FYUGP CURRICULAR FRAMEWORK FOR BACHELORS PROGRAMME WITH COMPUTER APPLICATIONS AS MAJOR

SEMESTER	COURSE CODE	TYPE OF COURSE	TITLE OF COURSE	CREDITS	
				THEORY	PRACTICAL / TUTORIAL
I	CAP122J	CT-1	**COMPUTER APPLICATIONS:** COMPUTER FUNDAMENTALS	4	2
II	CAP222J	CT-1	**COMPUTER APPLICATIONS:** PROGRAMMING FUNDAMENTALS THROUGH 'C'	4	2
III	CAP322J	CT-1	**COMPUTER APPLICATIONS:** DATA COMMUNICATIONS AND COMPUTER NETWORKS	4	2
IV	CAP422J1	CT-1	**COMPUTER APPLICATIONS:** DBMS	3	1
	CAP422J2	CT-2	**COMPUTER APPLICATIONS:** OOPS WITH C++	4	2
	CAP422J3	CT-3	**COMPUTER APPLICATIONS:** COMPUTING MATHEMATICS	4	2
V	CAP522J1	CT-1	**COMPUTER APPLICATIONS:** OPERATING SYSTEM	3	1
	CAP522J2	CT-2	**COMPUTER APPLICATIONS:** DATA STRUCTURES USING 'C'	4	2
	CAP522J3	CT-3	**COMPUTER APPLICATIONS:** DISCRETE MATHEMATICS	4	2
VI	CAP622J1	CT-1	**COMPUTER APPLICATIONS:** PYTHON PROGRAMMING	3	1
	CAP622J2	CT-2	**COMPUTER APPLICATIONS:** COMPUTER ORGANISATION AND ARCHITECTURE	4	2
	CAP622J3	CT-3	**COMPUTER APPLICATIONS:** PROBABILITY AND STATISTICS	4	2
FOR FYUGP HONOURS					
VII	CAP722J1	CT-1	**COMPUTER APPLICATIONS:** CYBER SECURITY	3	1
	CAP722J2	CT-2	**COMPUTER APPLICATIONS:** JAVA PROGRAMMING	4	2
	CAP722J3	CT-3	**COMPUTER APPLICATIONS:** MACHINE LEARNING	4	2
VIII	CAP822J1	CT-1	**COMPUTER APPLICATIONS:** SOFTWARE ENGINEERING	3	1
	CAP822J2	CT-2	**COMPUTER APPLICATIONS:** MINI PROJECT WITH REPORT	4	2
	CAP822J3	CT-3	**COMPUTER APPLICATIONS:** MOBILE APPLICATION DEVELOPMENT	4	2
FOR FYUGP HONOURS WITH RESEARCH					
VII	CAP722J1	CT-1	**COMPUTER APPLICATIONS:** CYBER SECURITY	3	1
	CAP722J2	CT-2	**COMPUTER APPLICATIONS:** JAVA PROGRAMMING	4	2
	CAP722J3	CT-3	**COMPUTER APPLICATIONS:** MACHINE LEARNING	4	2
VIII	CAP822RJ1	CT-1	**COMPUTER APPLICATIONS:** RESEARCH METHODOLOGY	3	1
	CAP822P	PROJECT	**COMPUTER APPLICATIONS:** PROJECT WITH DISSERTATION	-	12

HEAD OF THE DEPARTMENT / CONVENOR BOUGS

BACHELORS WITH COMPUTER APPLICATIONS AS MAJOR

1st SEMESTER

CAP122J: COMPUTER APPLICATIONS _ COMPUTER FUNDAMENTALS

CREDITS: THEORY - 04; PRACTICALS - 02

Course Objectives:

1. *To introduce to the students the basic understanding of the working of a computer system.*
2. *To familiarize the students with the basic notations and data representation methods used.*
3. *To familiarize the students with the various software and hardware aspects of computers.*
4. *To make the students understand the need and working of the interconnection and communication between computers.*
5. *To make the students familiar with the basic internet technology and concepts.*

THEORY (4 CREDITS)

UNIT – I

Introduction to Computers, History, Generation of Computers, Data Processing, Memory Hierarchy. Input/ Output devices, BIOS, VDU
Data Representation - Binary, Decimal, Octal, Hexadecimal and their conversions, 1's and 2's compliment. Block Diagram of a Basic Computer and its working.

UNIT – II

Application Software and System Software, Open-Source Software and Proprietary Software.
Computer Languages and its types (Machine Language, Assembly Language, High Level Language) Translators, Compiler, Interpreter
Operating System and its functions, Types (Single-User, Multi-User, Multi-Tasking, Time-Sharing, Distributed, Real-Time)

UNIT – III

Data Communication - Need for Network Communication, Modes of Communication-Simplex,
Duplex, Half-Duplex; Introduction to Networks, LAN, MAN, WAN
Protocols - Ethernet, IP, TCP, UDP, HTTP
Networking Elements - Switch, Router, Server, Firewall

UNIT – IV

Introduction of Internet and WWW, Basic working of a Web Browser, Introduction to popular web browsers. Concepts of URL, Domain Name, Web Server, Smartphone Apps, Email, Instant Messaging, ISP Communication and Collaboration: Using e-governance, search engines, Webhosting, netiquettes.

COMPUTER FUNDAMENTALS LAB. (2 CREDITS)

MS WORD BASICS:

1. Basics of Word Processing, Create, Save, Edit, open files.
2. Using the Interface (Menu Toolbars), Editing Text (Copy, Delete, Move Etc.). Finding and replacing text.
3. Insert: Table, images, textbox, word art, symbols.
4. Auto correct Feature, Grammar check Facility, Formatting and Editing, Font, Size, alignment paragraph, Bullets and numbering.
5. Table: Insert and Draw, changing cell width and height, insert/delete rows in columns.
6. Borders and shadings, Mail merge.

MS EXCEL BASIC:

Creating and opening worksheets, saving and data entry in cells.

7. Entry of Numbers, Text and Formulae, Moving Data in the Worksheet.
8. Selecting Data Range, Using the Interface (Toolbars, Menus).
9. Editing basics, working with Workbooks Saving, Cell Reference, Formatting, Editing.
10. Working with Data, charts, graphs.

MS POWER POINT BASICS:

11. Creating, opening and saving a PowerPoint slide.
12. Creating presentations using existing templates.
13. Entering and editing text. Inserting and deleting slides.
14. Use of fonts and drawing, inserting images, graphics., viewing and printing.
15. Creation of animated slides, adding images, graphics and sound in slides. Adding Timing, auto slide changes.

REFERENCES:

1. Fundamentals of Computers, V Rajaraman 6th edition PHI Learning Private Limited 2014
2. Computer today, Donald H. Sanders, McGraw Hill Publishing Company.
3. Microcomputers Software and Applications, Dennis P. Curtin and Leslie R. Portel, PHI.
4. Data Processing: An Introduction, Donald P. Spencer and Charles R. Merril Pub. And Co.
5. Computers and Their Applications, Larry Joel Goldestein, PHI.
6. Computer Fundamentals. P. K. Sinha
7. Internet Basics. E. Douglas Commer PHI.

FYUGP CURRICULAR FRAMEWORK FOR BACHELORS PROGRAMME WITH COMPUTER APPLICATIONS AS MINOR

(FOR STUDENTS WITH SUBJECTS OTHER THAN COMPUTER APPLICATIONS / IFORMATION TECHNOLOGY AS MAJOR)

SEMESTER	COURSE CODE	TYPE OF COURSE	TITLE OF COURSE	CREDITS	
				THEORY	PRACTICAL / TUTORIAL
I	**CAP122N**	**CT-1**	**COMPUTER APPLICATIONS:** COMPUTER FUNDAMENTALS	**4**	**2**
II	**CAP222N**	**CT-1**	**COMPUTER APPLICATIONS:** PROGRAMMING FUNDAMENTALS WITH 'C'	**4**	**2**
III	**CAP322N**	**CT-1**	**COMPUTER APPLICATIONS:** DATA COMMUNICATIONS AND COMPUTER NETWORKS	**4**	**2**
IV	**CAP422N**	**CT-1**	**COMPUTER APPLICATIONS:** DBMS	**3**	**1**
V	**CAP522N**	**CT-1**	**COMPUTER APPLICATIONS:** OPERATING SYSTEM	**3**	**1**
VI	**CAP622N**	**CT-1**	**COMPUTER APPLICATIONS:** PYTHON PROGRAMMING	**3**	**1**
VII	**CAP722N**	**CT-1**	**COMPUTER APPLICATIONS:** CYBER SECURITY	**3**	**1**
VIII	**CAP822N**	**CT-1**	**COMPUTER APPLICATIONS:** SOFTWARE ENGINEERING	**3**	**1**

HEAD OF THE DEPARTMENT / CONVENOR BOUGS

BACHELORS WITH COMPUTER APPLICATIONS AS MINOR

1st SEMESTER

(FOR STUDENTS WITH SUBJECTS OTHER THAN COMPUTER APPLICATIONS / IFORMATION TECHNOLOGY AS MAJOR)

CAP122N: COMPUTER APPLICATIONS _ COMPUTER FUNDAMENTALS

CREDITS: THEORY - 04; PRACTICALS - 02

Course Objectives:

1. *To introduce to the students the basic understanding of the working of a computer system.*
2. *To familiarize the students with the basic notations and data representation methods used.*
3. *To familiarize the students with the various software and hardware aspects of computers.*
4. *To make the students understand the need and working of the interconnection and communication between computers.*
5. *To make the students familiar with the basic internet technology and concepts.*

THEORY (4 CREDITS)

UNIT – I

Introduction to Computers, History, Generation of Computers, Data Processing, Memory Hierarchy. Input/ Output devices, BIOS, VDU
Data Representation - Binary, Decimal, Octal, Hexadecimal and their conversions, 1's and 2's compliment. Block Diagram of a Basic Computer and its working.

UNIT – II

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Operating System and its functions, Types (Single-User, Multi-User, Multi-Tasking, Time-Sharing, Distributed, Real-Time)

UNIT – III

Data Communication - Need for Network Communication, Modes of Communication-Simplex,
Duplex, Half-Duplex; Introduction to Networks, LAN, MAN, WAN
Protocols - Ethernet, IP, TCP, UDP, HTTP
Networking Elements - Switch, Router, Server, Firewall

UNIT – IV

Introduction of Internet and WWW, Basic working of a Web Browser, Introduction to popular web browsers. Concepts of URL, Domain Name, Web Server, Smartphone Apps, Email, Instant Messaging, ISP Communication and Collaboration: Using e-governance, search engines, Webhosting, netiquettes.

COMPUTER FUNDAMENTALS LAB. (2 CREDITS)

MS WORD BASICS:

1. Basics of Word Processing, Create, Save, Edit, open files.
2. Using the Interface (Menu Toolbars), Editing Text (Copy, Delete, Move Etc.). Finding and replacing text.
3. Insert: Table, images, textbox, word art, symbols.
4. Auto correct Feature, Grammar check Facility, Formatting and Editing, Font, Size, alignment paragraph, Bullets and numbering.
5. Table: Insert and Draw, changing cell width and height, insert/delete rows in columns.
6. Borders and shadings, Mail merge.

MS EXCEL BASIC:

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8. Selecting Data Range, Using the Interface (Toolbars, Menus).
9. Editing basics, working with Workbooks Saving, Cell Reference, Formatting, Editing.
10. Working with Data, charts, graphs.

MS POWER POINT BASICS:

11. Creating, opening and saving a PowerPoint slide.
12. Creating presentations using existing templates.
13. Entering and editing text. Inserting and deleting slides.
14. Use of fonts and drawing, inserting images, graphics., viewing and printing.
15. Creation of animated slides, adding images, graphics and sound in slides. Adding Timing, auto slide changes.

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1. Fundamentals of Computers, V Rajaraman 6th edition PHI Learning Private Limited 2014
2. Computer today, Donald H. Sanders, McGraw Hill Publishing Company.
3. Microcomputers Software and Applications, Dennis P. Curtin and Leslie R. Portel, PHI.
4. Data Processing: An Introduction, Donald P. Spencer and Charles R. Merril Pub. And Co.
5. Computers and Their Applications, Larry Joel Goldestein, PHI.
6. Computer Fundamentals. P. K. Sinha
7. Internet Basics. E. Douglas Commer PHI.

FYUGP CURRICULAR FRAMEWORK FOR BACHELORS PROGRAMME WITH APPLIED INFORMATION TECHNOLOGY AS MINOR

(FOR STUDENTS WITH COMPUTER APPLICATIONS / INFORMATION TECHNOLOGY AS MINOR ONLY)

SEMESTER	COURSE CODE	TYPE OF COURSE	TITLE OF COURSE	CREDITS	
				THEORY	PRACTICAL / TUTORIAL
I	**AIT124N**	**CT-1**	**APPLIED IT:** DIGITAL ELECTRONICS	**4**	**2**
II	**AIT223N**	**CT-1**	**APPLIED IT:** OPEN-SOURCE TOOLS AND TECHNOLOGIES	**4**	**2**
III	**AIT323N**	**CT-1**	**APPLIED IT:** CLOUD COMPUTING	**4**	**2**
IV	**AIT422N**	**CT-1**	**APPLIED IT:** IOT FUNDAMENTALS	**3**	**1**
V	**AIT522N**	**CT-1**	**APPLIED IT:** DESIGN ANALYSIS AND ALGORITHM	**3**	**1**
VI	**AIT622N**	**CT-1**	**APPLIED IT:** DATA MINING	**3**	**1**
VII	**AIT722N**	**CT-1**	**APPLIED IT:** ARTIFICIAL INTELLIGENCE	**3**	**1**
VIII	**AIT822N**	**CT-1**	**APPLIED IT:** LATEX	**3**	**1**

DIRECTOR IT&SS / CONVENOR BOUGS

BACHELORS WITH APPLIED INFORMATION TECHNOLOGY AS MINOR
1st SEMESTER
AIT122N: APPLIED INFORMATION TECHNOLOGY _ DIGITAL ELECTRONICS
CREDITS: THEORY: 4; PRACTICALS: 2

UNIT I:

NUMBER SYSTEMS: Binary, Octal, Decimal, Hexadecimal. Number base conversions,
Binary Arithmetic: Binary Addition, Decimal Subtraction Using 9's and 10's Compliment, Binary Subtraction Using 1's and 2's Compliment, Multiplication and Division.
LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations

Unit-II:

BOOLEAN ALGEBRA: Boolean postulates and laws – De-Morgan's Theorem, Principle of Duality, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms, Conversion between canonical forms, Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method.

Unit-III:

Combinational Circuits: Half Adder, Full Adder, Parallel Adder, Half Subtractor, Full Subtractor, 4-Bit Binary Adder Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, Parity Detector. Implementation of combinational logic using MUX, BCD to7 segment decoders.

Unit IV:

SEQUENTIAL CIRCUITS: Flip flops SR, JK, T, D and Master slave, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops. Asynchronous /Ripple counters, Synchronous counters, Modulo-n counter, Ring Counters. Design of Synchronous counters: state diagram, Circuit implementation. Shift registers**.**

PRACTICAL: (2-CREDITS)

Note: ***The Practical Component shall be based on the Unit-I to Unit-IV of Theory Course***

SUGGESTED READING:

1) Navaneeth, Kale and Gokhale, "Digital and Analogue Technique". ISBN-81-225-0153-2
2) Soumitra Mandal, "Digital Electronics", TMH, ISBN 0-07015382-5
3) Modern Digital Electronics by R. P. Jain, Tata McGrawHill.
4). Digital Fundamentals by Thomas Floyd, Prentice Hall.
5). Digital Logic and computer Design by' Morris Mano, PHI pvt. Ltd.
6) Jacob Millman, Christos Halkias, Chetan D Parikhu, Integrated Electronics, Tata Mc Graw

COURSE OUTLINE FOR CERTIFICATE COURSE *"WEB DEVELOPER"*

Name of Certificate Course	*Web Developer*
NSQF Level	5
Eligibility	Students pursuing undergraduate programme in any Stream
Batch Size	30

TABLE-I (12 CREDITS TO BE OFFERED IN EMBEDDED MODE IN 3RD/4TH, 5TH AND 6TH SEMESTERS)

Course Code/Course Title	***Credit Weightage***			***Duration in Number of Hours***
	Theory	***Practical***	***Total***	
WDP-1 *Internet Basics and HTML*	2	2	4	90
WDP-2 *Java Script and CSS Basics*	2	2	4	90
WDP-3 *Introduction to PHP and MYSQL*	2	2	4	90

To facilitate forward linkage of skill courses of 12 credits indicated in Table-I with the earning of UGC/NSQF skill certificate, add-on courses of 18 credits as indicated in Table-II are available on optional basis.

TABLE-II (18 CREDITS ADD-ON COURSES FOR CERTIFICATE COURSE "WEB DEVELOPER")

Course Code/Course Title	***Mode of training***	***Venue of training***	***Credit Weightage***	***Duration in Number of Hours***	***Semester in which to be offered***
WDP-4	Three Weeks Industrial Workshop-I	To be decided in consultation with Mentor Institution	6	90	These credits can be covered during winter vacations/ or after semester-end exams depending upon the availability of time
WDP -5	Three Weeks Industrial Workshop-II	To be decided in consultation with Mentor Institution	6	90	
WDP -6	Three Weeks Industrial Internship	To be decided in consultation with Mentor Institution	6	90	

1st SEMESTER
COMPUTER APPLICATIONS
(WEB DEVELOPER)
SKILL ENHANCEMENT COURSE (SEC)

WDP122S: INTERNET BASICS AND HTML

CREDITS: THEORY: 2, PRACTICAL: 2

THEORY (2 CREDITS)

UNIT 1 – INTERNET BASICS (15 LECTURES)

Communication using the Internet: Basic of Computer networks; LAN, WAN, OSI and TCP Network Models, Concept of Internet, Applications of Internet, Connecting to Internet, What is ISP, Knowing the Internet.

WWW and Web Browsers: World Wide Web, Web Browsing Software's, Search Engines, Understanding URL, Domain name, IP Address, Using e-Governance Website.

Communications and collaboration: Basics of Electronic Mail, Getting an Email Account, Sending and Receiving Emails, Accessing Sent Emails, Using Emails, Document Collaboration, Instant Messaging, Netiquettes.

UNIT 2 – HTML (15 LECTURES)

Introduction to Hyper Text Markup Language. Key components of HTML Document, HTML Elements, Tags and Attributes , Headers, HTML Basic Tags, Formatting Tags, Ordered List, Unordered List, Definition Lists, Nesting of Lists, Hyperlinks, Tables, Images, Images as Hyperlink, Forms, Frames, Div and Span Tags for Grouping, Using Object Tag to embed Multimedia Elements.

REFERENCE BOOKS:

1. Internet Basics E Douglas Commer PHI
2. Mastering HTML BPB Publications

PRACTICAL (2 CREDITS)

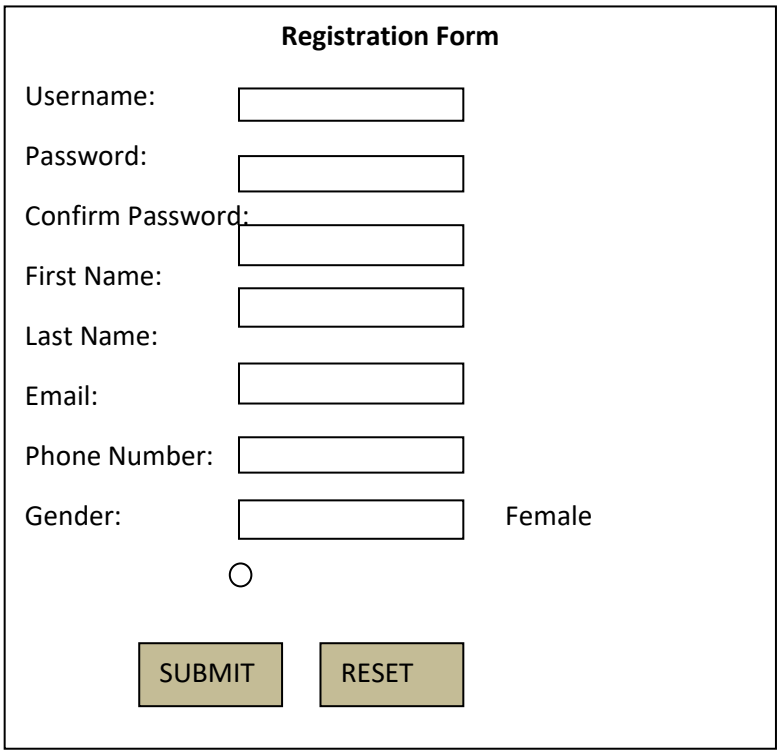
LAB SHEET- INTERNET BASICS AND HTML

1. Create an Email ID to
   a) Send an email
   b) Send an email to multiple participants
   c) Delete an email
   d) Email a picture
   e) Email a document
2. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.
3. Design a webpage that displays your information (Bio-data) using basic HTML Tags
4. Create HTML document and demonstrate Inserting Images, Internal and External linking
5. Create a table with the following data

Roll Number	Practical Marks		Total
	Internal	External	
4801	25	26	51
4802	24	25	49
4803	20	24	44

6. Design a webpage to print the following:
   A. Courses
      a. BCA
      b. BBA
      c. BSC IT
      d. BA
      e. BSC
      f. BMMMC
   B. Semester
      - First Semester
      - Second Semester
      - Third Semester
      - Fourth Semester
      - Fifth Semester
      - Sixth Semester
   C. Batch
      I. 2018
      II. 2019
      III. 2020
      IV. 2021

7. Write HTML code to demonstrate use of frames in a web page.
8. Write an HTML code to generate the following output


Registration Form
Username:
Password:
Confirm Password:
First Name:
Last Name:
Email:
Phone Number:
Gender:
Female
SUBMIT
RESET

BACHELORS WITH DIGITAL AND TECHNOLOGICAL SOLUTIONS AS VALUE ADDED COURSE
1st to 2nd SEMESTERS

DTS024V: DIGITAL AND TECHNOLOGICAL SOLUTIONS

CREDITS: 02

COURSE OBJECTIVES:

- *To gain familiarity with digital paradigms;*
- *To sensitize about role & significance of digital technology;*
- *To provide know how of communications & networks;*
- *To bring awareness about the e-governance and Digital India initiatives;*
- *To provide a flavour of emerging technologies - Cloud, Big Data, AI, 3D printing.*

COURSE OUTCOME:

- *Knowledge about digital paradigm;*
- *Realization of importance of digital technology, digital financial tools, e-commerce;*
- *Know-how of communication and networks;*
- *Familiarity with the e-governance and Digital India initiatives;*
- *An understanding of use & applications of digital technology;*
- *Basic knowledge of machine learning and big data.*

COURSE CONTENTS:

UNIT I

Introduction & Evolution of Digital Systems. Role & Significance of Digital Technology. Information & Communication Technology & Tools. Computer System & it's working, Software and its types. Operating Systems: Types and Functions. Problem Solving: Algorithms and Flowcharts.

Communication Systems: Principles, Model & Transmission Media. Computer Networks & Internet: Concepts & Applications, WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. Computer Based Information System: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.

UNIT II

Digital India & e-Governance: Initiatives, Infrastructure, Services and Empowerment. Digital Financial Tools: Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit / Debit Cards, e-Wallets, Internet Banking, NEFT/RTGS and IMPS, Online Bill Payments and PoS. Cyber Security: Threats, Significance, Challenges, Precautions, Safety Measures, & Tools, legal and ethical perspectives.

Emerging Technologies & their applications: Overview of Cloud Computing, Big Data, Internet of Things, Virtual Reality, Blockchain & Cryptocurrency, Robotics, Machine Learning & Artificial Intelligence, 3-D Printing. Digital Signatures.

TEXT BOOK

- F S Masoodi, Z S Masoodi and K B Dar, Digital and Technological Solutions, BPB Publications.

REFERENCE BOOKS

- V. Rajaraman, Introduction to Information Technology, 3rd Edition, PHI;
- E Balagurusamy, Fundamentals of Computers, Tata Mc GrawHill;
- Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill;
- Pramod Kumar, Anuradha Tomar, R. Sharmila, Emerging Technologies in Computing Theory, Practice, and Advances, Edition 2021, Chapman and Hall/CRC Imprint;
- Buvya, Broberg, and Gosciniski, Cloud Computing- Principals and Paradigms, Wiley
- Russel and Norving, Artificial Intelligence- A Modern Approach, Pearson Education;
- Samuel Greengard, Internet of Things, MIT Press;
- C.S.V. Murthy, E-commerce Concepts, Models, Strategies;
- Hurwith, Nugent Halper, Kaufman, Big Data for dummies, Wiley & Sons - Wiley.

SEMESTER 1st to 3rd
MULTI-DISCIPLINARY COURSE
CAP022I COMPUTER APPLICATIONS (INTRODUCTION TO COMPUTERS)

CREDITS: 3

COURSE OBJECTIVES

1. *To introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.*
2. *To provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.*
3. *To describe the organization and operation of a computer processor, primary and secondary memory, peripheral devices and to give computer specifications*

UNIT – I: COMPUTER BASICS

Introduction: Characteristics of Computer, Classification of Computers, Architecture and Chronology, Applications of Computer. Block Diagram of Computer.
Commonly used Terms: Hardware, Software, Firmware, Units of Measurement of Storage, Input/ Output Devices, Types of Memory, Generation of Computer Languages, and Introduction to Internet & E-Mail.

UNIT – II: OPERATING SYSTEM BASICS & GUI USING MS-WINDOWS.

Application Software and System Software, Open-Source Software and Proprietary Software.
Computer Languages and its types (Machine Language, Assembly Language, High Level Language) Translators, Compiler, Interpreter. Operating System and its functions.

UNIT –III: INTRODUCTION TO MS OFFICE

MS Word Basics: Basics of Word Processing, Text Selection, Opening Documents and Creating Documents, Saving Documents/Quitting Documents, Printing Documents. Using the Interface (Menu Toolbars), Editing Text (Copy, Delete, Move Etc.). Finding and replacing text. Special check Feature/ Auto correct Feature, Grammar check Facility, Formatting and Editing. Mail Merge, Bullets & Numbering, Borders and Shadings.

MS EXCEL BASIC:
Worksheet Workbook, Workspace Basics, Data Entry in cell, Entry of Numbers, Text and Formulate, Moving Data in the Worksheet, Selecting Data Range, Using the Interface (Toolbars, Menus), Editing basics, working with Workbooks Saving and Quitting, Cell Reference, Formatting, Editing.

MS POWER POINT BASICS:
Use of existing templates, fonts and drawing. Hands of MS PowerPoint, Creation of animated slides.

REFERENCE BOOKS:

1. Computer today, Donald H. Sanders, McGraw Hill Publishing Company.
2. Microcomputers Software and Applications, Dennis P. Curtin and Leslie R. Portel, PHI.
3. Data Processing: An Introduction, Donald P. Spencer and Charles R. Merril Pub. And Co.
4. Computers and Their Applications, Larry Joel Goldestein, PHI.
5. Windows-2000, kethy, Tata McGraw Hill Publishing Company.

Bachelor with Computer Applications as Major

Third Semester

Course Code: CAP322J Course Title: Data Communication& Computer Networks
Credits: Theory (4) Practical (2) Max. Marks: 100 Min. Marks: 36

Course Learning Outcomes:

1. To Understand the Rudiments of How computers communicate
2. To understand the operation on the components in a data communication systems and functional relationship of these components
3. To introduce the fundamental concepts of computer Network, topologies, protocols and functioning & significance of networking standards.
4. To provide knowledge of protocols, IP addressing and error detection & correction mechanisms.

Unit 1:

Data communication: Characteristics, Model, Data flow, Data representation, Analog and Digital Data, Analog and DigitalSignals, Bit rate, Band width, Nyquest Bit rate, Shanon capacity, Data transmissionmodes, Parallel transmission, Serial transmission, Transmission impairments, Guided and Unguided transmission media.

Unit 2:

Digital-to-Digital conversion (NRZ, Manchester), Analog-to-Digital conversion (Sampling, PCM, Quantization), Digital to Analog conversion (ASK, FSK, PSK), Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, De-Multiplexing, Introduction to Modulation and Demodulation.

Unit 3:

Components of Network, Topologies, Categories of Networking: LAN, WAN, MAN. OSI reference model and TCP/IP model, Switching, Circuit switched networks, Datagram Networks, Virtual Circuit Networks, Introduction to Routing.

Unit 4:

Network addressing: Physical & Logical, Subnetting, UDP and TCP, IPV4,Classful addressing,Network Protocols: HTTP, FTP, SMTP, SNMP, DNS, Error Detection & Correction, Hamming Distance, Parity check, Cyclic Redudancy check, Checksum.

Text Book:

1. Data Communications and NetworkingBook by Behrouz A. Forouzan

Reference Book

1. Computer networks / Andrew S. Tanenbaum, David J. Wetherall.
2. Data and Computer Communications by W Stallings

Unit Wise List of Practicals for Data Communication and Networking.

Unit 1: Data Communication and Transmission Media

1. **Analog vs. Digital Signals:** Demonstrate the differences between analog and digital signals using waveform visualization.
2. **Calculating Bit Rate and Bandwidth:** Calculate the bit rate and bandwidth using the Nyquist formula and Shannon capacity.
3. **Transmission Media Testing:** Crimp a network cable (Cat 5/6) and test its continuity using a cable tester.
4. **Transmission Impairments Simulation:** Use Packet Tracer to simulate different transmission impairments (attenuation, distortion) and observe their effects.
5. **Comparing Guided and Unguided Media:** Compare guided media (coaxial, fiber-optic) and unguided media (wireless) through practical examples.

Unit 2: Data and Signal Conversion, Multiplexing 6. **Digital-to-Analog Conversion:** Use Packet Tracer to demonstrate digital-to-analog conversion using ASK, FSK, and PSK modulation techniques.

7. **Analog-to-Digital Conversion:** Simulate the process of analog-to-digital conversion using PCM and quantization techniques in Packet Tracer.
8. **Frequency Division Multiplexing (FDM):** Set up a simple FDM scenario using Packet Tracer to multiplex multiple signals onto a common medium.
9. **Time Division Multiplexing (TDM):** Create a TDM scenario in Packet Tracer to show how multiple signals are time-shared over a single channel.
10. **Introduction to Modulation and Demodulation:** Demonstrate the process of modulation and demodulation using simple audio signals and software tools.

Unit 3: Networking Components, Models, and Topologies 11. **Building a LAN:** Using Packet Tracer, set up a basic local area network (LAN) with computers, switches, and cables to illustrate a star topology.

12. **Comparing OSI and TCP/IP Models:** Explain the differences between the OSI model and the TCP/IP model through practical examples of layer functions.
13. **Configuring a Router:** Use a physical or virtual router to demonstrate basic router configurations, including IP address assignment.
14. **Virtual LAN (VLAN) Setup:** Configure VLANs on a network switch using Packet Tracer to create separate broadcast domains.
15. **Introduction to Routing:** Set up a small routed network using Packet Tracer to showcase the routing process between subnets.

Unit 4: Network Addressing, Protocols, and Error Detection 16. **Subnetting Practice:** Given an IP address range, guide students through subnetting to create multiple subnets with varying host ranges.

17. **Configuring IP Addresses:** In Packet Tracer, configure IP addresses for devices in a network, ensuring proper subnetting.
18. **Testing UDP and TCP:** Use Packet Tracer to demonstrate the differences between UDP and TCP by sending data between devices.

19. **Exploring Network Protocols:** Set up a variety of services (HTTP, FTP, SMTP, DNS) in Packet Tracer to showcase their functions within a network.
20. **Error Detection Techniques:** Implement error detection techniques like parity check and CRC in Packet Tracer to show data integrity maintenance.

BACHELOR WITH COMPUTER APPLICATIONS AS MINOR

3rd SEMESTER

CAP322N: DATA COMMUNICATION & COMPUTER NETWORKS

Credits: Theory: 4; Practical: 2 Max. Marks: 100 Min. Marks: 36

Course Learning Outcomes:

1. *To Understand the Rudiments of How computers communicate*
2. *To understand the operation on the components in a data communication systems and functional relationship of these components*
3. *To introduce the fundamental concepts of computer Network, topologies, protocols and functioning & significance of networking standards.*
4. *To provide knowledge of protocols, IP addressing and error detection & correction mechanisms.*

Unit 1:

Data communication: Characteristics, Model, Data flow, Data representation, Analog and Digital Data, Analog and DigitalSignals, Bit rate, Band width, Nyquest Bit rate, Shanon capacity, Data transmissionmodes, Parallel transmission, Serial transmission, Transmission impairments, Guided and Unguided transmission media.

Unit 2:

Digital-to-Digital conversion (NRZ, Manchester), Analog-to-Digital conversion (Sampling, PCM, Quantization), Digital to Analog conversion (ASK, FSK, PSK), Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, De-Multiplexing, Introduction to Modulation and Demodulation.

Unit 3:

Components of Network, Topologies, Categories of Networking: LAN, WAN, MAN. OSI reference model and TCP/IP model, Switching, Circuit switched networks, Datagram Networks, Virtual Circuit Networks, Introduction to Routing.

Unit 4:

Network addressing: Physical & Logical, Subnetting, UDP and TCP, IPV4,Classful addressing,Network Protocols: HTTP, FTP, SMTP, SNMP, DNS, Error Detection & Correction, Hamming Distance, Parity check, Cyclic Redudancy check, Checksum.

Text Book:

1. Data Communications and NetworkingBook by Behrouz A. Forouzan

Reference Book

1. Computer networks / Andrew S. Tanenbaum, David J. Wetherall.
2. Data and Computer Communications by W Stallings

Unit Wise List of Practicals for Data Communication and Networking.

Unit 1: Data Communication and Transmission Media

1. **Analog vs. Digital Signals:** Demonstrate the differences between analog and digital signals using waveform visualization.
2. **Calculating Bit Rate and Bandwidth:** Calculate the bit rate and bandwidth using the Nyquist formula and Shannon capacity.
3. **Transmission Media Testing:** Crimp a network cable (Cat 5/6) and test its continuity using a cable tester.
4. **Transmission Impairments Simulation:** Use Packet Tracer to simulate different transmission impairments (attenuation, distortion) and observe their effects.
5. **Comparing Guided and Unguided Media:** Compare guided media (coaxial, fiber-optic) and unguided media (wireless) through practical examples.

Unit 2: Data and Signal Conversion, Multiplexing 6. **Digital-to-Analog Conversion:** Use Packet Tracer to demonstrate digital-to-analog conversion using ASK, FSK, and PSK modulation techniques.

7. **Analog-to-Digital Conversion:** Simulate the process of analog-to-digital conversion using PCM and quantization techniques in Packet Tracer.
8. **Frequency Division Multiplexing (FDM):** Set up a simple FDM scenario using Packet Tracer to multiplex multiple signals onto a common medium.
9. **Time Division Multiplexing (TDM):** Create a TDM scenario in Packet Tracer to show how multiple signals are time-shared over a single channel.
10. **Introduction to Modulation and Demodulation:** Demonstrate the process of modulation and demodulation using simple audio signals and software tools.

Unit 3: Networking Components, Models, and Topologies 11. **Building a LAN:** Using Packet Tracer, set up a basic local area network (LAN) with computers, switches, and cables to illustrate a star topology.

12. **Comparing OSI and TCP/IP Models:** Explain the differences between the OSI model and the TCP/IP model through practical examples of layer functions.
13. **Configuring a Router:** Use a physical or virtual router to demonstrate basic router configurations, including IP address assignment.
14. **Virtual LAN (VLAN) Setup:** Configure VLANs on a network switch using Packet Tracer to create separate broadcast domains.
15. **Introduction to Routing:** Set up a small routed network using Packet Tracer to showcase the routing process between subnets.

Unit 4: Network Addressing, Protocols, and Error Detection 16. **Subnetting Practice:** Given an IP address range, guide students through subnetting to create multiple subnets with varying host ranges.

17. **Configuring IP Addresses:** In Packet Tracer, configure IP addresses for devices in a network, ensuring proper subnetting.
18. **Testing UDP and TCP:** Use Packet Tracer to demonstrate the differences between UDP and TCP by sending data between devices.

19. **Exploring Network Protocols:** Set up a variety of services (HTTP, FTP, SMTP, DNS) in Packet Tracer to showcase their functions within a network.
20. **Error Detection Techniques:** Implement error detection techniques like parity check and CRC in Packet Tracer to show data integrity maintenance.

BACHELOR WITH APPLIED COMPUTING AS MINOR
3rd SEMESTER
(FOR STUDENTS WITH MAJOR IN COMPUTER APPLICATIONS / INFORMATION TECHNOLOGY)

ACP323N: APPLIED COMPUTING _ CRYPTOGRAPHY & NETWORK SECURITY

CREDITS: THEORY (4) PRACTICAL (2)

LEARNING OUTCOMES

- *Understand the fundamentals of cryptography, including classical ciphers, symmetric key cryptography, and public key cryptography.*
- *Apply cryptographic techniques to ensure message authentication and integrity.*
- *Comprehend the principles and applications of digital signatures.*
- *Understand the fundamental principles of network security and implement network security mechanisms.*
- *Analyse and mitigate network security threats and employ network security tools and techniques.*
- *Use Cryptool 2 to implement, analyse and understand various cryptographic procedures.*

THEORY (4 CREDITS, 60 HOURS) **MAX. MARKS: 100 MIN. MARKS: 36**

UNIT-I (15 hours)

Introduction to Cryptography: History of cryptography, Basics of cryptography, Types of cryptographic algorithms, Security implications of cryptography. Classical Ciphers: Caesar Cipher, Mono-alphabetic cipher, Hill cipher, Poly-alphabetic cipher (Vegnere Cipher), One time pad, Transposition Cipher (Rail-fence Cipher). Introduction to Number Theory: Prime Number Generation and Testing for Primality, Fermat's and Euler's Theorems. Symmetric Key Cryptography: Principles of symmetric key cryptography, Encryption and decryption algorithms, Claude Shannon's Theory of Diffusion and Confusion, Avalanche Effect, Feistel Cipher, Common symmetric key algorithms (e.g., DES, Triple DES, AES),

UNIT-II (15 HOURS)

Public Key Cryptography: Principles of public key cryptography, Key pair generation and Diffie-Hellman key exchange, Common public key algorithms (e.g., RSA)
Authentication Schemes and Hash Functions: Message Authentication, Introduction to digital signatures, Digital signature algorithms. (RSA). Introduction to hash functions, Properties of hash functions, Common hash algorithms (e.g., SHA1), Cryptographic Hash Applications: Password hashing and storage, Message Authentication Code (MAC)

UNIT-III (15 HOURS)

Network Security Principles and Protocols: Defining network security, understanding the CIA triad (Confidentiality, Integrity, Availability) in network security, identifying common network security threats and vulnerabilities. Introduction to network security protocols, including IPsec (Internet Protocol Security), SSL (Secure Sockets Layer). Exploring network security mechanisms such as firewalls, intrusion detection systems (IDS. Investigating the application of network security principles and protocols in various scenarios, including email security.

UNIT-IV (15 HOURS)

Network Security Threats and Mitigation Strategies: Understanding various types of network attacks, including denial-of-service (DoS) attacks, distributed denial-of-service (DDoS) attacks, man-in-the-middle (MitM) attacks, spoofing attacks, and malware attacks. Implementing network security mitigation strategies, including network hardening, vulnerability scanning and patching. Exploring network security tools and techniques, such as network sniffers for network traffic analysis.

REFERENCES:

- William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson. Eigth edition. 2023.
- Sarhan M. Musa, "Network Security and Cryptography," Mercury Learning and Information, 2nd edition. 2022.
- Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies" O'reilly, Second Eduction.
- Jan L. Harrington, "Network Security: A practical Approach," Morgan Kaufmann Publishers.
- Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg, "Network Security The Complete Reference," McGraw Hill Publications.

PRACTICAL (2 CREDIT)

1. Overview of Cryptool 2 and its features, Hashing (SHA1), (SHA2), (MD5)
2. Installation, and setup of Cryptool 2 environment. Download link https://www.cryptool.org/en/ct2/downloads.
3. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Caesar Cipher,
4. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Hill cipher
5. Use Cryptool 2 to demonstrate the principles of classical ciphers such as Vigenere Cipher.
6. Use Cryptool 2 to encrypt and decrypt messages using Feistel Cipher (FEAL).
7. Explore the processes of encryption and decryption in DES using Cryptool 2.
8. Explore the processes of encryption and decryption in AES using Cryptool 2.
9. Engage in experiments with public key algorithms (RSA) using Cryptool 2.
10. Use the “check password strength” tool in Cryptool 2 to assess and analyse the strength of a password.
11. Conduct experiments on hashing techniques (SHA-1) and the verification of hash values using Cryptool 2.
12. Conduct experiments on hashing techniques (SHA-2) and the verification of hash values using Cryptool 2
13. Setup and configure Windows Firewall for filtering. Explain its role in network security management on Windows-based systems.
14. Overview of wireshark tool,
15. Installation, and setup of Wireshark
16. Use Wireshark to capture and analyse network traffic. Identify patterns and anomalies, and discuss the role of network forensics in incident response.
17. Use Wireshark to capture and analyse network traffic on a test network. Identify different protocols, analyse packet headers, and discuss the significance of each.

3rd SEMESTER
COMPUTER APPLICATIONS
(WEB DEVELOPER)
SKILL ENHANCEMENT COURSE (SEC)

WDP322S: INTRODUCTION TO PHP AND MYSQL

CREDITS: THEORY: 2, PRACTICAL: 2

THEORY (2 CREDITS)

UNIT 1 – INTRODUCTION TO PHP (20 LECTURES)

Essential PHP. Creating a simple PHP program. PHP Building Blocks- Variables, Data Types, Operators and Expressions. Switching Flow, Loops , Functions- Calling, Defining Returning Values, Variable Scope Static Functions , Arrays, Array related Functions. Working with Objects- String, Date and Time

Working with Forms. Working with Cookies and User Sessions. Working with Files and Directories

UNIT 2 – PHP AND MYSQL (10 LECTURES)

Basic SQL Commands, Transactions and Stored Procedures.
Interacting with MYSQL using PHP- Creating Databases and Tables with PHP

REFERENCE BOOKS:

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback,O'reilly, 2014.

PRACTICAL (2 CREDITS)

LAB SHEET- INTRODUCTION TO PHP AND MYSQL

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function should accept the number as an argument.
3. Write a program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. WAP to sort an array.
7. WAP in PHP to create Login and Logout using sessions.
8. WAP in PHP to parse a sentence and calculate no. of words and punctuation marks.
9. Program to set, retrieve and delete a cookie
10. WAP in PHP to open a new connection to the MySQL server.
11. WAP to create, open, read, write, append, delete and close files.
12. Develop a PHP MySQL Login System.

SEMESTER 1st to 3rd
MULTI-DISCIPLINARY COURSE
CAP022I COMPUTER APPLICATIONS (INTRODUCTION TO COMPUTERS)

CREDITS: 3

COURSE OBJECTIVES

1. *To introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.*
2. *To provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills.*
3. *To describe the organization and operation of a computer processor, primary and secondary memory, peripheral devices and to give computer specifications*

UNIT – I: COMPUTER BASICS

Introduction: Characteristics of Computer, Classification of Computers, Architecture and Chronology, Applications of Computer. Block Diagram of Computer.
Commonly used Terms: Hardware, Software, Firmware, Units of Measurement of Storage, Input/ Output Devices, Types of Memory, Generation of Computer Languages, and Introduction to Internet & E-Mail.

UNIT – II: OPERATING SYSTEM BASICS & GUI USING MS-WINDOWS.

Application Software and System Software, Open-Source Software and Proprietary Software.
Computer Languages and its types (Machine Language, Assembly Language, High Level Language) Translators, Compiler, Interpreter. Operating System and its functions.

UNIT –III: INTRODUCTION TO MS OFFICE

MS Word Basics: Basics of Word Processing, Text Selection, Opening Documents and Creating Documents, Saving Documents/Quitting Documents, Printing Documents. Using the Interface (Menu Toolbars), Editing Text (Copy, Delete, Move Etc.). Finding and replacing text. Special check Feature/ Auto correct Feature, Grammar check Facility, Formatting and Editing. Mail Merge, Bullets & Numbering, Borders and Shadings.

MS EXCEL BASIC:
Worksheet Workbook, Workspace Basics, Data Entry in cell, Entry of Numbers, Text and Formulate, Moving Data in the Worksheet, Selecting Data Range, Using the Interface (Toolbars, Menus), Editing basics, working with Workbooks Saving and Quitting, Cell Reference, Formatting, Editing.

MS POWER POINT BASICS:
Use of existing templates, fonts and drawing. Hands of MS PowerPoint, Creation of animated slides.

REFERENCE BOOKS:

1. Computer today, Donald H. Sanders, McGraw Hill Publishing Company.
2. Microcomputers Software and Applications, Dennis P. Curtin and Leslie R. Portel, PHI.
3. Data Processing: An Introduction, Donald P. Spencer and Charles R. Merril Pub. And Co.
4. Computers and Their Applications, Larry Joel Goldestein, PHI.
5. Windows-2000, kethy, Tata McGraw Hill Publishing Company.

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-I)
5th SEMESTER

CAP522J1: COMPUTER APPLICATIONS _ OPERATING SYSTEM

CREDITS: THEORY (3) PRACTICAL (1)

COURSE LEARNING OUTCOMES:

At the end of this course, a student should be able to:

- *To learn and understand the concepts of operating system.*
- *To understand the core structure and functions of operating system.*
- *Explain process management, processor scheduling, and concurrent programming.*
- *Understand the concept of deadlocks and synchronization.*
- *Learn memory management, file management. I/O systems, and disk scheduling.*
- *Distinguish main memory and virtual memory.*
- *Leam Operating System Design issues.*
- *Leam basic Unix commands and shell programming*

UNIT-1 (15 HOURS)

Introduction: Goals & Structure of Operating System. Basic functions & Modes. Types of Operating System (Batch, Multiprogramming, Multitasking, Time Sharing, Parallel, Distributed A Real-Time OS). System calls.

Process: Process Concept, Process states, Threads, Uni-processor Scheduling: Types of scheduling (Pre-emptive & Non- pre-emptive). Scheduling algorithms (FCFS, SJF, RR, Priority, Thread Scheduling).

UNIT-2 (15 HOURS)

Concurrency: Principles of Concurrency, Mutual Exclusion: Software approaches, Hardware Support, Semaphores, Message Passing, Signals. Monitors, Classical Problems of Synchronization (Readers-Writers, Producer-Consumer, and Dining Philosopher problem).

Deadlock: Principles of Deadlock. Deadlock Prevention & Avoidance, Deadlock Detection.

UNIT-3 (15 HOURS)

Memory: Memory Management requirements, Memory partitioning (Fixed and Variable Partitioning), Memory Allocation Strategies (First Fit, Best Fit and Worst Fit), Fragmentation. Swapping, Segmentation, Paging.

Virtual Memory: Virtual Memory Concepts and Implementation, Concept of Demand Paging, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies). Thrashing.

PRACTICALS (I CREDIT: 30 HOURS)

- In Malling and setting up of Linux /Unix Operating system.
- Using Basic Unix commands like echo, printf. Is, who, date, passwd, cal.
- Using pwd, cd, mkdir, rmdir, cat commands
- Using mv, rm, cp, wc and od commands.
- Demonstrate the use of Pipes.
- Using Basic and Extended regular expressions
- Implementing file permissions, printing commands.
- Mount devices like usb drives in UNIX/Linux.
- Write a shell script to demonstrate the use of variable & basic input output on the console.
- Write a script to demonstrate the use of control statements

TEST BOOK:

- *Peter B Galvin, Greg Gagne. Abraham Silberschatz: Operating System Concepts. John Wiley & Sons, Inc.*
- *Shell Programming by Yashwant Kanetkar*

REFERENCE BOOKS:

- *Peter B Galvin. Greg Gagne. Abraham Silberschatz: Operating System Concepts. John Wiley A Sons, Inc.*
- *Andrew S. Tanenbaum: Modern Operating Systems, PHI*
- *William Stallings: Operating Systems, Pearson Education India*
- *M. G. Venkatesh Murthy: USIX & Shell Programming, Pearson Education*
- *Richard Blum, Christine Bresnahan: Linux Command Line and Shell Scripting Bible, Wiley.*

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-2)
5TH SEMESTER

CAP522J2: COMPUTER APPLICATIONS _ DATA STRUCTURES USING C
CREDITS: THEORY (4) INTERNSHIP / PRACTICAL (2)

OBJECTIVES:

- *To introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving.*
- *To learn the linear and non-linear data structures.*
- *To explore the applications of linear and non-linear data structures.*
- *To learn to represent data using tree and graph data structure.*
- *To learn the basic sorting and searching algorithms.*
- *To write programs for different Data Structures and Algorithms*

Unit-I: Linear Data Types – I (15 Lectures)
Introduction to data structure (Linear, Non-Linear, Primitive, Non-Primitive), Data Structure and Data Operations, Algorithm Complexity
Single dimensional array and its operations (Searching, traversing, inserting, deleting), Two-Dimensional array, Addressing, Sparse Matrices, recursion.
Searching Algorithms: Linear Search, Binary Search and their Comparison.

Unit –II: Linear Data Types – II (15 Lectures)
Array Sorting Algorithms: Selection sort. Insertion sort, Bubble Sort, Quick sort.
Stack: Definition & Concepts, Array Representation of Stack, Operations on Stack. Applications of Stack: Expressions and their representation: Infix, Prefix, Postfix and their conversions & evaluation.
Queue: Definition & Concepts, Array Representation of Queue, Operations on Queue, Circular Queue, Applications of Queue.

Unit-III: Linear Data Types – III (15 Lectures)
Review of structures & pointers.
Introduction to Linked Lists and their applications: Singly linked list: Definition & Concepts, representation in memory, operations on singly linked list (insertion, deletion, traversal, reversal). Variations of Linked List (Doubly linked list, circular linked list)
Linked list implementation of Stack and Queue.

Unit-IV: Non- Linear Data Types (15 Lectures)
Trees: Introduction to trees, terminology, Binary Trees, Binary tree representation and traversals (in-order, pre-order, post-order), Binary Search Trees, Applications of trees.
Graphs: Introduction, terminology, linked and matrix representation, Traversing a Graph: BFS, DFS. Dijkstra's Shortest Path Algorithm. Applications of graphs.

TEXT BOOK:

1. Fundamentals of Data Structures in C: Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed.
2. Data Structures & Algorithms; Concepts, Techniques & Algorithms: G. A. V. Pai Tata McGraw Hill.
3. Systematic approach to data structure using C: A M Padma Reddy Sri Nandi Publications

REFERENCES:

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms, Pearson Education, 1983.
3. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla , ― Data Structures and Program Design in C, Second Edition, Pearson Education, 2007
4. Jean-Paul Tremblay and Paul G. Sorenson, ―An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, 1991.

5. Pradip Dey and Manas Ghosh, ―Programming in C, Second Edition, Oxford University Press, 2011.
6. Data Structures Through C In Depth S.K.Srivastava, Deepali Srivastava BPB Publications
7. Data Structure Through C Yashavant P. Kanetkar BPB Publications

INTERNSHIP OR PRACTICALS (02 CREDITS: 60 HOURS)

1. Write a C Program to demonstrate the concept of one-dimensional array.
2. Write a C Program to insert and delete element in an array.
3. Write a C Program to Search an element using sequential search
4. Write a C Program to Search an element using binary search
5. Write a C Program to Add two 2-D Matrices
6. Write a C Program to multiply two 2-D Matrices
7. Write a C Program to read a 2-D Matrix and create its equivalent sparse representation.
8. Write a C Program to add two sparse matrices.
9. Write a C Program to implement recursion (factorial)
10. Write a C Program to arrange the list of numbers using Bubble Sort
11. Write a C Program to arrange the list of numbers using Insertion Sort
12. Write a C Program to arrange the list of numbers using Selection Sort.
13. Write a C Program to arrange the list of numbers using quick sort.
14. Write a C Program to implement stack operations using array.
15. Write a C Program to implement basic operations on queue.
16. Write a C Program to implement a circular queue.
17. Write a C Program to convert infix expression to its postfix form using stack operations.
18. Write a C Program to evaluate the given postfix expression using stack operations.
19. Write a C Program to create a singly linked list and perform operations such as insertions and deletions.
20. Write a C Program to reverse a singly linked list.
21. Write a C Program to implement stack and its operations using linked representation.
22. Write a C Program to implement queue and its operations using linked representation.
23. Write a C Program to implement basic operations on doubly linked list.
24. Write a C Program to implement basic operations creation of Binary Search tree.
25. Write a C Program to implement basic operations insertion, search, find min and find max on Binary Search tree.
26. Write a C Program to implement basic operations deletion on Binary Search tree.
27. Write a C Program to implement tree traversal methods
28. Write a C Program to implement breadth first graph traversal
29. Write a C Program to implement Depth first graph traversal.
30. Write a C Program to implement Dijsktra’s Shortest Path Algorithm on a graph.

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-3)

5th SEMESTER

CAP522J3 COMPUTER APPLICATIONS _ DISCRETE MATHEMATICS

CREDITS: THEORY (4) PRACTICAL (2)

COURSE LEARNING OUTCOMES:

1. *To be able to understand mathematical reasoning in order to read, comprehend, and construct mathematical arguments.*
2. *To be able to count or enumerate objects, and use basic techniques of counting to solve counting problems.*
3. *To be able to work with discrete structures such as sets, permutations, relations, graphs, and trees, and use them to represent discrete objects and the relationships between these objects.*

UNIT 1: (15 HOURS)

Sets, Types, Set Operations, Venn Diagrams, Cardinality, Set Properties and Identities.

Relations, Cartesian Product, Properties of Relations, Types of Relations, Representation of Relations, Closures, Equivalence Relations.

Functions, Domain, Codomain, Range, Types of Functions (one-to-one, many-to-one, onto), Composition of Functions. Algebra of Functions.

UNIT 2: (15 HOURS)

Logic: Propositions, Variables and Logical Operators with Truth Tables. Conditionals and Biconditionals. Converse, Contrapositive, and Inverse of a Proposition.

Truth Tables of Compound Propositions and their equivalence. Tautology, contradiction and contingency. De Morgan's Laws and other Logical Equivalences (laws). Satisfiability.

Predicates. Universal and Existential Quantifiers. Logical Equivalences Involving Quantifiers, Negation and De Morgan's Laws for Quantifiers. Converting English into Logical Expressions. Nested Quantifiers, Negation and Order of Nested Quantifiers. Rules of Inference.

UNIT 3: (15 HOURS)

Introduction to Matrices, operations on matrices (addition, multiplication, transpose). Adjacency Lists, Adjacency Matrices, Incidence Matrices. Counting: Pigeonhole Principle and its Applications.

Permutations, Combinations, Permutations and Combinations with Repetition, Binomial Theorem. Summations, Introduction to Recurrence Relations.

UNIT 4: (15 HOURS)

Graphs, Terminology, Types: Simple, Multigraphs, Directed, Undirected, Complete, Bipartite, Subgraphs. Graph isomorphism. Graph Connectivity, Euler and Hamilton Paths and Circuits, Konigsberg Bridge Problem. Cliques. Graph Coloring: Four Color Theorem.

Trees: Terminology, Arity, Ordered Rooted Trees, Unbalanced and Balanced Trees, Minimal Spanning Trees (Kruskal's & Prim's Algorithm).

DISCRETE MATHEMATICS (TUTORIAL)

1. Find whether $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$ is a tautology or a contradiction?
2. Prove the following De-Morgan's law using truth table:
   $\neg (p \wedge q)$ is logically equivalent to $(\neg p \vee \neg q)$
3. State which rule of inference is used in the argument:
   If it rains today, then we will not have a barbecue today. If we do not have a barbecue today, then we will have a barbecue tomorrow. Therefore, if it rains today, then we will have a barbecue tomorrow.
4. Prove by Mathematical Induction that:
   $2 + 6 + 10 + \ldots + (4n - 2) = 2n^2$
5. Give direct proof of the theorem "If n is an odd integer, n^2 is odd."
6. Prove by contraposition that if n is an integer and 3n+2 is odd, then n is odd.
7. Prove that if n=ab, where a and b are positive integers, then $a \leq \sqrt{n}$ or $b \leq \sqrt{n}$.
8. Prove that $\sqrt{2}$ is irrational using proof by contradiction.
9. Let f and g be the functions from the set of integers to a set of integers defined by f(x) =2x+3 and g(x) =3x+2. What is the composition of f and g? What is the composition of g and f?
10. a). Show that $f(x) = x^2+2x+1$ is $O(x^2)$.
    b). Show that n^2 is not O (n).
11. Determine whether the function $f(x) = x^2$ from the set of integers to a set of integers is one-to-one.
12. How many reflexive relations are there on a set with n elements?

13. Let m be a positive integer with m>1. Show that the relation
    a. R = {(a,b)|a≡b(mod m)}
    b. is an equivalence relation on a set of integers.
14. Draw the Hasse diagram of (D (75), divides), where the set D (75) represents the set of all divisors of 75. Check whether (D (75), divides) forms a lattice or not.
15. Find the transitive closure for the relation represented by the following matrix:

$$\begin{vmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{vmatrix}$$

16. How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen?
17. How many bit strings of length eight either start with a 1 bit or end with two bits 00.
18. Suppose that a department contains 10 men and 15 women. How many ways are there to form a committee with six members if it must have the same number of men and women?
19. A young pair of rabbits (one of each sex) is placed on an island. A pair of rabbits does not breed until they are two months old. After they are two months old, each pair of rabbits produces another pair each month. Find a recurrence relation for the number of pairs of rabbits on the island after n months, assuming that no rabbits ever die.
20. Let H_n denote the number of moves needed to solve the Tower of Hanoi problem with n disks. Set up a recurrence relation for the sequence H_n.
21. What is the solution of the recurrence relation

$$a_n - a_{n-1} + 2a_{n-2}$$

with $a_0 = 2$ and $a_1 = 7$?

22. Find all solutions to the recurrence relation

$$a_n = 5a_{n-1} - 6a_{n-2} + 7^n$$

23. Find all solutions to the recurrence relation

$$a_n = 3a_{n-1} + 2n$$

What is the solution with a_1=3?

24. Draw a graph from following adjacency matrix with respect to ordering of vertices a, b, c, d:

$$\begin{vmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{vmatrix}$$

25. Use Huffman coding to encode the following symbols with the frequencies listed:
    a. A: 0.08 B: 0.10 C: 0.12 D: 0.15 E: 0.20 F: 0.35
    b. What is the average number of bits used to encode the character?
26. Find a binary search tree for the words mathematics physics geography zoology meteorology geology psychology chemistry using alphabetical order.
    Use Prim's algorithm to find a minimum spanning tree of any graph.
27. What is the chromatic number of the complete bipartite graph $K_{m,n}$, where m and n are positive integers?
28. Show that C_6 is bipartite. Also show that K_3 is not bipartite.
29. Use Dijkstra's algorithm to find the length of a shortest path between any two vertices in some weighted connected graph.

TEXTBOOK:

1. Discrete Mathematics, Seymour Lipschutz, marc Lipson, McGraw Hill Publications.
2. Kenneth Rosen, Discrete Mathematics and its Applications (8e, 2019, McGraw-Hill)

REFERENCES:

1. Susanna Epp, Discrete Mathematics with Applications (5e, 2019, Cengage Learning)
2. Eric Lehman, F. Thomson Leighton, Mathematics for Computer Science (1e, 2018)
3. Sarah-Marie Belcastro, Discrete mathematics (2e, 2019, CRC Press)
4. Lipschutz, Schaum's outline of Discrete Mathematics-MGH (2007)
5. GSN Murthy, UM Swami, Mathematics for JEE (Main and Advanced) (Wiley)
6. R S Aggarwal, Senior Secondary School Mathematics for Class XI (Bharati Bhawan)

BACHELOR WITH COMPUTER APPLICATIONS AS MINOR (CT-I)
5th SEMESTER

CAP522N: COMPUTER APPLICATIONS _ OPERATING SYSTEM

CREDITS: THEORY (3) PRACTICAL (1)

COURSE LEARNING OUTCOMES:

At the end of this course, a student should be able to:

- *To learn and understand the concepts of operating system.*
- *To understand the core structure and functions of operating system.*
- *Explain process management, processor scheduling, and concurrent programming.*
- *Understand the concept of deadlocks and synchronization.*
- *Learn memory management, file management. I/O systems, and disk scheduling.*
- *Distinguish main memory and virtual memory.*
- *Leam Operating System Design issues.*
- *Leam basic Unix commands and shell programming*

UNIT-1 (15 HOURS)

Introduction: Goals & Structure of Operating System. Basic functions & Modes. Types of Operating System (Batch, Multiprogramming, Multitasking, Time Sharing, Parallel, Distributed A Real-Time OS). System calls.

Process: Process Concept, Process states, Threads, Uni-processor Scheduling: Types of scheduling (Pre-emptive & Non- pre-emptive). Scheduling algorithms (FCFS, SJF, RR, Priority, Thread Scheduling).

UNIT-2 (15 HOURS)

Concurrency: Principles of Concurrency, Mutual Exclusion: Software approaches, Hardware Support, Semaphores, Message Passing, Signals. Monitors, Classical Problems of Synchronization (Readers-Writers, Producer-Consumer, and Dining Philosopher problem).

Deadlock: Principles of Deadlock. Deadlock Prevention & Avoidance, Deadlock Detection.

UNIT-3 (15 HOURS)

Memory: Memory Management requirements, Memory partitioning (Fixed and Variable Partitioning), Memory Allocation Strategies (First Fit, Best Fit and Worst Fit), Fragmentation. Swapping, Segmentation, Paging.

Virtual Memory: Virtual Memory Concepts and Implementation, Concept of Demand Paging, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies). Thrashing.

PRACTICALS (I CREDIT: 30 HOURS)

- In Malling and setting up of Linux /Unix Operating system.
- Using Basic Unix commands like echo, printf. Is, who, date, passwd, cal.
- Using pwd, cd, mkdir, rmdir, cat commands
- Using mv, rm, cp, wc and od commands.
- Demonstrate the use of Pipes.
- Using Basic and Extended regular expressions
- Implementing file permissions, printing commands.
- Mount devices like usb drives in UNIX/Linux.
- Write a shell script to demonstrate the use of variable & basic input output on the console.
- Write a script to demonstrate the use of control statements

TEST BOOK:

- *Peter B Galvin, Greg Gagne. Abraham Silberschatz: Operating System Concepts. John Wiley & Sons, Inc.*
- *Shell Programming by Yashwant Kanetkar*

REFERENCE BOOKS:

- *Peter B Galvin. Greg Gagne. Abraham Silberschatz: Operating System Concepts. John Wiley A Sons, Inc.*
- *Andrew S. Tanenbaum: Modern Operating Systems, PHI*
- *William Stallings: Operating Systems, Pearson Education India*
- *M. G. Venkatesh Murthy: USIX & Shell Programming, Pearson Education*
- *Richard Blum, Christine Bresnahan: Linux Command Line and Shell Scripting Bible, Wiley.*

BACHELOR WITH APPLIED COMPUTING AS MINOR
5th SEMESTER
(FOR STUDENTS WITH MAJOR IN COMPUTER APPLICATIONS / INFORMATION TECHNOLOGY)

ACP522N: APPLIED COMPUTING _ THEORY OF COMPUTATION

CREDITS: THEORY (3) PRACTICAL (1)

MAX. MARKS: 100 MIN. MARKS: 36

COURSE LEARNING OUTCOMES:

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

1. *Understand the basic concepts of complexity theory, computability theory, and automata theory.*
2. *Apply different types of proof techniques, such as proof by construction, proof by contradiction, and proof by induction.*
3. *Design and analyze finite automata and regular expressions to recognize and generate regular languages.*
4. *Design and analyze pushdown automata and context-free grammars to recognize and generate context-free languages.*
5. *Understand the Church-Turing thesis and its implications for computability.*
6. *Define and analyze polynomial-time and NP problems.*
7. *Understand the P vs NP problem and its implications for complexity theory.*

THEORY (3 CREDITS)

UNIT 1:

Introduction to Automata Theory: Automata and Languages. Regular Languages: Finite Automata (formal definition of computation, designing finite automata, the regular operations).
Deterministic and non-deterministic automata, formal definition of NFA, equivalence of NFAs and DFAs. Closure under the regular operations.
Regular Expressions: Formal definition, equivalence with finite automata.

UNIT 2:

Introduction to Grammar and its hierarchy. Context Free Languages: Formal definition, examples, designing of CFGs, Ambiguity. Pushdown Automata: Formal definition, equivalence with CFGs.
Non-Context Free Languages. Deterministic Context-Free Languages: properties, Deterministic context-free grammars, relationship of DPDAs and DCFGs.
Recursive and Recursively enumerable languages.

UNIT 3:

Computability Theory. The Church-Turing Thesis: Turing Machines (formal definition, examples). Introduction to Decidability, Reducibility, Recursion Theorem. Introduction to Undecidability: Halting problem.
Complexity Theory. Time Complexity: Asymptotic notations, Class P (polynomial time, examples), The class NP, P vs NP, NP-completeness. Introduction to Space complexity.

TUTORIAL (1 CREDIT):

Examples and problems based on Unit 1st to 3rd as specified by the course teacher.

TEXT BOOK:

1. Introduction to the Theory of Computation, Third Edition Michael Sipser, Cengage Learning, ISBN-13: 978-1-133-18779-0

REFERENCE BOOK

1. Padma Reddy
2. Introduction to Automata Theory, Languages, and Computation by Jeffrey D. Hopcroft, John E. Hopcroft, and Jeffrey D. Ullman (3rd edition, 2006)
3. Formal Languages and Automata Theory by Peter Linz (3rd edition, 2011)

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-1)

7th SEMESTER

CAP722J1: COMPUTER APPLICATIONS _ CYBER SECURITY

CREDITS: THEORY (3) PRACTICAL (1)

LEARNING OUTCOMES:

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

- *Define and explain the key concepts of cybersecurity, including the CIA triad (Confidentiality, Integrity, and Availability), cyber threats and vulnerabilities, cybercrime, and cyberattack methods.*
- *Comprehend the importance of reporting cybercrime incidents and understand the procedures for reporting to law enforcement agencies and cybercrime reporting platforms.*
- *Identify the legal framework for cybersecurity, including relevant cybercrime laws, regulations, and data privacy laws. Implement data security measures to protect personal data from unauthorized access, use, or disclosure.*
- *Understand the security considerations for e-commerce transactions, digital payments, and social media platforms. Apply best practices to protect financial information and personal data in these domains.*
- *Implement cybersecurity best practices in daily life, such as creating strong passwords, protecting online accounts, avoiding suspicious links and attachments, and keeping software up to date. Understand the importance of user awareness and training in cybersecurity.*

THEORY (3 CREDITS, 45 hours)

UNIT-I (15 hours)

Introduction to Cybersecurity: Defining cybersecurity and its importance, The CIA triad: Confidentiality, Integrity, and Availability, Types of cyber threats and vulnerabilities, **Cybercrime and Its Types:** Understanding cybercrime and its motivations, Types of Cyber Attackers- White, grey and black hat, Common types of cybercrime: hacking, phishing, malware, ransomware, **Methods of Infiltration**: Social Engineering, Denial-of-Service, distributed DoS, Botnet, password attacks, The impact of cybercrime on individuals, organizations, and society, **Security Vulnerability & Exploits**: Hardware vulnerability, software vulnerability. **Remedial and Mitigation Measures:** Implementing security controls to prevent cyberattacks, Network security: firewalls, intrusion detection systems, access control, Endpoint security: antivirus, anti-malware, software updates, User awareness and training: educating users about cybersecurity threats and best practices.

UNIT-II (15 hours)

Reporting Cybercrime: The importance of reporting cybercrime incidents, Procedures for reporting cybercrime to law enforcement agencies, Role of cybercrime reporting platforms, Cyber Law: Legal framework for cybersecurity, Relevant cybercrime laws and regulations, Data privacy laws and their implications for cybersecurity practices. **Data Privacy and Security:** Understanding data privacy principles, Implementing data security measures: encryption, access controls, data retention policies, Protecting personal data from unauthorized access, use, or disclosure

UNIT-III (15 hours)

E-Commerce, Digital Payments and Its Security: Security considerations for e-commerce transactions, Protecting financial information and digital payments, Secure online payment methods and protocols,

Overview of social media and Its Security: Understanding social media platforms and their security challenges, Protecting personal information on social media, Avoiding social media scams and phishing attacks. **Cybersecurity Best Practices and Do's and Don'ts:** Implementing cybersecurity best practices in daily life, creating strong passwords and protecting online accounts, Avoiding suspicious links and attachments, Keeping software up to date and installing patches promptly.

REFERENCES:

- Raef Meeuwisse, "Cybersecurity for Beginners," Cyber Simplicity Limited, ISBN: 9781911452034, 1911452037.
- William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson. Eigth edition. 2023.
- Jeetendra Pande, "Introduction to Cyber Security" Uttarakhand Open University, Year: 2017, ISBN: 9789384813963.
- Mayank Bhushan, Raj Kumar Singh, Aatif Jamshed, " Fundamental of Cyber Security (Principles, Theory & Practices," BPB Publications.

- Mark Stamp, “Information Security – Principles and Practice,” Wiley Publication, Second edition, 2011.

PRACTICAL (1 CREDIT, 15 hours)

1. Discuss and define terms such as Confidentiality, Integrity, and Availability. Provide real world examples to illustrate these concepts.
2. Classify and discuss examples of cyber threats and vulnerabilities. Use case studies to analyse real-world scenarios.
3. Simulate a phishing email and discuss common signs of phishing. Teach students how to identify and avoid falling victim to social engineering.
4. Install and configure firewall, antivirus and anti-malware software on student machines. Discuss the significance of regular software updates.
5. Walk through the steps of reporting a simulated cybercrime incident on Cybercrime Portal (https://www.cybercrime.gov.in/). Discuss the role of law enforcement and reporting platforms.
6. Demonstrate the use of encryption tools and set up access controls on sample data. Discuss the importance of protecting sensitive information.
7. Simulate an e-commerce transaction, focusing on securing financial information. Discuss secure online payment methods and protocols.
8. Discuss and demonstrate security settings and features on popular social media platforms (Facebook, Twitter) that enhance security. Practice avoiding scams and phishing attacks.
9. Teach students to check if their email accounts have been compromised on the website https://haveibeenpwned.com
10. Conduct a workshop to evaluate the strength of passwords using the password strength checker at https://asecuritysite.com/encryption/passes, creating strong passwords, recognizing suspicious links, and installing software updates. Provide hands-on experience with these practices.

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-2)

7th SEMESTER

CAP722J2 COMPUTER APPLICATIONS _ JAVA PROGRAMMING

CREDITS: THEORY (4) PRACTICAL (2)

LEARNING OUTCOMES:

1. ***Basic Syntax:*** *Understand the fundamental syntax of Java, including variables, data types, operators, and control structures.*
2. ***Object-Oriented Programming:*** *Comprehend the principles of object-oriented programming, such as classes, objects, inheritance, encapsulation, and polymorphism.*
3. ***Exception Handling:*** *Master the concept of exception handling to deal with runtime errors effectively.*
4. ***File I/O:*** *Understand how to read from and write to files using Java's input/output capabilities.*
5. ***Multithreading:*** *Gain knowledge of concurrent programming by learning how to create and manage multiple threads.*
6. ***Networking:*** *Understand the concept of TCP/IP server sockets and use them to create networking applications for chatting or file transfer.*

UNIT I:

Introduction to Java Language, Java Virtual Machine (JVM) and Byte-code.

Java Language Overview: Lexical issues Installing JDK.PATH variable. Java program – Structure, Compilation and Execution. Java Class libraries (System Class). main () method.

Data types, Variables and Arrays: Primitive Data-types and Typed-Literals. Variables – Declaration, Initialization, Scope and Lifetime. **Arrays** – Single and Multidimensional. Type Conversion and Expression Promotion, Operators, Expressions and Control statements.

Class Fundamentals: Class Structure (Variable and Method declaration). Modifiers (Access Modifiers and Other Modifiers). Components of Class, Variable and Method declaration. Constructor and finalize (). Garbage Collection. Passing parameters to methods. Variable hiding. Method overloading. Constructor overloading and chaining. Use of this keyword. Code blocks - Static and non-static.

UNIT II :

Inheritance: Mechanism. Role of Access Modifiers. Method Overriding and Shadowing. Use of super keyword. Polymorphism - Early and late binding. Abstract Class and Interface. Components of Interface declaration. Implementing Interfaces.

Exception Handling: Mechanism - Exception-Object, Throwing an Exception, and Exception Handler. Catch or Specify policy. Types of Exception - Checked vs Unchecked, Built-in vs User defined. Catching an Exception - try-catch-finally. Specifying an Exception - throws. Manually throwing an Exception - throw. Custom Exceptions. Chained Exceptions.

Packages: Creating and Importing Packages. CLASSPATH variable. static import.

Strings: Mutable and Immutable Strings. Creating Strings. Operations on Strings.

UNIT III:

Threads: Creating Threads in Java. Java Thread Lifecycle. Multithreading in Java:
Synchronization and Inter- process communication (IPC) in Threads.

Applet: Java Applet class Architecture. Working and Lifecycle of Java Applet. Displaying text and animation, and passing parameters to Applet. Embedding Applets in a web page.

UNIT- IV

Event-Driven Programming: Java 1.1 Event Delegation Model – Source object, Event object and Listener object. Methods associated with Source, Event and Listener objects. Low-level vs Semantic events. Adapter classes, Inner classes, and Anonymous Inner classes. Adding GUI elements to Applet.

I/O Streams: Byte, Character, Buffered, Data, and Object Streams. Standard Streams. File I/O Basics, Reading and Writing to Files. Serializing Objects.

Networking Classes and Interfaces: TCP/IP Server Sockets in Java.

TEXTBOOK:

H. Schildt, Java: The Complete Reference, 9th Edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS:

K. Sierra, Sun Certified Programmer for Java 5, Wiley India, 2006.
K. Sierra and B. Bates, Head First Java (Java 5), 2nd Edition, O'Reilly, 2003.
H.M. Dietel and P.J. Dietel, Java: How to Program, 6th Edition, Pearson Education, 2007.
C.S. Horstmann and G. Cornell, Java 2 Vol-1 Fundamentals, 7th Indian Reprint, Pearson Education, 2006.
E. Balagurusamy, Programming with Java: A Primer, 4th Edition, Tata Mcgraw Hill, 2010.

JAVA PROGRAMMING (LAB MANUAL)

1. Download latest version of Java Development Kit (JDK), preferably JDK8 or above (Please visit https://java.com/en/download/).Follow the instructions that appear during the Installation ofJDK8, and set PATH variable to the appropriate directory location as instructed in the lecture.
2. Write a Java program that reads a floating-point number from keyboard, converts it to integer and displays it.
3. Write a Java program that reads a string from keyboard, converts it to a floating-point number and displays it.
4. Write a Java program that creates a 2D integer array with 5 rows and varying number of columns in each row. Using 'for each' variant of for loop display each element of every row.
5. Write a Java program that iteratively calculates factorial of a number.
   Write a Java program that sorts (using bubble sort) an integer array using for loop.
6. Write a Java program that creates a Class, namely Student.
   (a) Ensure that Age instance variable of the Class is never accessed directly, and its value is never less than 4 and greater than 40 for any Object of the Class (use methods to validate and assign the value).
   (b). Ensure that the constructor always assigns a unique value to Enrollment_No instance variable for every Object of the Class (use a static class variable for counting objects, say Object_Counter).
   (c). Ensure that when an Object is removed, the Object_Counter is automatically decremented (use finalize()), and whenever required the variable can only be accessed using a method even without an Object reference (make the counter private and use a static method to access it).
7. Write a Java program in which a Class overloads a method sum(), which takes 2 parameters. The overloaded methods should perform summation of either integer or floating-point values.
8. Write a Java program that reads a string from keyboard and displays it in reverse.
9. Write a Java program that creates a Class namely A that has a private instance variable and method, a protected instance variable and method, a default instance variable and method, and a public instance variable and method. Create another Class say B that inherits from A.
   (a).Show that all except private members are inherited.
   (b).Show that an inherited instance variable can be shadowed (with the same or weaker access visibility) but can be accessed using super keyword in the sub-class.
   (c). Show that an inherited method can be overridden (with the same or weaker access visibility) but can be accessed using super keyword in the sub-class.
   (d).Show that the reference variable of type A or B can't access an overridden method of A in the Object of B.
   (e). Show that the reference variable of type A can access a shadowed data member of A in the Object of B.
10. Write a Java program that creates an instance of a Class that has an explicit constructor, and static code blocks and non-static code blocks each displaying a different string.
11. Write a Java program that creates a Class that has an explicit constructor, and static and non-static code blocks each displaying a different string. Extend this class into another class that also has an explicit constructor, static code blocks and non-static code blocks, each displaying a different string. Create an instance of the derived class.
12. Write a Java program that creates a Class with 2 overloaded constructors each displaying a different string. Extend this class into 2 classes each invoking a different constructor of their super-class when instantiated.
13. Write a Java program that creates a Class in which a method throws ArithmeticException, and handles it by displaying a relevant message.
14. Write a Java program that creates a Class in which a method throws ArrayOutOfBoundsException, and handles it by displaying a relevant message.
15. Write a Java program that creates a Class in which a method throws FileNotFoundException, and handles it by displaying a relevant message.
16. Write a Java program that creates a Class in which a method asks the user to input 2 integer values, and calls another member function (say div()) to divide the first inputted number by the second number (by passing them as parameters). Handle an exception that can be raised in div() when the denominator equals zero (use try-catch statement).

17. Modify the above Java program so that it also creates a Custom Exception that is thrown by div() when the denominator value is 1 (use throw). Handle the exception.
18. Modify the above Java program so that the exception-handling in not performed by div() rather it only specifies all the possible exceptions it may throw (use throws). And, the method that calls div() does the exception handling.
    Create a Java Package (say pack1) that contains 2 Classes (say A and B) wherein each class has a show() method that displays a unique string. Use all the classes from the package in another Java program and invoke the show() method.
19. Write a Java program that demonstrates use of static import.
20. Write a Java program that reads a string from keyboard and displays the number of characters read without using any built-in method.
21. Write a Java program that uses fully qualified name for System. out.println() method to display a string.
22. Write a Java program to implement a solution for producer-consumer problem using synchronization and inter-process communication in Threads.
23. Write a Java program that creates a Class that extends an Applet class. The applet displays bar chart for the data passed as parameter. The data includes the number of male and female students enrolled in MCA course.
24. Write a Java program to create a Class that extends an Applet class. The derived Applet takes length and breadth as parameters and draws a rectangle.
25. Write a Java program to open and read a file (filename is passed as command line argument), and displays the number of words in the file?
    Write a Java program that opens a file (filename is passed as command line argument) and appends "hello world!" at its end.
26. Write a Java program (a client) that opens a connection to https://www.Internic.net website and displays information about www.google.com.
27. Write a Java program (client) that sends a text message to another Java program (server), which receives and displays it.

BACHELOR WITH COMPUTER APPLICATIONS AS MAJOR (CT-III)

7th SEMESTER

CAP722J3: COMPUTER APPLICATIONS _ MACHINE LEARNING

CREDITS: THEORY (4) PRACTICAL (2)

LEARNING OUTCOMES

1. *Understanding popular ML algorithms with their associated mathematical foundations for appreciating these algorithms.*
2. *Capability to implement basic algorithms using basic machine learning libraries mostly in python. Gain hands-on experience in applying ML to problems encountered in various domains. In addition, obtain exposure to high-level ML libraries or frameworks*
3. *Make aware of the role of data in the future of computing, and also in solving real-world problems using machine learning algorithms.*
4. *Help connect real-world problems to appropriate ML algorithm(s) for solving them. Enable formulating real world problems as machine learning tasks.*

UNIT I

Machine Learning, Applications, Types of Learning, Main Challenges of Machine Learning, Testing and Validating, designing a learning System, Inductive Bias and Hypothesis, Hypothesis Evaluation, Feature extraction, Types of feature selection, Feature Handling, Normalization, Missing data, Dimensionality Reduction: Principal Component Analysis

UNIT II

Linear Regression, Logistic Regression, Decision Tree Representation, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning, Clustering Algorithms: Euclidean and Mahalanobis Distance, K-means algorithm

UNIT III

Cluster validity index, Compactness Cluster measure, Distinctness Cluster Measure, Fuzzy C-means, Hierarchical Clustering, Density based spatial clustering of applications with noise (DBSCAN), Spectral clustering, k-medoids clustering, Kohenon Self Organizing Net, K- Nearest Neighbour and effect of various Distance measures

UNIT IV

Bayesian Learning: (Bayes Theorem and Concept Learning, Maximum Likelihood and Least- Squared Error Hypothesis, Naïve Bayes Classifier, Bayesian Belief Networks).

Support Vector Machine: Linear Support Vector Machine, Optimal Hyperplane, Kernel functions, Solving Non-Linear Classification problems with Linear Classifier, Multiclass Support Vector Machines, Applications of Support Vector Machines

TEXT BOOKS: Machine Learning by Tom M. Mitchel, McGraw-Hill publication

REFERENCE BOOKS

1. Pattern Classification by Duda and Hart. John Wiley publication
2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer.
3. Learning From Data, Yaser S. Abu-Mostafa, Hsuan-Tien Lin, Malik Magdon-Ismail, AML Book.
4. Introduction to Machine Learning by EthemAlpaydin, The MIT Press.
5. Machine Learning: An Algorithmic Perspective by Stephen Marsland, Chapman and Hall/CRC.

MACHINE LEARNING LAB MANUAL (2 CREDITS)

1. Installing a Python Distribution
2. Familiarization with NumPy, Pandas, Matplotlib, scikit-learn, SciPy
3. Working with Google Colab
    - Understanding what Google Colab does
    - Working with Notebooks
    - Performing Common Tasks
4. Write a python program to import and export data using Pandas library functions
5. Write a Python program to demonstrate various Data Visualization Techniques.
6. Demonstrate various data pre-processing techniques for a given dataset.
7. Use IRIS dataset from Scikit and apply data preprocessing methods
8. Use IRIS dataset from Scikit and plot 2D views of the dataset
9. Download the Iris flower dataset or any other dataset into a DataFrame. (e.g., https://archive.ics.uci.edu/ml/datasets/Iris). Scan the dataset and give the inference as:
    - List down the features and their types (e.g., numeric, nominal) available in the dataset.
    - Compare distributions and identify outliers.
10. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
11. Write a program to implement k-Nearest neighbour algorithm to classify the iris data set.
12. Describe the effects of various parameters of KNN algorithms on the performance.
13. How do various distance measures perform (Manhattan, Euclidean etc.) on the performance of the above KNN
14. Implement Linear Regression for a given dataset.
15. Implement Logistic Regression for a given dataset
16. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset using Logistic Regression.
17. Use IRIS dataset from Scikit and apply K-means clustering methods
18. Write a python program to implement K-Means clustering Algorithm. Describe the effects of various parameters of K-means algorithms on the performance
19. Build a Support Vector Machine (SVM) for classification.
20. Write a program in Python to predict if a loan will get approved or not.
21. Implement Dimensionality Reduction using Principal Component Analysis on Iris Dataset
22. Plot the sample of first two principal components (that is the direction for most variance in the dataset) for the above program
23. How does PCA help in dimensionality reduction (for the dataset in use)?
24. Naïve Bayes (implement from scratch for some dataset)
    a. How does the algorithm work?
    b. What are the variations to Naïve Bayes?
    c. What are the pros and cons of using the algorithm?
    d. What are the steps required to implement a basic Naïve Bayes?
    e. How can we improve the Naïve Bayes?
    f. When should we use Naïve Bayes?
25. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset using Naïve Bayes
26. Write a program to implement Anomaly Detection.
27. Solve the real-world problems using the following machine learning methods: Logistic Regression, Support Vector Machines, K-Means Clustering

BACHELOR WITH COMPUTER APPLICATIONS AS MINOR (CT-1)

7th SEMESTER

CAP722N: COMPUTER APPLICATIONS _ CYBER SECURITY

CREDITS: THEORY (3) PRACTICAL (1)

LEARNING OUTCOMES:

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

- *Define and explain the key concepts of cybersecurity, including the CIA triad (Confidentiality, Integrity, and Availability), cyber threats and vulnerabilities, cybercrime, and cyberattack methods.*
- *Comprehend the importance of reporting cybercrime incidents and understand the procedures for reporting to law enforcement agencies and cybercrime reporting platforms.*
- *Identify the legal framework for cybersecurity, including relevant cybercrime laws, regulations, and data privacy laws. Implement data security measures to protect personal data from unauthorized access, use, or disclosure.*
- *Understand the security considerations for e-commerce transactions, digital payments, and social media platforms. Apply best practices to protect financial information and personal data in these domains.*
- *Implement cybersecurity best practices in daily life, such as creating strong passwords, protecting online accounts, avoiding suspicious links and attachments, and keeping software up to date. Understand the importance of user awareness and training in cybersecurity.*

THEORY (3 CREDITS, 45 hours)

UNIT-I (15 hours)

Introduction to Cybersecurity: Defining cybersecurity and its importance, The CIA triad: Confidentiality, Integrity, and Availability, Types of cyber threats and vulnerabilities, **Cybercrime and Its Types:** Understanding cybercrime and its motivations, Types of Cyber Attackers- White, grey and black hat, Common types of cybercrime: hacking, phishing, malware, ransomware, **Methods of Infiltration**: Social Engineering, Denial-of-Service, distributed DoS, Botnet, password attacks, The impact of cybercrime on individuals, organizations, and society, **Security Vulnerability & Exploits**: Hardware vulnerability, software vulnerability. **Remedial and Mitigation Measures:** Implementing security controls to prevent cyberattacks, Network security: firewalls, intrusion detection systems, access control, Endpoint security: antivirus, anti-malware, software updates, User awareness and training: educating users about cybersecurity threats and best practices.

UNIT-II (15 hours)

Reporting Cybercrime: The importance of reporting cybercrime incidents, Procedures for reporting cybercrime to law enforcement agencies, Role of cybercrime reporting platforms, Cyber Law: Legal framework for cybersecurity, Relevant cybercrime laws and regulations, Data privacy laws and their implications for cybersecurity practices. **Data Privacy and Security:** Understanding data privacy principles, Implementing data security measures: encryption, access controls, data retention policies, Protecting personal data from unauthorized access, use, or disclosure

UNIT-III (15 hours)

E-Commerce, Digital Payments and Its Security: Security considerations for e-commerce transactions, Protecting financial information and digital payments, Secure online payment methods and protocols,

Overview of social media and Its Security: Understanding social media platforms and their security challenges, Protecting personal information on social media, Avoiding social media scams and phishing attacks. **Cybersecurity Best Practices and Do's and Don'ts:** Implementing cybersecurity best practices in daily life, creating strong passwords and protecting online accounts, Avoiding suspicious links and attachments, Keeping software up to date and installing patches promptly.

REFERENCES:

- Raef Meeuwisse, "Cybersecurity for Beginners," Cyber Simplicity Limited, ISBN: 9781911452034, 1911452037.
- William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson. Eigth edition. 2023.
- Jeetendra Pande, "Introduction to Cyber Security" Uttarakhand Open University, Year: 2017, ISBN: 9789384813963.
- Mayank Bhushan, Raj Kumar Singh, Aatif Jamshed, " Fundamental of Cyber Security (Principles, Theory & Practices," BPB Publications.

- Mark Stamp, “Information Security – Principles and Practice,” Wiley Publication, Second edition, 2011.

PRACTICAL (1 CREDIT, 15 hours)

1. Discuss and define terms such as Confidentiality, Integrity, and Availability. Provide real world examples to illustrate these concepts.
2. Classify and discuss examples of cyber threats and vulnerabilities. Use case studies to analyse real-world scenarios.
3. Simulate a phishing email and discuss common signs of phishing. Teach students how to identify and avoid falling victim to social engineering.
4. Install and configure firewall, antivirus and anti-malware software on student machines. Discuss the significance of regular software updates.
5. Walk through the steps of reporting a simulated cybercrime incident on Cybercrime Portal (https://www.cybercrime.gov.in/). Discuss the role of law enforcement and reporting platforms.
6. Demonstrate the use of encryption tools and set up access controls on sample data. Discuss the importance of protecting sensitive information.
7. Simulate an e-commerce transaction, focusing on securing financial information. Discuss secure online payment methods and protocols.
8. Discuss and demonstrate security settings and features on popular social media platforms (Facebook, Twitter) that enhance security. Practice avoiding scams and phishing attacks.
9. Teach students to check if their email accounts have been compromised on the website https://haveibeenpwned.com
10. Conduct a workshop to evaluate the strength of passwords using the password strength checker at https://asecuritysite.com/encryption/passes, creating strong passwords, recognizing suspicious links, and installing software updates. Provide hands-on experience with these practices.

BACHELOR WITH APPLIED COMPUTING AS MINOR (CT-I)

7th SEMESTER

ACP722N: APPLIED COMPUTING _ DESIGN & ANALYSIS OF ALGORITHMS

CREDITS: THEORY (3); PRACTICAL (1)

LEARNING OUTCOMES:

1. *Be able to compare functions using asymptotic analysis and describe the relative merits of worst-, average-, and best-case analysis. Be able to solve recurrences using the master, the iteration, and the substitution method.*
2. *Become familiar with a variety of sorting algorithms and their performance characteristics (e.g., running time, stability, space usage) and be able to choose the best one under a variety of requirements.*
3. *Be able to use the design techniques introduced i.e. dynamic programming, greedy algorithm etc. to design algorithms for more complex problems and analyse their performance.*
4. *Become familiar with P and NP problems.*

UNIT I:

Introduction to Algorithms, Analysis of Algorithms, Growth of functions, Asymptotic Notations (Big-O, Big-Omega, Big-Theta) (4L), Complexity Analysis Techniques (Substitution method, Recursion Tree) (4L), Masters Theorem (2L). Tower of Hanoi problem and its complexity (2L)

UNIT II:

Search Algorithms (Linear Search, Binary Search) (2L), Sorting Algorithms (Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort) (4L). Time complexity analysis of searching and Sorting algorithms (3L), Introduction to Divide and Conquer strategy, Greedy method, Knapsack problem (3L)

UNIT III:

Introduction to Backtracking Strategy, 8-Queens problem(3L), Dynamic programming Strategy, All pair shortest path problem (3L), Branch and Bound Strategy(2L), Lower bound theory, Lower bound theory through reductions (2L), P and NP problems (2L)

TEXT BOOK:

1. Horowitz, Sahni, Rajasekaran "Fundamentals of Computer Algorithms", Galgotia Publications

REFERENCE BOOKS:

1. Coremen, Leiserson, Rivest,Stein, "Introduction to Algorithms", 2nd edition, PHI.
2. Michael T. Goodrich, Roberto Tamassia "Algorithm Design and Applications", Wiley
3. Aho, Hopcroft and Ullman, "The Design and Analysis of Computer Algorithms", Pearso

LAB MANUAL

1. Write a program for iterative Linear Search
2. Write a program for iterative Binary search
3. Write a program for recursive binary search.
4. Write a program for Merge Sort.
5. Write a program for Selection Sort.
6. Write a program for Quick Sort.
7. Write a program for insertion Sort.
8. Write a program for Bubble Sort.
9. Write a program for Tower of Hanoi problem.
10. Write a program for Knapsack problem using greedy method.
11. Implement BFS.
12. Implement DFS.
13. Check whether a given graph is connected or not using DFS method.
14. Implement 8-Queens problem using backtracking strategy.
15. Implement All-pair shortest path problem.