

Semester: I

Title of the paper: DSC1 : Programming Fundamentals Using C

Class: F.Y.B.Sc(Computer Science)- Honours

Number of Credits: 06

Objectives:

1. To understand the concept of applying logic to solve a problem
2. Understand the programming concept

Course Content:

1. Overview of programming :

Introduction to computer based problem solving : Requirement of problem solving by computers, Problem definition, use of examples for problem solving, similarities between problems, problem solving strategies, Steps involved in problem solving

2. Program design and Implementation issues

Programs and algorithms, Top down design and stepwise refinement, construction of loops , basic programming constructs, implementations

3. Programming environment

Programming language classification, assemblers, examples of high level languages, compiler linking and loading, algorithms for problem solving.

4. Algorithms for Problem Solving

Examples : exchanging values of two variables, summation of set of numbers, decimal to binary , reversing of digits of integer, greatest common divisor of Two numbers, to verify whether a integer is prime or not, organize a given Set of numbers in ascending order, find a square root of a integer, factorial of a given number, generate Fibonacci numbers for n terms, to find the value of power of a number raised by a integer , reverse order elements of a array, find the largest number in a array, print elements of upper triangular matrix, of two matrices, compute roots of a quadratic equations

5. Overview of C

Structure of a C program, data types, Constants and variables, operators and expressions, operators : arithmetic, logical, relational, assignment, ternary, comma operators ; Control constructs: selection , iterative, branching statements; array constructs, Strings, basic I/O, functions, recursion. Macro, preprocessor directives

6. Pointers and structured data types

Pointers , structures and unions, enumerated data type Implementation of arrays and structure using pointers , Sparse Matrices (Array and Linked Representation)

7. FILE HANDLING

Text and data file create, open , read and write . (5 Lectures)

Course Level Learning Outcomes:

Upon completion of the course students should be able to:

- Write simple program using loops
- Understand the concept of pointers and functions
- File handling concepts

Reference Books :

1. Harsha Priya, R. Ranjeet, "Programming and problem solving through C language", Firewall Media
2. Jeri R. Hanly, Elliot B. Koffman, "Problem solving and program design in C", Pearson Addison Wesley.++
3. R. G. Dromey, "How to solve it by computer", PHI
4. E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of computer algorithm", Galgotia.
5. Byron Gottfried, "Programming with C", Tata McGraw Hill
6. Forouzan, "A Structured Programming Approach using C", 2nd Edition, Cengage Learning India, 2008.

Semester: I

Title of paper: GE-1 : IT Fundamentals

no of credits: Credits : 04) - (3 + 1 Lab)

objectives

1. To provide an understanding of essential Information Technology Concepts and Emerging Technologies.
2. It includes practical skills in data capture, analysis and presentation, report formatting, efficient search techniques and online collaboration tools.

Course content

Introduction: Introduction to logical organization of computer, input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, monitor, printer, plotter, primary memory, secondary memory, auxiliary memory.

User Interface: Operating system as user interface, system tools, utility programs

Database: Introduction to database, relational data model, Entity types, entity set, attribute and key

Networks: Definition of network, classification of network, LAN, MAN, WAN, distinction among the networks, Guided Media: Twisted pair, Coaxial cable, and Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite, LAN Topologies: Ring, bus, star, mesh and tree topologies.

Internet Applications: Internet as a global network, Search Engine, Online education, Internet utilities – email, online banking, reservations etc.

Use of Computers in Education and Research: Data analysis, Heterogeneous storage, eLibrary, Google Scholar, Domain specific packages such as SPSS, Mathematica etc.

Course level learning outcomes

- 1] Creating documents using Word processing features and working with spreadsheets.
- 2] Preparing presentations using presentation software.
- 3] Explain the emerging technologies and applications of Internet.

Suggested Reading(bibliography)

Reference Books: 1. A. Goel, Computer Fundamentals, Pearson Education, 2010.

2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006

3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Semester: I

Title of the paper: GE1 - Computer Applications – I

Class: F.Y.B.Com

Number of Credits: 04

Objectives:

3. To provide an understanding of essential Information Technology Concepts and Emerging Technologies.
4. It includes practical skills in data capture, analysis and presentation, report formatting, efficient search techniques and online collaboration tools.

Course Content:

Unit I Information Technology Basics

Information : Prerequisites of Information, Need for Information Technology and its advantages; Information Technology : Definition and components; Data : Definition, Types, Data Representation, Number system and Coding Schemes(ASCII and UNICODE); Parts of a Computer: CPU, Memory, Input/ Output Devices, Auxiliary Memory; Software – Definition, Relationship between Hardware and Software, Categories of Software, OS - definition & functions, Role of Information Technology in : Business, Mobile Computing, Health Services, Public Sector, Media, Defence Services, Education and Publication.

Unit II Introduction to Data Handling, Processing , Analysis and Presentation Software

Word processing concepts: Use of Templates, Working with word document: Editing text, Find and replace text, Formatting, spell check, Autocorrect, Autotext, Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting, filling and formatting a table; Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents Creating Business Documents using the above facilities.

Basics of presentations: Slides, Fonts, Drawing, Editing; Inserting: Tables, Images, texts, Symbols, Media; Design; Transition; Animation; and Slideshow. Creating Business Presentations using above facilities

Spreadsheet concepts: Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs, Generally used Spreadsheet functions: Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions.

Unit III Internet Applications and Emerging Technologies

Internet – role and importance, Web Browser, IP Addressing – Public Vs Private, Static Vs Dynamic; WWW & related protocols; Internet Applications.

Cloud Computing: Meaning, Features, & Service models – Infrastructure as a service, Advantages and disadvantages, Mobile Computing: Meaning, Business Applications of Mobile computing, Virtual reality & Augmented Reality: Meaning and applications, IOT - Internet of Things: Meaning & Application.

Course Level Learning Outcomes:

1] Design Google Forms

- 2] Creating documents using Word processing features and working with spreadsheets.
- 3] Preparing presentations using presentation software.
- 4] Explain the emerging technologies and applications of Internet.

Suggested Reading

- 1] Introduction to Information Technology by ITL Education Solutions Limited, second edition.
- 2] 'O' Level made simple "Introduction to ICT resources" by Satish Jain, Shashank Jain, Shashi Singh & M. Geetha Iyer, BPB publication.
- 3] Computer fundamentals fourth edition by Pradeep K. Sinha and Priti Sinha BPB publications.
- 4] Information Technology The breaking wave by Dennis Curtin Tata McGraw-hill edition.
- 5] Cloud Computing by Anandamurugan, T.Priyaa et al.
- 6] **Internet of Things: A Hands-On Approach by Arsheep Bahga.**

Semester:III

Title of paper:CSC103 : Database Management Systems

no of credits:Theory-04, Practicals-02)

Course Objectives : a) Provide a strong foundation in database concepts, technology, and practice.

b) Practice SQL programming through a variety of database problems.

c) Understand the use of concurrency and transactions in database

Course content:

1. Introduction to Data Base Systems: File Systems versus a DBMS, The Relational Model, Levels of abstraction in a DBMS, Data independence, Queries in DBMS, Concurrent Access and Crash

2. Conceptual design and Entity Relationship model: Overview of Data Base Design, The ER model-features, Key Constraints, Participation Constraints, weak Entities, Class Hierarchies, Aggregation, Entity versus attribute, Entity versus relationship, Binary versus ternary relationship, aggregation versus ternary relationships.

3. The Relational Model: Attributes and domains, Relations, Integrity Constraints, Key Constraints, Foreign Key Constraints, General Constraints, Enforcing Integrity constraints

4. Logical Database design ER to relational : Entity sets to tables, Relationship sets (without constraints) to tables, translating relationship sets with key constraints, translating relationship sets with participation constraints, translating weak entity sets, translating class hierarchies, translating ER diagrams with aggregation.

5. Schema Refinement and Normal forms: Introduction, Why Schema Refinement? Functional Dependencies, Normal Forms: BCNF, Third Normal Form, Normalisation-Decomposition up to BCNF

6.Relational Algebra: Relational algebra operations- select, project, join, natural join, equijoin and their implementation.

7. SQL: The Form of Basic SQL query, Condition specification, SQL Joins, Outer joins, Union, Intersect, Except, Nested queries, Aggregate Operators

8. SQL: Embedded SQL, Cursors, Dynamic SQL, Triggers and active databases

9. Transaction management : The concept and properties of transaction, transaction and schedule, Notion of consistency, Serializability, Isolation levels, Lock based concurrency control, concurrency control without locking, deadlocks

10. **Crash Recovery:** Introduction to crash recovery, Recovery and atomicity, Log based recovery, Shadow paging.

Course level learning outcomes

- 1 Learn to design Entity Relation Diagram and normalization
- 2 Learn to write queries
- 3 Learn Visual Studio .NET (VB to design form)
- 4 Learn database connectivity

Suggested reading(bibliography)

Text Books : 1). Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, McGraw Hill Education, 6th Edition.

Reference Books : 1). Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson Education, 7th Edition

2). Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill Education, 3rd Edition.

Skill Enhancement Courses

Semester III Computer Science -CSS103 : Programming in Python

Total Credits: (Credits: Theory-03, Practicals-01)

Course Objectives: 1. To introduce programming concepts using Python. 2. To introduce object oriented programming concepts.

Course Content : 1. Python Interpreter, Python Shell, strings, relational operators, logical operators, precedence of operators, bitwise operators, variables and assignment statements, script mode, functions, modules, command line arguments, control structures-

2. Data types- Boolean, numbers, coercing integers to floats and vice versa, numerical operations, lists, creating a list, slicing a list, adding and removing items from a list, searching for values in a list, tuples, immutability property, converting tuples into a list, sets, set operations, dictionaries, strings, Unicode, formatting strings, docString, modules, packages, scope, recursion

3. Object Oriented Concepts- Classes, Objects, Abstract Data types, polymorphism, encapsulation, modifier, accessor methods, static method, adding methods dynamically, composition, inheritance, built-in functions for classes.

4. Files, Exceptions

5. Applications of Python - use of Python libraries such as Matplotlib, Pandas, using databases with python, collecting information from Twitter etc. (at least three applications to be covered).

Course level learning outcomes

Upon completion of the course students should be able to:

1. Use the features of python programming language in a program.
2. Use the basic object-oriented concepts in computer problem solving.
3. Use the features of files and exceptions in managing software development.
4. Write python programs to solve common problems.

suggested reading(bibliography)

Text book : 1) Taneja Sheetal, Kumar Naveen , “Python Programming - A modular approach”, Pearson **Reference book:** 1). Guttag John V., “Introduction to Computation and Programming using Python”, MIT Press, 2nd Edition.

Semester : V

Title of the paper : CSC105: Computer Networks

Class : TY BSc. No. of Credits : 06

Course objectives:

- To provide a strong background of Network Concepts.
- To be familiar with the components required to build and design different types of networks.

Course Contents:

Data Communi cation	Introduction: Beginnings of Networking and data communication, ARPAnet
	Networks: Components and Categories, Types of Connections, Topologies, Transmission Modes
	Switching: Circuit switching, Message switching, Packet switching,
	Protocols and Standards: Layered Architecture, OSI model, TCP/IP model;
	Applications of Networks
Physical Layer	Functions of Physical layer
	Data Encoding: Manchester, Differential Manchester
	Transmission Media: Twisted pair, Coaxial Cable, Fiber Optics, Wireless Media
	Physical layer Devices: Hub, Repeater

Data Link Layer	Functions of Data link layer
	Data Framing techniques: Character Count, Character Stuffing, Bit Stuffing
	Error detection and correction: Parity, CRC, Hamming code
	Elementary Data Link Protocols: Stop and wait, Sliding window protocols - Go back-N: ARQ, Selective repeat ARQ
	MAC Sublayer, Random Access Protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols
	Network Standards: IEEE 802.3 (Ethernet) frame format , Categories of standard ethernet – 10BaseT, 10BaseF, Bridged ethernet, separating collision domains , Switched ethernet , Fast ethernet IEEE 802.11 Architecture, frame structure

	Data Link layer devices: Bridges, Switches
Network Layer	Functions of Network layer
	Network Service types: Virtual Circuits, Datagrams
	Routing Algorithms: Shortest path routing, Flooding, Distance Vector routing, Link State routing; Hierarchical Routing
	Congestion Control: Algorithms & Congestion Prevention Policies
	Internet Protocols: IP Frame Format, IP Addressing, Subnets, Internet Control Protocols: ICMP, ARP, RARP, DHCP
	Internetworking, Network layer device : Routers
Transport Layer and Application Layer	Functions of Transport layer
	Transport Services: Connectionless, Connection-oriented, Transport service primitives Berkley sockets, Gateways
	Transport layer Protocols: User Datagram Protocol, Transmission Control Protocol; Quality of Service parameters
	Functions of Applications layer
	Electronic Mail; Domain Name System

Learning Outcomes : Upon completion of the course, students should be able to:

- Describe the network models and networks based on type and topology.
 - Categorize and use transmission media based on their characteristics and applications.
 - Detect and correct errors using various techniques.
 - Explain different protocols for data transmission at the DLL.
 - Be able to setup networks and also implement subnetting.
- Be able to apply different transport and application layer protocols.

Text Book:

Behrouz A. Forouzan; Data Communications and Networking , McGraw Hill Education; Fifth Edition

References:

Andrew S. Tanenbaum; Computer Networks, Pearson Education India;5th Edition

Semester : V

Title of the paper : Object Oriented Programming

Class : TY BSc. No. of Credits : 06

Objectives

1. To present the object oriented method, in viewpoint of software engineering of the methods, tools and techniques for developing quality software in production environments.
2. To study how practicing software developers, in industrial as well as academic environments, can use object technology to improve the quality of the software they produce
3. Introduce Java Programming Environment and Design Patterns

Course Content:

1. Criteria of object orientation
2. Towards object technology
3. The static structure: classes
4. The run-time structure: objects
5. Memory management
6. Introduction to inheritance
7. Multiple inheritance
8. Exception handling
9. Genericity
10. Design patterns : introduction
11. Creational patterns
12. Structural patterns
13. Behavioral patterns

Course Level Learning Outcomes :

Upon completion of the course students should be able to:

1. Use the characteristics of an object-oriented programming language in a program.
2. Use the basic object-oriented design principles in computer problem solving.
3. Use the basic principles of software engineering in managing complex software project
4. Write Java programs using classes and object
5. Implement Design Patterns in Java Programs

Suggested Reading

Text Books:

1. Bertrand Meyer , Object Oriented Software Construction, Prentice Hall; Second edition
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns : Elements of Reusable Object-Oriented Software, Pearson

3. Khalid A. Mughal and Rolf W. Rasmussen, A Programmer's Guide to Java SCJP Certification, Addison-Wesley

Semester: V

Title of the paper: CSC107- Software Engineering

Class: T.Y.B.Sc(Computer Science)- Honours

Number of Credits: 06

Objectives:

3. To study various methods used for software development with a stress on Agile Software Development

Course Content:

1. Introduction to Software Engineering

Introduction to Software Engineering, Software Development phases(Requirements, Analysis, design and implementation, testing and maintenance), SDLC, Waterfall methodology, Prototyping and Iterative, Reverse engineering, reengineering

2. Introduction to Source Control tools

Introduction to Source Control tools - versioning, check-in/checkout, commit, branching, merging, synchronization

3. Agile Approach

Agile Approach: Agile Framework, Agile Manifesto, Agile Principles, Extreme Programming, Scrum

4. Software Project Management using Scrum

Software Project Management using scrum : User stories, Estimation using story points, sprint, backlog(product and sprint), Scrum team, scrum artifacts, scrum ceremonies

5. Design and Implementation using XP

Design and implementation using XP: TDD, refactoring(code smells and refactoring techniques) , Unit testing, Pair Programming

6. Quality Assurance

Quality assurance (Verification & Validation): Testing approaches, Types of testing, testing tools- JUnit, Selenium, Build tools, Iteration and Release planning, Introduction to Continuous Integration

Course Level Learning Outcomes:

Upon completion of the course students should be able to::

- Explain Evolution and fundamentals of software engineering methods
- Apply Agile software development method – Scrum
- Apply refactoring techniques
- Perform software testing using various quality assurance methods
- Explain Source Control Tools

Text Books:

1. Pankaj Jalote, Integrated Approach to Software Engineering, Narosa Publishing House
2. Chris Sims and Hillary Louise Johnson , Elements of Scrum, Dymaxicon, LLC
3. Martin Fowler, Refactoring, Addison Wesley; 2nd edition

Reference Books:

1. Ken Schwaber, Mike Beedle , Agile Software Development with Scrum, Pearson Education
2. S. Kenneth Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Pearson Education
3. Kent Beck, Extreme Programming Explained: Embrace Change, Addison Wesley, 2nd Edition

Semester: V**Title of the paper: CSD101- Human Computer Interaction****Class: T.Y.B.Sc(Computer Science)- Honours****Number of Credits: 04****Objectives:**

- To introduce the foundations of Human Computer Interaction, design technologies and user interface design and development.
 - Learn the foundations of Human Computer Interaction
 - Be familiar with the design technologies for individuals and persons with disabilities
 - Learn the guidelines for user interface design and development
- Be aware of mobile HCI

Course Content:

I	FOUNDATIONS OF HCI	The Human; The computer: Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms
II	DESIGN – RULES AND TECHNIQUES	Interactive Design basics;Usability engineering;Design rules: Evaluation Techniques;Universal Design.
III	MODELS AND THEORIES	Cognitive models, Communication and collaboration models-Hypertext, Multimedia and WWW
IV	MOBILE HCI	Mobile Ecosystem: Widgets, Applications, Games; Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
V	WEB INTERFACE DESIGN	Designing Web Interfaces
VI	CONTEMPORARY INTERFACE DESIGN TECHNOLOGY	Future Domains, IHCI and Case Studies

Course Outcomes : Upon completion of the course students should be able to::

- Develop meaningful user interface
- Assess the importance of user feedback
- Design effective HCI for individuals and persons with disabilities
- Develop persona, conduct interview
- Develop storyboard and design prototype
- Design GUI, Web UI and Reports.

Perform Heuristic Evaluation of the design

Reference Books :

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale; Human Computer Interaction; Pearson Education, 2004 (UNIT I,II and III), 3rd Edition.
2. Brian Fling; Mobile Design and Development , OReilly Media Inc., 2009 (UNIT –IV)
Bill Scott and Theresa Neil ; Designing Web Interfaces; OReilly, 2009 (UNIT V), First Edition

Semester: V

Title of the paper: DSE-2 Data Mining

Class: T.Y.B.Sc (Computer Science)

Number of Credits: 04

Objectives:

- To get an understanding of the general properties of data in large databases
- Understand a variety of real-world applications that require mining
- To introduce the basic concepts of Data Warehouse and Data Mining techniques.
- Examine the types of the data to be mined and apply pre-processing methods on raw data using data mining software.
- Become familiarized with association analysis, classification and cluster analysis of data objects.
- To discover interesting patterns, analyze and estimate the accuracy of popular data mining algorithms using different data sets.
- Get introduced to the challenges in mining complex data types.
- To develop skills of using data mining software for solving practical data mining problems.

Course Content:

1] Data Mining Overview: Evolution of Database Technology, What is Data Mining, Scope of Data Mining, Task of Data mining, Which Kind of Applications are Targeted-Business Intelligence, Web Search Engines, Common Data Mining Application Domains, Benefits of Data Mining, Data Mining and Society.

2] Data Pre-Processing: Data Objects and Attribute Types, Data Pre-processing – Data Quality: a Reason to Pre-process the Data, Major Task in Data Pre-processing-Data Cleaning-Missing Data; Noisy Data; Inconsistent Data, Need of Data Integration-Issues in Data Integration, Data Transformation, Need of Data Reduction, Data Visualization.

3] Data warehousing and OLAP: Introduction to Data Warehouse, Understanding a Data Warehouse, Data Warehouse Schema- Star, Snowflake, Fact Constellations.

4] Basics of Data Mining: Data Mining and Knowledge Discovery, What kind of Data can be Mined, Technologies used in Data Mining- Statistics; Database and Data Warehouse Systems; Information Retrieval; Machine Learning; Pattern Recognition, Data Mining System Architecture, Data Mining Techniques, Issues in Data Mining- Mining Methodology and User Interaction Issues; Performance Issues; Diverse Data Type Issues.

5] Association Analysis: Introduction to Association Analysis, Frequent Patterns, Market Basket Analysis, Association Rule Mining-Problem Definition, Important Concepts; The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation; Pseudocode for Apriori; Example of Apriori for Generating Frequent Itemsets ; Example of Apriori for Generating Association Rules, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, Other Applications of Association Rule Mining.

6] Classification and Prediction: Introduction, Classification and Prediction Techniques, How Does Classification work, Building the Classifier; Using Classifier for Classification, General Approach to Classification, Classification and Prediction Issues. Classifier Accuracy-Confusion Matrix: Accuracy; Recall; Precision; F-Measure, Type-I, Type-II errors.

7] Cluster Analysis: Introduction to Cluster Analysis, what is Clustering, Clustering Applications, Requirements for Clustering Algorithms, Major Clustering Methods- Partitioning Methods, Hierarchical Methods, Density Based Methods.

8] Trends in Data Mining: Introduction, Mining Complex Data Types-Temporal Data Mining, Streaming Data Mining, Spatial Data Mining, Text Mining and Multimedia Data Mining, Web Mining-Categories of Web Mining.

Course Level Learning Outcomes:

Design a DatawarehouseSchema.

Use Classification and prediction methods to solve problems.

Identify suitable clustering methods for different applications.

Suggested Reading

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques," 1st Edition Indian Reprint 2001, Harcourt India Private Limited.
2. Margaret Dunham, "Data Mining: Introductory and Advanced Topics," 1st Edition, 2003, Prentice Hall (Pearson Publication).
3. Arun K Pujari: Data Mining Techniques, 2nd Edition, Universities Press, 2009.