Maharashtra Education Society's

ABASAHEB GARWARE COLLEGE

(AUTONOMOUS)

(Affiliated to Savitribai Phule Pune University)

Three Years Degree Program in Computer Application

(Faculty of Science & Technology)

Syllabi under Autonomy

F.Y.B.C.A. (Science)

Choice Based Credit System Syllabus

To be implemented from academic year 2022-23

Title of the Course: B.C.A. (Science)

Preamble

The B.C.A. program is a combination of computer and allied courses from science stream. The course starts by giving the students the knowledge of basics of Computers, writing computer programs, logic development, web designing and basics of database. The applied courses include mathematics, statistics and electronics that provide theoretical foundation for the learner.

In consecutive years students get acquainted concept of Object oriented programming, System analysis and designing, Web programming, advanced concepts of databases, mobile application development. Theory courses are appropriately supplemented by hands-on practical courses. The program provides opportunities of hands-on learning through project which encourages a student to work effectively as team member and demonstrate professional behaviour.

The course is designed to make the students ready to undertake career in computer and mobile application development, careers in developing Web based applications

Learning Outcomes

- To produce knowledgeable and skilled human resources that is employable in IT and ITES.
- To impart knowledge required for planning, designing and building Complex Application Software Systems as well as to provide support for automated systems or applications.
- To produce entrepreneurs

Eligibility :

F.Y. B.C.A. (Science)

a. Any candidate who has passed XII standard examination in science stream from Maharashtra State Board of Secondary and Higher Secondary Education or equivalent board of examination is eligible for the admission to the first year of this programme
b. Passed three Years Diploma Course approved by DTE, Maharashtra State of equivalent authority.

Direct Second Year B.C.A.

Any candidate who has passed three Years Diploma course in Computer Engineering / Technology / Information Technology / Electronics Communication / Electronics Telecommunications / Electronics approved by the DTE, Maharashtra State or Equivalent authority is eligible for admission to direct second year (SYBCA) of this program

Structure of the Course: B.C.A. (Science)

Year	Semester	Course Type	Course Code	Course Title	Remark	Credit	No. of Lectures /Practical to be conducted
1	I	CC	USCA-111	Fundamentals of Computer		4	48
		CC	USCA-112	Problem Solving and C Programming		4	48
		CC	USCA-113	Applied Mathematics		4	48
		CC	USCA-114	Database Management System – I		4	48
		CC	USCAP-115	Practical Course in Fundamentals of Computer		1.5	12
		CC	USCAP-116	Practical Course in Problem Solving and C Programming		1.5	12
		CC	USCAP-117	Practical Course in Applied Mathematics		1.5	12
		CC	USCAP-118	Practical Course in Database Management System – I		1.5	12
	II	CC	USCA-121	Computer Organization		4	48
		CC	USCA-122	Advanced C Programming		4	48
		CC	USCA-123	Basics of Web Designing		4	48
		CC	USCA-124	Database Management System – II		4	48
		CC	USCAP-125	Practical Course in Computer Organization		1.5	12
		CC	USCAP-126	Practical Course in Advanced C Programming		1.5	12
		CC	USCAP-127	Practical Course in Basics of Web Designing		1.5	12
		CC	USCAP-128	Practical Course in Database Management System - II		1.5	12
		DEG	USDEG-12	Democracy, Election and Governance		2	30

2	III	CC	USCA-231	Data Structures using C		4	48
		CC	USCA-232	Python Programming		4	48
		CC	USCA-233	Computer Networks		4	48
		CC	USCAP-234	Practical Course in Data Structures using C		2	12
		CC	USCAP-235	Practical Course in Python Programming		2	12
		CC	USCAP-236	Practical Course in Computer Networks and Web Programming		2	12
		AECC	UEVS-231	Environmental Science – I		2	30
		AECC	USLGA-231	Language Communication – I		2	30
	IV	CC	USCA-241	Object Oriented Programming – I		4	48
		CC	USCA-242	Web Technology		4	48
		CC	USCA-243	Software Engineering		4	48
		CC	USCAP-244	Practical Course in Object Oriented Programming – I		2	12
		CC	USCAP-245	Practical Course in Web Technology		2	12
		CC	USCAP-246	Practical Course in Software Engineering		2	12
		AECC	UEVS-241	Environmental Science – II		2	30
		AECC	USLGA-241	Language Communication – II		2	30
	V	DSE	USCA-351	Object Oriented Programming – II		4	48
		DSE	USCA-352	Data Mining and Data Science		4	48
		DSE	USCA-353	Principles of Operating Systems		4	48
		SEC	USCASEC-355	Artificial Intelligence		2	30
		SEC	USCASEC-355	Cloud Computing		2	30
		DSE	USCAP-356	Practical Course based in Object Oriented Programming -II		2	12

3		DSE	USCAP-357	Practical Course based in Data Mining and Data Science		2	12
		DSE	USCAP-358	Practical Course based in Principles of Operating Systems and AI		2	12
	VI	DSE	USCA-361	Mobile Application Development		4	48
		DSE	USCA-362	Programming on GO		4	48
		DSE	USCA-363	Software Project Management		4	48
		SEC	USCASEC-364	Software Testing		2	30
		SEC	USCASEC-365	Internet of Things		2	30
		DSE	USCAP-366	Practical Course based in Mobile Application Development		2	12
		DSE	USCAP-367	Practical Course based in Programming in GO and Internet of Things		2	12
		DSE	USACAP-368	Project		2	12

FIRST YEAR - SEMESTER-I

Course Code and Title: USCA-111 Fundamentals of Computer

Prerequisites: **No. of Hours : 48 (Credits - 4)**

- None

Course Objectives:

1. To study the basics of Computer System
2. To Learn Basic Commands of Operating system and application software
3. To understand Open Source Software
4. To learn different Google tools

Learning Outcomes: On completion of the course student will be able to

1. Understand working of computers and peripherals, types of software and languages
2. Learn commands and features of operating systems and application software
3. Work with open source software and Google tools

Unit 1: Introduction **06**

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

Unit 2: Computer Peripherals **08**

2.1 Primary storage devices – RAM, ROM, PROM, EPROM, EEPROM
2.2 Secondary Storage Devices – Types of CD, DVD, Blue Ray, Pen drive, HDD, SSD, External HDD
2.3 Input Devices- Keyboards, Digitizers, Web camera, Scanners, MICR, OMR
2.4 Output Devices - Printers – Inkjet, Laser, Line Printers, Plotters, LCD, Plasma Display
2.5 Pointing Devices – Mouse, Joystick, Touch Screens
2.6 Introduction to Network devices – Hubs, Switches, Routers, MODEM, Access Points

Unit 3: Computer Software **10**

3.1 Types of software: System Software, Application Software
3.2 System Software: Operating System
3.3 Special purpose systems – Real time Embedded, Multimedia Distributed

3.4 Computing Environment: Traditional, Client Server, Peer-to-peer, Web Based

3.5 Basic Commands in Linux with options such as pwd, mkdir, cd, rmdir, cat, cp, mv, rm, ls, wc, man, grep, who, whoami, lp

3.6 Shell, Types of shells and basic shell script

3.7 Introduction to GUI: Desktop Icons, File and Directory structure, Menu Items, Control Panel, File and Directory Search

3.8 Utility programs: Anti-plagiarism software, Anti-virus, Disk Cleaning, Defragmentation, Compression/Decompression of file

Unit 4: Editors, Word Processors, Presentation Tools 10

4.1 Examples of basic and advanced editors like notepad/gedit/vi

4.2 Word Processors: Basic formatting of text, hyperlinks, watermarks, shapes, word art, tables, layouts, mail merge

4.3 Presentation Tools: Design Slides (using Text, images, charts, clipart), Text Animation, Slide transition, Template and theme creation

Unit 5: Spreadsheets and Google applications 10

5.1 Spreadsheets: Basics formatting, formulas, basic functions, if condition

5.2 Data sorting, filtering, graphs, conditional formatting

5.3 Advanced features: macros, sumif, countif, vlookup, find andremove duplicates

5.4 Google applications: Google docs, Google sheets, Google slide, Google calendar, Google form, Google drive, Google classroom

Unit 6: Open Source Software 04

6.1 Introduction: Open Source, Free Software, Free Software vs. Open Source software

6.2 Open Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris.

6.3 Technologies, Development tools, IDEs, LAMP, WAMP, XAMP

6.4 Example Open Source Projects: Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, Wordpress, GCC, github, Open Office

Reference Books

1. Computer Fundamentals by P.K. Sinha, Priti Sinha, BPB publication
2. Unix Concepts and Applications by Sumitabha Das, McGraw Hill Education publication
3. Operating System Concepts by Silberschatz, Galvin, Gagne, John Wiley & Sons publication
4. UNIX and Shell Programming by Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning publication

Course Code and Title: USCA-112 Problem Solving Using Computer and 'C' Programming

Prerequisites: **No. of Hours : 48 (Credits-4)**

- None

Course Objectives:

1. To develop the ability to analyze a problem and devise an algorithm to solve it.
2. To understand structured programming approach.
3. To implement algorithms in the 'C' language.
4. To test, debug and execute programs.

Learning Outcomes: On completion of the course student 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 Aspects **06**

1.1 Introduction to problem solving using computers.
1.2 Problem solving steps.
1.3 Algorithms-definition, characteristics, examples, advantages and limitations.
1.4 Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms.
1.5 Programming Languages as tools, programming paradigms, types of languages

Unit 2: Introduction to 'C' programming **03**

2.1 History of 'C' language.
2.2 Application areas.
2.3 Structure and example of first 'C' program.
2.4 Compilation process (compilers, interpreters), linking and loading, syntax and semantic errors, testing a program
2.5 Good Programming Practices (naming conventions, documentation, indentation).

Unit 3: 'C' Tokens **08**

3.1 Character set, Keywords, Identifiers
3.2 Variables, Constants (character, integer, float, string, escape sequences, enumeration constant).
3.3 Data Types (Built-in and user defined data types).
3.4 Operators, Expressions, Types of operators -Unary and Binary arithmetic operators, Increment Decrement operators, Relational and logical

operators, Bit wise operators, Assignment operators, Comma operator, size of operator, Ternary conditional operator, Operator precedence and Order of evaluation.

Unit 4: Input Output Statements 03

4.1 Character input and output.
4.2 String input and output.
4.3 Formatted input and output.
4.4 Format specifiers

Unit 5: Control Structures 10

5.1 Decision making structures:- if ,if-else, nested if-else, else if ladder, switch and conditional operator.
5.2 Loop control structures:- while ,do while, for.
5.3 Use of break and continue.
5.4 Nested structures.
5.5 Unconditional branching (goto statement).

Unit 6: Function 10

6.1 Concept of function, Advantages of Modular design.
6.2 Types of functions (Standard library functions, User defined functions)
6.3 Function parameters/arguments (Actual, Formal)
6.4 Parameter passing method (by value), return statement.
6.5 Recursive functions.
6.6 Scope of variables and Storage classes.

Unit 7: Array 08

7.1 Concept of array.
7.2 Types of Arrays – One, Two and Multidimensional array.
7.3 Array Operations - declaration, initialization, accessing array elements.
7.4 Memory representation of two-dimensional array (row-major and column-major)
7.5 Passing arrays to function.
7.6 Array applications - Linear search, Sorting an array (Simple exchange sort, bubble sort), Merging two sorted arrays, Matrix operations (trace of matrix, addition, transpose, multiplication, symmetric, upper/ lower triangular matrix

Reference Books

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

Course Code and Title: USCA-113 Applied Mathematics

Prerequisites: **No. of Hours : 48 (Credits-4)**

- None

Course Objectives:

1. Learn basic terminology formal logic, proofs, sets, relations, functions and perform the operations associated with same
2. Use formal logic proof and logical reasoning to solve problems
3. To understand significance of statistical measures
4. To study Correlation, Probability and sampling theory

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

1. Relate and apply techniques for constructing mathematical proofs and make use of appropriate set operations, propositional logic to solve problems
2. Use function or relation models to interpret associated relationships
3. Apply basic counting techniques and use principles of probability
4. Given a data, compute various statistical measures of central tendency
5. Use appropriate Sampling techniques

Unit 1: Sets and Logic **08**

1.1 **Sets–** Set Theory, Need for Sets, Representation of Sets, Set Operations, cardinality of set, **Types of Sets** – Bounded and Unbounded Sets, Countable Sets, Finite and Infinite Sets, power set

1.2 **Propositional Logic-** logic**,** Propositional Equivalences, Application of Propositional Logic-Translating English Sentences, Validity of arguments, Mathematical Induction

Unit 2: Relations and Functions **08**

2.1 **Relations:** Properties, n-ary Relations and Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings, partitions, Hasse Diagram, Transitive Closure and Warshall‘s Algorithm

2.2 **Functions-** Surjective, Injective and Bijective functions, Inverse Functions and Compositions of Functions

Unit 3: Counting Principles **08**

3.1 Basics of Counting, Rules of Sum and Product, Permutations and Combinations

3.2 Principle of Inclusion and Exclusion, Pigeonhole Principle

Unit 4: Data Presentation and Aggregation **08**

4.1 **Data Types:** attribute, variable, discrete and continuous variable
4.2 **Data presentation:** frequency distribution, histogram, ogive, stem and leaf, Box-plot
4.3 **Measures of Central Tendency:** Arithmetic Mean (AM), Weighted Arithmetic Mean, Arithmetic Mean computed from Grouped Data, Concept of Median, Mode, Geometric Mean (GM), Harmonic Mean (HM), Quartiles, Deciles, and Percentiles
4.4 **Standard Deviation and Other Measures of Dispersion:** Standard Deviation, Variance, Absolute and Relative Dispersion

Unit 5: Correlation Theory and Sampling 08

5.1 **Moments, Skewness and Kurtosis**: Moments, Computation of Moments for Grouped Data, Skewness, Kurtosis, Computation of Skewness and Kurtosis.
5.2 **Correlation:** Bivariate data, scatter plots, Linear Correlation, Karl Pearson's Coefficient of correlation.
5.3 **Linear regression:** Concept, The Least-Squares Method, Regression Line Y on X
5.4 **Elementary Sampling Theory**: Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement.

Unit 6: Probability & Hypothesis Testing 08

6.1 **Probability:** Random experiment, sample space, events types and operations of events, Probability definition, Axioms of probability, The four Elementary Theorems (without proof), Conditional probability, Bayes' theorem (without proof), Examples.
6.2 **Standard Distributions:** random variable; Discrete**,** Continuous, PDF/PMF, Mathematical Expectation, Variance of a random variable and Cumulative distribution function (CDF),Introduction and properties (without proof) for binomial, normal, Standard Normal, Chi-square distributions, Examples.
6.3 Introduction to Hypothesis testing

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Tata Mcgraw-Hill, Isbn 978-0-07-288008-3, 7th Edition.
2. Trivedi K.S., " Probability, Statistics, Design Of Experiments And Queuing Theory, With Applications Of Computer Science", Prentice Hall Of India, New Delhi
3. C L Liu, "Elements Of Discrete Mathematics", Tata Mcgraw-Hill, Isbn 10:0-07-066913-9.
4. Kulkarni M.B., Ghatpande S.B. And Gore S.D., "Common Statistical Tests" Satyajeet Prakashan, Pune
5. J.N. Kapur And H.C. Saxena, "Mathematical Statistics", S. Chand Publications, 20th Ed.

6. John P. D'angelo & Douglas B. West, "Mathematical Thinking–Problem Solving And Proofs" Prentice Hall, 2nd Ed.
7. Introduction to Linear Regression Analysis, Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, Wiley

Course Code and Title: USCA-114 Database Management System - I

Prerequisites: **No. of Hours : 48 (Credits-4)**

- 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.

Course Outcomes: On completion of the course student 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 **05**

1.1 Introduction
1.2 File system Vs DBMS
1.3 Types of Data Models – Relational, Hierarchical, Network
1.4 Levels of abstraction & data independence
1.5 Structure of DBMS
1.6 Users of DBMS
1.7 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: SQL **13**

3.1 Introduction to query languages
3.2 Basic structure

3.3 DDL Commands
3.4 DML Command
3.5 Forms of a basic SQL query (Expression and strings in SQL)
3.6 Set operations
3.7 Aggregate Operators and functions
3.8 Null value
3.9 Nested Subqueries
3.10 SQL mechanisms for joining relations (inner joins, outer joins and their types)
3.11 Examples on SQL

Unit 4: Relational Algebra and Calculus **06**

4.1 Preliminaries
4.2 Relational Algebra
4.4.1 Selection
4.4.2 Projection
4.4.3 Set operations
4.4.4 Renaming
4.4.5 Joins

Unit 5: Case Studies **06**

Any 3 case studies
Every case study will include -
5.1 Describe Case study
5.2 Construct E-R model
5.3 Design DB by converting E-R into relational form
5.4 Write at-least 5 SQL queries.

Unit 6: Introduction to RDBMS **06**

6.1 Concept of Functional Dependencies
6.2 Armstrong's axioms
6.3 F+, Closure of an attribute set
6.4 Algorithm to derive Primary Key and Super key with examples
6.5 Canonical Cover

Reference Books

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

Course Code and Title: USCAP-115 Practical Course in Fundamentals of Computer

Assignments **No. of Sessions :12 (Credits-1.5)**

1. Operating system commands
2. Word document processing – Basic features, hyperlink, bullets, watermark, shapes, word art
3. Word document processing – Mail merge, table, header, footer, page numbers
4. Presentation Tools – designing, slide transition
5. Presentation Tools – text animation, slide show
6. Spreadsheet – basic features, formulas
7. Spreadsheet – Advanced features
8. Utility programs – Disk cleaning, De-Fragmentation , anti-plagiarism, anti-virus, Compression and Decompression
9. Google apps – Google form, Google drive, Google calendar, docs, slide, spreadsheets
10. Basics shell scripts

Course Code and Title: USCAP-116 Practical Course in Problem solving and 'C' Programming

Assignments **No. of Sessions : 12 (Credits-1.5)**

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 menu driven programs
8. Assignment on writing C programs in modular way (use of user defined functions)
9. Assignment on recursive functions
10. Assignment on use of arrays (1-D array) and functions
11. Assignment on use of multidimensional array (2-D arrays) and functions
12. Assignment on Standard Library Function

Course Code and Title: USCAP-117 Practical Course in Applied Mathematics

Assignments **No of Sessions-12 (Credits-1.5)**

Assignments to be done based on Units I, II, III

1. Set Theory
2. Logic, Mathematical Induction
3. Relations
4. Functions
5. Counting Principles

Assignments to be done based on Units IV, V, VI

1. Using R execute the basic commands, array, list and frames
2. Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations
3. Using R, draw Simple bar diagram, Multiple bar diagram, Sub-divided bar diagram and Pie diagram
4. Using R, draw Rod or Spike Plot, Histogram, Stem and leaf chart and Box-Plot
5. Using R execute the statistical functions : mean, median, mode, quartiles, range, interquartile range, and standard deviation.
6. Using R import the data from Excel/.CSV file and calculate the skewness and kurtosis
7. Using R import the data from Excel/.CSV file and draw scatter plot, calculate correlation coefficient and obtain the line of regression of Y on X.
8. Import the data from Excel/.CSV and perform the Chi-squared Test

Course Code and Title: USCAP-118 Practical Course in Database Management System - I

Assignments **No of Sessions-12 (Credits – 1.5)**

1. To create simple tables with the primary key constraint (as a table level constraint & as a field level constraint) (include all data types). Inserting data in the tables.
2. Write simple queries based on single table
3. To create one or more tables with following constraints
    a. Primary Key
    b. Foreign Key
    c. Check constraint
    d. Unique constraint
    e. Not null constraint
4. 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)
5. To query the tables using simple form of select statement
    1. Select <field-list>
       from table
       [where <condition> order by <field list>]
    2. Select <field-list, aggregate functions >
       from table
       [where <condition> group by <> having <> order by <>]
6. To query table, using set operations (union, intersect)
7. To query tables using nested queries (use of except, exists, not exists, all clauses)

FIRST YEAR - SEMESTER-II

Course Code and Title: USCA-121: Computer organization

Prerequisites: **No. of Hours : 48 (Credits-4)**

- None

Course Objectives:

1. To learn number systems and their representation.
2. To understand basic logic gates, Boolean algebra and K-maps.
3. To understand combinational and sequential circuits.
4. To provide a broad overview of architecture and functioning of computer systems.
5. To study arithmetic circuits, combinational and sequential circuits.

Course Outcomes:

1. To get familiar with concepts of digital electronics.
2. Design of combinational circuits.
3. Explain block diagram of CPU, Memory and types of I/O transfers.
4. To learn the basic concepts behind the architecture and organization of computer.

Unit 1: Data representation and Computers Arithmetic 8

1.1 Review of Decimal, Binary, Octal, Hexadecimal Number system and their inter-conversion

1.2 BCD code, Gray code, Excess-3 code, ASCII, Concept of parity code.

1.3 Signed and Unsigned numbers, 1's and 2's complement of binary numbers,

1.4 Binary arithmetic (Addition, subtraction and subtraction using1's complement and 2's complement).

Unit 2: Boolean Algebra & Logic Gates 10

2.1 Introduction, Logic (AND OR NOT)

2.2 Boolean theorems, Boolean Laws, De Morgan's Theorem

2.3 Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit

2.4 Exclusive OR and Exclusive NOR gates, Universal Logic gates

2.5 Implementation of other gates using universal gates.

2.6 Minterm, Maxterm and Karnaugh Maps:

2.6.1 Introduction

2.6.2 minterms and sum of minterm form

2.6.3 maxterm and Product of maxterm form

2.6.4 Reduction technique using Karnaugh maps – 2/3/4 variable K-maps, grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression.

Unit 3: Combinational Circuits 8

3.1 Introduction - Multi-input, multi-output Combinational circuits

3.2 Code converters design and implementations

3.3 Arithmetic Circuits: Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator.

Unit 4: Sequential circuits 8

4.1 Introduction, Terminologies used

4.2 S-R flip-flop, D flip-flop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop

4.3 conversion from one type of flip-flop to another

4.4 Application of flip-flops.

4.5 Counters: Introduction, Asynchronous counter, Terms related to counters, IC7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Pre-settable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.

4.6 Shift Register: Introduction, parallel and shift registers, Ring counter, Johnson counter.

Unit 5: CPU, Memory and I/O Organization 8

5.1 Block diagram of CPU, functions of CPU

5.2 general register organization, flags, Concept of RISC and CISC

5.3 Introduction to hardwired and micro-programmed CPU.

5.4 Memory System hierarchy, Cache Memory, Internal Memory, External Memory, Concept of Virtual Memory.

5.5 Input/ Output: types of I/O data transfers - CPU initiated, interrupt initiated and DMA, Need of I/O interfaces

5.6 Parallel and serial communication (asynchronous and synchronous data transfer).

Unit 6: Introduction to Microprocessors and Microcontrollers 6

6.1 Block diagram of Pentium

6.2 Functional units,

6.3 Concept of pipeline and parallelism

6.4 Programmers model Introduction to Microcontroller Intel 8051 – Functional block diagram,

6.5 Introduction to multi-core processors.

Reference Books:

1. R.P. Jain, “Modern Digital Electronics”, McGraw-Hill Publications
2. Floyd and Jain, “Digital Fundamentals”, Pearson Publication.
3. Morris Mano, “Computer System Architecture”, Prentice-Hall.
4. James Antonakos, “The Pentium microprocessor”, Pearson Publication.

Course Code and Title: USCA-122 Advanced 'C' Programming

Prerequisites: **No. of Hours : 48 (Credits – 4)**

- 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 andstructures.
3. To work with files.

Course Outcomes: On completion of the course student 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 **12**

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

Unit 2: String **10**

2.1 Declaration, definition, initialization.
2.2 Syntax and use of predefined string functions (strlen, strcpy , strcat , strcmp , strcmpi , strrev , strlwr , strupr , strset , strchr , strrchr , strstr , strncpy , strncat , strncmp , strncmpi , strnset , strtok)
2.3 Array of strings.
2.4 Strings and Pointers
2.5 Command line arguments.

Unit 3: Structure and Union **12**

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 separateargument, passing structure by value / address.
3.6 Pointers and structures.

3.7 Self-referential structure and its application

3.8 Bit fields

3.9 Concept of Union, declaration, definition, accessing union members.

3.10 Difference between structures and union.

Unit 4: File Handling **08**

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.

Unit 5: Preprocessor **06**

5.1 Role of Preprocessor

5.2 Format of preprocessor directive

5.3 File inclusion directives (#include)

5.4 Macro substitution directive, argumented and nested macro

5.5 # and ## directives

5.6 Predefined macros (_DATE_ / _TIME_ /_FILE_ /_LINE_/ _STDC_)

5.7 Macros versus functions

Reference Books

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

Course Code and Title: USCA-123 Basics of Web Designing

Prerequisites: **No. of Hours : 48 (Credits – 4)**

- Fundamentals of Computers.

Course Objectives:

1. To learn HTML, CSS, Bootstrap, Java Scripts basics of Web designing
2. To understand web based applications development process

Course Outcomes: On completion of the course students will be able to:

1. Design a responsive website using HTML and CSS
2. Design simple web application

Unit 1: HTML **10**

1.1 Introduction to HTML, Structure of HTML
1.2 HTML tags and attributes
1.3 HTML formatting tags
1.4 HTML comment
1.5 Headings, Paragraph
1.6 Ways to define color – Plain color, RGB, Hex value, HSL value
1.7 Inserting an Image
1.8 List
1.9 Tables
1.10 Hyperlinks and Image links
1.11 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

Unit 3: 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 and
3.6 Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns

Unit 4: Bootstrap **06**

4.1 Introduction to Bootstrap
4.2 Tables, Images, Button, alerts

4.3 Button, Button Groups
4.4 Progress Bar, Pagination, Pager

Unit 5: Javascript **12**

5.1 Concept of script
5.2 Introduction to Javascript
5.3 Variables, identifiers and operators, control structures
5.4 Functions
5.5 Event Handling in Javascript
5.6 Concept of array, how to use it in Javascript, types of an array
5.7 Math and date object
5.8 String object and predefined String functions
5.9 DOM concept in Javascript, DOM objects
5.10 Validations in Javascript

Unit 6: XML **06**

6.1 Introduction to XML
6.2 Uses of XML
6.3 Simple XML
6.4 XML tags, elements and attributes
6.5 DTD and Schemas
6.6 XML Validator
6.7 XML with CSS

Reference Books

1. HTML Black Book by Steven Holzner, Dremtech press publication
2. The Complete Reference by Thomas A. Powell, Mc Graw Hill publication
3. Beginning PHP 5by Dave Mercer, Wrox publication

Course Code and Title: USCA-124 Database Management System - II

Prerequisites: **No. of Hours : 48 (Credits -4)**

- Basic Knowledge of RDBMS
- Knowledge of SQL Queries
- Basics of relational database design

Course Objectives:

1. To teach procedural extension of SQL
2. To be familiar with the basic issues of transaction processing like concurrency control and recovery
3. To understand data security and its importance

Course Outcomes: On completion of the course students will be able to:

1. Use database techniques such as SQL & PL/SQL
2. Understand transaction Management in relational database System.
3. Learn Database Security mechanisms.

Unit 1: Relational Database Design **08**

1.1 Introduction to Relational-Database Design (undesirable properties of a RDB design)

1.2 Concept of Decomposition

1.3 Desirable Properties of Decomposition (Lossless join, Lossy join, Dependency Preservation)

1.4 Concept of normalization, Normal Forms (1NF,2NF and 3NF, BCNF), Examples

Unit 2: Relational Database Design Using PLSQL **12**

2.1 Introduction to PLSQL
2.2 PL/PgSqL: Datatypes, Language structure
2.3 Controlling the program flow, conditional statements, loops
2.4 Stored Procedures
2.5 Stored Functions
2.6 Handling Errors and Exceptions
2.7 Cursors
2.8 Triggers
2.9 Views

Unit 3: Transaction Concepts and concurrency control **12**

3.1 Describe a transaction, properties of transaction, state of the transaction.

3.2 Executing transactions concurrently, Anomalies due to Interleaved Execution.

3.3 Schedules, types of schedules, concept of Serializability, Precedence graph for Serializability.

3.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations.

3.5 Specialized Locking Techniques

3.5.1 Multiple- Granularity Locking

3.5.2 Dynamic database concurrency (Phantom Problem).

3.6 Concurrency control without Locking

3.6.1 Optimistic Concurrency Control

3.6.2 Timestamp Based Concurrency, Thomas Write Rule.

3.6.3 Multiversion Concurrency Control

3.7 Deadlock

3.8 Deadlock handling

3.8.1 Deadlock Prevention (wait-die, wound-wait)

3.8.2 Deadlock Detection and Recovery (Wait for graph).

Unit 4: Crash Recovery **08**

4.1 Failure classification

4.2 Buffer Management : Stealing Frames and Forcing Pages

4.3 Recovery related steps during Normal Execution

4.4 Introduction to ARIES

4.5 The Log, other Recovery-related structures.

4.6 The Write-Ahead Log Protocol

4.7 Checkpoints

4.8 Recovering from a System Crash

4.8.1 Analysis Phase

4.8.2 Redo Phase

4.8.3 Undo Phase

4.9 Database backup and recovery from catastrophic failure

Unit 5: Database Integrity and Security Concepts **08**

5.1 Introduction to Database security

5.2 Access Control

5.3 Methods for database security

5.3.1 Discretionary access control method

5.3.2 Mandatory access control

5.3.3 Security for Internet Application

5.4 Additional Issues related to Security

5.4.1 Role of Database Administrator

5.4.2 Security in Statistical Databases

Reference Books

1. Database Management Systems by RaghuRamakrishnan, Mcgraw-hillhigher Education publication
2. Database System Concepts by Henry F. Korth, Abraham Silberschatz, Tata McGraw-Hill Education publication

3. Fundamentals of Database Systems by Elmasri and Navathe, Pearson publication
4. Beginning Databases with PostgreSQL: From Novice to Professional by Richard Stones, Neil Matthew, Apress publication
5. Practical Postgresql By Joshua D. Drake, John C Worsley O'Reilly publication

Course Code and Title: USCAP-125 Practical Course in Computer Organization

Assignments **No. of Sessions – 12 (Credits – 1.5)**

1. Study of Logic Gates and De Morgan's Theorems.
2. Study of interconversion of Logic gates.
3. Study of Binary to Gray & Gray to Binary Converter (K- Map based design).
4. Study of Half Adder and Full Adder using Logic Gates and nibble adder subtractor.
5. Use of Ex-OR as a 4-bit Parity Checker and Generator.
6. Study of Multiplexer and Demultiplexer (4:1 & 1:4).
7. Study of RS and D Flip flops and Study of SISO shift register as ring counter.
8. Study of mod 10 counter using IC 7490 and Interfacing of decade counter to Seven Segment Display using IC 7447.
9. Study of 4-bit asynchronous counter using IC 7493.

Course Code and Title: USCAP-126 Practical Course in Advanced 'C' Programming

Assignments **No. of Sessions – 12 (Credits – 1.5)**

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

Course Code and Title: USCAP-127 Practical Course in Basics of Web Designing

Assignments **No. of Sessions – 12 (Credits – 1.5)**

1. Basic HTML Tags - headings, paragraphs, line break, colors, fonts, links, Images
2. Creating List, tables and Frames by using HTML Tags
3. Creating forms by using HTML and HTML5 Tags
4. Styling HTML pages using CSS
5. Styling HTML pages using CSS3 and bootstrap
6. Basics of JavaScript
7. Functions in JavaScript
8. Field and Form validation using JavaScript
9. Designing Input screens using HTML, CSS and Javascript
10. XML

Course Code and Title: USCAP-128 Practical Course in Database Management System - II

Assignments **No. of Sessions – 12 (Credits – 1.5)**

1. Stored Procedure
   a. A Simple Stored Procedure
   b. A Stored Procedure with IN, OUT and IN/OUT parameter
2. Stored Function
   a. A Simple Stored Function
   b. A Stored Function that returns a value
   c. A Stored Function recursive
3. Cursors
   a. A Simple Cursor
   b. A Parameterize Cursor
4. Exception Handling
   a. Simple Exception- Raise Debug Level Messages
   b. Simple Exception- Raise Notice Level Messages
   c. Simple Exception- Raise Exception Level Messages
5. Triggers
   a. Before Triggers (insert, update, delete) (row level and statement level)
   b. After Triggers (insert, update, delete) (row level and statement level)
6. Views
   a. Creating Views on tables, and writing queries on the views.