

101: Basics of Software Development Skills

(4 Credits, 3L + 2T, Level 3)

Objectives: The main objective of this paper is to emphasize that Systems Thinking and Abstract Thinking are fundamental to efficient and effective software development. So the conventional 'Fundamentals of Information Technology' topics are taught to provide new perspective which is expected to be maintained in all other papers also.

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

- A) Visualize problems as systems and analyze problems carefully,
- B) Have knowledge about common hardware and software systems that help in software development,
- C) Have basic knowledge required for all other courses.

Prerequisites: XII Level Mathematics

Text Book(s): Presently, there is no book which embodies the spirit and simplicity of this course. The faculty from all institutes will jointly prepare unit-wise study material which would be used as a text book.

Syllabus:

Unit 1: System Concepts (3L)

Definition of a System, Elements of system, Characteristics of a System, Types of Systems, Components of TPS, DoS Model, Windows Model, Unix Model, LAN Model.

Unit 2: Hardware System & Data Communication & Networking Concepts :(12L)

Hardware Systems: Block Diagram, Analysis of CPU, Analysis of Internal Memory, Analysis of Arithmetic Logic Unit, Input Devices, Output Devices and Control Unit, Analysis of Firmware.

Data Communication and Networking: Introduction, Data communication Process, Communication concepts, Communication Types, Data transmission Medias, Types of Network: LAN, WAN, MAN, Topologies of LAN, Components of LAN: Media, NIC, NOS, Bridges, HUB, Routers, Brouters, Switch, Repeaters, Gateways, Modem, Communication Protocols, Roles of communication Protocol, layered protocols. Communication Processors: Multiplexers, Concentrators, Front End Processors. Asynchronous & Synchronous Transmission, Switching Techniques. Client/Server Computing.

Unit 3: Software Systems: (6 L)

Operating Systems: Definition of O.S., Functions of Operating Systems, Types and examples of Operating Systems, User Interface of Windows.

Application Software: Word Processors, Spread Sheets, Data Base Management Systems, Presentation Managers, Internet Systems, CAD Systems, Expert Systems

Unit 4: Abstraction: (9L)

Definition and Goals of Abstraction, Major Types of Abstraction- Problem Abstraction, Procedure Abstraction, Data Abstraction, and Program Abstraction. Problem Abstraction: Definition of the terms Problem and Problem Abstraction, Examples of Problem Abstraction.

Procedure Abstraction: Top-Down Approach to Problem Solving, Definition of Procedure and Procedure Abstraction, Examples. Data Abstraction: Nature and Types of Data, Internal and External Representations of Data, Bits and Bytes, Examples. Representation of Non-numeric Data- ASCII, Unicode. Examples. Program Abstraction: Definition of Program Abstraction and concept of an algorithm, Algorithm Representation-Pseudo Code, Algorithm Representation-Flow Charts, Elementary Algorithms for Search, Sort, and Merge Sort. Recursive Algorithms: Definition and Examples.

Unit 5: Representations :(12L)

Number Representation: Representation of Non-negative Integers, radix-r representation, conversion from radix-r to radix-s, Addition and Subtraction of Radix-r Integers, Error Detection, Multiplication of Radix-r Integers, Division of Radix-r Integers, Computing the remainder, BCD Representation and Arithmetic. Representation of Integers: Sign-Magnitude forms and r-1 and r complement forms, Arithmetic in r complement form. Representation of Rationals: Definition of Rational Numbers, Rational Arithmetic; Representation of Real Numbers: Mantissa and Fraction form, Exponent form, Normalization, IEEE 745 form, concept of precision, Addition and Subtraction of Floats, Multiplication and Division of Floats, Errors in Floating Point Arithmetic. Representation of Strings: Definition of String, Counted String Representation, Null Terminated Strings, String Manipulation.

Unit 6: Computer Language :(6L)

Introduction to Computer Languages, Language Types, Definition of Program, Programs in Machine Language, Assembly language and Programs in Assembly Language, Interpreters, Higher Level Languages, Major Paradigms-Procedure Oriented, Object Based, Object Oriented, Logic Based, Functional languages, Examples. Compilers and Translation Process
Programming: Meaning of Programming, Concept of Modular Programming.

Unit 7: Computer Maintenance, privacy & Security :(3)

Computer Maintenance- Introduction, Typical causes of System Failure & Disaster Recovery.

Computer Virus Computer Viruses, Trojan horse, Worms. Some reported viruses. File infectors, Disk Infectors, Partition Infectors, Boot Infectors, Companion Viruses, CMOS Virus, and Hardware Virus. Impact of Information Technology on Society, Computer Privacy, Security and Integrity.

102: Elementary Algorithmics

(4 Credits, 3L + 2T, Level 3)

Objectives: This is a foundational course. The course aims at developing the logical abilities of the student. The student will be exposed to varieties of problems and problem solving strategies.

Learning Outcomes: At the end of the course, student should be able to

- A) State precisely the problems and analyze the problems following the top-down approach;
- B) Design algorithms to standard problems following the Brute Force, Divide and Conquer, Decrease and Conquer, and Transform and Conquer strategies;
- C) Analyze the algorithms in terms of time complexity

Pre-requisites: XII standard Mathematics

Text Books:

1. Levitin A. (2007), Introduction to the Design and Analysis of Algorithms, Second Edition, Pearson Education.
2. Dromey R. G. (1982), How to Solve It by Computer, Prentice Hall India

Syllabus:

Unit 1: Concepts of a problem and instances of a problem, Solution of a problem, Procedures and algorithms, algorithm representation, Pseudo code language and Flow Chart language, Tracing of algorithms, Standard problem types – Problems of Sorting, Searching, and Merging, Problems of String Processing, Graph Problems, Combinatorial Problems, Geometric Problems, and Numerical Problems. (6L)

Unit 2: Concepts of Procedure Oriented Programming- Character set, Tokens, Key words and Identifiers, Constants, Statement types, Arithmetic and logical expressions, Syntax, semantic, and logical errors, data types, structured programming- sequence, selection, and iteration structures; one and two dimensional arrays, records, functions and procedures, parameter types, local and global variables, files and file concepts. (12L)

Unit 3: Factors that affect the performance of an algorithm, time and space complexities, Need for models of Computing, Operation Counts, Asymptotic Complexity measures.(6L)

Unit 4: Algorithm Design Methods- Brute Force Method, Divide and Conquer Method, Decrease and Conquer Method, Transform and Conquer Method. Simple applications of the methods to various standard problems. (15L)

Unit 5: Recursive algorithms and relation to iterative algorithms, execution of recursive algorithms, Analysis of recursive algorithms. Applications to standard problems. (6L)

103: Database Management Systems

(4 Credits, 3L + 2T, Level 3)

Objectives: This is a foundational course on Data Modeling. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.

Learning Outcomes: At the end of the course, student should be able to

- A) Understand the concepts of database and techniques for its management.
- B) Different Data Models at Conceptual and Logical level.
- C) Differentiate between the role of DBA and Data Architect
- D) Understanding Data Security standards and Methods

Pre-requisites: XII Standard Mathematics

Text Books:

Korth.(2006) Database Systems Concepts , Tata McGra-Hill, Fifth Edition.

Syllabus:

Unit 1: Basic Concepts and Architecture – (3L)

Database and Need for DBMS, Database System versus File Systems, Database Users, 3-tier Architecture, View of Data, Instances and Schema.

Unit 2: Data Modeling – (9L)

Logical Data Modeling, Hierarchical, Network , Relational, Advantages and Disadvantages, Conceptual Data Modeling –Entity –Relationship Model Entities, Relationships, Keys, different types of attributes, E-R Diagram conventions, degree, cardinality, participation, composite Entities, Strong and Weak Entity, E-R Diagram with case study, Extended E-R and Relational Model, Superclass and Subclass Entity types, Attribute inheritance Aggregation, Specialization, Generalization with examples, Logical view of Data, (Table and its characteristics) Concept Domain, tuple. Object Oriented data Modeling-Object and Object Identifier, Attributes and Methods, Class, Object Structure, Object Classes with example. Inheritance, Multiple inheritances, Object Identity, Object containment.

Unit 3: Relational Algebra – (6L)

Keys (composite, candidate, primary, secondary) Foreign, Integrity Rules, Relational Set Operators -Union, Intersect, Difference, Product, Select, Project, ,Divide, Assignment. Set Operators Join, Outer Join, Inner Join, with example, Relationship within the Relational

Database(1:M,1:1,M:N) with example. Problems and Reduction of M:N with example. Codd's Rules Examples of RDBMS that implements some Codd's rules.

Relational Database Design, Mapping Conceptual Model into relational model with example/case study

Unit 4: Normalization – (6L)

Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF) with examples. Case Study on normalization, Decomposition, Lossless join and dependency preserving Decomposition.

Unit 5: File Structure and Data Administration – (6L)

File Organization, Organization of records in file (Sequential, Clustering), Indexing and Hashing. Basic concepts, indices, B+ Tree index file, B- tree index file, Static Hashing, dynamic Hashing. Data administration, Role and responsibility of DBA, creating / deleting / updating table space, database monitoring, user management.

Unit 6: Transaction and Concurrency Control – (9L)

Concept of transaction, transaction state, ACID properties, Serializability, Lock based protocols, timestamp based protocols, Multiple Granularity, Multiple Version Techniques, Deadlock and its Handling. Backup and Recovery Techniques, Failure Classification, Recovery & Atomicity, Log Based Recovery, Checkpoints, Shadow Paging, Recovery with concurrent transactions, Failure with loss of non-volatile storage.

Unit 7: Data Quality and security management – (6L)

Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, ITCS304 (security standard) revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement.

104: Discrete Structures-I

(3 Credit, 2L+ 2T, Level 3)

Objectives:

This course provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory, automata theory, compiler construction and operating system.

Learning Outcomes: At the end of the course student should be able to:

- A) Solve Mathematical reasoning
- B) Developing the problem solving skills

Pre-requisites: XII Level Mathematics

Text Book(s)

Kenneth H. Rosen , Discrete Mathematics and its Applications Edition 6th Tata McGraw Hill

Syllabus:

Unit -1: Propositional and Predicate Logic- (15L)

Truth tables, Connectives, Conditional statements, ,Tautologies and fallacies, Logical expressions and their equivalence, Disjunctive and Conjunctive normal forms, satisfiability of a proposition. Predicates and quantifiers, Logical equivalence involving quantifiers, Negating quantified expressions, introduction to logical programming, Nested quantifiers, order of quantifiers, Rules of Inference for propositional logic, Building arguments, Principle of Resolution, Rules of Inference for predicate logic. Skolmization ,Introduction to Proofs: Basic Terminology, Direct Proofs, Proof by Contradiction, Proof methods and strategies

Unit-2: Sets- (6L)

Set operations and their properties, Power set, partitions, Cartesian products ,Computer representation of sets, Functions- One-to-one and Onto functions, Pigeon hole principles, inverse functions and composition of functions, Cardinality of sets, countable and uncountable sets ,cantor diagonalization argument, permutations and their properties.

Unit -3: Introduction and Recursion- (9L)

Mathematical induction and its applications, strong form of mathematical induction, Generalized Induction and its applications, Application of Mathematical induction to establish Programme Correctness, Recursive definitions, Lamé's Theorem.

Unit-4 Relations-(6L)

Basic, concepts, functions as relations, Reflexive, symmetric, asymmetric, Anti-symmetric, transitive, equivalence, partially ordered relations. Algorithm to verify the simple properties of relations, Combining relations-set operations, inverse and compositions of relation, N-ary relations and their applications.

Unit-5 Representing Relations-(9L)

Boolean matrices and operations on Boolean matrices, Corresponding between Relations and Boolean matrices, Basic concepts of graph and directed graphs, Representing of relations as directed graphs, Closures of Relations, Warshall's algorithm, Equivalence classes induced by a relation

105: Management Functions **(3 Credits, 2L+2T, Level 2)**

Objectives:

1. To orient the students to principles of management
2. To make them comprehend the process of management
3. To internalize the principles through rigorous assignments where they shall observe, analyze and infer the presence of principles transformed into practice.

Learning Outcome:

At the end of the course, the students shall acquire

1. Understanding of functions of management
2. Understand the principle of management woven in to the process of management
3. Understand how they are modified in to practice to suit the requirements
4. How IT influences the process of management

Prerequisites : Inquiring Mind and Strong inclination for observation

Reference Books :

1. H.Welrcih, Mark Cannice, H. Koontz, Management , A Global and Entrepreneurial Perspective , Mcgraw-Hill Companies, 12th edition.
2. P.C.Tripathi, P.N.Reddy, Principles and Practice of Management , Tata Mcgraw Hill , Third Edition
3. L.M. Prasad, Principles and Practice of Management, Seventh Edition
4. Stephan Robbins, Mary Coutler, Management

Syllabus

Unit I : (05 L)

The need of Management Study , Process of Management , Characteristics of Professional Management , Brief Review of Management Thought Social Responsibility of Management

Unit II: (04 L)

Decision Making Process , Planning and Steps in Planning , Types of Plan Making Planning Effective , Case Study on Planning, MBO

Unit III : (06 L)

Organization, Meaning and Process , Departmentalization,, Organization Structure , Authority and Delegation , Centralization verses Decentralization , Team Work , Case Study

Unit IV : (03 L)

Co-ordination – meaning and need , Techniques of establishing Co-ordination
Difficulties in establishing co-ordination , Case Study

Unit V : (05 L)

Formal and Informal Organization, Manpower Planning , Recruitment and Performance
Appraisal, Compensation and Incentives , issues related to Retention
Case study

Unit VI : (03 L)

An overview of Communication, Supervision and Direction , Leadership Styles , Control – need
and types and control techniques .

In addition there shall be tutorials of written examination type, field study and presentation.

106: Programming with C

(4 Credits, 2L + 4P, Level 3)

Objectives : This is a foundational course in programming. The course aims at practically developing the logical abilities of the student using C language. The student will be exposed to programming language C. Emphasis is on semantics and problem solving.

Learning Outcomes :

At the end of the course, student should be able to efficiently solve the problems and analyze the problems using of C language.

Pre-requisites : XII standard Mathematics

Text Books :

- 1.E. Balagurusamy (2009), Programming with C , Tata McGraw Hill
2. Yashawant Kanetkar, let Us C, BPB Publication

Syllabus :

Unit-I : (2L)

Origin of C, History, Structure of C Program, Characters and Character Set of C, Tokens in C- Identifiers, Keywords, Constants, Operators(arithmetic, relational, logical, assignment, bitwise, conditional, other operators), precedence and associativity rules. Formatted input and output , Data Types,

Unit-II : (5L)

Executable and Non-Executable Statements, Types of Executable Statements- Input Statements, Assignment and Arithmetic Statements, Control Statements- Sequential, Selection(if, if--else, switch..case), Iteration Statements(do..while, while, for), Output Statements.

Unit-III : (6L)

Functions in C : Introduction, Advantages, Standard library functions, User defined functions : Declaration, definition, function call, parameter passing (by value), return keyword, void, Scope of variables, storage classes, Recursion, Arrays : Declaration, initialization, Types – one, two and multidimensional, Passing arrays to functions

Unit-IV : (4L)

Pointers : Direct and Indirect Access; need of pointers, de-referencing, constant and variable pointers. Semantics of array and function declarations. Using key word const in array declarations, Function pointers. pointers as arguments to functions and as return types, generic pointer void *, Parsing pointer declarations,
Dynamic memory allocation :malloc, calloc, realloc and free

Unit-V : (2L)

Strings : Declaration and initialization, Standard library functions, Strings and pointers, Array of strings,

Unit-VI : (4L)

Structures and Unions : Creating structures, Accessing structure members (dot Operator), Array of structures, Pointers and structures, Unions, Difference between structures and unions, enum declaration

Unit-VII : (2L)

C Preprocessor : Format of Preprocessor directive, File Inclusion directive, Macro, Command Line Arguments :Accessing command line arguments

Unit-VIII : (5L)

File Handling : File organization (Sequential, Direct Access, Indexed Sequential), Operations on files, Random access to files

References :

1. Kernighan and Ritchie : The C Programming Language
2. Ellis Horowitz, SartajSahni : Fundamentals of Computer Algorithms (Galgotia)

Laboratory Experiments in C

1. Program to display whether inputted number is Armstrong number or not.
2. Program to display all numbers divisible by 7 between 1 to 100.
3. Program to input any number and display digits which are absent in given number.
4. Program to display all prime numbers between 1 to 500.
5. Program to display sum of digits of a given numbers upto a single digit.
6. Program to input any five digit number and display its last and first digit.
7. Program to convert rupees into thousands, hundreds and rupees
8. Display following pyramid

(i)	1 1 1 1 1 1	ii)	1
	2 2 2 2 2		2 1 2
	3 3 3 3		3 2 1 2 3

4 4 4

4 3 2 1 2 3 4

5 5

6

9. Program to calculate LCM and GCD of two numbers.
10. Program to calculate prime factors of a given number.
11. Program to input any decimal number and convert it into various bases.
12. Program to check whether inputted number is palindrome or not.
13. Program to calculate $1/1!+2/2!+.....+n/n!$
14. Read a line of characters from the user and count no of lines, words, spaces, tabs and characters in it.
15. If n is any inputted numbers then determine whether n is the sum of all of its divisors i.e n is sum of all t such that $1 \leq t < n$, and t divides n.
16. Program to calculate nCm .
17. Program to display GCD using recursion.
18. Program to calculate Fibonacci series using recursion.
19. Program to calculate n! using recursion.
20. If a is an array of n elements then write recursive function to display powerset of a.
21. Program to display all array elements in ascending order using selection sort.
22. Program to display all array elements in descending order using bubble sort.
23. Program to calculate largest and second largest from a set of n numbers.
24. Program to perform various operations on matrix (addition, subtraction, multiplication, norm of matrix, saddle point, magic square, inverse, transpose)
25. Program to display students list in ascending order.
26. Program to perform various string operations (find length, checking palindrome, copy one into another, comparing strings, find substring using user defined functions)
27. Display marksheet of student using structure.
28. Program to display bazaar bill of any customer.
29. Program to copy contents of one file into another.
30. Program to display contents of a file in uppercase letters.

107: Web Supporting Technologies

(4 Credits, 2L + 4P, Level 3)

Objectives: - To impart the basic knowledge and skills required to develop web applications using HTML, Cascading Style Sheets and JavaScript.

Learning Outcomes:- Upon successfully completing this course the student will be able to

- Apply the concepts and the principles of WWW
- Should be able to use CSS and JavaScript to achieve DHTML effects.

Text Book:- Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI ,BPB Publications.

Syllabus :-

Unit 1:- Overview of Internet and Intranet (2L)

Understanding internet and its need, concept of intranet, difference between internet and intranet, a brief history, internet applications, Internet Service Providers (ISP). Concept of client and server, web browser and web server, communicating on the internet, concept of domain-Physical domain, virtual domain, registering a domain. Need of IP addressing, Process to assign IP addresses, World Wide Web

Unit 2:- Introduction To HTML(2L)

Overview of HTML, concept of Tag, types of HTML tags structure of HTML program with simple examples. Text Formatting Through HTML:Emphasizing Material In a Web Page:Using Image tag, attributes of Image tag, Using Lists: unordered, ordered, definition lists.

Unit 3:- Handling Tables, Frames and Linking Documents (5L)

Tables:- To define header rows & data rows, use of caption tag, changing height & width of table, cellpadding, cellspacing, bgcolor, colspan, rowspan.

Hyperlink:- Concept of hyperlink, types of hyperlinks (Internal & External), linking to the beginning of document, linking to a particular location in a document, image as hyperlinks and image mapping.

Frames:- Introduction to frames with its attributes, using frames & framesets, named frames.

Unit 4:- Cascading Style Sheets (4L)

Introducing CSS, font attributes, color and background attributes, text attributes, border attributes, margin related attributes, list attributes. Using class and span tag

Types of style sheets: inline, embedded and external Style Sheets.

Unit 5:- Introduction To JavaScript (2L)

Introduction to scripting, overview of Java Script, advantages, client side java Script, capturing user input, writing Javascript into HTML

Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions

Unit 6:- Java Script Programming Constructs (4L)

Assignment, data declaration, if, switch, while, for, do while, label, break, continue, function call, return, with, delete, method invocation.

Types of functions in Java Script:- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions. Placing text into browser, window objects.

Dialog boxes - Alert dialog box, prompt dialog box, confirm dialog box.

Unit 7:- Java Script Document Object Model (3L)

Understanding JDOM, Java Script Assisted Style Sheets, understanding objects in HTML Browser objects, how a javascript enabled browser handles the document object, Form element array. Access to elements of a web page, manipulation of web page element. Handling web page events using Javascript, Javascript event handlers.

Unit 8:- Forms Used By Web Site (8L)

Form object, form object's Method, properties of form elements, methods of form element, Different elements - text, password, button, submit, reset, checkbox, Radio, TextArea, select & option.

Other built-in Object- String object, math object, date object, User defined objects- creation, instances, objects within objects.

Introduction to ASP, ASP request Processing, generating response, using session and cookies, application object, database connectivity and role of global.asa file.

108: General Course I (Communication skills)

(2 Credits)

Objectives: A widely-heard theme among employers is that IT professionals must be able to communicate effectively with colleagues and clients. Because of the importance of good communication skills in all computing careers, MCA students must sharpen their oral and writing skills in a variety of contexts -- both inside and outside of IT courses. In particular, students in IT programs should be able to:

- Communicate ideas effectively in written form
- Make effective oral presentations, both formally and informally
- Understand and offer constructive critiques of the presentations of others
- Have a pleasant demeanor as they work with people on their IT needs, either in person or by phone
- Write appropriate electronic communications (including email, blogs, instant messages, etc.) to all levels of workers in all IT endeavors.

While institutions may adopt different strategies to accomplish these goals, the program for each IT student must include numerous occasions for improving writing and practicing oral communication in a way that emphasizes both speaking and active listening skills.

At a minimum, an IT curriculum should require:

- Course work that emphasizes the mechanics and process of writing
- At least two formal oral presentations to a group
- The opportunity to critique at least two oral presentations

The institutes are expected to devise the course meeting the above objectives, keeping in mind the requirements of their students.

