

SKILL ENHANCEMENT COURSES

SYLLABUS FOR THE

SUBJECT: INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE DEVELOPMENT (VOCATIONAL)

for the award of the Degree in

BACHELOR OF ARTS/ BACHELOR OF SCIENCE/HONOURS

(Offered under 4-year UG Degree Programme)

(Credit Based Grading System)
under NEP 2020

Batch: 2025–29



GURU NANAK DEV UNIVERSITY AMRITSAR

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SCHEME

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)**

SKILL ENHANCEMENT COURSES (SEC)

SEC-I

Sr. No.	Course Code	Course Title	Credits L - T - P	Total Marks
1.		INTRODUCTION TO THE INTERNET (THEORY)	2 - 0 - 0	50
2.		INTRODUCTION TO THE INTERNET (PRACTICAL)	0 - 0 - 1	25

SEC-II

Sr. No.	Course Code	Course Title	Credits L - T - P	Total Marks
1.		CYBER SECURITY FUNDAMENTALS (THEORY)	2 - 0 - 0	50
2.		CYBER SECURITY FUNDAMENTALS (PRACTICAL)	0 - 0 - 1	25

SEC-III

Sr. No.	Course Code	Course Title	Credits L - T - P	Total Marks
1.		DATA STRUCTURES & FILE PROCESSING (THEORY)	2 - 0 - 0	50
2.		DATA STRUCTURES & FILE PROCESSING (PRACTICAL)	0 - 0 - 1	25

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)**

**SKILL ENHANCEMENT COURSES
SEC-I**

**INTRODUCTION TO THE INTERNET
(THEORY)**

**M. Marks: 50
Time: 3 Hours**

**Credits
L-T-P
2-0-0**

Instructions for the Paper Setters: -

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course Outcomes:

To give hands-on experience and provide a comprehensive, non-technical, hands-on overview of the Internet based services.

SECTION–A

Origin, growth and evolution of the Internet; the impact of the Internet; terminology: web pages, website, web browser, web server, bandwidth; Connect to the Internet: hardware and software, types of the Internet connections, Internet Service Providers; Navigating different types of websites and online resources.

Student should explore the local market to understand the internet service providers, rates, bandwidth etc.

SECTION – B

E-mail Communication: E-mail Etiquette and Best Practices, Managing and Organizing E-mails E-mail Tools and Features, identifying spam and phishing E-mails;

Searching on the Internet: Overview of internet resources and search engines, Basics of Using Search Engines -How search engines work, Basic search techniques and tips, Understanding search engine results pages (SERPs), Using search operators (e.g., AND, OR, NOT), Utilizing advanced search features (e.g., Google Advanced Search), Evaluating Online Sources - Criteria for evaluating credibility (e.g., authority, accuracy, objectivity), Identifying reliable and scholarly sources, Recognizing bias and detecting misinformation, Analyzing and synthesizing information from multiple sources

SECTION - C

Online Tools for Productivity: Introduction to productivity tools (e.g., Google Workspace, Microsoft Office 365), Cloud storage and file management (e.g., Google Drive), Task management and organization tools (e.g., Trello), Note-taking apps and techniques (e.g., Evernote)

Collaboration and Communication Tools: Online communication etiquette and best practices, using collaboration tools (e.g., Google Docs, Slack, Microsoft Teams), Effective virtual meeting strategies (e.g., Zoom, Google Meet)

SECTION – D

Building Online Presence: Creating and maintaining a professional online profile (e.g., LinkedIn), Personal branding and digital portfolios, Networking strategies for academic and career growth, Understanding digital footprints and online reputation.

Ethical and Responsible Internet Use: Understanding intellectual property and copyright issues, detecting fake news, Digital citizenship and respectful online behaviour, balancing screen time and managing digital distractions

Recommended Books and Materials:

1. Douglas E Comer, The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, CRC Press
2. Faithe Wempen, Digital Literacy For Dummies 1st Edition

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)
SKILL ENHANCEMENT COURSES
SEC-I**

**INTRODUCTION TO THE INTERNET
(PRACTICAL)**

**M. Marks: 25
Time: 3 Hours**

**Credits
L-T-P
0-0-1
Lab (2h/week)**

Lab exercises based on:

- Identifying internet connections and Configuring internet connection on PC/Laptop
- E-mail Tools and features
- Using the Google search engine and explore Bing
- Using Google Docs, Google Drive for document preparation and storage
- Collaboration using Slack
- Analyzing LinkedIn profiles
- Creating your own LinkedIn profile
- Virtual meeting platforms: Microsoft Teams, Zoom, Google Meet

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)**

**SKILL ENHANCEMENT COURSES
SEC-II**

**CYBER SECURITY FUNDAMENTALS
(THEORY)**

**M. Marks: 50
Time: 3 Hours**

**Credits
L-T-P
2-0-0**

Instructions for the Paper Setters: -

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course outcome:

1. To teach fundamentals of Cyber Space, Cyber Threats and defense strategies,
2. Understand the ethical, legal, and regulatory environment in the cyberspace.

SECTION-A

Introduction to the Internet, IP address, MAC address; Client-Server/P2P Architecture, Cloud Computing; Computation/ Storage as a service; confidentiality, Integrity, availability of information; desktop and mobile apps; Authentication & authorization; Data trails of an Internet user; cookies; Why security matters?

SECTION-B

Threats: Malicious software, Cyber threats, hackers, trackers, types of hackers, hacker motives; Types of Attacks: virus, worms, Trojan horse, spam, spoofing, phishing, spear-phishing, whaling, social engineering, ransomware, spyware, adware, malvertising, supply-chain attacks, zero-day viruses - software/hardware vulnerabilities, exploits; denial of service attacks; bots, botnets; Data breaches; risks of using public Wi-Fi; Cyber bullying;

SECTION-C

How to Safeguard: Using http/https; Anti-virus software, analysis of the tools available in the market; strong passwords/passphrases, password managers, changing passwords regularly; Cryptography: Encryption, Decryption, public/private cryptography, Digital signatures; Virtual private networks; Setting up private and secure Wi-Fi; Data backup and recovery – full/incremental/differential backup, backup vs archive; software updates/patches; URL filtering;

SECTION-D

privacy vs security vs anonymity, privacy settings in apps/browsers and popular social networking sites such as Facebook, Instagram, Snapchat; using web browser incognito mode, the tor browser;

Laws, regulations, and compliance; cybercrimes, Intellectual Property, Licensing, Compliance, Provisions in the IT act.

Reference Books:

1. Kenneth Einar Himma and Herman T. Tavani, Handbook of Information and Computer Ethics, Wiley.
2. Douglas E Comer, The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, CRC Press
3. Introduction to cyber security: stay safe online, The Open University
4. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co. (ULPC)
5. Anirudh Rastogi, Cyber Law-Law Of Information Technology And Internet, Lexis Nexis
6. James Graham, Ryanolson Rickhoward, Cyber Security Essentials By, CRC PRESS
7. R. K. Dhamija, Cybersecurity: An Introduction, BPB Publications
8. Charles J. Brooks, Christopher Grow, and Philip Craig, Cybersecurity Fundamentals by McGraw-Hill

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)**

**SKILL ENHANCEMENT COURSES
SEC-II**

**CYBER SECURITY FUNDAMENTALS
(PRACTICAL)**

**M. Marks: 25
Time: 3 Hours**

**Credits
L-T-P
0-0-1
Lab 2h/week)**

Instructions for the examiners: -

Two questions of equal marks strictly as per the syllabus and based on the practical exercises covered in the semester. Questions may be subdivided into parts (not exceeding four). Candidates will attempt ONE question, explain their answer by writing on the answer sheet, and then implement the same on the computer. Examiner will evaluate both the answers (theory as well as practical). The viva will also be conducted one-on-one alongside, and the student asked viva questions related to the question and the solution he/she is working on during the exam.

Lab Exercises based on

- Find IP/MAC addresses on personal devices
- Set up a simple cloud service (e.g., Google Drive)
- Check browser cookies and understand privacy settings
- Conduct a phishing simulation to identify red flags
- Analyze secure connections, creation of strong passwords
- Configure a VPN on personal devices
- Data backup routine using a cloud service or external drive
- Adjust privacy settings on popular platforms like Facebook and Instagram
- Understand anonymity using Tor network
- Install and configure antivirus and anti-malware software
- Configure a firewall rule using pfSense or similar tools
- Use OpenSSL to encrypt and decrypt messages.

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)**

**SKILL ENHANCEMENT COURSES
SEC-III**

**DATA STRUCTURES & FILE PROCESSING
(THEORY)**

**M. Marks: 50
Time: 3 Hours**

**Credits
L-T-P
2-0-0**

Instructions for the Paper Setters: -

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Course outcome:

- To understand the abstract data types stack, queue, and list.
- To understand the performance of the implementations of basic linear data structures.
- To understand prefix, infix, and postfix expression formats
- To be able to implement the abstract data type list as a linked list using the node and reference pattern.
- To understand and implement trees and graph data structures

SECTION–A

Basic Data Structures: Introduction to elementary Data Organization and its operations, complexity of Algorithms – Big O-Notation, and Time space trade off, Sparse Matrix, Arrays and its applications,

Searching Techniques: Linear and Binary Search

SECTION–B

Sorting Technique: Bubble Sort, selection sort, insertion sort, quick sort, merge sort

Stack and its applications – postfix notation, expression evaluation, recursion

Linked Lists: Implementation of linked list, singly and doubly linked list, linked list operations with algorithms

SECTION–C

Queues: Description of queue structure, implementation of queue using arrays and linked list

Trees: Description of tree structure and its terminology, binary search tree,

Graphs: Description of graph structure, implementing graphs in memory using adjacency matrix or adjacency lists;

SECTION–D

File Organization: Concept of field, record, file, blocking and compaction.

File Organization Techniques: Sequential indexed, indexed sequential, Direct, Hashing, Concept of master and transaction files.

Reference Books:

1. Seymour Lipschutz, Data Structure –Schaum Outline Series.
2. E Balaguruswamy, Data Structures using C, McGraw Hill Education
3. Yashwant Kanetker, Data Structures through C, BPB Publications
4. Trambley & Sorenson, Data Structures
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms
6. Mark Allen Weiss, Data Structures and Algorithm Analysis in C
7. Robert Sedgewick, Algorithms in C, Parts 1-4: Fundamentals, Data Structures, Sorting, Searching

**INFORMATION TECHNOLOGY SPECIALIZATION IN SOFTWARE
DEVELOPMENT (VOCATIONAL)****SKILL ENHANCEMENT COURSES
SEC-III****DATA STRUCTURES & FILE PROCESSING
(PRACTICAL)****M. Marks: 25
Time: 3 Hours****Credits
L-T-P
0-0-1
Lab 2h/week)****Instructions for the examiners: -**

Two questions of equal marks strictly as per the syllabus and based on the practical exercises covered in the semester. Questions may be subdivided into parts (not exceeding four). Candidates will attempt ONE question, explain their answer by writing on the answer sheet, and then implement the same on the computer. Examiner will evaluate both the answers (theory as well as practical). The viva will also be conducted one-on-one alongside, and the student asked viva questions related to the question and the solution he/she is working on during the exam.

Lab Exercises based on Implementation of Data Structures using the C language:

1. Arrays,
2. Searching(binary search, linear search)
3. Strings,
4. Linked list
5. Stacks (Using Arrays, linked lists)
6. Queues (Using Arrays, linked lists)
7. Trees – Traverse the BST, AVL Trees and B tree.
8. Sorting(selection sort, insertion sort, quick sort, merge sort, heap sort, bubble sort)
9. Graph-transversal, finding the shortest path
10. Handling the File structure