



**Maharashtra Education Society's
Abasaheb Garware College
(Autonomous)**

(Affiliated to Savitribai Phule Pune University)

**Three Year B.Sc. Degree Program in Computer Science
(Faculty of Science and Technology)**

F.Y.B.Sc. (Computer Science)

**Choice Based Credit System Syllabus
To be implemented from Academic Year 2024-2025**

Structure of the major for Course: B.Sc. (Computer Science)

Year	Semester	Course Type	Course Code	Course Title	Remark	Credit	No. of hours
1	I	Major	CS-111-TH	Problem Solving using Computer and C Programming		2	30
			CS-112-PR	Practical based on C programming		2	4 per batch
		Minor	ELC-111-TH	Foundation course in Instrumentation Systems		2	30
			ELC-112-PR	Practical based on Foundation course in Instrumentation Systems		2	4 per batch
			MTC-111-TH	Graph Theory		2	30
			MTC-112-PR	Practical Based on Graph Theory		2	4 per batch
		GE/OE	OE-111-CS	Introduction to Computers		2	30
	SEC	SEC-101-CS	Basics of Web Designing		1 + 1	15 +Practical	
	II	Major	CS-161-TH	Advanced C Programming		2	30
			CS-162-PR	Practical based on Advanced C Programming		2	4 per batch
		Minor	ELC-161-TH	Digital electronics		2	30
			ELC-162-PR	Practical based on Digital electronics		2	4 per batch
			MTC-161-TH	Data Representation and condensation		2	30
			MTC-162-PR	Practical based on Data Representation and condensation		2	4 per batch
GE/OE		OE-161-CS	E-commerce		2	30	
		OE-162-CS	Introduction to Google tools		2	4 per batch	
SEC	SEC-151-CS	Database Management System		1 + 1	15 +Practical		
2	III	Major	CS-201-MJ	Data Structures using C		2	30
			CS-202-MJ	Relational Database Management Systems		2	30
			CS-204-MJP	Practical Based on DS and RDBMS		2	4 per batch
		Minor	ELC-201-MN	Data communication and networking		2	30
			ELC-202-MNP	Practical based on Data communication and networking		2	4 per batch
			MTC-201-MN	Discrete Mathematics		2	30
			MTC-202-MNP	Practical based on Discrete Mathematics		2	4 per batch
		VSC	CS-222-VSC	Computer Networks		2	30
		FP	FP-231-CS	Project on Web designing			
		IKS	CS-200-IKS	Computing Science in Ancient India		2	30
GE/OE	OE-201-CS	Basics of Cyber Security		2	30		

3	IV		OE-202-CS	Introduction to Word, Excel and PowerPoint		2	4 per batch	
		Major	CS-251-MJ	Object Oriented Programming using C++		2	30	
			CS-252-MJ	Software Engineering		2	30	
			CS-254-MJP	Practical Based on C++ Programming		2	4 per batch	
		Minor	ELC-251-MN	Communication networks		2	30	
			ELC-252-MNP	Practical based on Communication networks		2	4 per batch	
			MTC-251-MN	Linear Algebra and Optimization Techniques		2	30	
			MTC-252-MNP	Practical based on Linear Algebra and Optimization Techniques		2	4 per batch	
		VSC	CS-272-VSC	Python Programming		1 + 1	15 +Practical	
		CEP	CS-281-CEP	Project on Software Engineering				
	GE/OE	OE-261-CS	Type Setting in LaTeX		1 + 1	15 +Practical		
	SEC	SEC-262-CS	Advanced Excel		1 + 1	15 +Practical		
	V	Major Core	CS-301-MJ	Operating Systems I		2	30	
			CS-302-MJ	Web Technology – I		2	30	
			CS-303-MJ	Theoretical Computer Science		2	30	
			CS-304-MJ	Fundamentals of Data Science		2	30	
			CS-305-MJP	Practical Based on Operating Systems I		2	4 per batch	
			CS-306-MJP	Practical Based Web Technology I		2	4 per batch	
		Major Elective	CS-311-MJ	Object Oriented Programming – I		2	30	
CS-312-MJP			Practical Based on Object Oriented Programming I		2	4 per batch		
OR								
CS-313-MJ			Software Testing and Testing Tools		2	30		
CS-314-MJP			Practical Based on Software Testing and Testing Tools		2	4 per batch		
Minor			ELC-301-MN	Internet of Things		2	30	
		MTC-301-MN	Calculus for Machine Learning		2	30		
VSC		CS-321-VSC	UX/UI		1 + 1	15 +Practical		
FP	CS-331-FP	Project						
VI	Major Core	CS-351-MJ	Operating Systems II		2	30		
		CS-352-MJ	Web Technology II		2	30		
		CS-353-MJ	Compiler Construction		2	30		
		CS-354-MJ	Data Analytics		2	30		
		CS-355-MJP	Practical Based on Operating Systems II		2	4 per batch		

			CS-356-MJP	Practical Based Web Technology II		2	4 per batch
	Major Elective		CS-361-MJ	Object Oriented Programming II		2	30
			CS-362-MJP	Practical Based on Object Oriented Programming II		2	4 per batch
		OR					
			CS-363-MJ	Mobile Technology		2	30
			CS-364-MJP	Practical Based on Mobile Technology		2	4 per batch
		VSC	CS-371-VSC	Network Security		2	30
	OJT	CS-381-OJT	On Job Training		4		

CS-111-TH: Problem Solving using Computer and C Programming

Lectures: 30 (Credits-2)

Prerequisites: None

Course Objectives:

1. To introduce the foundations of computing, programming and problem- solving using computers.
2. To develop the ability to analyze a problem and devise an algorithm to solve it.
3. To develop the basic concepts and terminology of programming in general.
4. To implement algorithms in C.
5. To test, debug and execute programs.

Learning Outcomes: On completion of this course, students will be able to:

1. Explore algorithmic approaches to problem solving.
2. Develop modular programs using control structures and arrays in C.

Unit 1: Problem solving and C programming

08

- 1.1 Problem solving using Computers
- 1.2 Programming Languages as tools, types of languages
- 1.3 Algorithms-definition, characteristics, examples, advantages and limitations
- 1.4 Flow charts - definition, notations, examples, advantages and limitations, Comparison with algorithms
- 1.5 Structure and example of first C program
- 1.6 Compilation process (compilers, interpreters)
- 1.7 Character set, Keywords, Identifiers
- 1.8 Variables, Constants (character, integer, float, string, escape sequences, enumeration, constant)
- 1.9 Data Types (Built-in and user defined data types)
- 1.10 Operators, Expressions, Types of operators
- 1.11 Arithmetic operators, Increment Decrement operators, Relational and logical operators, Bitwise operators, Assignment operators, Comma operator, size of operator, conditional operator, Operator precedence and Order of evaluation
- 1.12 Formatted input and output, format specifiers

Unit 2: Control Structures

07

- 2.1 Decision making structures: if, if-else, else-if ladder, switch
- 2.2 Loop control structures - while, do while, for
- 2.3 Use of break and continue
- 2.4 Nested control structures
- 2.5 Unconditional branching (goto statement)

Unit 3: Functions**07**

- 3.1 Function definition, Types of functions (Standard library and User defined functions)
- 3.2 Function parameters/arguments (Actual, Formal)
- 3.3 Parameter passing method (by value), return statement
- 3.4 Recursive functions
- 3.5 Scope of variables and Storage classes

Unit 4: Arrays**08**

- 4.1 Concept of array, advantages, disadvantages
- 4.2 Types of Arrays - One, Two dimensional array
- 4.3 Array Operations - declaration, initialization, accessing array elements
- 4.4 Memory representation of two-dimensional array (row major and column major)
- 4.5 Passing arrays to function
- 4.6 Array applications - Linear search, sorting an array (bubble sort)

Reference Books:

1. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
2. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill
3. Programming in ANSI C, Ram Kumar and Rakesh Agrawal
4. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI

CS-112-PR: Practical based on C programming

(Credits-2)

Assignments of C Programming:

1. Assignment on use of data types, simple operators (expressions)
2. Assignment on decision making statements (if and if-else, nested structures)
3. Assignment on decision making statements (switch case)
4. Assignment on use of while loops
5. Assignment on use of for loops
6. Assignment on nested loops
7. Assignment on writing C programs in modular way (use of user defined functions)
8. Assignment on recursive functions
9. Assignment on use of arrays (1-D array) and functions
10. Assignment on use of multidimensional array (2-D arrays) and functions

ELC-111-TH: Foundation course in Instrumentation Systems

Lectures: 30 (Credits-2)

Objectives:

1. To study various types of semiconductor devices
2. To study elementary electronic circuits and systems
3. To study Instrumentation System
4. To study various blocks of instrumentation System
5. To study smart instrumentation system

Unit 1: Semiconductor Diodes

05

Semiconductor, P and N type semiconductors, Formation of PN junction diode, it's working. Zener diode, LED, Photo diode (Symbol, working principal, list of applications only)

Unit 2: Bipolar Junction Transistor (BJT)

05

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α , β and γ , Concept of Biasing (numerical problems not expected),

Unit 3: OSCILLATORS

03

Barkhausen Criteria, Low frequency Wein-bridge oscillator, High frequency crystal oscillator

Unit 4: DATA CONVERTERS

05

Need of Digital to Analog converters, parameters, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, parameters, Flash ADC

Unit 5: Introduction to Instrumentation System

07

Block diagram of Instrumentation system, Definition of sensor and transducer Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensor (Thermistor, LM-35), Passive Infrared sensor (PIR), Actuators: DC Motor, stepper motor

Unit 6: OPAMP as signal Conditioner

05

Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, IC741/ LM324, concept of virtual ground.

Reference Books:

1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition
2. Principles of Analog Electronics - A.P.Malvino
3. Sedha R.S., A Text Book Of Applied Electronics, S.Chand& CompanyLtd
4. Sensors and Transducers: D. Patranabis, PHI publication, 2nd Edition
5. Sensors and Transducers: Prof A.D.Shaligram
6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad

ELC-112-PR: Practical based on Foundation course in Instrumentation Systems (Credits-2)

List of Assignments :

1. Study of forward and reverse bias characteristics of PN junction diode
2. Study of Zener diode as a voltage regulator
3. Study of Optocoupler (mechanism and characteristics, Working principle of Light emitting diode, photo diode)
4. Study of Transistor as a switch.
5. Study of IC 555 as astable multivibrator used as square wave generator / clock
6. Study of Digital to Analog Converter using R-2R ladder network
7. Study of Study of optical sensor (LDR)
8. Study of Study of Op amp as inverting and non inverting amplifier
9. Op Amp as a Unity gain follower
10. Study of Opamp as adder/subtractor
11. One activity equivalent to two practicals: Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)

(Note: Basics of the devices will be explained in theory and practical will be based on applications of different types and configurations of the devices learnt in theory. In this way they will learn in class as well as in lab and more concepts can be covered in given number of credits.)

MTC-111-TH: Graph Theory

Lectures: 30 (Credits-2)

Learning Objectives:

1. Students are introduced to basics of Graph Theory
2. Student should understand and implement important graph theory algorithms which are widely used in data science.
3. Students should to apply concepts of Graph theory to data structures.
4. Student should get acquainted with graph database.

Unit 1: An Introduction to graph

08

- 1.1 Definitions, Basic terminologies and properties of graph, Graph models.
- 1.2 Special types of graphs, basic terminologies, properties
- 1.3 Some applications of special types of graph.
- 1.4 Matrix representation and elementary results, Isomorphism of graphs.

Unit 2: Connected graph and Trees

06

- 2.1. Walk, trail, path, cycle, elementary properties of connectedness.
- 2.2. Cut edge (Bridge), Cut vertex, cut set, vertex connectivity, edge connectivity and properties.
- 2.3. Definition of a tree, basic terminologies, properties.
- 2.4. Binary tree – definition and elementary properties.

Unit 3: Graph Algorithms

12

- 3.1. BFS, DFS
- 3.2 Definition of spanning tree, Kruskal's algorithm to find minimal spanning tree
- 3.3. Prim's algorithm to find minimal spanning tree
- 3.4. Shortest path problem, Dijkstra's algorithm.

Unit 4: Graph Database

04

- 4.1. Why graph database?
- 4.2. Introduction to graph database
- 4.3 Introduction of Neo4j

Text Book:

Kenneth Rosen, Discrete Mathematics and its applications, Tata McGraw Hill, Seventh Edition.

Unit 1: Chapter 8: Sec. 8.1, 8.2, 8.3

Unit 2: Chapter 8: Sec. 8.4

Unit 3: Chapter 8: Sec. 8.5, 8.6

Unit 4: Chapter 9: Sec. 9.1, 9.2, 9.3, 9.4, 9.5.

Reference Books:

1. John Clark and Derek Holton, A first look at Graph theory, Allied Publishers.
2. Narsingh Deo, Graph Theory with applications to computer science and engineering, Prentice Hall.
3. Douglas B. West, Introduction to Graph Theory, Pearson Education, second edition.

MTC-112-PR: Practical based on Graph Theory

(Credits-2)

List of Practical:

1. Problems on Unit1.
2. Problems on Unit 2 (Connected graphs)
3. Problems on Unit 2 (Trees)
4. Problems on Unit 3 (DFS, BFS)
5. Problems on Unit 3 (Prim's algorithm)
6. Problems on Unit 3 (Kruskal's algorithm).
7. Problems on Unit 3 (Dijkstra's algorithm)
8. Miscellaneous Problems-Set 1
9. Miscellaneous Problems-Set 2
10. Demo of Neo4j

OE-111-CS: Introduction to Computers

Lectures: 30 (Credits-2)

Prerequisites: None

Course Objectives:

1. To learn basic fundamentals of computer.
2. To understand handling of Operating System.

Learning Outcomes: On completion of this course, students will be able to:

1. Understand different types of devices of Computer.
2. Manage software's, user directories and files.
3. Create and manage spreadsheet.
4. Understand presentation and editing tool.

Unit 1: Introduction to Computer System **10**

- 1.1 Introduction, Characteristics of Computers, Basic structure and operation of a computer - functional units and their interaction
- 1.2 Types of computers and features- Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Laptops and Tablets
- 1.3 Types of Programming Languages- Machine Languages, Assembly Languages, High Level Languages
- 1.4 Translators- Assembler, Compiler, Interpreter

Unit 2: Introduction to Computer Peripherals **10**

- 2.1 Primary storage devices – RAM, ROM, PROM, EPROM, EEPROM
- 2.2 Secondary Storage Devices - Pen drive, HDD, SSD, External HDD
- 2.3 I/O Devices- Scanners, Digitizers, Plotters, Monitor, Printer
- 2.4 Pointing Devices – Mouse, Joystick, Touch Screen
- 2.5 Introduction to Binary System – Binary to Decimal, Decimal to Binary conversion.

Unit 3: Concepts of Software **10**

- 3.1 Definition: software, Types of software: System Software, Application Software.
- 3.2 System Software: Operating System
- 3.3 Desktop, Icons, File and Directory, Structure, Menu Items, Control Panel, File and Directory Search, Notepad, Paintbrush.
- 3.4 Utility programs: Anti-plagiarism software, Anti-virus, Disk Cleaning, Compression/Decompression of file

Unit 4: Presentation and Editing Tool **06**

- 4.1 Design Slides (using Text, images, charts, clipart)
- 4.2 Animate slide content, Slide Animation, Slide Show
- 4.3 Transition and Slide Timings
- 4.4 Creating new document, Basic formatting of text and paragraphs
- 4.5 Inserting and formatting shapes, pictures, charts
- 4.6 Inserting and modify table
- 4.7 Change the page layout, background and borders

Unit 5: Spreadsheets **06**

- 5.1 Purpose, usage
- 5.2 Creating new worksheet, adding copying, removing sheets

- 5.3 Basic formatting of data in worksheet
- 5.4 Data sorting, filtering, conditional formatting, customized dropdown list
- 5.5 Basic functions – sum, count, average, min, max
- 5.6 Text functions – upper, lower, proper, trim, left, right, mid, len
- 5.7 Creating and formatting of charts

Unit 6: Introduction to Internet, WWW and Web Browsers

06

- 6.1 Basic of Computer networks; LAN, MAN, WAN
- 6.2 Concept of Internet
- 6.3 Applications of Internet
- 6.4 Basics of electronic Mail
- 6.5 World Wide Web, Web Browsing software's
- 6.6 Search Engines, Understanding URL

Reference Books:

1. Computer Fundamentals by P.K. Sinha, Priti Sinha, BPB publication
2. Computers Today by S. Basandra, Galgotia publication

SEC-101-CS: Basics of Web Designing
Lectures: 15 + Practical (Credits-2)

Prerequisites: None

Course Objectives:

1. To learn basic HTML tags.
2. To design static Webpage.
3. To define styles for web pages using CSS.
4. To create a dynamic and interactive web page using JavaScript

Learning Outcomes: On completion of this course, students will be able to:

1. Design a page using basic HTML tags.
2. Build simple static Web application.
3. Define different styles for HTML tags.
4. Understand scripting language which helps to develop interactive webpage.

Unit 1: HTML **08**

- 1.1 Introduction to HTML, Structure of HTML
- 1.2 HTML tags, attributes and HTML comment
- 1.3 HTML formatting tags
- 1.4 Headings, Paragraph
- 1.5 Ways to define color – Plain color, RGB, Hex value, HSL value
- 1.6 Inserting an Image
- 1.7 List
- 1.8 Tables
- 1.9 Hyperlinks and Image links
- 1.10 Frames and iFrame

Unit 2: HTML form designing and HTML 5 **06**

- 2.1 Inserting text box, text area, buttons, List box, radio, checkbox
- 2.2 Designing of Forms
- 2.3 GET and POST methods
- 2.4 Designing form using HTML 5 input tags

Unit3: CSS **08**

- 3.1 Introduction to Style Sheet
- 3.2 Ways to apply CSS to HTML
- 3.3 CSS Border, margin, positioning, color, text, link, background, list, table, padding,image, display properties, z-index, opacity
- 3.4 Use of Id and classes in CSS
- 3.5 Use of <div> and
- 3.6 Introduction of CSS3: Gradients, Transitions, Animations, multiple columns
- 3.7 Introduction to Bootstrap

Unit 4: JavaScript and JQuery

08

- 4.1 Concept of script
- 4.2 Introduction to JavaScript
- 4.3 Variables, identifiers and operators, control structures
- 4.4 Functions
- 4.5 Event Handling in JavaScript
- 4.6 Math and date object
- 4.7 String object and predefined String functions
- 4.8 DOM concept in JavaScript, DOM objects
- 4.9 Validations in JavaScript
- 4.10 JQuery library
- 4.11 Including jquery library in page JQuery selector
- 4.12 DOM manipulation using JQuery

Reference Books

- 2. HTML Black Book by Steven Holzner, Dremtech press.
- 3. The Complete Reference by Thomas A. Powell, Mc Graw Hill
- 4. <https://getbootstrap.com/>

Practical Assignments:

- 1. HTML Tags - headings, paragraphs, line break, colors, fonts, links, Images, List, tables and Frames
- 2. Creating forms by using HTML and HTML5 Tags
- 3. Styling HTML pages using CSS
- 4. Assignment on bootstrap
- 5. Assignment on Javascript
- 6. Assignment on jquery

CS-161-TH: Advanced C Programming

Lectures: 30 (Credits-2)

Prerequisites:

- Basic knowledge of C language.

Course Objectives:

1. To study advanced concepts of programming using the C language.
2. To understand code organization with complex data types and structures.
3. To work with files.

Learning Outcomes: On completion of this course, students will be able to:

1. Develop modular programs using control structures, pointers, arrays, strings and structures.
2. Design and develop solutions to real world problems using C.

Unit 1: Pointer

08

- 1.1 Introduction to Pointer
- 1.2 Declaration, definition, initialization, dereferencing
- 1.3 Pointer arithmetic
- 1.4 Relationship between Arrays & Pointers- Pointer to array, Array of pointers.
- 1.5 Multiple indirection (pointer to pointer)
- 1.6 Functions and pointers- Passing pointer to function, returning pointer from function, function pointer
- 1.7 Dynamic memory management- Allocation(malloc(), calloc()), Resizing (realloc()), Releasing(free()), Memory leak, dangling pointers

Unit 2: String

05

- 2.1 Definition, declaration, initialization
- 2.2 Predefined string functions
- 2.3 Array of strings
- 2.4 Strings and Pointers
- 2.5 Command line arguments

Unit 3: Structures and Unions

07

- 3.1 Concept of structure, definition and initialization, use of typedef
- 3.2 Accessing structure members
- 3.3 Nested Structures
- 3.4 Arrays of Structures
- 3.5 Structures and functions- Passing each member of structure as a separate argument, passing structure by value / address
- 3.6 Pointers and structures.
- 3.7 Self-referential structure and its application
- 3.8 Concept of Union, declaration, definition, accessing union members
- 3.9 Difference between structures and union

Unit 4: File Handling and Preprocessor

10

- 4.1 Introduction to streams
- 4.2 Types of files
- 4.3 Operations on text files
- 4.4 Standard library input/output functions
- 4.5 Random access to files
- 4.6 Role of Preprocessor
- 4.7 Format of preprocessor directive
- 4.8 File inclusion directives (#include)

4.9 Macro substitution directive, argumented and nested macro

4.10 Macros versus functions

Reference Books

1. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill
2. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI
3. Programming in C ,A Practical Approach, Ajay Mittal, Pearson
4. Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, Pearson Publication

CS-162-PR: Practical based on Advanced C Programming

(Credits-2)

Assignments of Advanced C:

1. To demonstrate use of pointers
2. To demonstrate advanced use of pointers
3. To demonstrate concept of strings, array of strings
4. To demonstrate string operations using pointers
5. To demonstrate command line arguments
6. To demonstrate structures (using array and functions)
7. To demonstrate nested structures and Unions
8. To demonstrate file handling
9. To demonstrate use of preprocessor directives

ELC-161-TH: Digital electronics

Lectures: 30 (Credits-2)

Objectives:

1. To get familiar with concepts of digital electronics.
2. To learn number systems, codes and their representation.
3. To understand basic logic gates, Boolean algebra and K-maps.
4. To study arithmetic circuits, combinational and sequential circuits.

Unit 1: Number Systems and Digital codes (10)

Introduction to Decimal, Binary and Hexadecimal Number Systems and their interconversions,

Binary addition and binary subtraction using 2's complement, Binary Coded Decimal Number, Gray Code, Gray to Binary and Binary to Gray conversion. Alphanumeric representation in ASCII codes.

Unit 2: Logic gates and Boolean Algebra (10)

Logic gates (NOT, AND, OR, NAND, NOR, XOR gate) With their symbol, Boolean Equation and truth table, Universal gates. Introduction of logic families TTL, ECL and CMOS, TTL logic family: Parameters like power supply, propagation delay, noise margin, fan in, fan out, Power Dissipation. Boolean algebra rules and Boolean Laws, De Morgan's theorem, Simplifications of Logic equations using Boolean algebra rules, Introduction to Karnaugh Map, problems based on the same (Up to 4 variables), Digital Designing using K Map for: Gray to Binary and Binary to Gray conversion.

Unit 3: Combinational Circuits (10)

Half adder and full adder, 4-Bit Universal adder/ Subtractor, Applications of Ex-OR gates as parity checker and generator. Study of Multiplexer (4:1) and Demultiplexer (1:4), Encoders - Decimal/ BCD to binary, Decoder- BCD to seven segment decoder, IC 74138 and IC 7447, Digital comparator.

Reference Books:

1. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education.
2. Digital Electronics: Jain R.P., Tata McGraw Hill.
3. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
4. M. Morris Mano, "Digital Design "3rd Edition, PHI, New Delhi.

ELC-162-PR: Digital electronics

(Credits-2)

List of Practical:

1. Study of Logic Gates (Verification of Truth tables). Knowing the various IC numbers and internal structure.
2. Study of Binary to Gray & Gray to Binary Converter (K- Map based design).
3. Study of Half Adder and Full Adder using Logic Gates. Study of nibble adder/ subtractor.
4. Study of Digital comparator (password) and comparison of bits (finding smaller, zero or larger).
5. Use of Ex-OR as a 4-bit Parity Checker and Generator circuits.
6. Study of Multiplexer and Demultiplexer (4:1 & 1:4).
7. Study of BCD to Seven Segment Display using IC 74138 and IC 7447.
8. Study of DeMorgan's Theorem and Interconversion of Logic gates.

MTC-161-TH: Data Representation and Condensation

Lectures: 30 (Credits-2)

Learning Objectives:

1. To introduce methods in descriptive statistics
2. To explain the concept of descriptive statistics for real data
3. To introduce methods for finding correlation between variables

Unit 1: Introduction

07

- 1.1 Raw data, attributes and variables, discrete and continuous variables. Presentation of data Using frequency distribution and cumulative frequency distribution.
- 1.2 Graphical Presentation of frequency distribution –histogram, stem and leaf chart, less than and more than type ogive curves.

Unit 2: Measures of Central tendency and dispersion

10

- 2.1 Measures of Central tendency: Mean, Mode, Median. Examples where each one of these is Most appropriate. Partition values: Quartiles, Box-Plot.
- 2.2 Measures of Dispersion: Range, Coefficient of range, Quartile deviation, Coefficient of quartile deviation, Variance, Standard Deviation, Coefficient of Variation.

Unit 3: Moments

05

- 3.1. Raw and Central moments: definition, computations for ungrouped and grouped data (only up to first four moments).
- 3.2. Relation between raw and central moments up to fourth order.
- 3.3. Numerical problems related to real life situations.

Unit 4: Skewness, Kurtosis and its measures

08

- 4.1 Concept of symmetric frequency distribution, skewness, positive and negative skewness.
- 4.2 Measures of skewness-Pearson's measure, Bowley's measure, β_1, γ_1 .
- 4.3 Kurtosis of a frequency distribution, types of kurtosis: leptokurtic, platykurtic and mesokurtic, measure of kurtosis (β_2, γ_2) based upon moments.
- 4.4 Numerical problems related to real life situations

Text Book:

1. Fundamentals of Applied Statistics, Gupta and Kapoor, S. Chand and Sons, New Delhi, 2014, Fourth Edition

Reference Books:

1. Statistical Methods,, G.W. Snedecor, W.G. Cochran, John Wiley & sons, 1991, Eight Edition
2. An Introductory Statistics, Kennedy and Gentle

**MTC-162-PR: Practical based on Data Representation and Condensation
(Credits-2)**

Manual problems solving practical:

1. Problems based on Unit 1
2. Measures of Central Tendency
3. Measures of Dispersion.
4. Measures of skewness and kurtosis

Practical using R software / Excel:

1. Introduction to R software / Excel
2. Graphical Presentation of frequency distribution – bar graph, stem and leaf chart, ogive curves
3. Measures of Central Tendency
4. Measures of Dispersion.
5. Measures of skewness and kurtosis

OE-161-CS: E-commerce

Lectures: 30 (Credits-2)

Prerequisites: None

Course Objectives:

1. Understand the fundamental concepts and components of e-commerce.
2. Analyze and evaluate e-commerce technologies and systems.
3. Discuss the legal, ethical, and security issues in e-commerce.
4. Explore emerging trends and future directions in e-commerce.

Learning Outcomes: On completion of this course, students will be able to:

1. Understand the fundamental concepts and components of e-commerce.
2. Analyze and evaluate e-commerce technologies and systems.
3. Understand legal, ethical, and security issues in e-commerce.
4. Understand emerging trends and future directions in e-commerce

Unit 1: Introduction to E-commerce

07

- 1.1 Definition and scope of e-commerce
- 1.2 Evolution and growth of e-commerce
- 1.3 E-commerce models: B2B, B2C, C2C, etc.
- 1.4 Social Media: Social media marketing and advertising, Social commerce and influencer marketing, Social network analysis and community detection
- 1.5 Ethical, Legal, and Social Issues in E-commerce

Unit 2: Web technologies for e-commerce

06

- 2.1 HTML, CSS, and JavaScript for web development
- 2.2 Client-server architecture
- 2.3 Responsive design and mobile optimization
- 2.4 Content management systems and e-commerce platforms
- 2.5 E-commerce Analytics: Data collection and analysis in e-commerce, Customer behaviour tracking and profiling, Data-driven decision making, Personalization and recommendation systems

Unit 3: Infrastructure, Security and Payment Systems

11

- 3.1 Internet protocols and networking fundamentals
- 3.2 Web servers, hosting, and domain registration
- 3.3 Cloud computing and virtualization
- 3.4 Performance optimization and scalability
- 3.5 Authentication and access control
- 3.6 Encryption and secure communication protocols
- 3.7 Payment security and fraud prevention
- 3.8 Privacy and legal considerations
- 3.9 Traditional payment methods (credit cards, checks)
- 3.10 Online payment gateways (PayPal, Stripe, etc.)
- 3.11 Cryptocurrencies and blockchain - based payments
- 3.12 Mobile payment systems

Unit 4: Emerging Trends in E-commerce

06

- 4.1 Mobile commerce and app development
- 4.2 Voice commerce and smart assistants
- 4.3 Augmented reality (AR) and virtual reality (VR) in e-commerce
- 4.4 Internet of Things (IoT) and connected devices

Reference Books:

1. "E-commerce: Business, Technology, Society" by Kenneth C. Laudon and Carol Guercio Traver.
2. "Electronic Commerce: A Managerial and Social Networks Perspective" by Efraim Turban, David King, Judy McKay, Peter Marshall, and Jae Kyu Lee.
3. "E-commerce: Concepts, Models, Strategies" by Ravi Kalakota and Andrew B. Whinston.
4. "E-commerce 2019: Business, Technology, Society" by Kenneth C. Laudon and Carol Guercio Traver.

OE-162-CS: Introduction to Google tools

(Credits-2)

Assignments:

1. Assignment on Google Email
2. Assignment on Google Drive
3. Assignment on Google Calendar
4. Assignment on Google Docs, Sheets, Slides
5. Assignment on G Talk
6. Assignment on Google Maps
7. Assignment on Google Contacts
8. Assignment on Google Assistant

SEC-151-CS: Database Management Systems

Lectures: 15 + Practical (Credits-2)

Prerequisites:

- Basic Knowledge of Files
- Basics of Set Theory

Course Objectives:

1. To understand the fundamental concepts of database
2. To understand user requirements and frame it in data model.
3. To understand creations, manipulation and querying of data in databases.

Learning Outcomes: On completion of this course, students will be able to:

1. design data models, schemas and instances
2. design E-R Model for given requirements and convert the same into database tables.
3. implement SQL: Data definition, constraints, schema, queries and operations in SQL

Unit 1: Introduction to DBMS

03

- 1.1 Introduction
- 1.2 File system Vs DBMS
- 1.3 Levels of abstraction & data independence
- 1.4 Structure of DBMS
- 1.5 Users of DBMS
- 1.6 Advantages of DBMS

Unit 2: Database Design and ER Model

12

- 2.1 Over view of DB design process
- 2.2 Conceptual Design using ER data model (entities, attributes, entity sets, relations, relationship sets)
- 2.3 Constraints (Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint, Domain, Check constraint, Mapping constraints)
- 2.4 Keys Concept with Examples: Primary Key, Candidate Keys and Super Keys
- 2.5 Extended features – Specialization, Aggregation, Generalization
- 2.6 Structure of Relational Databases (concepts of a table)
- 2.7 DBMS Versus RDBMS
- 2.8 Examples of E-R Model

Unit 3: Basic SQL

07

- 3.1 Introduction to query languages
- 3.2 Basic structure
- 3.3 DDL Commands

- 3.4 DML Commands
- 3.5 Forms of a basic SQL query (Expression and strings in SQL)

Unit 4: Advanced SQL

08

- 4.1 Set operations
- 4.2 Aggregate Operators and functions
- 4.3 Null value
- 4.4 Nested Subqueries
- 4.5 SQL mechanisms for joining relations (inner joins, outer joins and their types)
- 4.6 Examples on SQL

Reference Books

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan, Tata McGraw-Hill Education
2. Database Management Systems, Raghu Ramakrishnan, McGraw-hill higher Education
3. Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, Apress
4. Practical PostgreSQL, By Joshua D. Drake, John C Worsley, O'Reilly

Practical Assignments of DBMS:

1. To create simple tables with the primary key constraint (as a table level constraint & as a field level constraint) (include all data types). To create one or more tables with following constraints: Primary Key, Foreign Key Check constraint Unique constraint, Not null constraint.
2. To drop a table, alter schema of a table, insert / update / delete records using tables created in previous Assignments. (Use simple forms of insert / update / delete statements)
3. Write simple queries based on single table using simple form of select statement:
Select <field-list>
from table
[where <condition> order by <field list>]

Select <field-list, aggregate functions >
from table
[where <condition> group by <> having <> order by <>]
4. To query table, using set operations (union, intersect) and using nested queries (use of except, exists, not exists, all clauses)

Evaluation Pattern

The internal and external evaluation will be 50-50%

All the courses, both theory as well as practical, of major and minor are of two credits each. So, total marks will be 50. Out of 25 marks will be allotted for internal evaluation and 25 marks for external evaluation.

Theory Courses:

- Internal evaluation will be of 25 marks for which 2 continuous evaluation exams will be conducted
- External evaluation will be of 25 marks

Practical Courses:

Internal evaluation will be of 25 marks out of which 10 marks will be for assignment submissions done throughout the semester and a test/viva will be conducted for 15 marks

External evaluation will be of 25 marks

For Skill Enhancement and Vocational skills, 2 credit course is divided as 1 credit for theory and 1 credit of practical. In that case also internal and external will be of 50-50%. Distribution of 25 internal and 25 external (For total 2 credits) can be decided subject-wise

Methods of assessment for internal evaluation:

Seminar, objective test, open book test, Quiz, viva, projects, assignments, group discussion, research paper review, case study, industrial visit

Passing percentage

The student must secure at least 40% marks of that course to earn the full credit.

Examination	Credits	Marks Out of	Passing marks (40%)
Internal	2	25	10
External	2	25	10

Note: There is separate passing for internal and external examinations.