DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME OF INSTRUCTION AND SYLLABI of
B. Tech. Program

RGUKT Basar

CURRICULUM OF COMPUTER SCIENCE AND ENGINEERING
RGUKT BASAR

I YEAR
I SEMESTER

Subject Code	Course Name	L-T-P	Credits
CS1101	Programming in C	4-0-0	4
CY1001	Chemistry	4-0-0	4
MA1101	Mathematics-I	4-0-0	4
HS1001	English	4-0-0	4
	Network Analysis	4-0-0	4
CE1601	Engineering Drawing	0-0-3	2
CS1701	Programming in C Lab	0-0-3	2
CY1601	Chemistry Lab	0-0-3	2
Total		20-0-9	26

CS1101 PROGRAMMING IN C

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- This course starts from the basics of computers and program development
- It covers various concepts of C programming language
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures

UNIT – I

Introduction to Computer Programming: Computing Environments, Computer Languages, Creating and Running Programs. Algorithms and Flow charts : Definition of Algorithms, examples, Symbols used in Flow chart, examples. Introduction to C Language - Background, C Identifiers, Data Types, Operators, Variables, Constants, Input / Output, Expressions, C Programs, Precedence and Associativity, Evaluating Expressions, Type Conversion, Statements, Bitwise Operators.

UNIT-II

Selection: Logical Data and Operators, if-else, switch Statements, Standard Functions. Repetition: loops, while, for, do-while statements, Loop examples, break, continue, go to. Arrays - Concepts, Using Arrays in C, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection, Bubble, Insertion Sorts.

UNIT – III

Functions: Designing Structured Programs, Functions Basics, User Defined Functions, Inter Function Communication, Standard Functions, Scope, Storage Classes-auto, Register, Static, Extern, Scope Rules, and Type Qualifiers. Recursion- Recursive Functions, Preprocessor Commands. Strings - Concepts, C Strings, String Input / Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT – IV

Pointers - Introduction, Pointers to Pointers, Compatibility, void Pointers, Arrays and Pointers, Pointer constants, Pointers and Strings, Pointers to Functions, Pointers to Constant Objects, Constant Pointers, Pointer Arithmetic. Call-by-reference: Pointers for Inter-Function Communication, Passing Arrays to a Function. Dynamic Memory Allocation: Memory Allocation Functions, Programming Applications, Command-line Arguments.

UNIT – V

The Type Definition (type def), Enumerated Types Structure: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions. Input and Output: Files, Streams, Standard library Input Output Functions, Character Input Output Functions.

Suggested References:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
4. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill.
5. Ellis Horowitz, SatrajSahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company.
6. R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India.

CY1001 CHEMISTRY

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

MA1101 MATHEMATICS-I

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To understand the behavior of Real numbers and the real space.
- To give a thorough explanation of real sequences and series.
- To introduce the concepts of Euclidean space and the behavior of functions in them.
- To emphasize the applications of differentiation on real functions and their geometrical inferences.
- Introductions to Numerical analysis.

UNIT-I

Sets in R: Intervals, Neighborhood, Interior point, Open set, Closed set, Limit point, Isolated point, Derived set, Dense set, Enumerable set, Open cover and Compact set.

UNIT-II

Sequence: Infinite sequences, limit of a sequence, convergence, divergence, oscillation, bounded and monotonic sequences, Sandwich theorem, Algebra of limits, L'Hospital Rule in sequences, upper limit, lower limit, subsequences and its limit.

Series: Infinite series, partial sum, convergence, divergence, oscillation, Geometric series, Telescoping series, Algebra of sums, n-th term test, Comparison test, Comparison test (Limit Form), Integral test, D'Alembert's Ratio test, Cauchy's Root test, Alternating series, Leibnitz's Rule, Absolute convergence, Conditional convergence, Power series, Interval of convergence in a power series, Ratio test and Root test to find interval of convergence,

UNIT-III

Preliminaries: Definition of continuity and differentiability in single variable, n-dimensional Euclidean space, Neighborhood of a point in n-dimensional Euclidean space, Functions in n-variables, Functions in 2 variables, Interior points, Boundary points, open and closed regions, Functions of 3 variables.

Calculus of several variables: Limit and continuity, Two-path test, Discontinuities, Partial derivatives, Clairaut's theorem, Laplace's equation, Homogeneous functions and Euler's theorem, Differentials and derivatives, Derivatives of composite functions, Chain Rule, Jacobians, Taylor's Theorem, Maxima and minima, Lagrange's method of multipliers.

UNIT-IV

Differential calculus: Rolle's theorem, Lagrange's mean value theorem, Cauchy's Mean-value theorem, Taylor's Theorem and Expansion, Maclaurin's Theorem and Expansion, Indeterminate forms and application of L'Hospital Rule, Tangents and Normals (Cartesian curves), Angle of intersection of two curves, Radius of curvature, Envelope, Increasing and decreasing functions, concavity, convexity and point of inflexion, Asymptotes.

UNIT-V

Numerical Analysis (Part I):

Introduction: True value, Approximate Value, Error, Error percentage, Application of Numerical Analysis in various fields.

Numerical Analysis in solving equations: Algebraic equations, Transcendental equations, Newton-Raphson Method, Bisection Method.

Numerical Integrals: Trapezoidal Rule, Simpson's $1/3^{rd}$ rule.

Suggested References:

1. Unit I:
   a. Richard R. Goldberg, "Methods of Real analysis", Oxford &Ibh (2012).
   b. Walter Rudin, "Principle of Mathematical Analysis",(Third Edition), McGraw Hill.
   c. N.L. Carothers, "Real Analysis", Cambridge University Press.
2. Unit II:
   a. RGUKT E-1 Sem-1 Modules.
   b. Richard R. Goldberg, "Methods of Real analysis", Oxford &Ibh (2012).
   c. B.S. Grewal and J.S. Grewal, "Higher Engineering Mathematics",(40^{th} Edition), Khanna Publishers,2007
3. Unit III:
   a. RGUKT E-1 Sem-1 Modules.
4. Unit IV; Unit V:
   a. B.S. Grewal and J.S. Grewal, "Higher Engineering Mathematics",(40th Edition), Khanna Publishers,2007
   b. Erwin Kreyszig, "Advanced Engineering Mathematics", (9th Edition), Wiley-India.

HS1001 ENGLISH

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

NETWORK ANALYSIS

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

CS1601 ENGINEERING DRAWING LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

CS1701 PROGRAMMING IN C LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**
Objectives:

- Able to have fundamental concept on basics commands in Linux.
- Able to write, compile and debug programs in C language.
- Able to formulate problems and implement algorithms in C.
- Able to effectively choose programming components that efficiently solve computing problems in real-world

Experiments:
Suggested assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so that the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:
1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Files

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS1101 can be substituted

CY1601 CHEMISTRY LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

I YEAR
II SEMESTER

Subject Code	Course Name	L-T-P	Credits
CS1201	Data Structures	4-0-0	4
PH1001	Physics	4-0-0	4
MA1201	Mathematics-II	4-0-0	4
EE1001	Basic Electronics	4-0-0	4
	Engineering Mechanics	4-0-0	4
CS1802	Data Structures Lab	0-0-3	2
PH1601	Physics Lab	0-0-3	2
EE1601	Basic Electronics Lab	0-0-3	2
Total		20-0-9	26

CS1201 DATA STRUCTURES

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To develop proficiency in the specification, representation, and implementation of abstract data types and data structures.
- To get a good understanding of applications of data structures.
- To solve advanced computer science problems by making appropriate choice for intended applications

UNIT-I

Basic Concepts - Algorithm specification, Introduction, Recursive algorithms. Introduction to Linear and non-linear Data structures. Representation of single and two dimensional arrays, Singly Linked List Operations- Insertion, Deletion, Concatenating Single Linked Lists, Circular Linked List, Doubly Linked list.

UNIT-II

Stack ADT, definitions, Operations, array and linked representation in C, application infix to postfix conversion, postfix expression evaluation, recursion implementation. Queue ADT- definitions and operations, circular queues, double ended queue array and linked representation.

UNIT-III

Trees- Terminology, Representation of Trees, Binary tree ADT, Properties of Binary trees, array and linked representation of Binary trees, Max Heap, Min Heap. Graph- Introduction, Definition and terminology, Graph traversals- BFS and DFS.

UNIT-IV
Searching – Linear and Binary Search, Hashing, Sorting – Insertion, Bubble, Selection, Radix, Quick , Merge, Heap sorts. Comparisons of Sorting Algorithms.

UNIT-V
Search Trees- Binary search Trees, AVL Trees, B Trees, Red Black trees. Searching, insertion, deletion operations of trees.

Suggested References:

1. Ellis Horowitz, Dinesh Mehta, S. Sahani. Fundamentals of Data Structures in C++, Universities Press. 2007.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, PearsonEducation 2006.
3. Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures andAlgorithms in C++, Wiley India Pvt. Ltd, 2004

PH1001 PHYSICS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

MA1201 MATHEMATICS – II

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:

- To learn the concepts of eigen values, eigen vectors, vector spaces and its basis.
- To provide an overview of ordinary differential equations
- To study the methods of solving improper integrals and the concepts of multiple integrals
- To study vector differential and integral calculus

UNIT-I
Linear Algebra: Rank and inverse of a matrix, Eigen values and eigenvectors, properties of eigen values, Cayley - Hamilton Theorem, Hermitian and skew Hermitian matrices. Vector spaces - linear dependence of vectors, basis, linear transformations and its matrix representations, Quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II

Ordinary Differential Equations: Ordinary differential equation, order, degree, First order differential equations – Exact, finding integral factors, linear differential equations, equations reducible to linear form, Bernoulli's form,

UNIT-III

Ordinary Differential Equations: Linear dependent and independent functions, wronskian of functions, Second and higher order differential equations (homogeneous & non-homogeneous) with constant coefficients, Method of variation of parameters, Euler's equation.

UNIT-IV

Integral Calculus: Convergence of improper integrals, tests of convergence, Beta and Gamma functions - elementary properties, differentiation under integral sign, differentiation of integrals with variable limits - Leibnitz rule. Rectification, double and triple integrals, computations of surface and volumes, change of variables in double integrals - Jacobians of transformations, integrals dependent on parameters – applications.

UNIT-V

Vector Calculus : Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, Divergence, Laplacian, line and surface integrals, theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates.

Suggested References:

1. Advanced Engineering Mathematics (3rd Edition) by R. K. Jain and S. R. K. Iyengar, Narosa Publishing House, New Delhi.
2. Advanced Engineering Mathematics (8th Edition) by Erwin Kreyszig, Wiley-India.
3. Dr. M.D. Raisinghania, Ordinar and Partial differential equations, S.CHAND,1 7th Edition 2014.

EE1001 BASIC ELECTRONICS

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

ENGINEERING MECHANICS

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

CS1802 DATA STRUCTURES LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- To provide experience on design, testing, and analysis of Algorithms and Data Structures.
- To acquaint the students with the Data Structures used in the Computer Science field.

Experiments:

1. Representation of Polynomials using Arrays and Linked List and the different operations that can be performed on Polynomials
2. Representation of Sparse Matrix using Arrays and Linked List and the different operations that can be performed on Sparse Matrices
3. Representation of Stacks using Arrays and Linked List and the different operations that can be performed on Stacks
4. Representation of Queues using Arrays and Linked List and the different operations that can be performed on Queues
5. Representation of Double Ended Queue using Arrays and Linked List and the different operations that can be performed on Double Ended Queue
6. Representation of Priority Queues using Arrays and Linked List and the different operations that can be performed on Priority Queues
7. Representation of Binary Trees using Arrays and Linked List and the different operations that can be performed on Binary Trees
8. Representation of Graphs using Arrays and Linked List and the different operations that can be performed on Graphs
9. Infix, Postfix and Prefix conversions.
10. Different Sorting and Searching methods.
11. String representation using Arrays and Linked List and different pattern matching algorithms
12. Implementation and operations on B-Tree and B+ Tree

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS1201 can be substituted.

PH1601 PHYSICS LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

EE1601 BASIC ELECTRONICS LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

II YEAR
I SEMESTER

Subject Code	Course Name	L-T-P	Credits
MA2101	Discrete Structures	4-0-0	4
CS2101	Digital Logic Design	4-0-0	4
CS2102	Design and Analysis of Algorithms	4-0-0	4
CS2103	Scripting Languages	4-0-0	4
CS2104	Database Management System	4-0-0	4
CS2701	Digital Logic Design Lab	0-0-3	2
CS2704	Database Management System Lab	0-0-3	2
CS2901	Seminar-I		1
Total		20-0-6	25

MA2101 DISCRETE STRUCTURES

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:

- Cultivate clear thinking and creative problem solving.
- Teach the basic results in logic, sets and relations, number theory, combinatorics, graph theory and algebraic structures.
- Thoroughly prepare for the mathematical aspects of other Computer Science courses.

UNIT-I

Fundamentals of Logic: Propositional Logic, Propositional Equivalences, Predicate and Quantifiers, nested Quantifiers, Rules of Inference, Proof Methods and Strategy.

Set Theory: Sets, Set Operations.

Mathematical Induction: Introduction to Induction, strong Induction, Recursion.

UNIT-II

Number Theory: The division algorithm, Remainders, greatest common divisors, The fundamental theorem of arithmetic, infinity of primes.

Relations: Relations and their properties, n-ary Relations and their applications, Representing relations, Closures of relations, Equivalence relations, and Partial Orderings.

UNIT-III

Graphs: Graphs, Graph models, special types of graphs, Representing graphs, Graph Isomorphism, connectivity, Euler and Hamilton paths, Planar graphs, Graph Coloring, Matching problem.

Trees: Introduction to Trees, Applications of Trees, Binary Trees, n-ary Trees, Tree Traversal, Spanning Trees.

UNIT-IV:

Combinatorics: Basic principles of counting, The Pigeonhole principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations

Advanced Counting Techniques: Recurrence relations, Solving linear recurrence relations, Generating functions, Catalan Numbers, Principle of Inclusion and Exclusion, Applications of Inclusion and Exclusion.

UNIT-V

Algebraic Structures: Groups, Subgroups, Generators and Evaluation of Powers, Coset and Lagrange's theorem, Isomorphisms and Automorphisms, Homomorphismsm and Normal subgroups, Rings, Integral Domains and Fields.

Suggested References:

1. Kenneth H. Rosen, "Discrete Mathematics & Its Applications (with Combinatorics and Graph Theory)", (6^{th} Edition), McGraw-Hill, 2007.
2. C.L.Liu, D.P.Mohapatra, "Elements of Discrete Mathematics"(A Computer Oriented Aproach) (3^{rd} Edition), McGraw-Hill, 2008.
3. J.P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill, 1997.
4. Ronald L. Graham, Donald E. Knuth, Oren Patashnik, "Concrete Mathematics (A Foundation for Computer Science)" 2^{nd} Edition, Pearson Education,2007.
5. Dougla B. West, "Introduction to Graph Theory" 2^{nd} Edition, PHI Learning, 2009.
6. Richard A. Brualdi, "Introductory Combinatorics" 4^{th} Edition, Pearson, 2004,

CS2101 DIGITAL LOGIC DESIGN

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:

- To understand basic number systems codes and logical gates.
- To understand the Boolean algebra and minimization logic.
- To understand the design of combinational sequential circuits.
- To understand the basic s of various memory.

UNIT-I

Digital Systems: Binary Numbers, Octal, Hexa-Decimal and other base numbers, Number base conversions, complements, signed binary numbers, Floating point number representation, binary codes, error detecting and correcting codes, digital logic gates(AND, NAND,OR,NOR, Ex-OR, Ex-NOR), Boolean algebra , basic theorems and properties, Boolean functions, canonical and standard forms.

UNIT-II

Gate –Level Minimization and Combination Circuits: The K-Maps Methods, Three Variable, Four Variable, Five Variable , sum of products , product of sums Simplification, Don't care conditions , NAND and NOR implementation and other two level implantation.

UNIT-III

Combinational Circuits (CC): Design Procedure, Combinational circuit for different code converters and other problems, Binary Adder, subtractor, Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers.

UNIT-IV

Synchronous Sequential Circuits: Latches, Flip-flops, analysis of clocked sequential circuits, design of counters, Up-down counters, Ripple counters, Registers, Shift registers, Synchronous Counters.

Asynchronous Sequential Circuits: Reduction of state and follow tables, Role free Conditions.

UNIT-V

Memory: Random Access memory, types of ROM, Memory decoding, address and data bus, Sequential Memory, Cache Memory, Programmable Logic Arrays, memory Hierarchy in terms of capacity and access time.

Suggested References:

1. Digital Design- M. Morris Mano.
2. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
3. Switching and Logic Design, C.V.S. Rao, Pearson Education.
4. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
5. Fundamentals of Digital Logic & Micro Computer Design , 5TH Edition, M. Rafiquzzaman John Wiley.

CS2102 DESIGN AND ANALYSIS OF ALGORITHMS

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

UNIT-I:
Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis. Review of elementary data structures-heap and heap sort, hashing, set representation, UNION and FIND.

UNIT-II:
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.
Greedy method: General method, Fractional knapsack problem, Minimum cost spanning trees, Single source shortest path problem, Huffman Trees and Codes.

UNIT-III:
Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem. Bi-connected components and depth first search.

UNIT-IV:
Backtracking: General method, applications−n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT-V:
NP-Hard and NP-Complete problems: NP Hard and NP completeness: Basic concepts, cook's theorem, NP-hard graph problems and scheduling problem, NP- hard code generation problems, Clique Decision problem, Node covering problem, scheduling problem, NP hard code generation problem.

Suggested References:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekharan, University Press.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Introduction to the Design and Analysis of Algorithms, Anany V. Levitin. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
5. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

CS2103 SCRIPTING LANGUAGES

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:

- The goal of the course is the study of scripting languages such as PERL and Python
- Creation of programs in the Linux environment
- The study of the principles of scripting languages

UNIT-I:

Perl Scripting I: Introduction to Perl Scripting, Basic I/O, Variable, and Scalar data, Arrays, Lists, and Hashes, References,

UNIT-II:

Perl Scripting II: Control structures, Functions, File I/O, , Regular expressions, Special Variables and Debugging.

UNIT-II

Python Scripting I: Introduction-Variables, Strings, numbers, comments, Lists- introducing list, lists and looping, common list operations, removing items from list, numerical lists, list comprehensions, strings as lists, tuples.

More advanced data types(dictionary, string), file I/O, functions, Functions and return values, if and if-else statements, while loop

UNIT-IV

Python Scripting II: Dictionaries, common operations with dictionaries, looping through dictionaries, nesting, classes, inheritance, modules and classes, exceptions and testing. Exceptions, sorting, intro to standard libraries (os, sys).

UNIT-V

Python Scripting III: Network programming with python, multi-processing and multi-threading, debugging with pdb, python unit testing, DB programming, Web development, Python native call, Performance optimizations

Suggested References:

1. Larry Wall, Tom Christiansen, and John Orwant, *Programming Perl*, 3rd edition, O'Reilly, 2000.
2. Budd, *Exploring Python*. McGraw Hill, 2008.
3. Zelle, Python Programming: An Introduction to Computer Science. Franklin, Beedle & Assoc., 2010.

CS2104 DATABASE MANAGEMENT SYSTEM

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Objectives:
Upon successful completion of this Lab the student will be able to:

- Creating database objects
- Modifying database objects
- Manipulating the data
- Retrieving the data from the database server
- Performing database operations in a procedural manner using pl/sql
- Performing database operations (create, update, modify, retrieve, etc.,) using front end tools l
- Design and Develop applications like banking, reservation system, etc.,

UNIT-I

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/ altering Tables and Views.

UNIT-II

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational

Calculus - Domain relational calculus - Expressive Power of Algebra and calculus. Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability. Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations. Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

Suggested References:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006

CS2701 DIGITAL LOGIC DESIGN LAB

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **0-0-3-2**

Objectives:

- To provide an introduction to Logic Systems Design thereby giving hands on experience on working with digital ICS, which enable the study Computer System Architecture.

Experiments:

1. Familiarization of Logic Gates and Realization of Logic Circuits using basic Gates.
2. Design and implementation of Arithmetic Circuits:- Half Adder, Full Adder, n bit Ripple Carry
3. Adder, Carry Look ahead Adder, BCD Adder
4. Study of Flip Flops:- implementation of RS, JK, D, T and MS Flip Flops
5. Design and implementation of Synchronous and Asynchronous Counters, UP/DOWN Counters
6. Design and Implementation of Shift Registers, Counters using Shift Registers – Ring Counter and Johnson Counter
7. Study of Multiplexers , Demultiplexers, Encoder and Decoder
8. Design of Comparators and Parity Generators.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2101 can be substituted.

CS2704 DATABASE MANAGEMENT SYSTEM LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- To acquaint the students with the implementation and fundamental algorithms of database systems.
- To provide experience on design, querying, and processing of data in a relational database.

Experiments:
Experiments to implement the following

1. Relational algebra operations select, project and join.
2. Determination of Attribute Closure, Candidate Key, Functional Dependency.
3. Checking Serializability of a Schedule.
4. Dynamic Hashing.

Experiments in any relational database for the following

1. Creation, Insertion, Updation, Deletion of Tables, Indexes, Views.
2. Simple Queries, Nested Queries, Use of Arithmetic and String Functions.
3. Simple PL/SQL Programs, Use of Exceptions, Cursor, Procedure, Function, Trigger, Sequence.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2104 can be substituted.

II YEAR
II SEMESTER

Subject Code	Course Name	L-T-P	Credits
MA2201	Probability and Statistics	4-0-0	4
CE2001/3001	Environmental Science	4-0-0	4
CS2201	Computer Organization and Architecture	4-0-0	4
CS2202	Formal Languages and Automata Theory	4-0-0	4
CS2203	Object Oriented Programming	4-0-0	4
CS2801	Computer Organization and Architecture Lab	0-0-3	2
CS2803	Object Oriented Programming Lab	0-0-3	2
CS2902	Seminar-II		1
Total		20-0-6	25

MA2201 PROBABILITY & STATISTICS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To understand the basic concept of counting, probability and its properties.
- To understand the concept of random variables and expectation.
- To learn various distributions and their applications.
- To study the properties of convergence of random variables.
- To know the concepts of statistics applicable in estimation and testing.

UNIT-I

Principles of Counting: Counting using Sum Rule and Product rule. Concepts of permutations, combinations and circular permutations. Pigeonhole Principle, Occupancy Problem.

Basic Probability: Random experiment. Sample space. Mutually exclusive events. Empirical definition of probability. Problems based on probability. Axiomatic definition of probability. Properties based on axiomatic definition of probability. Conditional probability. Independent events.

Bayes' Theorem and Applications: Bayes' Theorem and problems based on conditional probability.

UNIT-II

Random Variables: Definition of random variables. Properties of discrete and continuous random variables.

Probability Distributions and Probability Densities: Definition and properties of probability mass function and probability density function. Definition of cumulative distribution function and its properties for discrete and continuous distributions.
Multivariate Distributions: Definition and properties of multivariate distribution (continuous and discrete). Joint probability distributions. Marginal probability distributions. Conditional probability distributions.
Mathematical Expectation: Concept of mathematical expectation of functions of random variables and their significance.

UNIT-III
Discrete Distributions: Properties of various discrete distributions: Binomial, Poisson, Negative Binomial, Geometric, Hypergeometric and Discrete uniform distributions.
Continuous Distributions: Properties of various continuous distributions: Uniform, Exponential, Normal, Gamma distributions.
Functions of Random Variables: Evaluating probability distribution of functions of random variables using CDF technique. Determination of joint probability distribution of functions of random variables using transformations. Using transformations to evaluate the distribution of functions of random variables.
Moments and Moment Generating Functions: Moments about origin, Central moments. Moment generating functions of random variables and its properties.

UNIT-IV
Covariance and Correlation: Definition and properties of covariance and correlation. Definition of bivariate normal distributions. Properties of its marginal distributions.
Inequalities and Limit Theorems: Chebychev's inequality, Cauchy Schwarz inequality. Convergence in probability. Central limit theorem.
Ordered Statistics: Probability distributions of ordered statistics and their properties.

UNIT-V
Measures of Central Tendency: Mean, median and mode for grouped and ungrouped data. Quartiles, variance and percentiles for given data.
Sampling and Estimation of Parameters: Concepts of sampling and estimation of mean and variance of a distribution form the sample.
Linear Regression: Linear regression for relationship between two variables.
Hypothesis Testing: Formulation of hypothesis and alternate hypothesis. One-sided and two-sided tests.Comparison of means.

Suggested References:

1. Miller, I., Miller, M., John E. Freund's Mathematical Statistics with Applications (7^{th} Edition), Pearson Education, Inc., 2009.
2. Ross, S.M., Introduction to Probability and Statistics for Engineers and Scientists (4^{th} Edition), Academic Press, 2011.
3. Gupta, S.C., Kapoor V.K., Fundamentals of Mathematical Statistics (11^{th} Edition), Sultan Chand & Sons, 2002.
4. Gupta, A., Groundwork of Mathematical Probability and Statistics (5^{th} Edition), Academic Publishers, 2002.

5. Feller, W., An Introduction to Probability Theory and its Applications, Volume 1 (3rd Edition), John Wiley & Sons, Inc., 1967.
6. Feller, W., An Introduction to Probability Theory and its Applications, Volume 2 (2nd Edition), John Wiley & Sons, Inc., 1971.

CE2001/3001 ENVIRONMENTAL SCIENCE

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

CS2201 COMPUTER ORGANIZATION AND ARCHITECTURE

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To understand how Computer Systems work & its basic principles
- To learn how to analyze the system performance.
- To understand the concepts behind advanced pipelining techniques.
- To learn the current state of art in memory system design
- To understand how I/O devices are being accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism

UNIT-I:
Basic functional blocks of a computer, Basic Functional blocks - CPU, Memory, Input-output, Control unit, Instructions and Instruction execution cycle, Instruction set architecture-Elements of machine instructions, Instruction representation, Instruction types, classification based on number of addresses, Data types, Types of operations-Data transfer, Arithmetic, Logical, Conversion, Input-output, system, Control and transfer of control operations, Addressing modes, Case study of 8086 instruction set.

UNIT-II:
Data representation and Arithmetic Data Representation: signed number representation, fixed and floating point representations, character representation. Converting between different bit lengths,
Integer arithmetic: Negation, integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication shift-and-add, and Booth multiplier. Division non restoring and

restoring techniques, floating point: floating point representation and floating point arithmetic: Addition, Subtraction, Division, Multiplication

UNIT-III:
CPU control unit design Micro operations : fetch, indirect, interrupt, execute, Instruction cycle, Control Signals: inputs and outputs, Hard Wired Control Unit, Micro instructions: horizontal and vertical instruction formats, Micro program, Micro programmed control unit, Advantages and Disadvantages of hardwired and Micro programmed control unit Pipelining: Parallel processing, pipelining, Arithmetic pipelining, Instruction pipelining, RISC pipelining, throughput and speedup, pipeline hazards and solutions.

UNIT-IV:
Input-output organization External devices, Input -output Interface: I/O Bus and interface Modules, I/O Versus memory Bus, I/O Modules structure and their functions, Modes of Transfer: Programmed I/O, Interrupt driven I/O, Direct Memory Access: DMA Controller and Transfer, DMA Configurations, Privileged and Non-privileged instructions, Software Interrupts and exceptions, Processor modes: User mode and kernel mode.

UNIT-V:
Semi-conductor main memory & Memory organization Memory Hierarchy, Main Memory: Semi-conductor main memory, Organization of memory cell, RAM: DRAM, SRAM and ROM Chips, Memory Connection to CPU. Auxiliary memory: Disks, Read and write mechanisms, Data organization and formatting, Physical Characteristics, Disk performance parameters, Overview of optical discs, Memory Organization: Memory Interleaving, Cache memory, Cache memory principles, Mapping functions: Direct mapping, Associative mapping function, Set-Associative mapping function, Replacement Algorithms, Write policy.

Suggested References:

1. William Stallings, Computer Organization & Architecture, 6thdition, Pearson Education Asia
2. M.Morris Mano, Computer System Architecture,3rd edition, Pearson Education Asia
3. V.CarlHamacher, Z.G.Vranesic, S.G.Zaky, Computer organization, McGraw Hill.

CS2202 FORMAL LANGUAGES AND AUTOMATA THEORY

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:
- Understand basic properties of formal languages and formal grammars
- Understand basic properties of deterministic and nondeterministic finite automata
- Understand the relation between types of languages and types of finite automata
- Understand basic properties of Turing machines and computing with Turing machines

- Understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problems
- Understand the challenges for Theoretical Computer Science and its contribution to other sciences

UNIT-I:
Automata: Introduction to Finite Automata, Central Concepts of Automata Theory. Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, An application, Finite Automata with Epsilon Transitions. Regular expressions & Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions.

UNIT-II:
Properties of Regular Languages: Proving Languages not to be Regular, Closure properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization ofAutomata, Mealy and Moore Machine.

UNIT III:
Context Free Grammars and Languages: Context free grammars, Parses Trees, derivations, Applications, Ambiguity in Grammars and Languages, Normal Forms for Context Free Grammars:
CNF and GNF.Pushdown Automata: Definition, Languages of PDA, Deterministic Pushdown Automata.

UNIT-IV:
Equivalence of PDA's and CFG's, Pumping Lemma, Closure properties and Decision Properties ofCFL's.CFL and Regular language. Introduction to Turing Machines: Formal definition of TM, TM languages, Extensions to the Turing Machines, Restricted Turing Machines.

UNIT-V:
Church Turing thesis, Decidability, Reducibility, Un-decidability: Undecidable problems about Turing Machines, Post's Correspondence Problem, Halting problem and others. Intractable Problems: The Classes P and NP and NP Completeproblems.

Suggested References:

1. John. E. Hopcroft, Rajeev Motwani, Jeffery, D. Ulman, Introduction to Automata Theory,Languages and Computation, 3nd edition, Pearson Education-2007
2. ShyamalenduKandar, Introduction to Automata Theory, Formal Languages andComputation, 1st edition, Pearson Education India.
3. Michael Sipser. 1996. Introduction to the Theory of Computation (3rd ed.). CengageLearning, 2012.
4. Peter Linz, An Introduction to Formal Languages and Automata, Jones & BartlettPublishers, 2011.

CS2203 OBJECTED ORIENTED PROGRAMMING

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To be able to differentiate between structures oriented programming and object oriented programming.
- To be able to use object oriented programming language like Java and associated libraries to develop object oriented programs.
- To Able to understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using Java language.
- To be able to apply concepts of operator overloading, constructors and destructors.
- To be able to apply exception handling and use built-in classes

UNIT-1:

Introduction to OOPS: Paradigms of Programming Languages, Basic concepts of Object Oriented Programming, Differences between Procedure Oriented Programming and Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication, Benefits of OOP , Application of OOPs.

Java : History, Java features, Java Environment, JDK, API.

Introduction to Java : Types of java program, Creating and Executing a Java program, Java Tokens, Keywords, Character set, Identifiers, Literals, Separator, Java Virtual Machine (JVM), Command Line Arguments, Comments in Java program.

UNIT -2:

Elements: Constants, Variables, Data types, Scope of variables, Type casting, Operators: Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment, Conditional, Special operator, Expressions – Evaluation of Expressions

Decision making and Branching: Simple if statement, if, else statement, Nesting if, else, else if Ladder, switch statement, Decision making and Looping: While loop, do, While loop, for loop, break, labelled loop, continue Statement.-, Simple programs

Arrays: One Dimensional Array, Creating an array, Array processing, Multidimensional Array, Vectors, Wrapper classes, Simple programs

UNIT-3:

Strings: String Array, String Methods, String Buffer Class, Simple programs

Class and objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword, Command line input, Simple programs
Inheritance: Defining a subclass, Deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, Final classes, Finalizer methods, Abstract methods and classes, Visibility Control: Public access, Private access, friend, protected. Interfaces: Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables, Simple programs

UNIT- 4:

Packages: Java API Packages, System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package, Hiding Classes, Programs
Applets: Introduction, Applet Life cycle, Creating & Executing an Applet, Applet tags in HTML, Parameter tag, Aligning the display, Graphics Class: Drawing and filling lines, Rectangles, Polygon, Circles, Arcs, Line Graphs, Drawing Bar charts, Programs
AWT Components and Even Handlers: Abstract window tool kit, Event Handlers, Event Listeners, AWT Controls and Event Handling: Labels, TextComponent, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers- Input Events, Menus, Programs

UNIT-5:

Exception Handling: Limitations of Error handling, Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement
Multithreading: Creating Threads, Life of a Thread, Defining & Running Thread, Thread Methods, Thread Priority, Synchronization, Implementing runnable interface, Thread Scheduling.
I/O Streams: File, Streams, Advantages, The stream classes, Byte streams, Character streams.

JDBC, ODBC Drivers, JDBC ODBC Bridges, Seven Steps to JDBC, Importing java SQL Packages, Loading & Registering the drivers, Establishing connection. Creating &Executing the statement.

Suggested References:

1. Programming with Java - E. Balagurusamy
2. Java the complete reference, 7th editon, Herbert schildt, TMH.
3. Understanding OOP with Java, updated edition, T. Budd, pearsoneduction.

4. Object oriented Programming in Java - Dr. G.Thampi
5. Let us Java – Yashavant Kanetkar - BPB Publications, New Delhi - First Edition 2012
6. An Introduction to Oops with Java - C Thomas WU - TataMc-Graw Hill, New Delhi - 4th Edition
7. Object oriented Programming through Java - ISRD Group - TataMc-Graw Hill, New Delhi - Eight Reprint 2011

CS2801 COMPUTER ORGANIZATION AND ARCHITECTURE LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

This course concentrates on the practical part of Computer Organization by using Assembly language. This course allows students to practice writing programs based on the concepts the will learn through the course by giving the students different types of problems to be solved using an emulator.

Objectives:

- Teach students basic principles about computer architecture, machine language, and low-level programming.
- Teach students enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
- Improving students systems programming skills through programming exercises carried out by students.
- Students are expected to implement solutions to problems using the concepts they will take through the course.

Experiments:

1. Basic Concepts
2. Assembly Language Fundamentals
3. Data Transfers, Addressing, and Arithmetic
4. Procedures
5. Conditional Processing
6. Integer Arithmetic
7. Strings and Arrays
8. 16-Bit MS-DOS Programming

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2201 can be substituted

CS2803 OBJECTED ORIENTED PROGRAMMING LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- To be able to apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
- To be able to reuse the code and write the classes which work like built-in types.
- To be able to design applications which are easier to debug, maintain and extend.
- To be able to apply object-oriented concepts in real world applications.

Experiments:

1. A program to illustrate the concept of class with constructors, methods and overloading.
2. A program to illustrate the concept of inheritance and dynamic polymorphism.
3. A program to illustrate the usage of abstract class.
4. A program to illustrate multithreading.
5. A program to illustrate thread synchronization.
6. A program to illustrate Exception handling.
7. A program to illustrate user-defined Exceptions
8. A program to demonstrate use of User-defined Packages.
9. A program using String Tokenize.
10. A program using Linked list class
11. A program using Tree Set class
12. A program using Hash Set and Iterator classes
13. A program using Map classes.
14. A program using Enumeration and Comparator interfaces.
15. A program using File and Filename Filter
16. A program to illustrate the usage of Byte and Character I/O streams.
17. A program to illustrate the usage of Serialization.
18. Program using Data class.\
19. An application involving GUI with different controls, menus and event handling.
20. A program to implement an applet.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2203 can be substituted

III YEAR
I SEMESTER

Subject Code	Course Name	L-T-P	Credits
CS3101	Artificial Intelligence	4-0-0	4
CS3102	Compiler Design	4-0-0	4
CS3103	Operating Systems	4-0-0	4
CS3104	Web Technologies	4-0-0	4
	Microprocessor and Microcontrollers	4-0-0	4
CS3703	Operating Systems Lab	0-0-3	2
CS3704	Web Technologies Lab	0-0-3	2
CS3901	Seminar-III		1
Total		20-0-6	25

CS3101 ARTIFICIAL INTELLIGENCE

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To develop the student's understanding of the issues involved in trying to define and simulate intelligence.
- To familiarize the student with specific, well known Artificial Intelligence methods, algorithms and results.
- To provide the student additional experience in the analysis and evaluation of complicated systems.
- To provide the student with paper and proposal writing experience.

UNIT-I:
Introduction : AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT – II:
Searching : Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Greedy best first search, A* search Game Playing: Adversial search, Games, minmax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.

UNIT – III:
Knowledge Representation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in proposional logic, Resolution, Forward & Backward. Chaining.

UNIT – IV:
First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution. Fuzzy logic.

UNIT – V:
Characteristics of Neural Networks, Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units.

Suggested References:

1. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/ Pearson Education.
2. Artificial Neural Networks B. YagnaNarayana, PHI
3. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
4. Artificial Intelligence and Expert Systems – Patterson PHI.
5. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
6. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
7. Neural Networks Simon Haykin PHI
8. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition.

CS3102 COMPILER DESIGN

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:
- To introduce the major concept areas of language translation and compiler design.
- To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To provide practical programming skills necessary for constructing a compiler.

UNIT-I:

Introduction – Programs related to compilers. Analysis of source program, Phases of compiler, modules related to compiler, Grouping of phases. Lexical analysis – The role of Lexical Analyzer. Input Buffering. Specification of Tokens. Recognition of Tokens. The Lexical-Analyzer Generator Lex.

UNIT-II:
Syntax Analysis – Introduction. Top-Down parsing, Brute Forcing, Recursive Descent, Predicative LL(1),Bottom-Up parsing : Shift reduce parsing, Introduction to LR Parsing, Powerful LR parsers: SLR, CALR,LALR, Parser Generators – Yacc. Error Recovery : Introduction, Error detecting and Reporting in various Phases, Lexical Errors, Syntax Errors handling, and error Recovery in various Phases

UNIT-III:
Syntax Directed Translation – Syntax Directed Definitions. Evaluation Orders for SDDs. Applications of Syntax Directed Translation. Symbol Table Organization - Structure of Symbol table, Symbol Table organization, Data Structures of symbol Table.

UNIT-IV:
Intermediate code generation : Variants of syntax trees. Three-Address Code, Types and Declarations. Translation of Expressions. Type Checking. Control Flow.
Activation record, activation tree and run time storage management.

UNIT-V:
Code Generation – Issues in the Design of a Code Generator. The Target Language. Addresses in the Target Code Basic Blocks and Flow Graphs. Optimization of Basic Blocks. Peephole Optimization. Register Allocation and Assignment. Machine Independent Optimizations – The Principal Sources of Optimizations, Introduction to data flow analysis, Foundation of data flow analysis.

Suggested References:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman – Compilers: Principles, Techniques & Tools, Pearson Education 2nd Edition 2007.
2. Keith D Cooper & Linda Tarezon, Engineering a Compiler, Morgan Kafman, Second edition.
3. Kenneth C Louden, Compiler Construction: Principles and Practice , Cengage Learning.
4. Lex&Yacc, John R Levine, Oreilly Publishers.

CS3103 OPERATING SYSTEMS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems.
- In particular, the course will consider inherent functionality and processing of program execution.
- The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software.

UNIT-1:
Introduction to Operating systems:- OS structure and strategies, Process concept, interprocess communication, threads, multithreaded programming.
Process scheduling- scheduling criteria, scheduling algorithms, multi process scheduling, thread scheduling.

UNIT-2:
Memory Management, swapping, contiguous memory allocation, paging, static and dynamic partition, demand paging, page replacement algorithms, thrashing, segmentation with paging, virtual memory.
File System Interface:- file concept, access methods, directory structure, file system mounting, file sharing and protection.
File system structure, file system implementation, directory implementation, allocation methods, free space management, efficiency and performance, recovery
Case studies: - UNIX file system, Windows file system.

UNIT-3:
Process synchronization- critical section problem, semaphore, monitors.
Dead Locks- Necessary conditions, resource allocation graph, methods for handling deadlocks, prevention, avoidance, detection and recovery, protection, goals of protection, access matrix.

UNIT-4:
Device Management- Disk structure, Disk Attachment, Disk scheduling, Disk management, RAID structure, Stable Storage implementation
IO System- IO hardware, Application IO interface, Kernel IO subsystem, Transforming IO request to hardware operation, Streams.

UNIT-5:
Case Studies:-
Linux Systems:- Design principles, Kernel modules, process management, scheduling memory management, file systems, input and output, inter process communication, network structure, security.
Windows XP – Design principles, Architecture, Environment subsystem, file subsystem, networking, programming interface, Android OS.

Suggested Reading:

1. Abraham Siberchatz, Peter B. Galvin, Greg Gagne, Operating system concepts, Wiley India, 2006
2. Andrew S. Tanebaum, Modern Operating system, third edition, pearson education. Asia2008.
3. Dhananjay M. Dhamdhere, Operating system-concept based approach, third editon, Tata McGraw Hill, Asia 2009

CS3104 WEB TECHNOLOGIES

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- Impart the new concepts in Web Technologies
- To develop understanding about the different technologies used in the World Wide Web

UNIT-I:

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols - The World Wide Web-HTTP request message-response message-Web Clients Web Servers-Case Study.

Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-XML Creating HTML Documents-Case Study

UNIT-II:

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-StyleSheets and HTML Style Rule Cascading and Inheritance-Text Properties-Box Model-Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study.

Client-Side Programming: The JavaScript Language-History and Versions Introduction to JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT-III

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window - Case Study.

Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Case Study-Related Technologies.

UNIT-IV

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies.

Separating Programming and Presentation: JSP Technology-Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.

UNIT-V

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java WebService Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

Suggested References:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2007 .
3. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
4. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.

MICROPROCESSOR AND MICROCONTROLLERS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

CS3703 OPERATING SYSTEMS LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- Describe the general structure and purpose of an operating system
- Explain the concepts of process, address space, and file
- Compare and contrast various CPU scheduling algorithms
- Understand the differences between segmented and paged memories, and be able to describe the advantages and disadvantages of each

Experiments:

1. Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 7/8).
2. Execute various UNIX commands
3. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc). Write C programs to simulate UNIX commands like ls, grep, etc.
4. CPU Scheduling Policies.
5. FORK and JOIN construct
6. IPC – Semaphore
7. Implement some memory management schemes – I (Paging concepts)
8. Implementation of resource allocation graph (RAG) and Bankers Algorithm.
9. Implement any file allocation technique (Linked, Indexed or Contiguous)

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS3103 can be substituted

CS3704 WEB TECHNOLOGIES LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
- Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services

Experiments:

1. Will create a fully functional website(eg. online book store) using mvc architecture

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS3104 can be substituted

III YEAR
II SEMESTER

Subject Code	Course Name	L-T-P	Credits
CS3201	Principle of Programming Languages	4-2-0	4
CS3202	Linux Programming	4-0-0	4
CS3203	Data Mining	4-0-0	4
CS3204	Computer Networks	4-0-0	4
CS3205	Software Engineering	4-0-0	4
CS3803	Data Mining Lab	0-0-3	2
CS3805	Software Engineering Lab	0-0-3	2
CS3902	Seminar-IV		1
CS3000	Comprehensive Viva-I		1
CS3900	Internship		2
Total		20-2-6	28

CS3201 PRINCIPLE OF PROGRAMMING LANGUAGES

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To provide an overview of the key paradigms used in developing modern programming languages.
- To explore the implementation details of languages to provide an understanding of the source program and its execution behavior.

UNIT I:
Introduction – Role of programming languages - Programming domains - Language evaluation criteria - Influence on language design - Implementation methods - Virtual computers – Bindings Concept of binding.

UNIT-II:
Data types - Implementation of data types - Primitive, User defined – Names –Variables – Type checking- Strong Typing - Type compatibility -Scope – Lifetime - Referencing environments Named constants – Virtualization - Heap management.

UNIT-III:

Expressions, Assignments and Control Structures. Arithmetic expressions – Assignment statements - Compound statements - Selection statements - Iterative statements – Unconditional branching – Guarded commands.

UNIT-IV:
Subprograms-Fundamentals-Design issues-Local Referencing Environment-Parameter passing methods –Subprogram names as parameters – Overloaded Subprograms – Generic Subprograms –Separate & independent compilation – Design issues for functions – Accessing non-local environments – User defined overloaded operators – Co-routines.

UNIT-V:
Implementation of Subprograms – General semantics of calls & returns- Activation Records – Blocks – Recursion Exceptions and Programming Paradigms - Exception handling in C++, Java, PL/I, Ada ,Fundamentals of Functional programming language – Examples – LISP Interpreter - Overview of Logic programming - Basic elements of Prolog.

Suggested References:

1. Concepts of Programming Languages Robert .W. Sebesta 8/e, Pearson Education, 2008.
2. Programming Language Design Concepts, D. A. Watt, Wiley dreamtech, rp-2007.

CS3202 LINUX PROGRAMMING

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming
- To familiarize students with basic Linux administration

UNIT - I:
Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.Sed-Scripts, Operation, Addresses, Commands, awk-Execution, Fields and Records,Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions.

UNIT - II:
Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links - symlink, link, unlink. Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

UNIT - III:

Process - Process concept, Layout of a C program image in main memory. Process environment-environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.Signals - Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

UNIT - IV:

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pies-creation, IPC between related processes using unnamed pipes, FIFOs- creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes,popen and pclose library functions. Message Queues- Kernel support for messages, APIs for message queues, client/server example. Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

UNIT - V:

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example. Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Socket options-set sockopt and fcntl system calls, Comparison of IPC mechanisms.

Suggested References:

1. Unix System Programming using C++, T. Chan, PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Unix Network Programming, W. R. Stevens, PHI.

CS3203 DATA MINING

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

- To impart an introduction to Data Mining.
- To develop basic knowledge of how data is transformed to Data Warehouses.

UNIT – I:

Introduction to Data Mining: What is data mining? Related technologies - Machine Learning, DBMS, OLAP and Statistics**.** Data Mining Goals, Stages of the Data Mining Process **,** Data Mining Techniques. Knowledge Representation Methods, Applications. Example: weather data

Data Warehouse and OLAP: Data Warehouse and DBMS, Multidimensional data model **,** OLAP operations, Example: loan data set.

UNIT – II:

Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies**.** Installing Weka 3 Data Mining System. Experiments with Weka - filters, discretization.

Data mining knowledge representation : Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques, Experiments with Weka – visualization.

Attribute-oriented analysis: Attribute generalization**,** Attribute relevance, Class comparison, Statistical measures, Experiments with Weka - using filters and statistics

UNIT – III:

Data mining algorithms: Association rules - Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis. Experiments with Weka - mining association rules.

Data mining algorithms: Classification - Basic learning/mining tasks, Inferring rudimentary rules: 1R algorithm, Decision trees, Covering rules, Experiments with Weka - decision trees, rules

UNIT – IV:

Data mining algorithms: Prediction - The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), Linear models, Experiments with Weka-Prediction

Evaluating what's been learned: Basic issues, Training and testing, Estimating classifier accuracy (holdout, cross-validation, leave-one-out), Combining multiple models (bagging, boosting, stacking), Minimum Description Length Principle (MLD), Experiments with Weka - training and testing

UNIT – V:

Clustering: Basic issues in clustering, First conceptual clustering system: Cluster/2 **,** Partitioning methods: k-means, expectation maximization (EM), Hierarchical methods: distance-based agglomerative and divisible clustering, Conceptual clustering: Cobweb, Experiments with Weka - k-means, EM, Cobweb

Advanced techniques, Data Mining software and applications: Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing). Bayesian approach to classifying text
Web mining: classifying web pages, extracting knowledge from the web. Data Mining software and applications

Suggested References:

1. I. H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann. 2000.
2. J. Han and M. Kamber. Data Mining: Concepts and Techniques, 2nd Ed. Morgan Kaufman. 2006.
3. M. H. Dunham. Data Mining: Introductory and Advanced Topics. Pearson Education. 2001.
4. D. Hand, H. Mannila and P. Smyth. Principles of Data Mining. Prentice-Hall. 2001.
5. Pang-Ning Tan, Michael Steinbach, Vipin Kumar. Introduction to Data Mining. Addison-Wesley Longman Publishing Co.

CS3204 COMPUTER NETWORKS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To introduce UDP and TCP Models.

UNIT - I:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparioson of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Data Link Layer: design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol.

UNIT - II:

Multi Access Protocols: ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT-III:

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing alhorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT-IV:

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

UNIT-V:

The Internet Transport Protocols: UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer: Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH

Suggested References:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Edication.
4. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
5. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.
6. Computer Networks, L. L. Peterson and B. S. Davie, 4th edition, ELSEVIER.
7. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education.

CS3205 SOFTWARE ENGINEERING

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To familiarize the steps in designing a Computer Software System following the conventions in Engineering Design.
- To introduce the fundamentals of Structured and Object Oriented Designs and Design Tools.

Unit-I:

The Evolving role of Software – Software – The changing Nature of Software – Legacy software ,Introduction to CASE tools, A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment – Personal and Team Process Models. Product and Process. Process Models – The Waterfall Model –Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models– Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – the Unified Process.

Unit-II:

Management: Functions - Project planning - Software productivity - Productivity metrics Cost estimation - COCOMO & COCOMO II - Project control - Work breakdown structures, Gantt Charts, PERT charts - Dealing with deviations - Team organization - centralized, de-centralized, mixed - An assessment of organizations - Risk management – Configuration Management. Introduction to project management and planning CASE tools.

Unit-III:

Requirements Engineering: Requirements Engineering tasks – Initiating the requirements Engineering Process-Eliciting Requirements – Developing Use cases – Building the Analysis Models– Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – Validating Requirements. SRS Document.

Unit-IV:

Design activity & its objectives – Function Oriented and Object Oriented Design Modularization techniques - module structure and its representation, interface and information hiding, categories, specific techniques to accommodate change, stepwise refinement, top-down and bottom-up design - Handling anomalies. Case Study with UML and CASE Tool support.

Unit-V:

Implementation Techniques - Programming principles and guidelines – Structured Programming. Software Testing Fundamentals-Test Case Design-White-Box Testing-Basis Path Testing-Control Structure Testing- Black-Box Testing- Various levels of Testing: Modules to System. Case study: Test case design and Test log preparation.

Suggested References:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005

2. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004.

CS3803 DATA MINING LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- To conceptualize Data Mining and the need for pre-processing.
- To learn the algorithms used for various types of Data Mining Problem

Experiments:

1. Dimension reduction techniques to handle multi-dimensional data
2. Practical Machine Learning Tools and Techniques
3. Dimension reduction techniques to handle multi-dimensional data
4. Scalable algorithms for classification and clustering
5. Bayesian Networks

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS3203 can be substituted

CS3805 SOFTWARE ENGINEERING LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- Able to prepare SRS document, design document, test cases and software configuration management and risk management related document.
- Develop function oriented and object oriented software design using tools like rational rose.
- Able to perform unit testing and integration testing.
- Apply various white box and black box testing techniques
- Able to track the progress of a project using Openproj tool.

Experiments:

1. Identifying the Requirements from Problem Statements
2. Estimation of Project Metrics
3. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
4. E-R Modeling from the Problem Statements

5. Identifying Domain Classes from the Problem Statements
6. State chart and Activity Modeling
7. Modeling UML Class Diagrams and Sequence diagrams
8. Modeling Data Flow Diagrams
9. Estimation of Test Coverage Metrics and Structural Complexity
10. Designing Test Suites

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS3205 can be substituted

IV YEAR
I SEMESTER

Subject Code	Course Name	(L-T)-P	Credits
BM3001/4001	Managerial Economics and Financial Analysis	4-0-0	4
CS1401	Mobile Computing	4-0-0	4
CS1402	Information Security	4-0-0	4
CS41__	Elective-I	4-0-0	4
CS4700	Project		4
Total		20-0-0	20

BM3001/4001 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

CS1401 MOBILE COMPUTING

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- Introduction of an advanced element of learning in the field of wireless communication.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- To understand the use of transaction and e-commerce principles over such devices to support mobile business concepts

UNIT-I:
Introduction to Mobile Communications and Computing: Mobile Computing (MC) : Introduction to MC, novel applications, limitations, and architecture.
GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

UNIT-II:
(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT-III:

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT-IV:

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT-V

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP.(Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Suggested References:

1. Jochen Schiller,"Mobile Communications",Addison-Wesley. (Chapters 4,7,9,10,11),second edition, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028. (Chapters 11, 15, 17, 26 and 27)
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004,
4. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
6. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

CS1402 INFORMATION SECURITY

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Objectives:

- To be able to understand the basic concepts and goals of Information security such as Confidentiality, Integrity, Authentication, Non-Repudiation, Authorization, and Availability and their relevance in various Contexts.
- To be able to understand the classical cryptosystems and techniques used to break them.
- To be able to understand the ideas of public key cryptosystems and digital signature schemes.
- To be able to understand different network issues as well as database security issues and the solutions for the mthrough firewall, intrusion detection system.
- To be able to understand and critically evaluate a range of access control and authentication mechanisms.

UNIT-I:
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II:
Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT-III:
Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.
Email privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT-IV:
IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.
Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT-V:
Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats.
Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

Suggested References:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik and Ryan Permeh, wileyDreamtech,

IV YEAR
II SEMESTER

Subject Code	Course Name	(L-T)-P	Credits
CS42__	Elective-II	4-0-0	4
CS42__	Elective-III(Open Elective)	4-0-0	4
CS4800	Project		12
CS4000	Comprehensive Viva-II		1
Total		8-0-0	21

LIST OF ELECTIVES

SI No	Elective Subject	(L-T)- P	Credits
1	Distributed Systems	4-0	4
2	Advanced Operating Systems	4-0	4
3	Embedded Systems	4-0	4
4	Advanced Java	4-0	4
5	Cloud Computing	4-0	4
6	Bio Informatics	4-0	4
7	Robotics	4-0	4
8	Computational Geometry	4-0	4
9	Parallel Algorithm	4-0	4
10	Advanced Algorithm	4-0	4
11	Computational Number Theory and Cryptography	4-0	4
12	Advanced Data Mining	4-0	4
13	Machine Learning and Soft Computing	4-0	4
14	Speech Processing	4-0	4
15	Pattern Recognition and It's applications	4-0	4
16	Digital Image Processing	4-0	4
17	Natural Language Processing	4-0	4
18	Wireless Sensor Network	4-0	4
19	Internet of Things	4-0	4
20	Big Data and Data Analytics	4-0	4