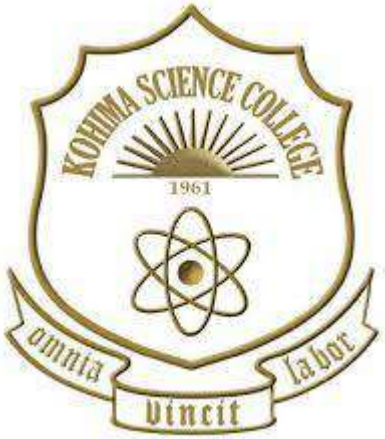
CURRICULUM AND CREDIT FRAMEWORK FOR
UNDERGRADUATE PROGRAMMES

Department
Of
Computer Science



KOHIMA SCIENCE P.G COLLEGE, JOTSOMA

Proposed B.Sc Computer Science Syllabus

CURRICULUM AND CREDIT FRAMEWORK FOR UNDERGRADUATE PROGRAMMES

Department of Computer Science

SEM	MAJOR	Credit	MINOR	Credit	Ability Enhancement Course	Credit	MULTI-DISCIPLINARY	Credit	SEC	Credit	VAC	Credit	Total credit
I	Computer Fundamentals	4	Computer Fundamentals	4	AEC1	3	Office Automation Tools	2+1	Graphic Designing	1+2	EVS	3	20
II	Programming Fundamentals using C	3+1	Programming Fundamentals using C	3+1	AEC2	3	Cyber Security Fundamentals	2+1	Programming in MATLAB	1+2	**Option 1:** E-Commerce Technologies **OR** Option 2: Indian Knowledge System	3	20
III	Computer Organization & Architecture	3+1	Computer Organization & Architecture	3+1	AEC3	2	Fundamentals of Graphic Designing	2+1	Programming in R	1+2			20
	Data Structures	3+1											
IV	Object Oriented Programming in C++	3+1	HTML & CSS	3+1									20
	Programming in Java	3+1											
	HTML & CSS	3+1											
	Theory of Computation	4											
V	Operating System	4	Computer Networks	3+1					INTERSHIP	4			20
	Computer Networks	3+1											
	Software Engineering	4											

VI	Database Management Systems	3+1	Python Programming	3+1									20
	Design and Analysis of Algorithms	4											
	PHP Programming	3+1											
	Python Programming	3+1											
VII	Research Methodology	4	Artificial Intelligence	4									20
	Artificial Intelligence	4											
	Internet Technologies	3+1											
	Cyber Security & Law	3+1											
VIII	Machine Learning	3+1	Cloud Computing	4									20
	Data Mining	3+1											
	Computer Graphics	3+1											
	Cloud Computing	4											
	Total 160 Credits												

DEPARTMENT OF COMPUTER SCIENCE
Course Structure 4-year Undergraduate Programme

Semester	Course Opted	Paper Name	Paper Code	Credits
I	MJ-1	Computer Fundamentals		4
	MN-1	Computer Fundamentals		4
	AEC-1	AEC1		3
	MD-1	Office Automation Tools		2
	SEC-1	Graphic Designing		1
	VAC-1	EVS		3
	MD-1 (Practical)	Office Automation Tools LAB		1
	SEC-1 (Practical)	Graphic Designing LAB		2
				Total: 20
II	MJ-2	Programming Fundamentals using C		3
	MN-2	Programming Fundamentals using C		3
	AEC-2	AEC1		3
	MD-2	Cyber Security Fundamentals		2
	SEC-2	Programming in MATLAB		1
	VAC-2	E-Commerce Technologies **OR** Indian Knowledge System		3
	MJ-2 (Practical)	Programming Fundamentals using C LAB		1
	MN-2 (Practical)	Programming Fundamentals using C LAB		1
	MD-2 (Practical)	Cyber Security Fundamentals LAB		1
	SEC-2 (Practical)	Programming in MATLAB LAB		2
				Total: 20
III	MJ-3	Computer Organization & Architecture		3
	MJ-4	Data Structures		3
	MN-3	Computer Organization & Architecture		3
	AEC-3	AEC3		2
	MD-3	Fundamentals of Graphic Designing		2
	SEC-3	Programming in R		1
	MJ-3 (Practical)	Computer Organization & Architecture LAB		1
	MJ-4 (Practical)	Data Structures LAB		1
	MN-3 (Practical)	Computer Organization & Architecture LAB		1
	MD-3 (Practical)	Fundamentals of Graphic Designing LAB		1
	SEC-3 (Practical)	Programming in R LAB		2
				Total: 20
IV	MJ-5	Object Oriented Programming in C++		3
	MJ-6	Programming in Java		3
	MJ-7	HTML & CSS		3
	MJ-8	Theory of Computation		4
	MN-4	HTML & CSS		3
	MJ-5 (Practical)	Object Oriented Programming in C++ LAB		1
	MJ-6 (Practical)	Programming in Java LAB		1
	MJ-7 (Practical)	HTML & CSS LAB		1
	MN-4 (Practical)	HTML & CSS LAB		1
				Total: 20
V	MJ-9	Operating System		4
	MJ-10	Computer Networks		3
	MJ-11	Software Engineering		4
	MN-5	Computer Networks		3
		INTERSHIP		4
	MJ-10 (Practical)	Computer Networks LAB		1
	MN-5 (Practical)	Computer Networks LAB		1

				Total: 20
VI	MJ-12	Database Management Systems		3
	MJ-13	Design and Analysis of Algorithms		4
	MJ-14	PHP Programming		3
	MJ-15	Python Programming		3
	MN-6	Python Programming		3
	MJ-12 (Practical)	Database Management Systems LAB		1
	MJ-14 (Practical)	PHP Programming LAB		1
	MJ-15 (Practical)	Python Programming LAB		1
	MN-6 (Practical)	Python Programming LAB		1
				Total: 20
VII	MJ-16	Research Methodology		4
	MJ-17	Artificial Intelligence		4
	MJ-18	Internet Technologies		3
	MJ-19	Cyber Security & Law		3
	MN-7	Artificial Intelligence		4
	MJ-18 (Practical)	Internet Technologies LAB		1
	MJ-19 (Practical)	Cyber Security & Law LAB		1
				Total: 20
VIII	MJ-20	Machine Learning		3
	MJ-21	Data Mining		3
	MJ-22	Computer Graphics		3
	MJ-23	Cloud Computing		4
	MN-8	Cloud Computing		4
	MJ-20 (Practical)	Machine Learning LAB		1
	MJ-21 (Practical)	Data Mining LAB		1
	MJ-22 (Practical)	Computer Graphics LAB		1
				Total: 20

Total Credits: 160

CURRICULUM AND CREDIT FRAMEWORK FOR UNDERGRADUATE PROGRAMMES

Department Of Computer Science

Major Courses (Core papers)

Semester	Paper Code	Title of the paper	Theory/Practical	Credit
I	C1	Computer Fundamentals	Theory	4
II	C2	Programming Fundamentals using C	Theory	3
		LAB: Programming Fundamentals using C	**Practical**	1
III	C3	Computer Organization & Architecture	Theory	3
		LAB: Computer Organization & Architecture	**Practical**	1
	C4	Data Structures	Theory	3
		LAB: Data Structures	**Practical**	1
IV	C5	Object Oriented Programming in C++	Theory	3
		LAB: Object Oriented Programming in C++	**Practical**	1
	C6	Programming in Java	Theory	3
		LAB: Programming in Java	**Practical**	1
	C7	HTML & CSS	Theory	3
		LAB: HTML & CSS	**Practical**	1
	C8	Theory of Computation	Theory	4
V	C9	Operating System	Theory	3
		LAB: Operating System	**Practical**	1
	C10	Computer Networks	Theory	3
		LAB: Computer Networks	**Practical**	1
	C11	Software Engineering	Theory	4
VI	C12	Database Management Systems	Theory	3
		LAB: Database Management Systems	**Practical**	1
	C13	Design and Analysis of Algorithms	Theory	4
	C14	PHP Programming	Theory	3
		LAB: PHP Programming	**Practical**	1
	C15	Python Programming	Theory	3
		LAB: Python Programming	**Practical**	1

VII	C16	Research Methodology	Theory	4
	C17	Artificial Intelligence	Theory	4
	C18	Internet Technologies	Theory	3
		LAB: Internet Technologies	**Practical**	1
	C19	Cyber Security & Law	Theory	3
		LAB: Cyber Security & Law	**Practical**	1
VIII	C20	Machine Learning	Theory	3
		LAB: Machine Learning	**Practical**	1
	C21	Data Mining	Theory	3
		LAB: Data Mining	**Practical**	1
	C22	Computer Graphics	Theory	3
		LAB: Computer Graphics	**Practical**	1
	C23	Cloud Computing	Theory	4

Department Of Computer Science

Minor Papers

Semester	Course	Title of the paper	Theory/Practical	Credit
I	Minor I	Computer Fundamentals	Theory	4
II	Minor II	Programming Fundamentals using C	Theory	3
		LAB: Programming Fundamentals using C	**Practical**	1
III	Minor III	Computer Organization & Architecture	Theory	3
		LAB: Computer Organization & Architecture	**Practical**	1
IV	Minor IV	HTML & CSS	Theory	3
		LAB: HTML & CSS	**Practical**	1
V	Minor V	Computer Networks	Theory	3
		LAB: Computer Networks	**Practical**	1
VI	Minor VI	Python Programming	Theory	3
		LAB: Python Programming	**Practical**	1
VII	Minor VII	Artificial Intelligence	Theory	4
VIII	Minor VIII	Cloud Computing	Theory	4

COMPUTER SCIENCE

SEMESTER I

COMPUTER FUNDAMENTALS

(*Major & Minor Paper*)

Credits: 04 (Theory: 04)

UNIT I: Introduction to computer

Introduction to Computer: Definition, Characteristics, Capabilities and Limitations. Introduction to Operating System. Components of a Computer System-Control Unit, ALU, input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile, Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

UNIT II: Devices

Input, Output Units: Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera. Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non-Impact Printers- DeskJet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters.

UNIT III: Computer Organization and Architecture

C.P.U., registers, system bus, main memory unit, cache memory, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors

UNIT IV: Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Recommended books and references:

1. Computer Fundamentals – B. Ram – New Age International Publishers
2. C.S. French "Data Processing and Information Technology", BPB Publications
3. P.K Sinha `Computer Fundamentals`, BPB Publications
4. S.K.Basandra, “Computers Today “, Galgotia Publications.

COMPUTER SCIENCE

SEMESTER I

OFFICE AUTOMATION TOOLS
(Multi-Disciplinary)

Credits: 03 (Theory: 02 & Practical: 01)

UNIT I: MS - Word & Excel

Starting word - Parts of word window - formatting features - menus, commands, Toolbars - File menu, Edit, view, insert, Format and tool menus - Working with text, tables - checking spelling and Grammars.

Mail merge concept - creating main document, data source, Adding fields - Remarks fields Macros - Creating templates and working with templates.

Excel Basics - Creating Work Sheets - Formulas - Functions - Charts - Coping Data, between worksheets - Case studies pay bill, profit and loss accounts etc.

UNIT II: MS – PowerPoint & Access

MS - PowerPoint: Making presentation with MS- power points - working with power point - organization chart - inserting chart from excel.

MS-Access: Introduction - creating a new Database - saving the database - Forms - Reports.

Recommended books and references:

1) **Microsoft Office 365: Connect and Collaborate Virtually Anywhere, Anytime"** by Katherine Murray.
2) **Office 2010:** Vasu Jain.

MS OFFICE TOOLS
PRACTICAL

MS-OFFICE

1.MS-Word

a) Cursor

b) Basic window elements- Title bar, rulers, Status bar, Scrollbars, Menu bar, toolbars (formatting, standard, and drawing), etc.

c) Word essentials- Bold, Italics, Underline, strikethrough, bullets and numbers, columns, formatting text, formatting and sorting lists, subscript and superscript, find and replace, autocorrect and auto text, reusing text and graphics, formatting paragraphs, macro, mail merge, page design and layout, page setup, margins, page numbers, tables, protecting documents, printing, short cut keys.

2.MS-Excel

Essential skills, selecting cells, cell address, adding, renaming and deleting sheets, formatting cells, different pointer shapes, commands, entering data (autofill and fill series), copying and pasting cells, inserting graphics, cell referencing, formulas, charts, formatting a chart, organizing and analyzing data in a list, protecting a workbook, exchanging data with other applications, importing and exporting documents, printing.

3.MS-POWERPOINT

Creating slides, slide layouts, custom animation, inserting picture, sound and videos, charts, slide show, slide transitions.

4.MS-ACCESS

Creating a database, creating a query, creating a report, creating a form.

COMPUTER SCIENCE
SEMESTER I

GRAPHIC DESIGNING
(SEC)

Credits: 03 (Theory: 01 & Practical: 02)

UNIT I:
Introduction to Multimedia: What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media.

UNIT II:
Image: Colour Science, Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing (Can Use Photoshop), Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.

Recommended Books and References:

1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, 2008.
2. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3. Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.

GRAPHIC DESIGNING
PRACTICAL

1. Adobe Photoshop:
   i. Introduction Photoshop: Interface, Raster graphics & Vector graphics, Image formats, Operations on image.
   ii. Manipulation of Image: The Marquee tool, the Lasso tool, Magic Wand tool, Inverting Selection, Layers, Brush tool, Eraser tool, Fill tool, Blur tool, Smudge tool, Sharpen tool, Dodge tool, Sponge tool, Darken tool.
   iii. Transformation & Retouching: Free transform, scaling, rotation, skew, perspective, wrap, distort, crop, image size, canvas size, clone stamp tool, healing brush tool, patch tool, red eye tool, history brush too.
   iv. Colour: Correction Colour swatch, image modes, colour adjudgments, colour selection.
   v. Text: The Text tool, editing text, formatting, line & spacing, wrap text, text effects.
   vi. Effects Blending: modes, styles, filters, liquefy, vanishing point.
   vii. Drawing: The pen tool, drawing shapes, managing paths, converting path to selection.

2. Adobe InDesign:
   i. Looking at the Work Area: Using the tools, Using palettes, Workspaces, Using context menus, Opening and closing documents, Changing the view, Selecting objects, Saving a document, Recovering a document after a failure, Undoing mistakes, Working with preferences and defaults.
   ii. Setting Up Pages: Setting up basic layout options, Using rulers, grids, and guides, Working with pages and spreads, Numbering pages, Changing Numbering and Section Options, Using master pages, Laying out pages with frames, Adjusting layout objects automatically, Working with layers.

iii. Working with Text: About text frames, About threading text frames, Adding text to frames, Setting text frame properties, Editing text, Finding and changing text, Finding and changing fonts, Combining text and graphics, Creating path type 6.

iv. Setting Type: Formatting characters, Formatting paragraphs, Working with tabs, Copying type attributes with the eyedropper tool, Working with the type composition engines, Controlling hyphenation and justification, Paragraph and character style sheets, Creating nested styles, OpenType, Glyphs palette.

v. Arranging and Combining Objects: Modifying objects using graphics frames, Grouping and ungrouping objects, Stacking objects, Aligning and distributing objects, Locking object position, Moving objects, Changing size, proportions, or orientation, Duplicating objects.

vi. Applying Color: About spot and process color types, Working with swatches and unnamed colors, Applying color, Using the Swatches palette, Mixed inks, Mixed ink groups, Using swatch libraries, Using the Color palette, Applying colors by dragging and dropping, Creating gradients

vii. Creating Tables: Creating and editing tables, Importing spreadsheets from Word or Excel, Advanced table techniques, Placing graphics into tables.

viii. Adobe Product Integration: Working with Acrobat, Photoshop, and Illustrator files, Using Photoshop layer masks instead of clipping paths, Using Photoshop's file browser, Copy and Paste from Illustrator to InDesign CS.

ix. PDF, Print, Preflight, and Package: PDF styles, Export options, PDF in detail, Other export formats (ID Interchange), Preflighting your files, Using the Package command, Printing and transparency, Flattener settings, The Separations palette.

SEMESTER I

EVS

(VAC)

Credits: 03 (Theory: 03)

COMPUTER SCIENCE
SEMESTER II

PROGRAMMING FUNDAMENTALS USING C

(Major & Minor Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:

Introduction to C Programming: Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants.

Input and output with C: Formatted I/O functions - printf and scanf, control stings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display single character and a string - getchar, putchar, gets and puts functions.

C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.

UNIT II:

Control Structures: Decision making Statements - Simple if, if_else, nested if_else, else_if ladder, Switch-case, goto, break & continue statements; Looping Statements - Entry controlled and Exit controlled statements, while, do-while, for loops, Nested loops. Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions - strlen, strcmp, strcpy and strcat; Character handling functions - toascii, toupper, tolower, isalpha, isnumeric etc.

UNIT III:

Pointers in C: Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers;

User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type.

User defined data types: Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.

Recommended books and references:

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. M.T Somashekara, D.S Guru and K.S. Manjunatha: Problem solving with C, PHI publication
3. E. Balgurusamy: Programming in ANSI C (TMH)
4. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
5. V. Rajaraman: Programming in C (PHI – EEE)
6. S. ByronGottfried: Programming with C (TMH)
7. Kernighan & Ritche: The C Programming Language (PHI)
8. Yashwant Kanitkar: Let us C
9. P.B. Kottur: Programming in C (Sapna Book House)

PROGRAMMING FUNDAMENTALS USING C
PRACTICAL

Part A:

1. Write a C Program to read radius of a circle and to find area and circumference
2. Write a C Program to read three numbers and find the biggest of three
3. Write a C Program to demonstrate library functions in math.h
4. Write a C Program to check for prime
5. Write a C Program to generate n primes
6. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Write a C Program to find the roots of quadratic equation (demonstration of switch-case statement) 10. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Write a C Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:

1. Write a C Program to find the length of a string without using built in function
2. Write a C Program to demonstrate string functions.
3. Write a C Program to demonstrate pointers in C
4. Write a C Program to check a number for prime by defining isprime() function
5. Write a C Program to read, display and to find the trace of a square matrix
6. Write a C Program to read, display and add two m x n matrices using functions
7. Write a C Program to read, display and multiply two matrices using functions
8. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Write a C Program to Reverse a String using Pointer
10. Write a C Program to Swap Two Numbers using Pointers
11. Write a C Program to demonstrate student structure to read & display records of n students.
12. Write a C Program to demonstrate the difference between structure & union.

COMPUTER SCIENCE
SEMESTER II

CYBER SECURITY FUNDAMENTALS
(Multi-Disciplinary)

Credits: 03 (Theory: 02 & Practical: 01)

UNIT I: Introduction of Information Security

Introduction of Information Security, The Attributes of Information Security, Needs of Information Security, Aspect of Information Security, Information Security Life Cycle, Hackers, Category of Hackers, Threats and Vulnerabilities.

UNIT II: Internet and Cyber Crime

Internet and Cyber Crime, Types of Cyber Crime, Cyber Bullying, Cyber Stalking, Identity Theft, Hacktivism, Online Fraud and Scams, Protecting Personal Information Online, Copyright and Fair Use, Gaming and Online Safety, Safe Online Transactions, recognizing red flags and best practices online, Consequences of Crime, Reporting Cyber Crime.

UNIT III: Malicious Software & System Ethics and Hygiene

Malicious Software: Malicious Software's, Types of Malicious Software, Virus, Worms, Ransomware, Malicious Software life cycle, Impact of Malicious Software, Countermeasures.

System Ethics and Hygiene: Importance of Genuine Software, Update and Patches, Anti-Virus, Windows Defender, Password Policies, ACL, Firewall, Data Encryptions and Backups, Secure Shares. Authentication Methods. Factors of Authentication. Identity & Access Management.

Recommended Books and References:

1. Peter W. Singer and Allan Friedman Cybersecurity and Cyberwar, Oxford University Press, 2014.
2. Jonathan Clough, Principles of Cybercrime, Cambridge University Press, 24-Sep-2015.
3. Jie Wang, Zachary A. Kissel, Introduction to Network Security: Theory and Practice, Wiely 2016.
4. Michael Bazzell, Open Source Intelligence Techniques: Resources for Searching and Analyzing Online Information, 2nd edition, CreateSpace Independent Publishing Platform,2014.
5. Robert Radvanovsky, Jacob Brodsky, Handbook of SCADA/Control Systems Security, CRC Press, 2013.
6. Ed Skoudis, Lenny Zeltser, Malware: Fighting Malicious Code, Prentice Hall Series in Computer Networking and Distributed, 2003.
7. Michael Sikorski, Andrew Honig, Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software 2012, No Starch Press, San Francisco.

CYBER SECURITY FUNDAMENTALS
PRACTICAL

COMPUTER SCIENCE
SEMESTER II

PROGRAMMING IN MATLAB
(SEC)

Credits: 03 (Theory: 01 & Practical: 02)

UNIT I:
Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy Programming Environment: MATLAB Windows, A First Program, Expressions, Constants, Variable and assignment statement, array. Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, For loop.

UNIT II:
Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Procedures and Functions: Arguments and return values, M-files Formatted console input-output, String handling. Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list .GUI Interface: Attaching buttons to actions, Getting Input, Setting Output

Recommended Books and References:
1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004,
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.

PROGRAMMING IN MATLAB
PRACTICAL

1. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

2. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

3. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

4. The —identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.
5. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that are square numbers.
6. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

COMPUTER SCIENCE
SEMESTER II

E-COMMERCE
(VAC)

Credits: 03 (Theory: 03)

UNIT I: Introduction to E-Commerce
Introduction and definition of E-commerce, Technical components and Functions of E-commerce, Advantages and Disadvantages of E-commerce, Scope and applications of E-commerce; E-commerce and E-business

UNIT II: The Internet and WWW
Evolution of internet, Domain names and Internet organization, Types of network- Intranet and Extranet, Role of Internet in B2B application and building own website, Web promotion, Target email, Banner exchange, Shopping Bots.
Internet Security- privacy issues and software packages for privacy, computer crime, threats and attacks on computer system, Encryption/Decryption, Authorization and authentication, digital signature, Firewall.

UNIT III: EDI
Basic concepts of EDI, Applications of EDI, EDI model and disadvantages of EDI model, Electronic Payment System- Payment types, Electronic Fund Transfer.
Planning E-commerce initiates, Linking objectives to business strategies, Managing costs, Strategies for developing e-commerce website.

Recommended Books and References:
1. Chand (Wiley),E-Commerce, Fundamentals & Applications.
2. G.S.V.Murthy, E-Commerce Concepts, Models, Strategies, Himalaya Publishing House
3. Gray P. Schneider, Electronic Commerce
4. Kamlesh K Bajaj and Debjani Nag, E-Commerce.

COMPUTER SCIENCE
SEMESTER II

VEDIC SCIENCE (INDIAN KNOWLEDGE SYSTEM)

Value Added Course (Optional Paper)

UNIT - I

Name of forty areas of Vedic Science and their expression in Human Physiology and characteristics of consciousness.

Consciousness, types of consciousness, characteristics of higher stages of consciousness.

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UNIT - II

Introduction: Vedic Management. Fundamental elements of Vedic Management – Totality Management of Science and Art .

UNIT - III

Vedic Management and Leadership. The Idea Leadership is based upon the Totality of Employee's Style

Suggested Readings:

_ Chetna –His Holiness Maharishi Mahesh Yogi Jee

_ Maharishi Sandesh - 1 and 2 , II-His Holiness Maharishi Mahesh Yogijee

_ Scientific Yoga Ashanas –Dr. SatPal.

_ Dhyan Shailly by Brahmchari Dr. Girish Ji

COMPUTER SCIENCE
SEMESTER III

COMPUTER ORANIZATION & ARCHITECTURE
(Major & Minor Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction, Data Representation and Basic Computer Arithmetic
Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, adders, multiplexers, registers, counters. Number systems, complements, fixed and floating-point representation, character representation, addition, subtraction, magnitude comparison, multiplication, and division algorithms for integers.

UNIT II: Basic Computer Organization and Design
Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT III: Central Processing Unit & Input-Output Organization
Register organization, arithmetic and logical microoperations, stack organization, micro programmed control, Instruction codes, machine language, assembly language, RISC, CISC architectures, External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Recommended Books and References:
1. Computer Systems: Digital Design, Fundamentals of Computer Architecture and Assembly Language, Ata Elahi, 2017.
2. Computer Architecture: Fundamentals and Principles of Computer Design, Second Edition, Joseph D. Dumas II, 2016.
3. M.M. Mano, Digital Design, Pearson Education Asia, 2013.
4. Computer Systems Architecture, Aharon Yadin, 2016.

COMPUTER ORANIZATION & ARCHITECTURE
PRACTICAL

1. Program to add two 8-bit numbers in 8085 microprocessors.
2. Microprocessor program to add two 16-bit numbers.
3. Program to multiply two 8-bit numbers.
4. Program to subtract two 8-bit numbers.
5. Program to divide two 8-bit numbers.
6. Program to swap two 8-bit numbers.

COMPUTER SCIENCE
SEMESTER III

DATA STRUCTURES
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient ${}^{n}Cr$, Towers of Hanoi; Comparison between iterative and recursive functions. Arrays: Basic Concepts – Definition, Declaration, Initialisation, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory.

UNIT II:
Operations on arrays: Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices.
Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls.
Queues: Basic Concepts – Definition and Representation of queues; Types of queues – Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues.

UNIT III:
Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and deallocation functions - malloc, calloc, realloc and free.
Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory;
Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection

Recommended books and references:

1. Sartaj Sahani: Fundamentals of Data Structures
2. Tanenbaum: Data structures using C (Pearson Education)
3. Kamathane: Introduction to Data structures (Pearson Education)
4. Y. Kanitkar: Data Structures Using C (BPB)
5. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

DATA STRUCTURES
PRACTICAL

Part A:

1. Write a C Program to find GCD using recursive function
2. Write a C Program to display Pascal Triangle using binomial function
3. Write a C Program to generate n Fibonacci numbers using recursive function.
4. Write a C Program to implement Towers of Hanoi.
5. Write a C Program to implement dynamic array, find smallest and largest element of the array. 6. Write a C Program to create two files to store even and odd numbers.
7. Write a C Program to create a file to store student records.
8. Write a C Program to read the names of cities and arrange them alphabetically.
9. Write a C Program to sort the given list using selection sort technique.
10. Write a C Program to sort the given list using bubble sort technique.

Part B:

1. Write a C Program to sort the given list using insertion sort technique.
2. Write a C Program to sort the given list using quick sort technique.
3. Write a C Program to sort the given list using merge sort technique.
4. Write a C Program to search an element using linear search technique.
5. Write a C Program to search an element using recursive binary search technique.
6. Write a C Program to implement Stack.
7. Write a C Program to convert an infix expression to postfix.
8. Write a C Program to implement simple queue.
9. Write a C Program to implement linear linked list.

COMPUTER SCIENCE
SEMESTER III

FUNDAMENTALS OF GRAPHIC DESIGNING
(Multi-Disciplinary)

Credits: 03 (Theory: 02 & Practical: 01)

UNIT I:
Introduction to Multimedia: What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media.

Unit II:
Image: Colour Science, Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing (Can Use Photoshop), Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.

Recommended Books and References:
1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, 2008.
2. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3. Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.

FUNDAMENTALS OF GRAPHIC DESIGNING
PRACTICAL

1. Adobe Photoshop:
   i. Introduction Photoshop: Interface, Raster graphics & Vector graphics, Image formats, Operations on image.
   ii. Manipulation of Image: The Marquee tool, the Lasso tool, Magic Wand tool, Inverting Selection, Layers, Brush tool, Eraser tool, Fill tool, Blur tool, Smudge tool, Sharpen tool, Dodge tool, Sponge tool, Darken tool.
   iii. Transformation & Retouching: Free transform, scaling, rotation, skew, perspective, wrap, distort, crop, image size, canvas size, clone stamp tool, healing brush tool, patch tool, red eye tool, history brush too.
   iv. Colour: Correction Colour swatch, image modes, colour adjudgments, colour selection.
   v. Text: The Text tool, editing text, formatting, line & spacing, wrap text, text effects.
   vi. Effects Blending: modes, styles, filters, liquefy, vanishing point.
   vii. Drawing: The pen tool, drawing shapes, managing paths, converting path to selection.

2. Adobe InDesign:
   i. Looking at the Work Area: Using the tools, Using palettes, Workspaces, Using context menus, Opening and closing documents, Changing the view, Selecting objects, Saving a document, Recovering a document after a failure, Undoing mistakes, Working with preferences and defaults.
   ii. Setting Up Pages: Setting up basic layout options, Using rulers, grids, and guides, Working with pages and spreads, Numbering pages, Changing Numbering and Section Options, Using master pages, Laying out pages with frames, Adjusting layout objects automatically, Working with layers.

iii. Working with Text: About text frames, About threading text frames, Adding text to frames, Setting text frame properties, Editing text, Finding and changing text, Finding and changing fonts, Combining text and graphics, Creating path type 6.

iv. Setting Type: Formatting characters, Formatting paragraphs, Working with tabs, Copying type attributes with the eyedropper tool, Working with the type composition engines, Controlling hyphenation and justification, Paragraph and character style sheets, Creating nested styles, OpenType, Glyphs palette.

v. Arranging and Combining Objects: Modifying objects using graphics frames, Grouping and ungrouping objects, Stacking objects, Aligning and distributing objects, Locking object position, Moving objects, Changing size, proportions, or orientation, Duplicating objects.

vi. Applying Color: About spot and process color types, Working with swatches and unnamed colors, Applying color, Using the Swatches palette, Mixed inks, Mixed ink groups, Using swatch libraries, Using the Color palette, Applying colors by dragging and dropping, Creating gradients

vii. Creating Tables: Creating and editing tables, Importing spreadsheets from Word or Excel, Advanced table techniques, Placing graphics into tables.

viii. Adobe Product Integration: Working with Acrobat, Photoshop, and Illustrator files, Using Photoshop layer masks instead of clipping paths, Using Photoshop's file browser, Copy and Paste from Illustrator to InDesign CS.

ix. PDF, Print, Preflight, and Package: PDF styles, Export options, PDF in detail, Other export formats (ID Interchange), Preflighting your files, Using the Package command, Printing and transparency, Flattener settings, The Separations palette.

COMPUTER SCIENCE
SEMESTER III

PROGRAMMING WITH R
(SEC)

Credits: 03 (Theory: 01 & Practical: 02)

UNIT I:
R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.

UNIT II:
Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centring, scaling and normalizing the data values, converting types of values, using string in-built functions, Statistical analysis of data for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot
Designing GUI: Building interactive application and connecting it with database

Recommended Books and References:

1. Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reilly Media Inc.
2. Gardener, M.(2017). Beginning R: The statistical programming language, WILEY.
3. Lawrence, M., & Verzani, J. (2016). Programming Graphical User Interfaces in R. CRC press.

PROGRAMMING WITH R
PRACTICAL

Q1. Write an R script to do the following:
a) simulate a sample of 100 random data points from a normal distribution with mean 100 and standard deviation 5 and store the result in a vector.
b) visualize the vector created above using different plots.
c) test the hypothesis that the mean equals 100.
d) use wilcox test to test the hypothesis that mean equals 90.

Q2. Using the Algae data set from package DMwR to complete the following tasks.
a) create a graph that you find adequate to show the distribution of the values of algae a6.
b) show the distribution of the values of size 3.
c) check visually if oPO4 follows a normal distribution.
d) produce a graph that allows you to understand how the values of NO3 are distributed across the sizes of river.
e) using a graph check if the distribution of algae a1 varies with the speed of the river.
f) visualize the relationship between the frequencies of algae a1 and a6. Give the appropriate graph title, x-axis and y-axis title.

Q3. Read the file Coweeta.CSV and write an R script to do the following:
a) count the number of observations per species.
b) take a subset of the data including only those species with at least 10 observations.
c) make a scatter plot of biomass versus height, with the symbol colour varying by species, and use filled squares for the symbols. Also add a title to the plot, in italics.

d) log-transform biomass, and redraw the plot.

Q4. The built-in data set mammals contain data on body weight versus brain weight. Write R commands to:

a) Find the Pearson and Spearman correlation coefficients. Are they similar?

b) Plot the data using the plot command .

c) Plot the logarithm (log) of each variable and see if that makes a difference.

Q5. In the library MASS is a dataset UScereal which contains information about popular breakfast cereals. Attach the data set and use different kinds of plots to investigate the following relationships:

a) relationship between manufacturer and shelf

b) relationship between fat and vitamins

c) relationship between fat and shelf

d) relationship between carbohydrates and sugars

e) relationship between fibre and manufacturer

f) relationship between sodium and sugars

Q6. Write R script to:

a) Do two simulations of a binomial number with n = 100 and p = .5. Do you get the same results each time? What is different? What is similar?

b) Do a simulation of the normal two times. Once with n = 10, $\mu = 10$ and $\sigma = 10$, the other with n = 10, $\mu = 100$ and $\sigma = 100$. How are they different? How are they similar? Are both approximately normal?

Q7. Create a database medicines that contains the details about medicines such as {manufacturer, composition, price}. Create an interactive application using which the user can find an alternative to a given medicine with the same composition.

Q8. Create a database songs that contains the fields {song_name, mood, online_link_play_song}. Create an application where the mood of the user is given as input and the list of songs corresponding to that mood appears as the output. The user can listen to any song form the list via the online link given.

Q9. Create a package in R to perform certain basic statistics functions.

Mini project using data set of your choice from Open Data Portal (https://data.gov.in/) for the following exercises

COMPUTER SCIENCE
SEMESTER IV

OBJECT ORIENTED PROGRAMMING IN C++
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:
Principles of Object-oriented Programming (OOP), Software Evaluation, A Look at Procedure Oriented Programming, OOP Paradigm, Basic Concepts of OOP, Benefits of OPP, Application of OOP. Introduction to C++ What is C++, A simple C++ Program, More C++ statements, Structure of C++ Program.
Tokens, Expression and controls Structures Tokens, Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables, Operators in C++: Scope resolution operator, Member differencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures.
Functions The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT II:
Classes and Objects Introduction, specifying a Class, defining member Functions, C++ Program with Class, Nesting of Member functions, Private member functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects.
Pointers: Declaration and initializing, Manipulation of pointers, pointers Expression and Pointer Arithmetic, Pointer with Arrays, Arrays of Pointers, Pointers to objects, this pointers, Arrays of Pointers to Objects
Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a class, Copy constructor, Destructors.
Operator overloading: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Type Conversions.

UNIT III:
Inheritance and Polymorphisms Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

Recommended books and references:
1. E. Balagurusamy - Object Oriented Programming with C++ - TMH.
2. Robert Lafore - Object Oriented Programming in Microsoft C++ - Galgotia.

OBJECT ORIENTED PROGRAMMING IN C++
PRACTICAL

1. Write a cpp program which explains the use of scope resolution operator.
2. Write a cpp program which explains the use of a manipulators operator.
3. Write a cpp program which explains the use of reference variable.
4. Write a cpp program which explains the feature of an inline function.

5. Write a program that will overload the function volume() three times.
6. Write a C++ program that contains a class called 'temp' and member functions for accepting a temperature in Fahrenheit and displays it in Celcius.
7. Write a cpp program for arrays within a class. (how to use an array in a class)
8. Write a cpp program for static class member. (class member should be static variable.)
9. Write a cpp program which shows use of "static member function".
10. Write a cpp program which explain concept of an "array object".
11. Write a cpp program which explain concept of "object as arguments".
12. Write a cpp program for a friend function.
13. Write a cpp program for a function friendly to two classes.
14. Write a cpp program of a swapping private data of classes.
15. Write a cpp program which explain concept of a returning objects.
16. Write a cpp program for class with constructors.
17. Write a cpp program for overloaded constructors.
18. Write a cpp program of copy constructors.
19. Write a cpp program for implementation of destructors.
20. Write a cpp program for implementation of unary minus (-) operator.
21. Write a cpp program for implementation of binary plus (+) operator.
22. Write a cpp program for implementation of a single inheritance of public data member.
23. Write a cpp program for implementation of a single inheritance of private data member.
24. Write a cpp program of multilevel inheritance.
25. Write a cpp program of multiple inheritances.
26. Write a cpp program of hybrid inheritance.
27. Write a cpp program of virtual base class.
28. Write a cpp program in which use constructors in derived class.
29. Write a cpp program of initialization list in constructors.
30. Write a cpp program for implementation of pointers to objects.
31. Write a program to define an array of pointers to objects that can be used to access the individual objects.
32. Write a program to illustrate the use of this pointer.
33. Write a program to illustrate how pointers to a derived object are used

34. Define a class called STUDENT with the data members Roll No., Name, Marks secured in five subjects. Write member functions to do the following:
    i. Read data
    ii. Find the total mark and division
    iii. Display Roll No., Name, Total mark, and Division
35. Define a class called SHAPE with appropriate data members. Find the area of different geometrical shapes using function overloading.
36. Define a class called ACCOUNT with the data members Account no. Customer name, Amount and initialize with suitable constructor. Write member functions to do the following:
    i. Deposit amount
    ii. Withdraw amount
    iii. Check balance
37. Using operator overloading add two given Lengths expressed as Feet and Inch.
38. Using operator overloading add two given TIMEs expressed as Hour : Minute : Second.

COMPUTER SCIENCE
SEMESTER IV

PROGRAMMING IN JAVA

(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction to Java

Java Architecture and Features, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Basic Program, Decision making constructs and Nesting, Java Methods Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods.

UNIT II: Arrays, Strings and I/O

Creating & Using Arrays, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, Simple I/O using system.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files, Java Exceptions.

UNIT III: Object-Oriented Programming Overview

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, final classes, Object class, Garbage Collection. Inheritance, Encapsulation, Interfaces, Packages, Enumerations, Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Wrapper Classes, Enumerations and Metadata.

Recommended Books and References:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley "The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition, Publisher: Addison-Wesley, 2008.
4. Java: The Complete Reference, Twelfth Edition, Herbert Schildt, 2021.
5. Head First Java, Kathy Sierra, 2003.

PROGRAMMING IN JAVA
PRACTICAL

1. To find the sum of any number of integers entered as command line arguments.
2. To find the factorial of a given number.
3. To learn use of single dimensional array and two- dimensional array.
4. To check if a number is prime or not, by taking the number as input from the keyboard.
5. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
6. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(), setLength(), append(), insert(), concat()and equals().
7. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type).

8. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
9. Write a program to demonstrate the concept inheritance, encapsulation, polymorphism.
10. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.

COMPUTER SCIENCE
SEMESTER IV

HTML & CSS
(Major & Minor Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction
Intro to HTML, Basic Structure of HTML – DOCTYPE**,** HTML, Head, Title and Body. Basic tags (Headings, Paragraph, Line break, Horizontal line), Formatted and Unformatted Text, Basic text formatting tags, HTML Attributes - Font (size, face, color), Lists – ordered, unordered, definition lists. Nested list.

UNIT II: Links & Images
Links: Introduction to links, Relative links & Absolute links, Link target attributes, Using the id attribute to link within a document, Link to an email.
Images: Web Graphic Format (GIF, JPEG, PNG). Putting an image on a page, Inline images, using images as links, Putting an image in the background.

UNIT III: Tables & Forms with CSS
Tables: Creating a Table, Table Headers, Captions, Colspan and Rowspan, Table background attributes.
Forms: HTML Form Controls, Fieldset & Legend Tag, <pre> tag. Introduction to CSS – Inline, Internal and External CSS. CSS Styles, Div tag.

Recommended Books and References:
1. Introduction to **HTML** and CSS - O'Reilly, 2010.
2. Jon Duckett, HTML and CSS, John Wiely, 2012.

HTML & CSS (PRACTICAL)
1. Create an HTML document with the following formatting options:
    I. Bold
    II. Italics
    III. Underline
    IV. Headings (Using H1 to H6 heading styles)
    V. Font (Type, Size and Color)
    VI. Background (Colored background/Image in background)
    VII. Paragraph
    VIII. Line Break
    IX. Horizontal Rule
    X. Pre tag
2. Create an HTML document which consists of:
    I. Ordered List
    II. Unordered List
    III. Nested List
    IV. Image
3. Create a form using HTML which has the following types of controls:
    I. Text Box
    II. Option/radio buttons
    III. Check boxes
    IV. Reset and Submit buttons
4. Create an HTML document which implements Internal linking as well as External linking.

COMPUTER SCIENCE
SEMESTER IV

THEORY OF COMPUTATION

(Major Paper)

Credits: 04 (Theory: 04)

UNIT I: Languages
Alphabets, string, language, Basic Operations on language, Concatenation, Kleene Star, automata introduction

UNIT II: Finite Automata and Regular Languages
Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, closure properties of regular languages.

UNIT III: Context Free Languages
Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata, Pumping Lemma, Properties of context free languages, normal forms.

UNIT IV: Turing Machines and Models of Computation
Turing Machine as a model of computation, Universal Turing Machine, Language, decidability, halting problem, enumerable and recursive languages, insolvability problems.

Recommended Books and References:
1. Introduction to the Theory of Computation, Michael Sipser, 2012.
2. An Introduction to Formal Languages and Automata, Susan H. Rodger, 2022.
3. Introduction to Theory of Computation, Michiel Smid, 2014.
4. Theory of Computation (With Formal Languages) R.B. [VNV] Patel, 2010.

COMPUTER SCIENCE
SEMESTER V

OPERATING SYSTEMS

(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction to Operating System Organization

OS: Basic Operating System (OS) functions & services, Resource abstraction, Types of OS – Batch systems, Multiprogramming systems, Time sharing systems, Distributed systems, Network systems & Real time systems. OS for personal computers & workstations.

Kernel: User & Kernel modes, Types of kernels, System calls and System programs.

UNIT II: Process Management

Process **–** Process Life Cycle & Process Control Block (PCB), threads, types of threads, Process Scheduling - Pre-emptive and None pre-emptive scheduling algorithms. Methods for inter-process communication, Deadlocks.

UNIT III: Memory, File and I/O Management

Memory Management: Physical and virtual address space, Memory allocation strategies - Fixed & Variable partitions. Paging, Segmentation, Virtual memory.

File and I/O Management: Directory structure, File operations, File allocation methods, Device management.

Recommended Books and References:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

OPERATING SYSTEMS
PRACTICAL

1. Write a program, using fork() command, where a parent process creates 7 new child processes.
2. Write a program, using fork() command, where parent and child execute same program and same code.
3. Write a program, using fork() command, where parent and child execute same program and different code.
4. Write a program, using fork() command, where parent and child execute and before terminating, the parent waits for the child to finish its task.
5. Write a program, using cat and awk commands, to report behaviour of Linux kernel including kernel version, CPU type and model.
6. Write a program, using cat and awk commands, to report behaviour of Linux kernel including information on configured memory, amount of free and used memory.

COMPUTER SCIENCE
SEMESTER V

COMPUTER NETWORKS
(Major & Minor Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:
Introduction to data communications and networking, use of computer networks, Network Hardware and Software, Network Classification; Network Topologies (bus, star, ring, mesh, tree, hybrid), features, advantages and disadvantages of each type; transmission modes- simplex, half duplex and full duplex; Transmission media- Guided Media (Twisted pair, Coaxial Cable, Fiber Optics), Unguided Media (Radio waves, Infrared, Micro-wave, Satellite).

UNIT II:
Layered Network architecture- OSI reference model, function of the layers, TCP/IP protocol suite; Data Communication and Switching Techniques- Framing, Error and Flow control, Shared media protocols - CSMA/CD and CSMA/CA, Switching techniques- circuit, message, and packet switching; Switching Devices- hubs, switches, bridges, repeaters, routers and gateways; Multiplexing (FDM, WDM, TDM).

UNIT III:
Transport layer- Transport Services and Protocols (TCP, UDP); Internet Service Providers (ISP) and IP addressing system; application layer protocols and services- DNS, URL, WWW, FTP, SMTP, HTTP, TELNET; Network Security.

Recommended Books and References:

1. B.A. Forouzan: Data Communication and Networking, 4th Edition, THM, 2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI, 2002.
3. D.E. Comer, Internetworking with TCP/IP, Vol. I, PHI, 1998.
4. W. Stalling, Data & Computer Communication, 8th edition, PHI 2006

COMPUTER NETWORKS
PRACTICAL

Practical shall be based on concepts taught in the paper such as

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool
2. Study of Network Devices in Detail.
3. Study of network IP.
4. Connect the computers in Local Area Network.
5. Study of basic network command and Network configuration commands
6. Interpreting Ping and Traceroute Output
7. Performing an Initial Switch/Router Configuration
8. Connecting a Switch.
9. Configuring WEP on a Wireless Router
10. Examining Network Address Translation (NAT)

COMPUTER SCIENCE
SEMESTER VII

SOFTWARE ENGINEERING THEORY
(Major Paper)

Credits: 04 (Theory: 04)

UNIT I: Introduction

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Process Models – Waterfall, RAD, Spiral Models. Software Process Framework - Framework and Umbrella Activities, Capability Maturity Model Integration (CMMI).

UNIT II: Requirement Analysis & Quality Management

Requirement Analysis: Requirement Engineering Process, Requirement Analysis and Modelling Techniques, Flow Oriented Modelling, Need for SRS, Characteristics and Components of SRS.

Quality Management**:** Quality Concepts, Software Quality Management - Quality Assurance, Quality Planning and Quality Control. Software Reviews.

UNIT III: Design Engineering

Design Concepts, Fundamental Software Design Concepts, Design Model Elements, Data Design at the Architectural Level and Component Level, Mapping of Data Flow - SafeHome security system.

UNIT IV: Testing Strategies & Tactics

Software Testing Fundamentals, Strategic Approach to Software Testing - Manual and Automatic testing. Verification & Validation Testing, Black-Box testing, White-Box testing and Grey-Box testing. Levels of software testing - Unit testing, Integration testing, System testing & Acceptance testing. Basis Path Testing.

Recommended Books and References:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.

2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.

3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.

4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.

5. D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.

6. R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

COMPUTER SCIENCE
SEMESTER VI

DATABASE MANAGEMENT SYSTEMS
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction
Database**,** DBMS, Database system architecture – Types of DBMS architecture and the three-schema architecture. Data models, Data independence.

UNIT II: Entity Relationship (ER) Modelling
ER model concepts, Components of ER diagram, DBMS keys, Reduction of ER diagram to table, Relation data model concepts - RDBMS, Codd's 12 rules, Relational constraints, Relational algebra, SQL queries.

UNIT III: Database Design & File Organization
Database Design: Mapping ER model to relational database, Functional dependencies, Normalization - Normal forms (up to BCNF), Decomposition – Lossless and lossy.
File Organization in DBMS: Sequential file organization, Heap file organization, Hash file organization, Indexed sequential access method (ISAM), B+ file organization and Cluster file organization.

Recommended Books and References:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design & application Programming, 6th Edition, Pearson Education, 2013.

DATABASE MANAGEMENT SYSTEMS
PRACTICAL

EMPLOYEE Table

Eno	Ename	Job_type	Manager	Hire_date	Dno	Salary
736	Smith	Clerk	790	1981-12-17	20	1000.00
752	Ward	Sales_man	769	1981-02-22	30	1300.00
756	Jones	Manager	783	1981-04-02	20	2300.00
765	Martin	Sales_man	784	1981-04-22	30	1250.00
769	Blake	Manager	783	1981-05-01	30	2870.00
778	Clark	Manager	783	1981-06-09	10	2900.00
783	King	President	Null	1981-11-17	10	2950.00
788	Scott	Analyst	756	1982-12-09	20	2850.00

DEPARTMENT Table

Dno	Dname	Location
10	Accounting	New York
20	Research	Dallas
30	Sales	Chicago

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No=788.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.
9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don't have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is 'A'.
14. Query to display Name of all employees either have two R's or have two A's in their name and are either in Dept No=30 or their Manger's Employee No=790.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.

COMPUTER SCIENCE
SEMESTER V

DESIGN AND ANALYSIS OF ALGORITHM
(Major Paper)

Credits: 04 (Theory: 04)

UNIT I:
Basic Design and Analysis techniques of Algorithms, Computational complexity and Correctness of Algorithm. Mathematical preliminaries: Growth of functions, asymptotic notation, standard notations and common functions, Recurrences.

UNIT II:
Divide and Conquer Algorithms: General method (linear search), binary search, merge sort, quick sort algorithms, space and running time analysis of the algorithms. Sorting Algorithms: insertion sort, heap sort, sorting in linear time –bucket sort, radix sort and count sort

UNIT III:
Graph algorithms: Representation of graphs, Breadth-first search, Depth-first search, topological sort. Dynamic Programming and Greedy Algorithms: Minimum spanning tree, Shortest path in a graph, o/1 knapsack problem and fractional knapsack problem

Recommended Books and References:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

SEMESTER VI

PHP PROGRAMMING

(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), role of PHP in web application development.

Starting PHP programming: Basics of PHP programming, variables, scope of a variable, constants, expressions, operators & operator precedence. Decision making based on conditions, case structure, and loops

UNIT II:

Modular programming- functions and objects, declaring and calling of a function, passing parameters. Strings and arrays- Creating and accessing strings, built-in functions for strings and string formatting, creating index based and associative array, accessing array elements.

Handling HTML form with PHP- Capturing form data, GET and POST form method, processing of form data, and use of regular expressions.

UNIT III:

Integrating PHP and DBMS- Connecting PHP and DBMS, creating database, defining database structure and accessing data stored in tables using PHP

Recommended Books and References:

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

PHP PROGRAMMING
PRACTICAL

Programs based on the concepts covered in theory such as

1. Get name of the user from a form and show greeting text.
2. Write a php program to check whether given number is palindrome or not.
3. Write a php program to check whether given number is Armstrong or not.
4. Write a php program to Array manipulation or sort an array
5. Write a Mathematical calculator program.
6. Write a Age calculator program.
7. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string
8. Write a PHP script that removes the whitespaces from a string.
9. Create a PHP page for login page with sql connection.
10. Create a web page for software company website.

COMPUTER SCIENCE
SEMESTER VI

PYTHON PROGRAMMING
(Major &b Minor Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I:
Python variable declaration, Keywords, Indents in Python, Python input/output operations. Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence

UNIT II:
Control Flow Statements- if, else, elseif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.
.

UNIT III:
Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs.Creating and Storing Strings; Accessing Sting Characters; the
str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.

Recommended Books and References:

1. Computer Fundamentals (BPB), P. K. Sinha & Priti Sinha
2. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online 2015.
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.

PYTHON PROGRAMMING
PRACTICAL

Practical
1. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.
2. Using a while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).
3. Write a program that reads an integer value and prints ―leap year‖ or ―not a leap year.
4. Write a program to check whether the input number is even or odd.
5.Write a program to compare three numbers and print the largest one.
6. Write a program to print factors of a given number.
7. Write a method to calculate GCD of two numbers.
8. Write a program to create Stack Class and implement all its methods.(Use Lists).
9. Write a program to create Queue Class and implement all its methods. (Use Lists)
10. Write a program to implement linear and binary search on lists.
11. Write a program to sort a list using insertion sort and bubble sort and selection sort.

COMPUTER SCIENCE
SEMESTER VII

Research Methodology
(Major Paper)

Credits: 04 (Theory: 04)

Unit I: Introduction to Research Methods: Definition of research, role and objectives of research, applications and types of research, research process and steps in it. Collecting and reviewing the literature, conceptualization and Formulation of a research problem, Identifying variables, constructing hypothesis, Synopsis.

Unit II: Research Design: Selecting and defining a research problem, need for research design, features of a good research design, different research designs (exploratory, descriptive experimental and diagnostic research).

Data Collection & Analysis: Primary & secondary data, Validity and Reliability of data collection procedures, data preparation, exploratory data analysis, parametric and nonparametric tests, correlation and regression analysis, ANOVA, Multivariate Techniques.

Unit III: Research Report Writing: Mechanics of Reporting Quantitative/Qualitative Research- Format, Language, Style, Bibliography/Referencing, Appendix, Variation in the scheme of Reporting, Tables and figures, Footnotes, Bibliography, Pagination Typing and Font, Format of Report Writing; APA reference style.
Ethical considerations in quantitative and qualitative research: Accuracy, credibility, confidentiality, transparency, honesty, originality, protecting, authenticity, plagiarism.

Unit IV: Computer Applications: Data Communication and networks, LAN, WAN, GAN, Internet, Website, Webpage, E-mail, Search Engines, Scientific search engines. PDF and Latex files.
MS WORD: Test formatting, Math Type, MS Equation editor, INFLIBNET, e-journals, e-library, Scopus, Central blatt Math, Mathematical reviews.

Recommended Books:
1. Krishna Swamy K.N., Siva Kumar A.I., Mathirajan M., "Management Research Methodology (2006), Pearson Education, New Delhi.
2. Kothari C.R., "Research Methodology, Methods and Techniques, Second edition, (2008), New Age International Publication.
3. Ranjit Kumar : Research Methodology, A step by step guide for beginners, Pearson Education, Sixth Edition 2009.
4. Mark Saunders, Philip Lewis, Adrain Thornhiu:Research Methods for Business Students, Pearson Education.
5. Ram Ahuja, "Research Methods", (2001), Rawat Publications, New Delhi.
6. Cooper D., Schindler P., Business research methods", (2003) Tata Mc-Graw Hill, New Delhi

COMPUTER SCIENCE
SEMESTER VII

ARTIFICIAL INTELLIGENCE

(Major & Minor Paper)

Credits: 04 (Theory: 04)

UNIT I:

Introduction to Artificial Intelligence: Definition, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, characteristics/ behaviour and environment, Future of AI.

UNIT II:

Problem Solving and Searching Techniques**:** Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

UNIT III:

Knowledge Representation: First Order Predicate Logic, Programming in Logic (PROLOG), Unification, Forward chaining & Backward chaining, Resolution, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs.

UNIT IV:

Dealing with Uncertainty and Inconsistencies: Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.
AI Applications: Language Models, Information retrieval, Information extraction, Natural Language Processing, Machine Translation, Speech Recognition.

Recommended Books and References:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw 2nd Hill,
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing edition, 1991. House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

COMPUTER SCIENCE
SEMESTER VII

INTERNET TECHNOLOGIES
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Java & JavaScript
Java - Use of Objects, Array and Array List class.
JavaScript (JS) - Internal and external JS, Data types, Operators, Functions, Control structures, Events and Event handling.

UNIT II: JDBC
JDBC Fundamentals – Components, Architecture, Drivers (Type I, II, III & IV). JDBC Database Connectivity with Oracle & MySQL. JDBC Statements - Create, Prepared and Callable Statements, Working with ResultSet Interface.

UNIT III: JSP & JavaBeans
JSP: Introduction to Java Server Pages (JSP), HTTP and Servlet Basics, The problem with Servlets, JSP Engine, JSP Processing, JSP life cycle, Model View Controller, Anatomy of JSP Page - JSP Scripting Elements (Scriptlet, Declaration, Expression tags), JSP Directives and JSP Actions. Implicit JSP objects, Displaying Values - Out object. Error Handling and Debugging in JSP, Sharing Data Between JSP Pages - request.getParameter().
JavaBeans: Java Beans Fundamentals, JAR files and developing a simple Bean.

Recommended Books and References:
1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, JavaScript, Perl CGI, BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication, 3rd Edition, 2009.
3. Herbert Schildt, Java 7, The Complete Reference, 8th Edition, 2009.
4. Jim Keogh, The Complete Reference J2EE, TMH, 2002.
5. O'Reilly, Java Server Pages, Hans Bergsten, Third Edition, 2003.

INTERNET TECHNOLOGIES
PRACTICAL

Create event driven program for following:
1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers.
3. Find the factorial of a number n.
4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

COMPUTER SCIENCE
SEMESTER VII

CYBER SECURITY
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I : **Introduction to Cyber security**

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society,
Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

UNIT II : **Cyber crime and Cyber law**

Classification of cyber crimes, Common cyber crimes cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India.

UNIT III : **Social Media Overview and Security**

Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media.

SUGGESTED READINGS:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra ,Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and LegalPerspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson,13thNovember, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

CYBER SECURITY
PRACTICAL

COMPUTER SCIENCE

SEMESTER VIII

MACHINE LEARNING

(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction

Learning theory, Hypothesis and target class, Inductive bias and bias-variance tradeoff, Occam's razor, Limitations of inference machines, Approximation and estimation errors.

UNIT II: Supervised learning & Unsupervised learning

Supervised learning: Linear separability and decision regions, Linear discriminants, Bayes optimal classifier, Linear regression, Standard and stochastic gradient descent, Lasso and Ridge Regression, Logistic regression, Support Vector Machines, Perceptron, Back propagation, Artificial Neural Networks, Decision Tree Induction, Overfitting, Pruning of decision trees, Bagging and Boosting, Dimensionality reduction and Feature selection.

Unsupervised learning: Clustering, Mixture models, Expectation Maximization, Spectral Clustering, Non-parametric density estimation.

UNIT III: Support Vector Machines & Evaluation

Vector Machines: Structural and empirical risk, Margin of a classifier, Support Vector Machines, Learning nonlinear hypothesis using kernel functions.

Evaluation: Performance evaluation metrics, ROC Curves, Validation methods, Bias variance decomposition, Model complexity.

Recommended Books and References:

1. E. Alpaydin, Introduction to Machine Learning, 3rd Edition, Prentice Hall of India, 2014.
2. T Hastie, R Tibshirani and J Friedman, The Elements of Statistical Learning Data Mining, Inference, and Prediction, 2nd Edition, Springer, 2009.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2010.
4. R. O. Duda, P. E. Hart, and D.G. Stork, Pattern Classification, John Wiley and Sons, 2012.
5. Simon O. Haykin, Neural Networks and Learning Machines, Pearson Education, 2016.

MACHINE LEARNING WITH PYTHON
PRACTICAL

COMPUTER SCIENCE
SEMESTER VIII

DATA MINING
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Overview of Data Mining & Data Preprocessing
Overview: The process of knowledge discovery in databases, predictive and descriptive data mining techniques, supervised and unsupervised learning techniques.
Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization.

UNIT II: Classification Techniques
Supervised learning for predictive data mining, Basic issues in predictive data mining Decision trees, Decision rules, Statistical classification, Instance-based methods (nearest neighbor), Evaluation and Validation methods.

UNIT III: Clustering Techniques & Association Rule Mining
Clustering Techniques: Unsupervised learning for descriptive data mining, Basic issues in clustering, Partitioning methods, Hierarchical methods for clustering, Density-based methods, Cluster Validation methods and metrics.
Association Rule Mining: Frequent item set, Maximal and Closed itemsets, Apriori property, Apriori algorithm.

Recommended Books and References:

1. J Zaki Mohammed and Wagner Meira, Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014.

2. P. Tan, M. Steinbach, A Karpatne, and V. Kumar, Introduction to Data Mining, 2nd Ed., Pearson Education, 2018.

3. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques,3nd Ed., Morgan Kaufmann, 2011.

4. Charu C Agrawal, Data Mining: The Textbook, Springer, 2015.

DATA MINING
PRACTICAL

COMPUTER SCIENCE
SEMESTER VIII

COMPUTER GRAPHICS
(Major Paper)

Credits: 04 (Theory: 03 & Practical: 01)

UNIT I: Introduction
Basic elements of Computer graphics, Applications of Computer Graphics. Graphics Hardware: Architecture of Raster and Random scan display devices, input/output devices.

UNIT II: Fundamental Techniques in Graphics
Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations. (Projections-Parallel and Perspective), Vanishing points.

UNIT III: Geometric Modelling
Representing curves & Surfaces. Hidden surface elimination. Illumination and shading models. Basic colour models and Computer Animation

Recommended Books and References:
1. D. Hearn, Baker: Computer Graphics, Prentice Hall of India, 2008.
2. Fundamentals of Computer Graphics, Michael Ashikhmin, 2002.
3. Computer Graphics - From Pixels to Programmable Graphics HardwareBy Alexey Boreskov, Evgeniy Shikin, 2013.
4. Interactive Computer Graphics, Edward Angel, 2019.

COMPUTER GRAPHICS
PRACTICAL

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

COMPUTER SCIENCE
SEMESTER VIII

CLOUD COMPUTING
(Major & Minor Paper)

Credits: 04 (Theory: 04)

UNIT I: Recent trends in Computing
Cloud Computing – History, Recent trends. Cloud Computing technologies – Virtualization, SOA, Grid computing, Cluster computing, Distributed computing, Utility computing. Cloud service providers, Benefits and limitations of cloud computing, Cloud computing architecture and infrastructure, Hypervisor, Comparison with traditional computing architecture (client/server).

UNIT II: Service Models
Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), How Cloud Computing Works, Deployment Models - Public cloud, Private cloud, Hybrid cloud, Community cloud.

UNIT III: Service Management in Cloud Computing
Service Level Agreements (SLAs), Types of SLAs, Economics of scaling, Types of scaling, Comparing scaling hardware - Traditional vs. Cloud. Examples of cloud systems like Google App Engine, Microsoft Azure, AmazonEC2.

UNIT IV: Cloud Security
CSA model, Cloud security principles - Identity security, Information security and Infrastructure security - Network, Host and Application levels. Data security and storage - Data privacy and security issues, Authentication in cloud computing.

Recommended Books and References:

1. Cloud Computing - U S Pandey and K Choudhary, S Chand.
2. Cloud Computing: Principles and Paradigms - Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley.