
| **Practical /Lab** | | | | | | |
| 5 | **Lab / Practical** | NCN-405 | Lab-7: Mobile Application Development | 1 | 1 | 2 |
| | | NCN-406 | Lab-8: Web Technology | 1 | 1 | 2 |
| 6 | **Open Elective** | NCN-407A | University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR | 4 | 0 | 4 |
| | | NCN-407 B | Client and Server Technology | | | |
| 7 | **Skill based Activity** | NCN-408 | SK-04 | 1 | 0 | 1 |
| | Total credits | | | | | **25** |

| Course Code: | NCN-101 | **Course Name:** Computer System Organization | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

Student need to be understood by looking inside how computer architecture is build.
Study of various components as building block
Architecture of different configuration for different requirement or problem size
Memory and IO related interfacing

**Course Outcome:**

Solve problems based on computer arithmetic
Explain processor structure and its function
Understating micro programming
Understand concepts related to memory and IO mapping
Design and analysis of memory and IO system

**Unit-1:** Basic Structure of Computers

Functional units, basic operational concepts, Bus structures, Software performance, Memory locations and addresses, Memory operations, Instruction and instruction sequencing Addressing modes, Assembly language, Basic I/O operations, Stacks and queues.

**Unit-2:** Arithmetic Unit

Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive numbers, Signed operand multiplication and fast multiplication, Integer division, Floating point numbers and operations.

**Unit-3:** Basic Processing Unit

Fundamental concepts, Execution of a complete instruction, Multiple bus organization, Hardwired control, Micro programmed control

**Unit-4:** Advance Control unit Design techniques

Pipelining, Basic concepts, Data hazards Instruction hazards, Influence on Instruction sets, Data path and control consideration Superscalar operation.

**Unit-5:** Memory System

Basic concepts, Semiconductor RAMs, ROMs , Speed, size and cost, Cache memories Performance consideration, Virtual memory, Memory Management requirements, Secondary storage.

**Unit-6:** I/O Organization

Accessing I/O devices, Interrupts, Direct Memory Access, Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB).

**Text Books:**


| | |
|---|---|
| **1.** | Computer Organization - Carl Hamacher, ZvonkoVranesic and SafwatZaky, 5th Edition McGraw- Hill, 2002. |


**Reference Books**


| | |
|---|---|
| **1.** | Computer Organization and Architecture Designing for Performance- William Stallings, 6th Edition, Pearson Education. |
| **2.** | Computer Organization and Design: The hardware / software interface- David A. Patterson and John L. Hennessy, 2nd Edition, Morgan Kaufmann Press. |
| **3.** | Computer Architecture and Organization- John P. Hayes, 3rd Edition, McGraw-Hill |

| Course Code: | NCN-102 | Course Name: Computer Network | Credits: 4 |
|---|---|---|---|
| | | | |
| **Course Objectives:** | | | |
| To understand the basic concepts of computer network and firm foundation for understanding how data communication occurring using computer network. It is based around the OSI Reference Model which deals with the major issues and related protocol studies in the various layers (Physical, Data Link, Network, Transport, Session, Presentation and Application) of the model. | | | |
| | | | |
| **Course Outcome:** | | | |
| 1.analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;<br>2.specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;<br>3.analyze,specify and design the topological and routing strategies for an IP based networking infrastructure<br>4.Have a working knowledge of datagram and internet socket programming | | | |
| | | | |
| **Unit-1:** | Introduction to computer networks and Internet | | |
| Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet-switching network, protocols layers and their service model, History of the computer network | | | |
| | | | |
| **Unit-2:** | Application Layer | | |
| Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP | | | |
| | | | |
| **Unit-3:** | Transport Layer | | |
| Introduction and transport layer services, Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP), Congestion control. | | | |
| | | | |
| **Unit-4:** | Network Layer | | |
| Introduction, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing | | | |
| | | | |
| **Unit-5:** | The Link layer and Local area networks | | |
| Introduction and link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches. | | | |
| | | | |
| **Unit-6:** | Introduction to LAN | | |
| Devices, Topologies, Tools, Cables, Configuration | | | |
| | | | |
| **Text Books:** | | | |
| **1.** | Computer Networking-A Top-Down approach, 5thedition, Kurose and Ross, Pearson | | |
| **Reference Books** | | | |
| **1.** | Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall | | |
| **2.** | Computer Networking and the Internet (5thedition),Fred Halsall, Addison Wesley | | |
| **3.** | Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill | | |

| Course Code: | NCN-103 | Course Name: Database Management System | Credits: 4 |
|---|---|---|---|

**Course Objectives:**

1. To understand the features of Relational database.
2. To describe data models and schemas in DBMS.
3. To use SQL- the standard language of relational databases for database operations.
4. To understand the functional dependencies and design of the databases.

**Course Outcome:**

1: To study the basic concepts of relational databases
2: Learn and practice data modelling using the entity-relationship and developing database designs.
3: Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.
4: Apply normalization techniques to normalize the databases.

| | |
|---|---|
| **Unit-1:** | Introduction |

Problems in Traditional file oriented approach, Three level architecture of DBMS, basic database components like schema, views, instances, General Architecture of DBMS, Roles of DBA, Data Dictionary, Advantages and Disadvantages of DBMS.

| | |
|---|---|
| **Unit-2:** | DATA Models |

Concepts of Abstraction and Data Model, Discussions on data modeling using Entity Relationship model, Discussions on data modeling using Relational Model, E-R to Relational Conversion.

| | |
|---|---|
| **Unit-3:** | Relational Algebra |

Basics of Relational Algebra, selection, projection, division, cross product Operators Set Operators, Join and its types, writing Relational Algebra notations for user queries.

| | |
|---|---|
| **Unit-4:** | Basic Normalization |

Introduction to attributes, Keys, relationships and their types, Anomalies in databases, understanding Functional Dependencies(Determinant, partial, full, transitive, multi valued, etc), normalization process, First Normal form, Second Normal Form, Third Normal Form etc.

| | |
|---|---|
| **Unit-5:** | Advance Normalization |

Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

| | |
|---|---|
| **Unit-6:** | SQL |

Introduction to data retrieval languages like QBE, QUEL, SQL Discussions on SQL, Table , View Definitions ,DDL Statements, DML Statements, DCL Statements , TCL statements , SQL Functions ,Introduction to PL/SQL , Cursors.

**Text Books:**

| | |
|---|---|
| **1.** | Database Management Systems- Raghu Ramakrishnan, Johannes, Gehrke, Tata McGraw Hill. |
| **2** | Database System Concepts- Silber Schatz Korth, Tata McGraw Hill. |

**Reference Books**

| | |
|---|---|
| **1.** | Fundamental of Database System- Sham Kanth B. Navathe, Pearson Education. |
| **2.** | Introduction to Database management System- Bipin Desai, Galgotia Publications. |
| **3.** | Oracle Development Language Oracle PL/SQL Programming, Steven Feuerstein , O'Reilly |
| **4.** | ORACLE documentations on ORACLE PRESS / Internet. |

| **Course Code:** | NCN-104 A Elective | **Course Name:** Programming Language Concepts | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

1.To help the students understand the fundamental concepts of programming Languages.
2.To prepare students about the need and use of data structures
3.To prepare students to identify and apply data structures for problem solving

**Course Outcome:**

Understanding the concepts of evolution of programming languages.
Understanding the concepts of object oriented languages, functional and logical programming languages
Analyzing the methods and tools to define syntax and semantics of a languages
Analyzing the design issues involved in various constructs of programming languages

| | |
|---|---|
| **Unit-1:** | The role of Programming Languages |

Introduction to Languages, Basic types of languages (Machine, Assembly, High level Languages), Toward Higher-Level Languages, Programming Paradigms, Language Implementation: Bridge the Gap.

| | |
|---|---|
| **Unit-2:** | Language Description: Syntactic Structure |

Expression Notations, Abstract Syntax Trees, Lexical Syntax: Tokens and Spellings, Context-Free Grammars, Grammars for Expressions, Handling Associativity and Precedence.

| | |
|---|---|
| **Unit-3:** | Statements: Structured Programming |

Need for Structured Programming, Syntax-directed Control Flow (conditional, Looping Construct, for, Selection Case) Design considerations: Syntax, Programming with Invariants.

| | |
|---|---|
| **Unit-4:** | Types: Data Representation |

The role of types, Basic types, Arrays: Sequence of elements, Records: Name Fields, Union and Variant Records, Sets, Pointers.

| | |
|---|---|
| **Unit-5:** | Procedure Activations |

Introduction to Procedures, Parameter-Passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope.

| | |
|---|---|
| **Unit-6:** | Logic Programming |

Computing with relations, Introduction to Prolog, Data Structure in Prolog, Programming Techniques, Control in Prolog, cuts.

**Text Books:**


| | |
|---|---|
| **1.** | Programming Languages Concepts and constructs- Ravi Sethi, Pearson Education. |
| **2.** | Concepts of Programming Languages- Robert .W. Sebesta, Pearson Education. |
| **3.** | Programming Language Design Concepts- D. A. Watt, Wiley Dream Tech. |


**Reference Books**


| | |
|---|---|
| **1.** | Programming Languages- A. B. Tucker, R. E. Noonan, 2nd Edition, TMH. |
| **2.** | Programming Languages- K. C. Louden, 2nd Edition, Thomson Press. |

| Course Code: | NCN-104B Elective | **Course Name:** System Analysis and Design | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

System analysis helps in discovering means to design systems where sub-system may have apparently conflicting objectives. It helps in achieving inter compatibility and unity of purpose of sub-systems. It offers a means to create understanding of the complex structures

**Course Outcome:**

After successfully completing this course, students will understand concepts of Analysis and Designing Information Systems. Students will understand writing system proposals, system development scheduling, and cost-benefits analysis etc. also dealing with quality assurance.

1: To learn basic things of systems, System development Life cycle, and System Analyst.
2: To determine specific needs of system.
3: Discuss approaches and tasks of system. Planning for developing system
4: Evaluate tools and techniques.
5: Use appropriate methods and techniques to design software.
6: Implementation of Developed System, Evaluation and Testing of system.

**Unit-1:** Introduction

System Definition, Characteristics, Elements and Types of system, Need of System Analysis and design, Role and Qualities of System Analyst, System Development Life Cycle.

**Unit-2:** Feasibility Study

Project Initiation, Feasibility study, Ascertaining HW/SW needs, Criteria for HW/SW selection, Make v/s Buy Decision, Cost Benefit Analysis.

**Unit-3:** Decision Modules

Structured Analysis tools- DFD, Data Dictionary, Decision Tree, Decision Table, Structured English, Activity planning control, Activity Diagrams, Case modeling, UML, Class Diagram.

**Unit-4:** Scheduling

System Proposal, Project Scheduling, Information Gathering Tools- Interviews, Questionnaire, JAD, Prototyping.

**Unit-5:** Design

System Design, Input/output Design, From Design, Database Design, File organization.

**Unit-6:** Implementation

System Implementation Plan, Activity Network for Conversion, Combating Resistance to Change, System Testing, Test Plan AND test data, Types of System Test, Quality Assurance, Documentation.

**Text Books:**


| | |
|---|---|
| **1.** | System Analysis and Design- Kendall and Kendall, Pearson Education, Inc., Prentice Hall. |


**Reference Books**


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|---|---|
| **1.** | System Analysis and Design- E. M. Awad, Galgotia Publications Pvt. Ltd |
| **2.** | Modern System Analysis and Design - Jeffrey A. Hoffer, Prentice-Hall, Inc. |

| **Course Code:** | NCN-105 | **Course Name:** Lab-1:Computer Network | **Credits: 2** |
|---|---|---|---|

**Course Objectives:**

This course provides students with hands on training regarding the design, troubleshooting, modeling and evaluation of computer networks. In this course, students are going to experiment in a real test-bed networking environment, and learn about network design and troubleshooting topics and tools such as: network addressing, Address Resolution Protocol (ARP), basic troubleshooting tools (e.g. ping, ICMP), IP routing (e,g, RIP), route discovery (e.g. traceroute), TCP and UDP, IP fragmentation and many others. Student will also be introduced to the network modeling and simulation, and they will have the opportunity to build some simple networking models using the tool and perform simulations that will help them evaluate their design approaches and expected network performance

**Course Outcome:**

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in Detail.
3. Study of network IP.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration commands.

| **Course Code:** | NCN-106 | **Course Name:** Lab-2:DBMS | **Credits: 2** |
|---|---|---|---|

**Course Objectives:**

This course aims at giving adequate exposure to students on the Database design and E-R modeling. The course also facilitates students with hands on training on SQL and programming language extension to SQL within the RDBMS environment.

**Course Outcome:**

1: Model Entity Relationship with E-R diagrams
2: Design database schema considering normalization and relationships within database
3: Write SQL queries to user specifications
4: Develop triggers, procedures, user defined functions and design accurate and PLSQL programs in Oracle and DB2.
5: Use the database from a front end application
6: Prepare technical report on the observations of the experiments

6. Creating database objects
7. Modifying database objects
8. Manipulating the data
9. Retrieving the data from the database server
10. Performing database operations in a procedural manner using pl/sql
11. Performing database operations (create, update, modify, retrieve, etc.,) using front-end tools
12. Design and Develop applications like banking, reservation system, etc.,
13. To create a DDL to perform creation of table, alter, modify and drop column.
14. To create a view for the purpose of display in order to hide the data.
15. Study of DCL extensive feature in order to safeguard information stored in its tables from unauthorized viewing and damage. The rights that allow the user of some or all oracle resources on the server are called privileges.
16. To create a single row functions.
17. Study of PL/SQL features
18. To Perform Banking Operations Using Procedures
19. To carryout payroll application using procedures
20. To write an algorithm to perform database connectivity using MS Access.

| Code:<br><br>NCN- 107 A | First semester | **Open Elective** | Credits: 04 |
|---|---|---|---|
| **Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses** | | | |

## OR

| **Course Code:** | NCN-107 B | **Course Name:** Data Communications | **Credits: 4** |
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| **Course Objectives:** | | | |
| At the end of the course, students will be able to understand basic computer network technology. Understand and explain various components of computer networks. Identify the different types of network topologies and protocols. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer. Identify the different types of network devices and their functions within a network. Understand and build the skills of routing mechanisms. | | | |
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| **Course Outcome:** | | | |
| 1: Describe the building blocks of Computer Networks<br>2: Explain the functionalities and protocols of various layers in ISO/OSI Network model.<br>3: Implement a suitable routing strategies for a given network<br>4: Use suitable transport/application layer protocol based on application requirements | | | |
| | | | |
| **Unit-1:** | Introduction | | |
| Introduction to Communications Model, Data Communications, Networks, The Internet, An Example Configuration, The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Model, Standardization Within a Protocol Architecture, Traditional Internet-Based Applications, Multimedia. | | | |
| | | | |
| **Unit-2:** | Data Transmission | | |
| Data transmission, Concepts and Terminology, Analog and Digital Data Transmission Transmission Impairments, Channel Capacity. | | | |
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| **Unit-3:** | Transmission Media | | |
| Transmission media, Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission. | | | |
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| **Unit-4:** | Digital Data Communication Techniques | | |
| Digital Data communication techniques, Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations. | | | |
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| **Unit-5:** | Data Link Control Protocols | | |
| Data link Control protocols, Flow Control, Error Control, High-Level Data Link Control (HDLC). | | | |
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| **Unit-6:** | Multiplexing | | |
| Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing, Asymmetric Digital Subscriber Line,xDS. | | | |
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| **Text Books:** | | | |

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|---|---|
| **1.** | Data and Computer Communications- William Stallings, 8th Edition Pearson Publication. |
| **Reference Books** | |
| **1.** | Data Communications and Networking, Behrouz A. Forouzan, 2nd Edition, McGraw Hill Publication. |

| Code: | First semester | **Skill based Activity** | Credits: 01 |
|---|---|---|---|
| NCN-108 | | **SK- 01: PC Assembly and Maintenance** | |
| Scope : Practically understand the PC and surrounding peripherals. The student will assemble / setup and upgrade personal computer systems; install OS and other application software, diagnose and isolate faulty components; optimize system performance and install / connect peripherals. | | | |

| **Course Code:** | NCN-201 | **Course Name:** Operating System Concepts | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols

**Course Outcome:**

Students will be able to:

- Analyze the structure of OS and basic architectural components involved in OS design
- Analyze and design the applications to run in parallel either using process or thread models of different OS
- Analyze the various device and resource management techniques for timesharing and distributed systems

**Unit-1:** Overview of Operating System

Operating system objectives and functions, Evolution of OS, Characteristics of modern OS, Basic concepts: Processes, Files, System calls, Shell, Kernel architectures: Monolithic, Micro-kernel, Layered, Kernel mode of operations.

**Unit-2:** Process Management

Process description: Process, Process States, Process Control Block (PCB), Threads, Thread management. Process Scheduling: Types, Comparison of different scheduling policies.

**Unit-3:** Process Co-ordination

Principles of Concurrency, Race condition and critical section, Mutual Exclusion, Semaphores, Message Passing, Deadlock: Principles of Deadlock, Deadlock Detection, Deadlock Avoidance, Deadlock Prevention.

**Unit-4:** Memory Management

Memory Management Requirements, Memory Partitioning, Virtual memory: Paging; Segmentation; Page replacement policies.

**Unit-5:** File System

File concept, Access methods, Directory and disk structure, File system mounting, File sharing, Protection.

**Unit-6:** Input Output Management

I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling and disk scheduling algorithms.

**Text Books:**

**1.** Operating Systems Concepts- Silberschatz A., Galvin P., Gagne G, Wiley Publication.

| Course Code: | NCN-202 | **Course Name:** Elementary Data Structures and Algorithms | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

- IT will demonstrate familiarity with major algorithms and data structures.
- Analyze performance of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs.
- Use various data structures effectively in application programs.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.

**Course Outcome:**

- Explain the organization and operations of data structures Stack, Queues, Trees, Graphs, Heaps and Hash tables.
- Compare and contrast the functionalities and applications of different data structures
- Demonstrate specific search and sort algorithms using data structures given specific user requirements.
- Apply the operations of data structures in designing software procedures based on specific requirements

| **Unit-1:** | Introduction to Algorithm |
|---|---|

Data, Variables ( Local and Global), Data types, arrays Introduction to Algorithm, The efficiency of Algorithms, Analysis of Algorithms, overview of Space and Time Complexities, some fundamental algorithms for exchange , counting , summation .

| **Unit-2:** | Introduction to data structures |
|---|---|

Introduction to data structures, Basic terminology, Primitive data structure operations
Overview of STACKS, QUEUES, LINKED LISTS, BINARY TREES and GRAPHS ( Basic Definition , Representations, Characteristics , Types, Applications )

| **Unit-3:** | Tree and Graph |
|---|---|

Minimum Spanning Trees, Growing a minimum spanning tree, The algorithms of Kruskal and Prim Graphs: DFS and BFS algorithms associated with Graphs, Single-source shortest Paths, The Bellman-ford algorithm.

| **Unit-4:** | Sorting and Searching |
|---|---|

Introduction to searching and sorting problems, Linear search , Binary search, Selection sort , Bubble sort , Insertion sort , Merge sort, Complexities of searching and sorting algorithms.

| **Unit-5:** | Divide and Conquer Techniques |
|---|---|

Divide and conquer, General method, Binary search, Merge sort, Strassen's matrix multiplication.

| **Unit-6:** | Advanced Data Structure |
|---|---|

Introduction to Greedy method, The general method, Container loading knapsack problem, Introduction to Dynamic Programming, General method, Introduction to NP Theory.

**Text Books:**

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|---|---|
| **1.** | Fundamentals of Computer Algorithms- Ellis Horowitz, Satraj Sahani, |

**Reference Books**

| | |
|---|---|
| **1.** | Data Structures, Lipschutz , Tata McGraw Hills. |
| **2.** | How to solve it by Computers- R.G. Dromey , 8th Edition , Pearson Education. |

| **Course Code:** | NCN-203 | **Course Name:** Programming in Java | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

The objective of this course is to create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism, use data types, arrays and other data collections, implement error-handling techniques using exception handling, create and event-driven GUI using Applet.

**Course Outcome:**

To design, write, compile, test and execute straightforward programs using a high level language.
To implement, compile, test and run Java programs comprising more than one class, to address a particular software problem
To demonstrate the ability to use simple data structures like arrays in a Java program.

| **Unit-1:** | Introduction to Java |
|---|---|

History, Features, How java differ from C and C++?, Java program structure, Java tokens, Java Statements, Java virtual machine, Command line arguments, Constants, Variable, Data types, Type casting.

| **Unit-2:** | Operators and Expression |
|---|---|

Decision making and branching, Decision making and looping, Class, Methods, Objects, Constructors, Method overloading, Static members, nesting of methods.

| **Unit-3:** | Inheritance |
|---|---|

Overriding methods, Final variables, Final methods, Final Classes, Finalizer method, Abstract methods, Abstract Classes, Visibility Control, Interface, Arrays, Strings, Vectors, Wrapper Classes.

| **Unit-4:** | System Packages |
|---|---|

Naming conventions, Creating and accessing packages, Introduction to multithreaded programming, Creating and extending threads, Life cycle of thread, Thread exception, Thread priority, Synchronization, Implementing Runnable interface, Types of errors, Exceptions, Exception handling code, Multiple catch statements, finally statement, Throwing our own exceptions, Exception for debugging.

| **Unit-5:** | Introduction to Applet |
|---|---|

How applet differ from application?, Applet code, Applet life cycle, Creating an executable applet, designing a web page, Applet tag, Passing parameter to applet.

| **Unit-6:** | The Graphic Class |
|---|---|

Lines, Rectangles, Circles, Ellipses, Arcs, Polygons, Line graphs, Bar charts, Control loops in applet.

**Text Books:**

| | |
|---|---|
| **1.** | Programming with Java A Primer – E.Balaguruswamy, McGraw Hill. |
| **2.** | Java 7 Programming Black Book -Kogent Learning Solutions Inc,DreamTech press. |

**Reference Books**

| | |
|---|---|
| **1.** | Java Fundamentals A comprehensive introduction- Herbert Schildt, Dale Skrien, McGraw Hill Education. |
| **2.** | The Complete Reference, Java 2 -, Herbert Schild, (Fourth Edition) - TMH. |
| **3.** | Core Java Volume-I Fundamentals- Horstmannand Cornell, - Pearson Education. |

| Course Code: | NCN-204 A Elective | **Course Name:** Wireless Networking | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

Introduction to planning and design of wireless networks
Introduction to HSPA systems
To study emerging technologies like Bluetooth, zigbee, Wimax
Understanding the wireless sensor network architecture and the protocol stack and WSN applications.

**Course Outcome:**

The students will be able to:
Describe the phases of planning and design of mobile wireless networks
List and compare personal area network ( PAN) technologies such as Zigbee, Bluetooth etc
Students will details of sensor network architecture, traffic related protocols , transmission technology etc
Understand middleware protocol and network management issues of sensor networks

| | |
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| **Unit-1:** | Overview of Cellular Systems |

Mobile telephony, introduction to GSM, Universal mobile telecommunication system, Introduction to HSPA, Advanced Antenna Systems for HSPA + and LTE

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|---|---|
| **Unit-2:** | Planning and Design of Wide-Area Wireless Networks |

Basics of indoor RF planning, Three phases of wireless network design, Indoor coverage from the macro layer, Link budgets for GSM, CDMA, CDMA2000, HSDPA systems, indoor UMTS/HSPA challenge, common UMTS rollout mistake

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| **Unit-3:** | Emerging Wireless Technologies |

Bluetooth: Concepts of Pico net, scatter net etc., protocol stack, link types, security, network connection establishments, usage models, etc.
ZigBee: Components, architecture, network topologies, protocol stack etc.
UWB and RFID: Technical requirements, components and characteristics, applications
WiMAX: 802.16 based protocol architecture, physical layer, fixed and mobile WiMAX

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| **Unit-4:** | Overview of Wireless Sensor Network 1 |

Background of sensor network technology, sensor network architectural elements, historical survey of sensor networks, Applications of wireless sensor network, range of applications, examples of category 1 and 2 WSN Applications

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| **Unit-5:** | Overview of Wireless Sensor Network 2 |

Technologies for wireless sensor network, sensor node technology, hardware and software, sensor taxonomy, Wireless network, operating environment, wireless network trends, transmission technology

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| **Unit-6:** | Middleware for Sensor Networks & Network Management |

Middleware principles, Middleware architecture, existing middleware, Network management, requirements, Network management models, design issues

**Text Books:**

| | |
|---|---|
| **1.** | Indoor Radio Planning: A Practical Guide for GSM, DCS, UMTS, HSPA and LTE, 2nd Edition Morten Tolstrup ISBN: 978-0-470-71070-8 480 -July 2011 -Wiley |
| **2.** | Vijay K. Garg, ―Wireless Communication and Networking‖, Morgan -Kaufmann Series in Networking—Elsevier |

**Reference Books**

| | |
|---|---|
| **1.** | Kazem Sohraby, Daniel Minoli, and Taieb Znati, ―Wireless Sensor Networks: Technology, Protocols, and Applications‖, Wiley Student Edition |
| **2.** | Feng Zhao andLeonidas Guibas, ―Wireless Sensor Networks, An Information Processin Approach‖,--Morgan Kaufmann |

| **Course Code:** | NCN-204 B Elective | **Course Name:** Distributed System | **Credits: 4** |
|---|---|---|---|

**Course Objectives:**

- Understand foundations of Distributed Systems.
- Introduce the idea of peer to peer services and file system.
- Understand in detail the system level and support required for distributed system.

**Course Outcome:**

- Discuss trends in Distributed Systems.
- Apply network virtualization.
- Apply remote method invocation and objects.

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| **Unit-1:** | Introduction |

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

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| **Unit-2:** | Communication in Distributed System |

System Model – Inter process Communication – the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction – Request-reply protocols – Remote procedure call – Remote method invocation. Case study: Java RMI – Group communication – Publish-subscribe systems – Message queues – Shared memory approaches – Distributed objects – Case study: Enterprise Java Beans -from objects to components.

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| **Unit-3:** | Peer to Peer Services and File System |

Peer-to-peer Systems – Introduction – Napster and its legacy – Peer-to-peer – Middleware – Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction – File service architecture – Andrew File system. File System: Features-File model -File accessing models – File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

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| **Unit-4:** | Synchronization And Replication |

Introduction – Clocks, events and process states – Synchronizing physical clocks- Logical time and logical clocks – Global states – Coordination and Agreement – Introduction – Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control – Timestamp ordering – Atomic Commit protocols - Distributed deadlocks – Replication – Case study – Coda.

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| **Unit-5:** | Process & Resource Management |

Process Management: Process Migration: Features, Mechanism – Threads: Models, Issues, Implementation.

| | |
|---|---|
| **Unit-6:** | Resource Management |

Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**Text Books:**


| | |
|---|---|
| **1.** | George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012. |
| **2.** | Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007. |


**Reference Books**


| | |
|---|---|
| **1.** | Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007. |

| Course Code: | NCN-205 | **Course Name:** Lab-3: Data Structures | **Credits: 2** |
|---|---|---|---|

**Course Objectives:**

- To develop skills to design and analyze simple linear and nonlinear data structures
- To strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To gain knowledge in practical applications of data structures

**Course Outcome:**

- To learn elementary data structures such as stacks, queues, linked lists, trees and graphs
- To design and analyze the time and space efficiency of the data structure
- To identity the appropriate data structure for given problem
- To have practical knowledge on the application of data structures
- To discuss different data structures to represent real world problems
- To design algorithms to solve the problems.

**List of Experiments**

1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of list ADT
3. Array implementations of stack ADT
4. Linked list implementations of stack ADT

The following three exercises are to be done by implementing the following source files

a) Program for 'Balanced parenthesis'
b) Array implementation of stack ADT
c) Linked list implementation of stack ADT
d) Program for 'Evaluating Postfix Expressions'

An appropriate header file for the stack ADT should be # included in (a) and (d)

5. Implement the application for checking 'balanced parenthesis' using array Implementation of stack ADT (by implementing files (a) and (b) given above)
6. Implement the application for checking 'Balanced Parenthesis' using linked list Implementation of stack ADT (by using file (a) from experiment 6 and implementing file (c))
7. Implement the application for 'Evaluating Postfix Expressions' using array and linked list implementations of Stack ADT (by implementing file (d) and using file (b), and then by using files (d) and (c))
8. Queue ADT
9. Search Tree ADT – Binary Search Tree
10. Heap Sort, Quick Sort

**Lecture: 0; Practical: 45; Total: 45**

| Course Code: | NCN-206 | **Course Name:** Lab-4: Java Programming | **Credits: 2** |
|---|---|---|---|
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| **Course Objectives:** | | | |
| To enable the students practice the concepts of java programming language and develop solutions for real world problems. | | | |
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| **Course Outcome:** | | | |
| 1: Understand the enabling technologies for building internet applications. Understand<br>2: Write Java programs for techniques and features of the networking and remote method development to Construct a internet application<br>3: Implement packages, access specifiers and interfaces in a program<br>4: Implement Program for Events and interactivity using Layout Manager.<br>5: Generate program for network chatting Analyze<br>6: Write technical report on the observations from the experiments | | | |
| | | | |
| 1. Use of Objects<br>2. Using classes and inheritance<br>3. JNI concepts<br>4. Multithread applications<br>5. Exception handling<br>6. Implementing packages, access specifiers and interfaces<br>7. Streams<br>8. JDBC program using different statements<br>9. Applet program for Animation text, images and sounds<br>10. Events and interactivity using Layout Manager.<br>11. Socket program for network chatting<br>12. Client server application using RMI techniques | | | |
| | | | |

| Code:<br><br>NCN- 207 A | First semester | **Open Elective** | Credits: 04 |
|---|---|---|---|
| **Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses** | | | |

**OR**

| Course Code: | NCN-207 B | **Course Name:** Cyber Forensics and Information Security | **Credits: 4** |
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**Course Objectives:**

Securing vital resources and information in the network is the most challenging feat for system enterprise. Develop an understanding of information assurance as practised in computer operating systems, networks and representative applications. Gain familiarity with prevalent attacks, defenses

**Course Outcome:**

- Understand the importance of network security in today's world and apply security services and mechanisms in evaluating networked systems and also while creating new applications.
- Analyze and uses apply best suited Network Security mechanisms and standards in various applications.

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|---|---|
| **Unit-1:** | Security Principles and Practices |

Information system security principles, Threats and attacks, Classification of threats and assessing damages, Protecting information systems security, Information system security engineering process

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| **Unit-2:** | Security Threats |

Types of security threats- worms, viruses, Trojan horse, malware, malicious spyware, adware, botnet, spam, phishing, stack and buffer overflow

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|---|---|
| **Unit-3:** | Operating System Security |

Role of operating systems in information systems applications, Operating systems security, Patched operating systems, Protected objects and methods of protection, Memory address protection, File protection mechanism

| | |
|---|---|
| **Unit-4:** | Wireless Networks Security |

Overview of wireless technology, Wireless security protocols - Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), WPA2, Attacks on wireless networks.

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| **Unit-5:** | Understanding Cyber Forensics |

Computer forensics, Cyber forensics and Digital evidence, rules of evidence, Forensics analysis of e-mail- RFC282, Digital forensics life cycle, Chain of custody concept, Network forensics, Setting up a computer forensics laboratory, Computer forensics and steganography, Rootkits, Information hiding, relevance of the OSI 7 layer model to computer forensics, Forensics and social networking sites: The security/privacy, Threats.

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| **Unit-6:** | Challenges in Cyber Forensics |

Technical challenges: understanding the raw data and its structure, The legal challenges in computer forensics and data privacy issues , Special tools and techniques - digital forensics tools, Special technique: data mining used in cyber forensics, Forensics auditing, Anti forensics.

**Text Books:**

| | |
|---|---|
| **1.** | Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition (Information Security), **Albert Marcella Jr. , Doug Menendez** |
| **2.** | |

**Reference Books**

| | |
|---|---|
| **1.** | |

| Code: NCN-208 | Second semester | **Skill based Activity**<br><br>**SK-02: Networking Essentials** | Credits: 01 |
|---|---|---|---|
| **Scope :** Networking Essentials deals with knowing what is a network, how to install, configure, and troubleshoot a computer network It includes knowledge of the fundamental building blocks that form a modern network, such as various cables, switches, routers, connectors, LAN-NIC cards and network operating systems. It then provides in-depth coverage of the most important concepts in contemporary networking like connecting computers/ peripherals, servers and clients, Wi-Fi connectivity, etc. Students are expected to have the skills to build a network / LAN from scratch and maintain, upgrade, and troubleshoot an existing network. | | | |