PANJAB UNIVERSITY CHANDIGARH- 160014 (INDIA)

(Estted. under the Panjab University Act VII of 1947-enacted by the Govt. of India)

FACULTY OF SCIENCE

SYLLABI
FOR
M.Sc. (HONOURS SCHOOL) COMPUTER SCIENCE
(SEMESTER SYSTEM)

EXAMINATIONS 2017- 2018

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PANJAB UNIVERSITY, CHANDIGARH
Outlines of Tests, Syllabi and Courses of Reading for M. Sc. (H.S.) Computer Science (Two Year Degree Programme) for Session 2017-2018

Paper Code	Paper Name	Theory/ Practical Lectures	Univ. Exam Marks	Int. Ass. Marks.	Total Credits
FIRST YEAR					
	FIRST SEMESTER				
MCS-113	Software Engineering	4	80	20	4
MCS-110	Data Base Management System(Elective I)	4	80	20	4
MCS-114	Operating Systems	4	80	20	4
MCS-310	Analysis and Design of Algorithms(Elective II)	4	80	20	4
MCS-309	Practical based on MCS-310	8	60	15	3
MCS-112	Practical based on MCS-110 and MCS-114	8	60	15	3
				Total	22
	SECOND SEMESTER				
MCS-407	Advance Java and Network Programming (Elective III)	4	80	20	4
MCS-210	Artificial Intelligence (Using LISP) (Elective IV)	4	80	20	4
MCS-203	Interactive Computer Graphics	4	80	20	4
MCS-211	Data Mining and Data Warehousing	4	80	20	4
MCS-205	Practical based on MCS-203	8	60	15	3
MCS-408	Practical based on MCS-407	8	60	15	3
				Total	22
SECOND YEAR					
	THIRD SEMESTER				
MCS-306	Soft Computing Techniques using Neural Networks (Elective V)	4	80	20	4
MCS-302	Optimization Techniques	4	80	20	4
MCS-307	Software Project Management	4	80	20	4
MCS-115	.NET Framework and C# (Elective VI)	4	80	20	4
MCS-308	Practical based on MCS-306 & MCS-210	8	60	15	3
MCS-108	Practical based on MCS-115	8	60	15	3
				Total	22
	FOURTH SEMESTER				
MCS-304	Major Project Phase I (SRS, DFD, Database Design, Input/output Design)	-	100	--	4
MCS-404	Major Project: Phase II (Coding, Testing & Deployment)	-	100	--	4
MCS-409	Seminar (Based on MCS-304 and MCS-404)	-	150	--	6
				Total	14

GUIDELINES FOR SUBMISSION OF PROJECT REPORT (MCS-304 & MCS-404)

The report should consist of the following :

- Cover page including Project title, Name of the student, Name of the Department and Names of the Project Guides (both External and Internal).
- Acknowledgements.
- Certificates from company and department duly signed by external guide, Principal and internal guide.
- Contents with page numbers.
- Introduction (includes background and application or importance of the project)
- Objectives
- System Analysis

System Feasibility study

- Software requirement specifications
- Design with system flowcharts and input/output design.
- Implementation and Testing

- Hardware and software used
- Listing of well commented programs with result/output or detailed algorithms with input and output.

Further scope of the project

- Bibliography
- Appendices (any other information related to project)

Each student should observe the following norms while submitting the synopsis/thesis for the Project:

(a) Use both sides of the paper instead of only single side.
(b) Use one and half interline spacing in the text (instead of double space)
(c) Stop using a blank sheet before the page, carrying figure or table.
(d) Try to insert figure/table in the text page itself (instead of using a fresh page for it, each time.)

Students must consult/inform the internal guides regarding the progress of their work at least once in 20 days. It is the duty of the student to be in touch with his internal guide. The student must prepare 5 copies of the report including one copy for self. The remaining four are to be submitted before 31st May every year as per the following :

1. Main Library
2. Department Library
3. Internal Guide
4. Company

One softcopy of the work is to be submitted to the concerned head of the department/institution along with the report. The student must present his/ her work in 15 minutes mainly focusing on his/her contribution with the help of slides followed by demonstration of the practical work done. The project Viva will be completed before 15th June every year exact dates will be informed before 31st May every year.
An external examiner, internal examiner and the internal guide will conduct project viva.

SYLLABUS AND COURSE OF READINGS
FIRST SEMESTER

Paper Title: SOFTWARE ENGINEERING

Paper Code: MCS-113 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: The course aims to give students a theoretical foundation in Software Engineering and help them learn its principles and methods including emerging practices and support tools. It also familiarizes students with concepts of Software testing and quality assurance and its various techniques.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Introduction:
Software Engineering goals, SDLC, Software Process Models : Waterfall, Prototyping, Spiral; Fourth generation techniques, Software inspection, Communication skills for software engineer, preview and inspection procedures, Composition of inspection team, Checklist, Human factors in software engineering, Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.

2. Software Project Planning:
Objectives, Decomposition techniques, Problem based estimation (LOC, FP), Empirical Estimation Models, COCOMO model, Risk in estimation.

UNIT-II

3. Software Design:
Objectives, Principles, Concepts, Design Process, Design Strategies and Methods, Structured design, Modular design, Object oriented design, User-interface design. Principles of structured Analysis and Design Tools i.e. DFD, DD, decision tables and decision trees, I/O design.

4. Quality Assurance:
Overview of software quality, Software quality attributes, Factors affecting software quality, Building software quality assurance plan, Components of SQAP, Quality management principles, Essence of international standards: ISO 9000 quality standard, SEI capability maturity model.

UNIT-III

5. Software Testing and Techniques:
Software Testing, Objectives of software testing, Software testing process, Static and dynamic analysis, Black-Box testing & its technique: Equivalence class partitioning, Boundary value analysis, Cause-Effect graph, Comparison testing, White-Box testing & its techniques: Basis path testing, Structural testing, Logic based testing, Fault based testing.

6. Software Testing Strategies:
Characteristics, Unit testing, Integration testing, Functional testing, Regression testing, Systems and acceptance testing, Object oriented testing, Alpha and beta testing.

UNIT-IV

7. Software Maintenance
Characteristics, Types of software maintenance, Reverse engineering, Software maintenance process models.

8. System Configuration Management (SCM):
Basic requirements for SCM system, SCM principles, Planning and organizing for SCM, Benefits of SCM, Change management, Version and release management.

Suggested Readings :
1. Pressman : Software Engineering, Tata McGraw Hill.
2. Sommerville, I., 1986 : Software Engineering, Narosa Publ. House.
3. Mall, Rajiv, 2009: Fundamentals of Software Engineering.
4. Jalote, Pankaj, 1995: An Integrated Approach to Software Engineering, Narosa Publ.
5. Fairley, R.E., 1985: Software Engineering Concepts, McGraw Hill.
6. Lewis, T.G., 1982: Software Engineering, McGraw Hill.
7. Meyers, G., 1979: The Art of Software Testing, Wiley-Inter-Science.
8. Hibbard, P.G.: Constructing Quality Software, North Holland Publication.
9. Shere, Kenneth, 1988: Software Engineering & Management, Prentice Hall.
10. Deutsch, Willis, 1989: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.

Paper Title: DATABASE MANAGEMENT SYSTEM

Paper Code:MCS-110 Max. Marks: 80 Time: 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objective: The objective of this course is to teach a student concepts related to database, database design techniques, transaction management, Crash recovery, Backup and security of databases.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. **Basic Concepts :** Database , DBMS : Need , Characteristics ,Database users, 3-tier architecture, advantages over 2-tier, Components , Advantages , Disadvantages, Views of data-schemas and instances, Data independence, Conventional data models & systems.

2. **Data Models :** Data Associations , Entities, Attributes, Relationships among entities, Representation of associations and relationships, Data models classification: File based System, Traditional data models - Hierarchical, Network , Relational Models. Entity- relationship model: Entities, Relationships, Representation of entities, attributes, Representation of relationship set, Generalization, aggregation.

UNIT-II

3. Storage and File Organization : Overview of physical storage media, RAID , Storage access; File organization: Organization of records in files, Operations on Files, Serial Files, Sequential Files , Index-Sequential Files, Direct Files .

4. The Relational Model: Relational Database: Attributes, Domains, Tuples, Relations and their schemes, relation representation, Keys, relationship, relational operations, Integrity constraints.

UNIT-III

4. Relational Algebra and Relational Calculus: Relational Algebra: Operations- union, intersection, difference, Cartesian product, projection, selection, division and relational algebra queries; Relational Calculus: Tuple oriented and domain oriented relational calculus and its operations.

6. Transaction and Concurrency control: Concept of transaction, ACID properties , Serializibility, States of transaction, Concurrency control : Locking techniques ,Time stamp based protocols, Granularity of data items, Deadlock .

UNIT-IV

7. Crash Recovery and Backup: Failure classifications, storage structure , Recovery & atomicity, Log base recovery, Recovery with concurrent transactions, Failure with loss of non-volatile storage, Database backup & recovery from catastrophic failure, Remote Backup System.

8. Security and privacy: Database security issues, Discretionary access control based on grant & revoking privilege, Mandatory access control and role based access control for multilevel security, Encryption & public key infrastructures.

Suggested Readings:

1. Introduction to database systems: C.J.Date
2. Database Management Systems : Bipin Desai
3. Database system concepts : Korth
4. Principles of Database Management: James Martin
5. Computer Database organization : James Martin
6. Fundamentals of Database Systems: Elmasri Navathe
7. Object-oriented modeling and design: Rumbaugh and Blaha
8. Object-oriented analysis and design: Grady Booch

Paper Title: OPERATING SYSTEMS
Paper Code: MCS-114 Max. Marks: 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: To understand the various concepts of Operating System like process management, synchronization, deadlocks, storage and memory management.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Introduction to Operating System:
Introduction to operating system, its need and services; Operating system classification: Single user, Multi user, Simple batch processing, Multiprogramming, Multitasking, Parallel systems, Distributed system, Real time system;

2. Process Management:
Process: Process state, Process control block, Threads; Process scheduling: Scheduling queues, Schedulers, Context switch; Operations on process: Process creation and termination; Inter process communication: Shared memory systems, Message passing systems; Process scheduling: CPU-I/O burst cycle, CPU scheduler, Pre-emptive and non pre-emptive scheduling; Scheduling algorithms: FCFS, SJFS, RRS, Priority scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

UNIT-II

3. Synchronization: Critical section problem, Peterson's solution, Synchronization hardware, Semaphores: Mutual exclusion, Binary semaphores, Bounded concurrency, Producer-consumers, Reader-writers problem; Deadlocks & starvation, Problems of synchronization: Bounded buffer, Dining philosophers; Monitors.

4. Deadlocks: System model, Deadlock characterization: Necessary conditions, Resource allocation graph, Method for handling deadlock; Deadlock prevention: Mutual exclusion, Hold and wait, No preemption, Circular wait, Deadlock avoidance: Safe state, Resource allocation graph algorithm, Banker's algorithm; Deadlock detection, Recovery from deadlock.

UNIT-III

5. Memory Management-I:
Static and dynamic memory allocation, Memory allocation to process: Stacks, Heap, Memory allocation model; Reuse of memory: Performing fresh allocations using a free list, memory fragmentation, Merging free areas; Contiguous memory allocation: Fragmentation, Swapping;

6. Memory Management-II:
Paging: Hardware support, Protection, shared pages, Techniques for structuring of page table, Memory mapped files; Segmentation**,** Demand paging, Page replacement Algorithms: FIFO, Optimal, LRU, Counting based page replacement; Thrashing.

UNIT-IV

7. Storage Management I:
File Concept: Attributes, Operations, Types, Structure; Access methods: Sequential and direct access, Index ; Directory structure: Single level, Two Level, Tree Structured, acyclic Graph directories; File System mounting, File sharing, Protection: Types of access, access Control.

8. Storage Management II:
File system structure, File system implementation, Directory implementation, Allocation methods, Free space management, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK; Disk management, Swap space management, RAID.

Suggested Readings:

1. Peterson, James, L. and Silberschatz, A., 1985: Operating System Concepts, Wiley Publ. Comp.
2. Dhamdhere, D M:Operating Systems-A concept based approach, Mc Graw Hill.
3. Deitel, H.M., 1984: An Introduction to Operating System, Addison-Wesley Publ. Comp.
4. Milenkovic, M., 1987: Operating System – Concepts and Design, McGraw Hill International Editions.
5. Richie: Operating System, BPB.
6. Hansen Per Brineh, 1978: Operating System Principles, Prentice Hall India.
7. Madnick and Donovan: Operating System, McGraw Hill Book Co.
8. Joshi, R.C.: Operating Systems, Wiley India Pvt. Ltd.

Paper Title: ANALYSIS AND DESIGN OF ALGORITHMS

Paper Code: MCS-310 Max. Marks: 80 Time: 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objective: The objective of the module is to create skills in students to design and analyze algorithms.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. **Algorithms and Analysis :**
Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O, _, and Θ, *o*) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.

2. **Divide and Conquer:**
General method, Binary search, Merge sort, Quick sort, Selection problem, Strassen's matrix multiplication and analysis of these problems.

UNIT-II

3. **Greedy Method:**
General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees, Single source shortcut paths and analysis of these problems.

4. **Dynamic Programming :**
General method, Optimal binary search trees, 0/1 Knapsack, the travelling salesperson problem.

UNIT-III

5. **Back Tracking :**
General method, 8 queen's problem, Graph coloring, Hamiltonian cycles, Analysis of these problems.

6. **Branch-And-Bound :**
Method, 0/1 Knapsack and Travelling Salesperson problems, Efficiency considerations.

UNIT-IV

7. **Lower-Bound Theory:**
Introduction to Algebraic problems, Introduction to lower bounds, Comparison Trees ,Techniques for Algebraic problems, Some Lower Bounds on Parallel Computation.

8. **NP-hard and NP-complete problems:**
Basic concepts, Statement of Cook's Theorem, Examples of NP-hard graph and NP-scheduling problems, some simplified NP-hard problems.

Suggested Readings:

1. Horowitz, Ellis and Sahni, Sartaj 2008: Fundamentals of Computer Algorithms, Galgotia Publications, 2nd Edition.
2. Aho, A.V., Hopcroft, J.E., Ullman, J.D., 2003: The Design and Analysis of Computer Algorithms, Addison-Wesley, First Edition.
3. Bentley, J.L.: Writing Efficient Programs, Prentice-Hall India, Eastern Economy Edition.
4. Goodman, S.E. & Hedetniemi, 2004: Introduction to the Design and Analysis of Algorithms, McGraw- Hill Book Comp.
5. Knuth, D. E., 1996: Fundamental of Algorithms: The Art of Computer Programming, Vol.-1, Naresh Publ. House.
6. Brassad, Gilles and Bartley, Paul 1996: Fundamentals of Algorithms, Prentice Hall of India.
7. Mark Allen Weiss: Data Structure and Algorithms Analysis in C++, Pearson Education.

SEMESTER II

Paper Title : ADVANCED JAVA AND NETWORK PROGRAMMING

Paper Code : MCS-407 Max. Marks : 80 Time : 3 Hrs.
Course Duration : 60 Lectures of one hour each.

Objectives : To create enterprise application development skills among students using Advanced Java.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Review of Java Basic Features, Applets, AWT Controls, Event handling, Multithreading, I/O files.

2. Swing : Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

UNIT-II

3. Java Database Connectivity: Connectivity model, Java.SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications.

4. Java RMI: Distributed object technologies, RMI architecture, creating RMI applications.

UNIT-III

5. Java Servlets: Servlets vs CGI, Servlet lifecycle, creating and running servlets.

6. Networking: Networking basics, Client/server model, Java and the Net, TCP/IP client sockets,TCP/IP server sockets, Inet Address, URL, Data grams, creating networking applications.

UNIT-IV

7. Java Beans : Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK),JAR files, introspection, developing Beans, Using Bound properties, The Java Beans API, Introduction to EJB (Enterprise Java Beans),Types of EJB, Uses of EJB.

8. Java Server Pages: Introduction, JSP Architecture, JSP objects, developing Web Applications.

Suggested Readings:

1. Schildt , Herbert : The Complete Reference Java 2, , TMH.
2. Ivan Bayross : Web Enabled Commercial Application Development using Java 2.0, BPB.
3. Cornell , Gary and Horstmann Cay S. : Core Java, Vol I and Vol II, Sun Microsystems Press.
4. Keogh , James : J2EE : The Complete Reference.
5. Martin Bond, Debbie Law, Andy Longshaw, Dan Haywood, Peter Roxburgh**:** Sams: Teach Yourself J2EE in 21 days, Pearson.
9. Boldwins, Douglas: Algorithms and data structures: The science of computing, Wiley India Pvt. Ltd.
10. Jim Keogh/Davidson: Data Structures—Principles and fundamentals, Wiley India Pvt. Ltd.
11. Leendert: Algorithms and data structure in C++, Wiley India Pvt. Ltd.

Paper Title : ARTIFICIAL INTELLIGENCE (USING LISP)

Paper Code: MCS-210 Max. Marks: 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: The objective of this course is to familiarize students with concepts of AI, its tools & technologies.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.
Prerequisite: System Software, Operating System, Data and File Structure.

UNIT-I

1. **Introduction to Artificial Intelligence (AI) and Problem Space:**
Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies : Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.

2. **Heuristic Search Technologies:**
Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*, constraint satisfaction and Means-ends-analysis techniques.

UNIT-II

3. **Knowledge representation:**
Information and knowledge, Knowledge acquisition and manipulation, Issues in knowledge representation, Knowledge representation methods - Propositional logic and first order predicate logic, Resolution principle, Horn's clauses, Features of language PROLOG, Semantic networks, Partitioned semantic nets, Frames, Scripts and conceptual dependencies.

4. **Game playing:**
MiniMax search procedure, reducing alternatives using Alpha-Beta pruning method examples.

UNIT-III

5. **Expert systems:**
Introduction, examples, characteristics architecture, people involved and their role in building an expert systems, case studies of expert systems, MYCIN and DENDRAL; features of knowledge acquisition systems : MOLE and SALT.

6. **Natural Language understanding and processing:**
Introduction, Complexity of the problem, Chompsky hierarchy of grammars, Techniques for Syntactic processing, Semantic Analysis, Discourse and pragmatic processing

UNIT-IV

7. **Tools and Technologies for AI:**
Introduction to AI language LISP : Symbolic expression, creating, appending and modifying lists, defining functions, Predicates, Conditionals, Recursion, Iteration, Printing and reading , Lambda expressions and higher order function, List storage.

Laboratory work:
1. Programming in LISP & PROLOG.
2. Hands on experience with expert system shell.

Suggested Readings:
1. Rich Elaine and Knight Kevin Shiva Shankar B Nair: Artificial Intelligence, Third Edition, Tata-McGraw Hill.
2. Winston, P.H. and Horn, B.K.P.: LISP, Pearson.
3. Rajasekharan, S. and Vijayalakshmi Pai, G. A.: Neural Networks, Fuzzy Logic and Genetic Algorithms, Prentice Hall of India.
4. Russel & Norvig: Artificial Intelligence, Pearson.
5. Patterson: Artificial Intelligence and Expert Systems, Pearson Education.

Paper Title: INTERACTIVE COMPUTER GRAPHICS

Paper Code: MCS-203 Max. Marks: 80 Time: 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives : The aim is to introduce the students to key concepts of Computer Graphics like display devices, co-ordinate system, transformations, line and circle drawing, pointing, positioning, projections, etc.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. **Display Devices :**
Line and point plotting systems, Raster, vector, pixel and point plotters, Continual Refresh and storage displays, Digital frame buffer, Plasma panel displays, Display processors, Character generators, Colour-display techniques : shadow mask and penetration CRT, Colour look-up tables, hard-copy colour printers.

UNIT-II

2. **Display Description:**
Screen co-ordinates, user co-ordinates, use of homogeneous coordinates, Display code generation, Graphical functions, the view algorithm, Two-dimensional transformation, Line-drawing, Circle drawing algorithms.

UNIT-III

3. **Interactive Graphics:**
Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse, track balls), Interactive graphical techniques, Positioning, (Elastic or Rubber Band lines, Linking, zooming, panning, clipping, windowing, scissoring), Mouse Programming.

4. **3-D Graphics:**
Wire-frame, perspective display, perspective depth, Projective transformations, Hidden line and surface elimination (Black face removal algorithm).

UNIT-IV

5. **Turbo-C Graphic Language:**
Primitives (constants, actions, operators, variables), plotting and geometric transformations, display subroutines, Concept of Animation, Saving, Loading and Printing graphics images from/to disk, Animated algorithms for Sorting, Towers of Hanoi.

6. **Open GL:** Primitives of the language and interface with C/C++.

7. **Programming Projects: Two** Dimensional Transformations, 3-dimensional Transformations, Interactive Graphical Techniques, GUI, Turbo C (Graphics Routines) is to be used as the standard teaching tool.

Suggested Readings:

1. Giloi, W.K., 1978: Interactive Computer Graphics, Prentice-Hall.
2. Newman, W., Sproul, R.F., 1980: Principles of Interactive Computer Graphics, McGraw-Hill.
3. Rogers, D.F., 1985: Procedural Elements for Computer Graphics, McGraw-Hill.
4. Harrington, S., 1983: Computer Graphics: A Programming Approach, Tata McGraw-Hill.
5. Foley, J.D., Van Dam A., 1982: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
6. Hearn, D., Baker, P.M., 1986: Computer Graphics, Prentice-Hall.
7. Tosijasu, L.K., 1983: Computer Graphics, Springer-Verlag.
8. Kelley Bootle: Mastering Turbo C. Galgotia.
9. Plastock, Roy, 1986: Theory & Problems of Computer Graphics, Schaum Series, Tata McGraw Hill.

Paper Title : DATA MINING AND DATA WAREHOUSING

Paper Code : MCS-211 Max. Marks : 80 Time : 3 Hrs.
Course Duration : 60 Lectures of one hour each.

Objectives: This course will introduce concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, application of data warehousing and data mining. Some systems for data warehousing and/or data mining will also be introduced. To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. **Introduction:**
Data Warehousing: Definition, usage and trends, Characteristics of a Data Warehouse, DBMS vs. data warehouse

2. **Developing Data Warehouse:**
Building a Data warehouse, Data ware housing components, Architecture for a warehouse, Three-tier Data warehouse architecture, Steps and Crucial decisions for the design and construction of Data Warehouses, Design performance and technological considerations, Metadata.

UNIT-II

3. **Developing Data Mart based Data warehouse:**
Types of data marts, Loading a data mart, Metadata for a data mart, Data model for a data mart, Maintenance of a data mart, Software components for a data mart, External data, Reference data, Performance issues, Security in data mart, Nature of data in data Mart: External data, Reference data.

4. **OLTP and OLAP Systems:**
OLTP vs. OLAP, types of OLAP, Relational vs. Multidimensional OLAP, Data modeling, Schemas for multidimensional view: Star schema, Snowflake schema, implementing data warehouse; Categories of OLAP tools.

UNIT-III

5. **Data Mining:**
Introduction to data mining definition, KDD versus data mining, Steps of data mining process, Application areas for data mining, Data preprocessing: Data cleaning, Data integration and transformation, Data reduction; Tools for data mining.

6. Data Mining Techniques: Association rules: Introduction, Market basket analysis, Association rules mining algorithms: Apriori algorithm, Partition algorithm.

UNIT-IV

7. **Classification and Prediction**: Definition, issues regarding classification and prediction, classification by decision tree induction, Bayesian Classification, Prediction: Linear and Non-Linear Regression

8. Clustering: Definition, Types of data in cluster analysis, Clustering paradigms, Partitioning Algorithms: K-means and K-method, CLARANS; Hierarchical methods: BIRCH, CURE.

Suggested Readings:

1. Inmon, W. H., 2002: Building the Data Warehouse, John Wiley.
2. Inmon, W. H., 1996: Developing the Data Warehouse, John Wiley.
3. Mattison, 1999: Data Warehousing and Knowledge Management, Tata McGraw Hill.
4. Inmon, W.H., 1999: Managing the Data Warehouse, C. L. Gassey, John Wiley.
5. Jiawei Han, Micheline Kamber, 2000: Data Mining: Concepts and Techniques, Morgan Koffman Elsvier.
6. Fayyad, Usama M., 1996: Advances in Knowledge Discovery and Data Mining, MIT Press.

SEMESTER III

Paper Title: SOFT COMPUTING TECHNIQUES USING NEURAL NETWORKS

Paper Code: MCS-306 Max. Marks: 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: To get the knowledge and exposure for Advanced AI Techniques to solve the problem lying in fuzzy environment.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

Fundamentals:

1. **Introduction to Soft Computing:** Basic soft computing techniques: Neural networks, Fuzzy logic, Genetic algorithms; Hybrid systems, Application to soft computing.

2. **Basics of Neural Networks:** Characteristics of neural networks, Basic models of artificial neural network: Connections, Learning method, Activation functions; Neural network architectures; Applications of neural networks.

UNIT-II

Neural Network Learning Models:

3. **Supervised Learning Networks :** Introduction to supervised learning, Architecture and training algorithms for perception network and back propagation networks

4. **Unsupervised Learning Networks:** Introduction to unsupervised learning, Architecture and training algorithms for Kohonen self-organizing maps and adaptive resonance theory networks.

5. **Hopfield Networks:** Introduction, Architecture and training algorithm for discrete Hopfield nets.

UNIT-III

Fuzzy Logic :

6. **Fuzzy Logic:** Introduction and Application to Fuzzy logic, Classical sets, Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership functions, Defuzzification methods.

7. **Fuzzy Logic Control Systems:** Architecture and Operation of Fuzzy Logic Control (FLC) systems, FLC System Models, Applications of FLC Systems.

UNIT-IV

Genetic Algorithms:

8. Introduction to genetic algorithms; Biological background, Genetic algorithms versus traditional algorithms. Basic terminologies in genetic algorithm: Genes, fitness and populations.
9. General Genetic Algorithm; Operations in genetic Algorithm: Selection, Crossover and Mutation, Applications of Genetic Algorithm.

Suggested Readings:

1. S.N. Sivanandam and S.N. Deepa: Principles of Soft Computing, Second Edition, John Wiley.
2. Karray and Silva: Soft Computing and Intelligent Systems Design, Pearson Education.
3. Gallant Stephen: Neural Network Learning and Expert System, MIT Press.
4. S. Rajasekaran and Pai: Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI.
5. Rao and Rao: C++ Neural Networks & Fuzzy Logic, BPB.

Paper Title: OPTIMIZATION TECHNIQUES

Paper Code: MCS-302 Max. Marks: 80 Time: 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Linear Programming - Mathematical model, assumptions of linear programming, principles of simplex method, Revised simplex method, Applications, Duality, Dual simplex method, sensitivity analyses.

UNIT-II

2. Special types of linear programming problems -Transportation and assignment problems.

3. Integer programming: Introduction, Branch and bound techniques, Binary linear programming.

UNIT-III

4. Assignment and Travelling salesman problems

5. Dynamic Programming, Deterministic and probabilistic dynamic programming.

UNIT-IV

6. Queuing models: Application and characteristics of queuing models, Structure of basic queuing system.

7. PERT and CPM: Phases of project management, PERT and CPM computations.

8. Simulation: Definition: Types of simulation models; Phases of simulation; Applications of simulation; Inventory and queuing problems; Advantages and disadvantages.

Suggested Readings:

1. Hiller, F.S. & Liberman, G.J., 1974: Introduction to Operations Research, 2nd Edn. Holden Day Inc.London.
2. Tara, H.A., 1982: Operations Research, 3rd Edn., McMillan Publishing Company.
3. Beightler, C.S. & Phillips, D.T., 1979: Foundations of Optimisation, 2nd. Edn. Prentice-Hall.
4. McMillan Claude Jr.: Mathematical Programming, 2nd. Edn., Wiley Series.
5. Srinath, L.S.: Linear Programming, East-West, New Delhi.
6. Churchman, C.W. & Arnchoff, E.L.: Introduction to Operations Research, John Wiley and Sons.
7. Gillett, B.G., 1976: Introduction to Operation Research - A Computer Oriented Algorithmic Approach, McGraw-Hill Book Comp.
8. Hillier, F.S. & Liberman, G.T., 1967: Introduction to Operation Research, Holden Day Inc.
9. Rao, S. S., 1978: Introduction to Optimization : Theory & Applications, Wiley Eastern.

Paper Title: SOFTWARE PROJECT MANAGEMENT

Paper Code: MCS-307 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objective: To familiarize the students with Project management, Project Planning and Scheduling, advance DSS, ERP and Software metrics.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Project Management: Introduction to project and project management, problems with software projects , Project management knowledge area and framework, Stages of project : feasibility study :cost-benefit analysis , Planning , project execution , project and product life cycle ; Project stakeholders : All parties of project , role of project manager ; Exploration of open source software tools for project management .

2. Checkpoints and Processes of Project: Major milestones, Minor milestones, Periodic status assessments, Project processes: Initiating processes, Planning processes, Control processes, Executing processes, Closing processes, Process Groups, Process interactions.

UNIT-II

3. Project Planning : Integration management : Introduction , Project plan development , Plan execution ; Scope management : Introduction , methods for selecting projects , project charter , scope statement , work breakdown structure ; Stepwise project planning :Overview , Main steps in project planning.

4. Project Scheduling: Time Management: Importance of project schedules, Schedules and activities, Sequencing and scheduling activity; Project network diagrams: Network planning models, Duration estimating and schedule development, Critical path analysis, Program evaluation and review Techniques.

UNIT-III

5.Technical Metrics for Software: Software process and project metrics: Size oriented metrics, Function-oriented metrics, Extended function point metrics, A Framework for technical software metrics, Metrics for requirement specification quality, Metrics for analysis, Metrics for design, Metrics for source code, Metrics for testing, Metrics for maintenance.

6. **Technical Metrics for Object-Oriented Systems:** Intent of object-oriented metrics, Characteristics of object-oriented metrics, Metrics for OO design model, Class-oriented metrics, Operation-oriented metrics, Metrics for object-oriented testing, Metrics for object-oriented projects.

UNIT-IV

7. Introduction to ERP: Overview, Benefits, Technologies related to ERP, ERP packages, Business process re-engineering, Implementation life cycle of ERP, Training : Team training, End user training; Post implementation (maintenance mode), Implementation in large-scale organization, Applications of ERP in functional areas: Marketing, Personnel, Financial & Production.

8. DSS: Decision structure, Decision support trends, DSS components, Using DSS: What-if analysis, sensitivity analysis, Goal seeking analysis, Optimization analysis, Executive information systems, Enterprise portals and decision support, knowledge management systems.

Suggested Readings:

1. James A O'Brien,George M Maracas,Ramesh Behl: Management Information Systems,Mc Graw Hill.
2. Walker Royce: Pearson Education, 2005: Software Project Management.
3. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA, (2004).
4. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide , Wiley Publishers (2006)
5. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook (2003).
6. Joel Henry, Pearson Education: Software Project Management.
7. Pankaj Jalote, Pearson Education, 2005: Software Project Management.

Paper Title: .NET FRAMEWORK AND C#

Paper Code: MCS-115 Max. Marks : 80 Time : 3 Hrs.

Course Duration: 60 Lectures of one hour each.
Objectives: This course aims at making a student capable of developing console , windows and web applications using C# on .NET platform.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Introduction to .NET environment:

The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach.

2. Introduction to C#:

Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations, difference between C++ and C#, difference between Java and C#.

UNIT-II

3. Object oriented aspects of C#:

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

4. I/O and object serialization:

I/O: System, I/O, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader, FileStream, File ; Serialization: Binary, SOAP,XML and custom serialization.

UNIT-III

5. Writing windows forms applications and deploying windows forms applications:
Writing windows forms applications: Understanding windows forms, Window form controls, Menus, MDI forms, Using inheritance in windows forms, Using common dialog controls, Deploying windows forms applications: Introduction to deployment, ClickOnce deployment, creating an installation package for project.

6. Writing asp .net applications and deploying asp.net applications:

Introduction to ASP.NET, Using validation controls, Managing state in ASP.NET web applications, Deploying ASP.NET Applications with windows installer.

UNIT-IV

7. Accessing data with ado .net:
ADO.NET: Architecture, Components, Database, Data Reader, Data Adapter, Dataset, Viewing data using DataGridView Control, creating applications .

Suggested Readings:

1. Jones, Bradley L.: Sams Teach Yourself C# in 21 Days.
2. Balagurusamy, E., 2004: Programming in C#, Tata McGraw-Hill (Unit I, II).
3. Liberty, J., 2002: Programming C#, 2nd ed., O'Reilly (Unit III, IV, V).
4. Schildt, Herbert 2004: The Complete Reference: C#, Tata McGraw-Hill.
5. Robinson, 2002: Professional C#, 2nd Ed., Wrox Press.
6. Jason Beres: Sams Teach Yourself Visual studio.net 2003 in 21 days.
7. Watsel, nagel, Pedersen, Reid, Skinne, White: Beginning Microsoft Visual C#2008, Wrox Publications

OLD/ELECTIVE PAPERS

PAPER TITLE : ARTIFICIAL INTELLIGENCE -OLD
Paper Code : MCS - 101 **Max. Marks : 80 Time : 3 Hrs.**
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to familiarize students with concepts of AI, its tools & techno logics.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.
Prerequisite : System Software, Operating System, Data and File Structure.

SECTION-A

1. **Introduction to Artificial Intelligence (AI) and Problem Space:**
Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies : Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.

2. Heuristic Search Technologies :
Introduction to heuristic search, Generate and test, Hill Climbing, Best First search , A*, Problem reduction, AO*, constraint satisfaction and Means-ends-Analysis techniques.

SECTION-B

3. Knowledge Representation :
Information and Knowledge, Knowledge Acquisition and Manipulation, Issues in knowledge representation, Knowledge Representation Methods - Propositional Logic and First Order Predicate Logic, Resolution Principle, Horn's Clauses, Features of Language PROLOG, Semantic networks, Partitioned Semantic Nets, Frames, Scripts and Conceptual Dependencies.

4. Game Playing :
MiniMax search procedure, reducing alternatives using Alpha-Beta pruning method examples.

SECTION-C

5. Expert Systems :
Introduction, examples, characteristics Architecture, people involved and their role in building an expert systems, case studies of expert systems, MYCIN and DENDRAL; features of knowledge acquisition systems : MOLE and SALT.

6. Natural Language understanding and Processing :
Introduction, Complexity of the problem, Chompsky hierarchy of grammars, Techniques for Syntactic processing, Semantic Analysis, Discourse and pragmatic processing
_ Introduction to Perception and Action.
_ Introduction to Parallel and distributed AI.

SECTION-D

7. Introduction to Neural Networks, Fuzzy Logic and Genetic Algorithms and their applications.
8. Tools and Technologies for AI :
Introduction to AI language LISP : Symbolic expression, creating, appending and modifying lists, Defining functions, Predicates, Conditionals, Recursion, Iteration, Lambda Expressions and Higher order function.

Laboratory Work :
1. Programming in LISP & PROLOG.
2. Hands on experience with expert system shell.

SUGGESTED READINGS :
1. Rich Elaine and Knight KevinNair Shiva Shankar B, 1991: Artificial Intelligence, Third Edition, Tata-McGraw Hill.
2. Winston, P.H. and Horn, B.K.P.,1993: LISP, Pearson.
3. Rajasekharan S., G. A.Vijayalakshmi Pai, 2004: Neural Networks, Fuzzy Logic and Genetic Algorithms, Prentice Hall of India.
4. Russel & Norvig, 2009 : Artificial Intelligence, Pearson.
5. Patterson, 1995 : Artificial Intelligence and Expert Systems,Pearson Education.
6. Jones, M. Tin, 2006 : Artificial Intelligence Application Programming,Wiley India Pvt. Ltd.
7. Tani Moto, 1995 : Elements of Artificial Intelligence using CommonLISP, Computer Science Press.
8. Sangal, Rajeev , 1995 : LISP Programming, Tata McGraw Hill.
9. Mishkoff, Henry. C., 1986. : Understanding Artificial Intelligence, BPBPublications.
10. Bharti & Chaitany, 2005 : Natural Language Processing, PHI.

PAPER TITLE : SOFTWARE ENGINEERING -OLD
Paper Code : MCS - 102 **Max. Marks : 80 Time : 3 Hrs.**
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to provide an overview of Software Engg. concepts.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.
Prerequisite : Computer Organization & Assembly Language Programming, Problem Solving and C- Programming.

SECTION-A

1. Introduction :
Software Engineering goals, Characteristics of well-engineered software, Software Process Models : Waterfall, Prototyping, Spiral, Fourth Generation Techniques, Role of Matrices and Measurements, S/w Inspection, Communication skills for Software Engineer, Preview and Inspection Procedures, Composition of inspection team, Checklist, Human factors in Software Engineering.
2. Software Specifications :
Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.

SECTION-B

3. Software Project Planning & Scheduling :
Objectives, Decomposition techniques, Problem based estimation, Cost estimation models, COCOMO model, Risk in estimation.
4. System Analysis :
Principles of Structured Analysis, DFD, E-R-diagram, Data Dictionary

SECTION-C

5. Software Metrics: Objectives, introduction, estimation technique Decomposition Tech Model: Problem Based Estimation (LOC,FP), Process Based Estimation : Efforts (LOC,FP), Empirical Estimation Model, COCOMO model.
6. Software Design :
Objectives, Principles, Concepts, Design Process, Design Methodologies, Structured design, Modular design, Object oriented design, User-interface design, Features of a Modern GUI, Windows, icons, error messages etc.

SECTION-D

7. System Administration and Training :

User manual, Implementation Documentation, Operation plan and Maintenance.

8. Hardware and Software Selection :

Hardware acquisition, Benchmarking, Vendor selection, Software selection, Performance and acceptance criteria, Site preparation.

SUGGESTED READINGS :

1. Fairley, R.E., 1985. : Software Engineering Concepts, McGraw Hill.
2. Lewis, T.G., 1982. : Software Engineering, McGraw Hill.
3. Meyers, G., 1979. : The Art of Software Testing, Wiley-Inter-Science.
4. Hibbard, P.G., 1978 : Constructing Quality Software, North Holland Publication.
5. Shere, Kenneth, 1988. : Software Engineering & Management, Prentice Hall.
6. Deutsch, Willis, 1989. : Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.
7. Sommerville, I.,1986.: Software Engineering, Narosa Publ. House.
8. Doug Bell, Ian Murrey and John Pugh, 1992.: Software Engineering: A Programming Approach, PrenticeHall.
9. Pressman, 2010 : Software Engineering, Tata McGraw Hill.
10. Ghazzi, Carlo, 1995. : Fundamentals of Software Engineering, PHI.
11. Jalota, Pankaj, 1995. : An Integrated Approach to Software Engineering, Narosa Publ.

PAPER TITLE : ADVANCED JAVA PROGRAMMING -OLD
Paper Code : MCS - 103 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to familiarize and create skills in Programming using advanced Java.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

1. Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files.
2. Swing : Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

SECTION- B

3. Java Database Connectivity : Connectivity model, Java. SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications.
4. Java RMI : Distributed object technologies, RMI architecture, creating RMI applications.

SECTION-C

5. Java Servlets : Servelets vs CGI, Servlet lifecycle, creating and running servlets.
6. Networking : Networking basics, Client/server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Data grams, creating networking applications.

SECTION-D

7. Java Beans : Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK), JAR files, introspection, developing Beans, Using Bound properties, The Java Beans API.
8. Java Server Pages : Introduction, JSP Architecture, JSP objects, developing Web Applications.

SUGGESTED READINGS:
1. Gary Cornell and Horstmann Cay S., 2003: Core Java, Vol I and Vol II, Sun Microsystems Press
2. Bayross, Ivan, 2003 : Web Enabled commercial Application Development using Java2.0, BPB
3. Schildt, Herbert, 1998 : The Complete Reference Java 2, TMH.
4. Keogh, 2002 : J2EE: The Complete Reference.

PAPER TITLE: . NET FRAMEWORK AND C# -OLD
Paper Code : MCS - 107 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to familiarize and create skills in Programming using Net and C#.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

INTRODUCTION TO .NET ENVIRONMENT :
The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach
INTRODUCTION TO C#
Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations. , difference between C++ and C#, difference between Java and C#.

SECION-B

OBJECT ORIENTED ASPECTS OF C#
Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.
I/O, OBJECT SERIALIZATION AND REMOTING:
System. I/O, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader, Serialized Object Persistence and formatters, Remoting

SECTION-C

WRITING WINDOWS FORMS APPLICATIONS AND DEPLOYING WINDOWS FORMS APPLICATIONS
Writing Windows Forms Applications**:** Understanding Windows Forms**,** Working with Controls Dynamically in Code**,** Using Menus and MDI Forms**,** Using Inheritance in Windows Forms**,** Using Common Dialog Controls Deploying Windows Forms Applications**:** Deployment, Introduction, Understanding, Creating, Adding

WRITING ASP.NET APPLICATIONS AND DEPLOYING ASP.NET APPLICATIONS

Introduction to ASP.NET , Using Validation Controls , Managing State in ASP.NET Web Applications, Deploying ASP.NET Applications: Introduction, Creating, Project Deploying, Deploying ASP.NET Applications with Windows Installer.

SECTION-D

ACCESSING DATA WITH ADO.NET

Looking Inside ADO.NET ,Database, Using Objects, Using DataAdapters and Datasets, Using Binding to a DataGrid Control, Creating Applications.

SUGGESTED READING :

1. Jones, Bradley L, 2005 : Sams Teach Yourself C# in 21 Days
2. Balagurusamy E. 2004 : "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
3. Liberty J. 2002 : "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)
4. Schildt Herbert 2004 : "The Complete Reference: C#", Tata McGraw-Hill.
5. et al Robinson 2002 : "Professional C#", 2nd ed., Wrox Press.
6. Troelsen Andrew 2003 : "C# and the .NET Platform", A! Press.
7. Selvi S. Thamarai,Murugesan R. 2003: "A Textbook on C#", Pearson Education.

PAPER TITLE : OPERATING SYSTEMS (O.S)-OLD
Paper Code : MCS - 201 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to create skills of students in operating systems concepts.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt **ONE** question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

1. Introduction to Operating System :
OS, Types of OS, functions/operations of OS, History of OS. User services/jobs.
2. Memory Management -I:
Address Protection, segmentation, virtual memory, paging, page replacement algorithms.

SECTION-B

3.Memory Management -II:
Cache memory, hierarchy of memory types, associative memory.
4.Support for Concurrent Process :
Mutual exclusion, shared data, critical sections, busy form of waiting, lock and unlock primitives, synchronization.

SECTION-C

5. Scheduling :
Process states, virtual processors, interrupt mechanism, scheduling algorithms.
Preemptive Scheduling & Non-Preemptive scheduling.

SECTION-D

6. System Deadlock :
Prevention, detection and avoidance.
7. Multiprogramming System :
Queue management, File and directory systems, disk scheduling. FCFS, SSTF, SCAN,C-SCAN, LOOK, C-LOOK.

SUGGESTED READINGS :
1. Peterson, James, L andSilberschatz, A., 1985: Operating System Concepts, Wiley Publ. Comp.
2. Deitel, H.M., 1984 : An Introduction to Operating System, Addison-Wesley Publ. Comp.
3. Milenkovic, M., 1987 : Operating System – Concepts and Design, McGrawHill International Editions.

4. Richie, C., 2001 : Operating System, BPB.
5. Hansen Per Brineh,1978: Operating System Principles, Prentice Hall India.
6. Madnick and Donovan,1978: Operating System, McGraw Hill Book Co.
7. Joshi, R.C., 2005 : Operating Systems, Wiley India Pvt. Ltd.

PAPER TITLE: DESIGN AND ANALYSIS OF ALGORITHMS-OLD
Paper Code : MCS - 202 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is create skills in students to design and analysis of algorithms.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.
Prerequisite : Computer Programming and Problem Solving, Data and File Structure.

SECTION-A

1. Algorithms and Analysis :
Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O, _, and _, *o*) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.
2. Divide and Conquer :
General method, Binary Search, Merge sort, Quick sort, Selection sort, Strassen's matrix multiplication and analysis of these problems.

SECTION-B

3. Greedy Method :
General Method, Knapsack problem, Job sequencing with dead lines, Minimum spanning Trees, Single Source Shortcut paths and analysis of these problems.
4. Dynamic Programming :
General method, Optimal Binary Search Trees, 0/1 Knapsack, the travelling salesperson problem.

SECTION-C

5. Back Tracking :
General method, 8 queen's problem, Graph colouring, Hamiltonian cycles, Analysis of these problems.
6. Branch-And-Bound :
Method, 0/1 Knapsack and Travelling Salesperson problems, Efficiency considerations.

SECTION-D

7. Lower-Bound Theory :
Techniques for Algebraic problems, Some Lower Bounds on Parallel Computation.
8. NP-hard and NP-complete problems :
Basic concepts, Statement of Cook's Theorem, Examples of NP-hard graph and NP scheduling problems, some simplified NP-hard problems.

SUGGESTED READINGS :
1. Ellis Horowitz and SahniSartaj , 2008: Fundamentals of Computer Algorithms,Galgotia Publications. 2nd edition.
2. Aho, A.V., Hopcroft, J.E.,Ullman, J.D., 2003: The Design and Analysis of Computer Algorithms, Addison-Wesley, first edition.
3. Bentley, J.L., 1982 : Writing Efficient Programs, Prentice-HallIndia, Eastern Economy Edition.
4. Goodman, S.E. & Hedetniemi2004: Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Comp.
5. Knuth, D. E. , 1996 : Fundamental of Algorithms : The Art ofComputer Programming, Vol.-1, Naresh Publ.House.
6. Brassad, Gilles and Bartley,Paul 1996: Fundamentals of Algorithms, Prentice Hall of India.
7. Mark Allen Weiss, 2007 : Data Structure and Algorithms Analysis in C++, Pearson Education.

Paper Title: DATA AND FILE STRUCTURES (USING C)

Paper Code : MCS-209 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. **Introduction to Data Structures:**
Concepts and definition of data types, Linear and non-linear data structures.

2. Array: Representation of one and multidimensional arrays in memory, ADT, Operations: traversing, insertion, deletion, reversing, searching, sorting, merging two arrays; Matrix operations: addition, multiplication; Sparse matrices: ADT, representation; Applications of array : Polynomial evaluation and addition of two polynomial.

UNIT-II

3. **Linked list:** Introduction, sequential vs linked representation, Operations: Traversal, Creation, Insertion, Deletion, Reversing; Application of linked lists: Polynomial addition; Introduction to the operations of Circular linked lists and doubly linked lists; Fundamental concepts of dynamic memory allocation and garbage collection.

4. **Stacks And Queues :** Sequential and linked representations, ADT, Stack Operations: Traversal ,Pop , Push; Applications of stack: polish notation, infix to post fix , evaluating post fix expression; Queues: Sequential and linked representation ,Queue operations : Traversal, insertion, deletion, Dequeue, Circular queues.

UNIT-III

5. **Trees:** Terminology, ADT, Types: Binary tree, Complete binary tree , Threaded Binary tree, Binary search tree, B-trees ; Binary tree : properties, sequential and linked representation, Traversal Techniques: inorder, pre-order, post order; BST operations: traversal ,searching, insertion, deletion.

6. **Sets and Graphs:**
Sets: representation, union and find algorithms; Graphs: ADT, types, sequential and linked representation; Operations: Insertion, deletion, traversal: DFS, BFS; Minimum cost spanning trees: Kruskal and Prim's algorithm.

UNIT-IV

7. **Searching and Sorting:** Definition of recursion and its applications, Towers of Hanoi ; Sorting Techniques: Bubble sort, Selection sort, Merger sort, Heap sort ,Quick sort; Implementation of Linear and binary searching techniques in C.

8. **File structures:**
Sequential file organization, variable length records and text files. Indexing structures: B-trees, ISAM, Hashing techniques for direct files.

Suggested Readings:

1. Horwitz, E., and Sahni, S., 2003: Fundamentals of data structures, Computer Science Press.
2. Wirth, Niclaus, 2002: Algorithms + Data structures = programs, Prentice Hall International.
3. Tremblay, 2002: An introduction to data structures with applications, Tata McGraw.
4. Aho, A. V., Hopcroft, and Ullman, J.E., 1982: Data structures and algorithms, Addison Wesley.
5. Tanenbaum, A. M. and Augenstein, M.J., 1985: Data structures using C, Prentice Hall International.
6. Lipschutz, Seymour, 1986: Theory & problems of data structures, Schaum Series.
7. Berman, A. Michael, 2002: Data structure via C++, Oxford University Press.
8. Deshpanday: C and data structures, Wiley India Pvt. Ltd.

PAPER TITLE : PARALLEL PROGRAMMING
Paper Code : MCS – 301 **Max. Marks : 80 Time : 3 Hrs.**
Course Duration: 60 Lectures of one hour each.
Objective: The objective of the module is to develop an understanding of concepts of parallel processing.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

1. Introduction : Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science; Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.
2. Parallel Processing Architectures : Parallelism in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

SECTION-B

3. Data Dependency Analysis : Introduction, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.
4. Shared Memory Programming : General Model, Process Model under UNIX.

SECTION-C

5. Thread-based Implementation : Thread Management, Thread Implementation.
6. Distributed Computing : Message passing Model, Parallel Virtual Machine(PVM), Remote procedure call.

SECTION-D

7. Algorithms for Parallel Machines : Speedup, Complexity and Cost, Parallel Reduction, Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System.
8. Parallel Programming Languages : Fortran 90, nCUBE C, Occam, C-Linda.

Laboratory Exercise
Using FORTRAN – 90 or 'C'. Write Parallel programs for sorting, matrix multiplication, merging operations, Graph algorithms, solving linear systems.

Minor Project Work

• Design and simulate parallel environment using MPI and PVM .
• Design and Develop distributed applications using parallel and distributed computing.

SUGGESTED READINGS:

1. Sasikumar M.,Shikhara Dinesh,Prakash P. Ravi, 2004: Introduction to Parallel Processing, PHI.
2. Wilkinson, Barry 2004 : Parallel Programming Techniques & Applications &Michael Allen using Networked workstations and parallelcomputers, Pearson Education.
3. Joel M.Crichlow, 1997 : An Introduction to Distributed and Parallel Computing,PHI.
4. Rajaraman V., 1990 : Elements of Parallel Computing, PHI.
5. Ragsdale Susann,1992: Parallel Programming, Intel McGraw Hill.
6. Quinn, 2003 : Parallel Programming in 'C' with MPI and Open MP, TataMcGraw Hill.

PAPER TITLE : UNIX SYSTEM PROGRAMMING
Paper Code : MCS - 401 **Max. Marks : 80 Time : 3 Hrs.**
Course Duration: 60 Lectures of one hour each.
Course Description:
This course begins with a review of Unix shell scripting and a survey of development tools that are commonly found in Unix environments. The main body of the course focuses on the interface between application programs and the Unix kernel. The course spans topics ranging from file and directory management, process control, inter-process communication, and socket programming.

Course Objectives:
1. To develop an understanding of the various components of the Unix/Linux operating systems from a system programmer's perspective including both the shell and programming interfaces.
2. To develop the ability to use a variety of components of the system library**.**

Pre-requisites:
1. Computer Operating Systems
2. Good C programming skills
3. Experience with using a UNIX operating system

Question Paper Scheme:
Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

1. Review of Unix
History of Unix – flavors, origins; Unix standardization and implementations; Shell scripting; Programs and Processes; System Calls vs Library functions.
2. Unix-Kernel Interface via C
Meaning of operating system kernel; Unix-kernel; Error handling with system calls; What is system programming?; C as a system programming language.

SECTION-B

3. File Processing using Direct I/O System Calls
File and directory structure; permissions; sequential and random file access; accessing directories; I/O redirections; concept of direct (or block) I/O; How is file maintained in Unix?; Description of I/O system calls – umask(); creat(); open(); read(); write(); lseek(); dup(); link(); access(); chmod(); chown().

4. Process Management using System Calls
Process concept; process model in unix; process environment; process creation and termination; process control; description of process management system calls – fork(); getpid(); getppid(); exit(); wait(); sleep().

SECTION-C

5. Program Call Interface
Execve() system call; derived exec** functions; system calls to access real and effective User Ids;Unix command programs; How shell executes command programs?; environment around command process; structure of shell command.
6. Signals in Unix
Signal concept; catching and handling signals; signal system calls – kill(); signal().

SECTION-D

7. Interprocess Communication
Process synchronization and communication concepts; Pipes – popen(), pclose(); Named pipes; Semaphores; Shared memory.
8. Socket Programming
Introduction to sockets; TCP/IP architecture; Client/server programming.

Textbook:
Advanced Programming in the UNIX Environment, Richard Stevens, Addison-Wesley, 1993.
References:
1. Robbins, Kay andRobbins, Steven 2003: UNIX Systems Programming: Concurrency, Communication,and Threads, Prentice Hall.
2. Eric S. Raymond,Addison-Wesley, 2004.: The Art of UNIX Programming.
3. Keith Haviland, DinaGray and Ben Salama,1999: UNIX System Programming,2nd ed., Addison-Wesley.
4. Matthew, Neil andStones, Richard 1999: Beginning Linux Programming, 2nd ed., Wrox Press.
5. Syed Sarwar, RobertKoretsky, Addison-Wesley 2002: Linux: The Textbook, 2002.
6. The Nooks andCrannies, John Gray,2003: Interprocess Communications in Linux: Prentice Hall.
7. Stevens, W. Richard,Fenner, Bill and RudoffAndrew M., 2004: UNIX Network Programming, Volume 1: The SocketsNetworking APIs, 3rd ed., Prentice Hall.
8. Syed Sarwar and KhaledAl-Saqabi, AddisonWesley, 2003: LINUX & UNIX Programming Tools: A Primer for SoftwareDevelopers.
9. Craig Hollabaugh,Addison Wesley, 2002: Embedded Linux: Hardware, Software, and Interfacing.
10. Maurice Bach, 1986 The Design of the UNIX operating System, Prentice Hall.
11. Uresh Vahalia, 1996 UNIX Internals: The New Frontiers, Prentice Hall.
12. Graham Glass & KingAbles, 2003UNIX for Programmers and Users, 3rd ed., Prentice Hall.

PAPER TITLE : E-COMMERCE AND WEB TECHNOLOGIES
Paper Code : MCS – 402 **Max. Marks : 80 Time : 3 Hrs.**
Course Duration: 60 Lectures of one hour each.
Objective: To develop an understanding of concepts of E-Commerce and various tools used in web Technologies.

Note :
i. The Question Paper will consist of Four Sections.
ii. Examiner will set total of **NINE** questions comprising **TWO** questions from each Section and **ONE** compulsory question of short answer type covering whole syllabi.
iii. The students are required to attempt ONE question from each Section and the Compulsory question.
iv. All questions carry equal marks.

SECTION-A

1. **E-Commerce :** Meaning, E-Commerce drivers, myths, advantages, limitations, value chains in E-Commerce, E-Commerce applications : Business-to-consumer, Business-to-Business, Business-within-Business, Internet and www: History, benefits, network architecture, designing and managing networks.

SECTION-B

2. **Website designing and hosting** : Life cycle of website building, website content and traffic management. How ISPs work, choosing on ISP, choosing and registering a domain name.
3. I**mplementation and Maintenance** : Implementation strategies, managing implementation, maintenance strategies, legal and ethical issues in E-commerce.

SECTION-C

4. **Payment Systems** : From Barter to money, requirements of Internet-based payments, electronic payment media : Credit cards, debit cards, smark cards, issues and implications.
5. **Marketing on the Internet** : Pros and cons of online shopping, internet marketing techniques and cycles, attracting and tracking customers.

SECTION–D

6. **E-security** : Security threats, designing for security, security solutions internet security protocols and standards (SSI , SET, S-HTTP), firewalls and network security.

SUGGESTED READINGS :

1. Elias M. Awad, 2006 : Electronic Commerce from vision to fulfillment, PHI.
2. Kalakota Ravi & Andrew B. Whinston,1997: Electronic Commerce, A manager's Guide, Person Education.
3. Kenneth C, Landon,Carol Guercio Traver,2010: E-Commerce – Business Technology society, Pearson Education.

Paper Title: THEORY OF COMPUTATIONS
Paper Code: MCS-406 Max. Marks : 80 Time : 3 Hrs.
Course Duration: 60 Lectures of one hour each.

Objectives: The goal of this course is to provide students with an understanding of basic concepts of Theory of Computation.

Note:
(i) The Question Paper will consist of Four UNITS.
(ii) Examiner will set total of nine questions comprising two questions from each UNIT and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each UNIT and the compulsory question.
(iv) All questions carry equal marks.

UNIT-I

1. Recursive Languages: Recursive definition, Alphabets, Language, Regular expression, definitions of Finite state machine, Transition graphs, Deterministic & non-deterministic finite state machines, Regular grammar, Left-linear and right linear, Thomson's construction to convert regular Expression to NDFA & subset algorithm to convert NDFA to DFA. Minimization of DFA, Finite state machine with output (Moore machine and Meally Machine), conversion of Moore machine to Meally machine & vice-versa.

UNIT-II

2. Properties of Regular languages: Conversion of DFA to regular expression, Pumping lemma, Properties and limitations of finite state machine, Decision properties of regular languages, Application of finite automata.

3. **Context Free Grammar**: Context free grammar, Writing context free grammar for problems, Derivation tree and ambiguity, Application of context free grammars, Chomsky and Greibach Normal form, Conversion of CFG to CNF and GNF. Properties of context free grammar, CYK algorithm.

UNIT-III

4. PDA: Push down stack machine, Design of deterministic and non-deterministic push-down stack, Parser design.

5. Turing Machine: Turing machine definition and design of Turing Machine, Church-Turing Thesis, Variations of Turing Machines, combining Turing machine, Universal Turing Machine, Post Machine, Chomsky Hierarchy.

UNIT-IV

6. Incommutability: Halting problem, Turing enumerability, Turing acceptability and Turing decidabilities, Unsolvable problems about Turing machines.

7. Computation Complexity: P, NP and NP Complete Problems.

Suggested Readings:

1. Lewis, Harry R. and Papadimitriou, Christos H.: Theory of Computation, Prentice Hall of India, 1996.
2. Hopcroft, John E. and Ullman, Jefrey D.: Introduction to Automata Theory, Languages and Computation, Addison-Wesley Publishing Company Inc.
3. Brady, J.M.: Theory of Computer Science, Wiley.
4. A.V. Aho, J.E. Hopcroft and J.D. Ullman, 'Introduction to Automata, Languages and Computations, Addison Wesley, 1980.
5. V.J. Rayward Smith, 'A First Course on Computability, Blackwell Scientific Publications, Oxford, 1986.
6. M.Davis and E.J. Weyuker 'Computability, Complexity and Languages' Academic Press, 1982.
7. D. Gries, 'Science of Programming', Springer Verlag, New York, 1981.
8. Dewire, Dawna Tranis: Client Server Computing, McGraw Hill.