Guru Nanak Dev Engineering College

Ludhiana

Department of Computer Science & Engineering

Scheme & Syllabus

B. Tech. Computer Science &Engineering

(2014 Batch Onwards)

B.Tech. Computer Science and Engineering Course Scheme

Course Code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
Third Semester								
CS-14301	Mathematics-III	3	1	-	40	60	100	4
CS-14302	Computer Architecture and Organization	3	1	-	40	60	100	4
CS-14303	Digital Circuits and Logic Design	3	1	-	40	60	100	4
CS-14304	Data Structures and Algorithms	3	1	-	40	60	100	4
CS-14305	Object Oriented Programming using C++	3	1	-	40	60	100	4
CS-14306	Digital Circuits and Logic Design Lab	-	-	4	30	20	50	2
CS-14307	Data Structures and Algorithms Lab	-	-	4	30	20	50	2
CS-14308	Object Oriented Programming using C++ Lab	-	-	4	30	20	50	2
TR-14301	Workshop Training*				60	40	100	2
Total		**15**	**5**	**12**	**350**	**400**	**750**	**28**
		Contact Hours= 32						
Fourth Semester								
CS-14401	Discrete Structures	3	1	-	40	60	100	4
CS-14402	Operating System	3	1	-	40	60	100	4
CS-14403	Computer Networks	3	1	-	40	60	100	4
CS-14404	Microprocessor Architecture and Programming	3	1	-	40	60	100	4
CS-14405	Java Programming	3	1	-	40	60	100	4
CS-14406	Operating Systems Lab	-	-	4	30	20	50	2
CS-14407	Computer Networks Lab	-	-	4	30	20	50	2
CS-14408	Microprocessor Architecture and Programming Lab	-	-	2	30	20	50	1

CS-14409	Java Programming Lab	-	-	4	30	20	50	2
GF-14401	General Fitness	-	-	-	100	-	100	1
Total		**15**	**5**	**14**	**420**	**380**	**800**	**28**
		Contact Hours= 34						
Fifth Semester								
CS-14501	Relational Database Management System	3	1	-	40	60	100	4
CS-14502	Computer Graphics	3	1	-	40	60	100	4
CS-14503	Design and Analysis of Algorithms	3	1	-	40	60	100	4
CS-14504	Web Technologies	3	1	-	40	60	100	4
DECS-145xx	Elective-I	3	1	-	40	60	100	4
CS-14511	Relational Database Management System Lab	-	-	4	30	20	50	2
CS-14512	Computer Graphics Lab	-	-	2	30	20	50	1
CS-14513	Design and Analysis of Algorithms Lab	-	-	2	30	20	50	1
CS-14514	Web Technologies Lab	-	-	4	30	20	50	2
TR-14501	Industrial Training-I[&]				60	40	100	2
Total		**15**	**5**	**12**	**380**	**420**	**800**	**28**
		Contact Hours= 32						
Sixth Semester								
CS-14601	Theory of Computation	3	1	-	40	60	100	4
CS-14602	Advanced Database Systems	3	1	-	40	60	100	4
CS-14603	Software Engineering	3	1	-	40	60	100	4
DECS-146xx	Elective-II	3	1	-	40	60	100	4
OECS-146xx	Open Elective	3	-	-	40	60	100	3
CS-14610	Advanced Database Systems Lab	-	-	4	30	20	50	2
CS-14611	Software Engineering Lab	-	-	4	30	20	50	2

DECS-146xx	Elective-II Lab	-	-	2	30	20	50	1
PRCS-14601	Minor Project	-	-	1	60	40	100	1
GF-14601	General Fitness	-	-	-	100	-	100	1
Total		**15**	**4**	**11**	**450**	**400**	**850**	**26**
		Contact Hours= 30						
Seventh/Eighth Semester								
CS-14701	Advanced Computer Networks	3	1	-	40	60	100	4
CS-14702	Compiler Design	3	1	-	40	60	100	4
CS-14703	Cyber Laws and IPR	3	1	-	40	60	100	4
DECS-147xx	Elective-III	3	1	-	40	60	100	4
DECS-147xx	Elective-IV	3	1	-	40	60	100	4
CS-14715	Advanced Computer Networks Lab	-	-	4	30	20	50	2
PRCS-14701	Major Project	-	-	3	120	80	200	3
DECS-147xx	Elective-III Lab	-	-	2	30	20	50	1
GF-14701	General Fitness	-	-	-	100	-	100	1
Total		**15**	**5**	**09**	**480**	**420**	**900**	**27**
		Contact Hours= 29						
Seventh/Eighth Semester								
TRCS-14701	Industrial Training-II[#]		-		450	350	800	13
TRCS-14702	Industry Oriented Training[$]		-		200	-	200	02
Total					**650**	**350**	**1000**	**15**

*Workshop training will be imparted at the end of 2nd semester in the institute for four weeks.

[&]06 weeks Industrial Training-I will be after the end of 4th semester.

[#]This component will be based on Industrial Training/Institute Department Training/Project Work/Skill Development (Grade-6) Entrepreneurship Training facility created by IKG-PTU, Mohali.

[$]This component will be based on Two Weeks Workshop/Software/Latest Development through Global Initiative of Academic Networks (GIAN).

List of Electives

Elective-I

DECS-14505 Advanced Computer Architecture

DECS-14506 Cryptography and Network Security

DECS-14507 Wireless Networks

DECS-14508 Ethical Hacking

DECS-14509 Network Protocols

DECS-14510 Embedded Systems

Elective-II

DECS-14604 Simulation and Modelling

DECS-14605 Digital Image Processing

DECS-14606 Artificial Intelligence

DECS-14607 Advanced Java

DECS-14608 .NET Technologies

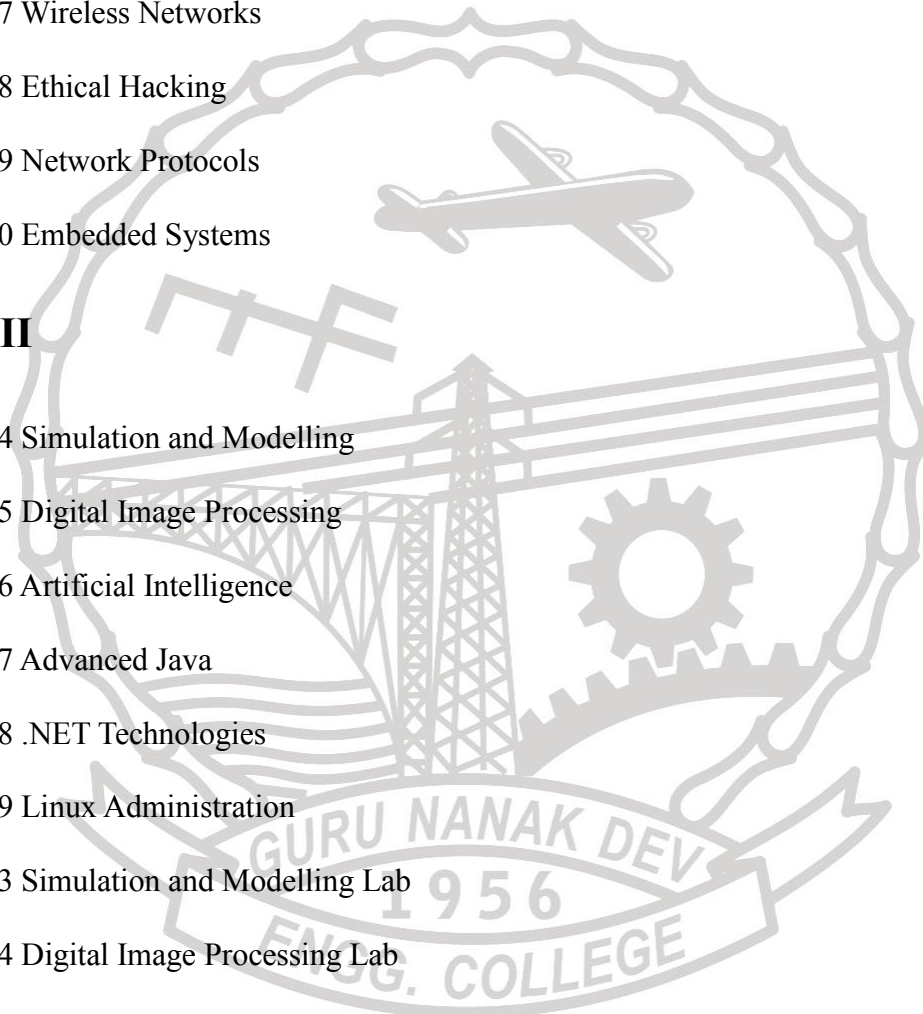DECS-14609 Linux Administration

DECS-14613 Simulation and Modelling Lab

DECS-14614 Digital Image Processing Lab

DECS-14615 Artificial Intelligence Lab

DECS-14616 Advanced Java Lab

DECS-14617 .NET TechnologiesLab

DECS-14618 Linux Administration Lab

Elective-III

DECS-14704 Parallel Computing

DECS-14705 Mobile Computing

DECS-14706 Cloud Computing

DECS-14707 Big Data andBusinessAnalytics

DECS-14708 Data Warehouse and Data Mining

DECS-14717 Parallel Computing Lab

DECS-14718 Mobile Computing Lab

DECS-14719 Cloud Computing Lab

DECS-14720 Big Data and Business Analytics Lab

DECS-14721Data Warehouse and Data Mining Lab

Elective-IV

DECS-14709 Natural Language Processing

DECS-14710MachineLearning

DECS-14711Software Testing and Quality Assurance

DECS-14712 Information Security

DECS-14713 Soft Computing

DECS-14714 Agile Software Development

Open Electives

OECS-14601Software Project Management

OECE-14602 Object Oriented Programming using JAVA
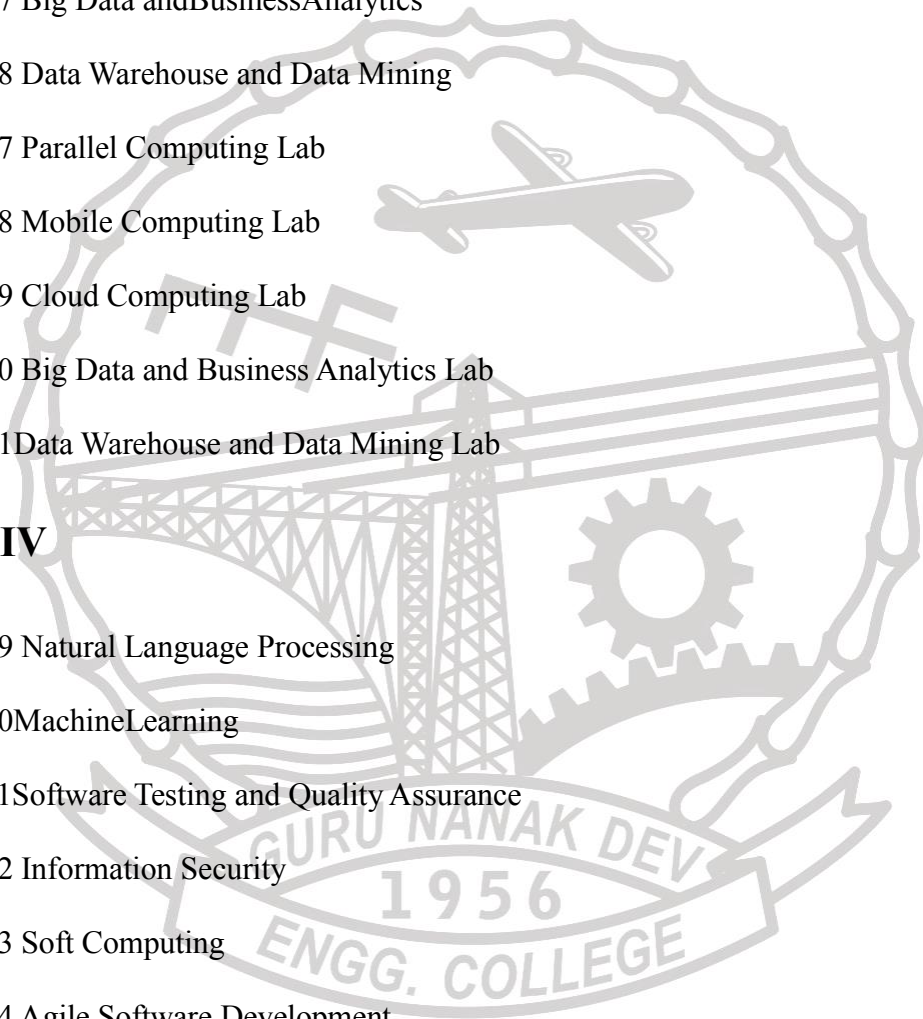
CS-14301 Mathematics-III

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Fourier Series: Periodic functions, Euler's formula, Even and odd functions, Half range expansions, Fourier series of different waveforms. [4]

Laplace Transformations: Laplace transforms of various standard functions, Properties of laplace transform. [4]

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, Homogeneous partial differential equations with constant coefficients. [6]

Functions of Complex Variables: Limits, Continuity and derivatives of the function of complex variables, Analytic function, Cauchy-Riemann equations, Conjugate functions. [6]

Linear Systems and Eigen-Values: Gauss-elimination method, Gauss-Jordan method, Gauss-Seidal iteration method, Rayleigh's power method for eigen values and eigenvectors. [5]

Numerical Methods: Numerical solutions of non-linear algebraic equations by secant, bisection and Newton-Raphson Method, Numerical integration by trapezoidal and Simpson's rules. [6]

Probability: Binomial, Poisson and normal distribution. [5]

Sampling Distribution: Sampling distribution and testing of hypothesis – Sampling, Distribution of means and variance, Chi-square distribution, T-distribution, F-distribution. General concepts of hypothesis, Testing a statistical hypothesis, One and two tailed tests, Critical region, Confidence interval estimation, Single and two sample tests on proportion, Mean and variance. [6]

Recommended Books:
1. E.Kreyszing, "Advanced Engineering Mathematics", Wiley Enstern.
2. P.E.Danko, A.G.Popov, T.Y.A Kaznevnikova, "Higher Mathematics in Problems and Exercise", Mir Publishers.
3. Bali, N.P., "A Text Book on Engineering Mathematics" Laxmi Pub., New Delhi.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning.
5. M.K. Jain, S.R.K. Lyengar, R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers.
6. B.S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publishers.

CS-14301 Mathematics-III (2017 batch onwards)

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Fourier Series: Periodic functions, Euler's formula, Even and odd functions, Half range expansions, Fourier series of different waveforms. [4]

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, Homogeneous partial differential equations with constant coefficients. [6]

Applications of PDEs: Wave equation and Heat conduction equation in one dimension, Solution by the method of separation of variables. [4]

Complex Functions: Modulus amplitude form of a complex no., De-moivre's theorem and its basic questions, finding roots of a complex number, Real and imaginary parts of exponential, logarithmic, circular and hyperbolic functions of complex variables. [7]

Functions of Complex Variables: Limits, Continuity and derivatives of the function of complex variables, Analytic function, Cauchy-Riemann equations, Conjugate functions. [6]

Linear Systems and Eigen-Values: Gauss-elimination method, Gauss-Jordan method, Gauss-Seidal iteration method, Rayleigh's power method for eigen values and eigenvectors. [5]

Numerical Methods: Numerical solutions of non-linear algebraic equations by secant, bisection and Newton-Raphson Method. [4]

Sampling Distribution: Sampling distribution and testing of hypothesis – Sampling, Distribution of means and variance, Chi-square distribution, T-distribution, F-distribution. General concepts of hypothesis, Testing a statistical hypothesis, One and two tailed tests, Critical region, Confidence interval estimation, Single and two sample tests on proportion, Mean and variance. [6]

Recommended Books:
1. E.Kreyszing, "Advanced Engineering Mathematics", Wiley Enstern.
2. P.E.Danko, A.G.Popov, T.Y.A Kaznevnikova, "Higher Mathematics in Problems and Exercise", Mir Publishers.
3. Bali, N.P., "A Text Book on Engineering Mathematics" Laxmi Pub., New Delhi.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning.
5. M.K. Jain, S.R.K. Lyengar, R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publishers.
6. B.S. Grewal, "Numerical Methods in Engineering & Science", Khannap Publishers.

CS-14302 Computer Architecture and Organization

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Data Representation: Data types, Complements, Fixed point representation, Floating point representation, Error detection and correction. [3]

Register Transfer and Micro-operations: Addition, Subtraction, Multiplication and division algorithms and hardware, Register transfer language and operations, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, Arithmetic logic shift unit. [6]

Computer Organisation and Design: Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory reference instructions, Input/ Output and interrupts, Design and working of a complete basic computer, Control functions, Design of accumulator logic. [6]

Design of Control Unit: Control memory, Address sequencing, Design of control unit – Microprogrammed, Hardwired, and their comparative study. [4]

Central Processing Unit: General register organisation, Stack organisation, Instruction formats, Addressing modes, Data transfer and manipulations, Program control, RISC and CISC architecture. [6]

Input-Output Organisation: Peripheral devices, I/O interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, DMA, I/O processor, Serial communication, Introduction to ATA, SCSI and SAS interfaces. [5]

Memory Organisation: Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware. [6]

Pipelining: Flynn's taxonomy, Parallel processors, Parallel and pipeline processing, Pipelining-Arithmetic pipeline, Instruction pipeline, RISC pipeline, Pipeline hazards, Introduction to array processors. [4]

Recommended Books:
1. M. Moris Mano, "Computer System Architecture", Pearson Education.
2. William Stallings, "Computer Organisation and Architecture", Pearson Education.
3. David A. Patterson, "Computer Architecture", Pearson Education.
4. P. Pal Choudhary, "Computer Organisation and Design", PHI.
5. J. P. Hayes, "Computer System Architecture", Pearson Education.
6. John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson Education

CS-14303 Digital Circuits and Logic Design

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Number System Representation: Binary, Octal, Decimal, Hexadecimal, Number base conversions, 1's, 2's, rth's complements, Signed and unsigned binary numbers. Binary codes – Weighted BCD, Gray code, Excess-3 code, ASCII code and code conversions.   [5]

Boolean Algebra: Boolean postulates and laws – De-Morgan's theorem, Principle of Duality, Boolean arithmetic, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterms, Maxterms, Canonical forms, Conversion between canonical forms, Karnaugh Map minimization and Quine-McCluskey method with Don't care conditions.   [6]

Logic Gates and Families: Logic Gates– AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR gates. Realization of logic functions using gates and Universal gates. Introduction to logic families, Specification and characteristics of logic families, Circuits of RTL, DTL, TTL, MOS for realizations of basic gate, Comparison of various logic families.   [6]

Combinational Circuits: Design procedure of Adders, Subtractors, Serial adder/subtractor, Parallel adder/subtractor, Carry look ahead adder, BCD adder, Magnitude comparator, Multiplexer/Demultiplexer, Encoder/Decoder, Parity checker and code converters. Implementation of combinational circuits using Logic Gates, Multiplexers and Demultiplexers.
[6]

Sequential Circuits: Latches, Flip flops - SR, JK, T, D and Master slave – Characteristic Table, Excitation table, Edge triggering, Level triggering, Flip flop realization using other flip flops. Asynchronous/Ripple counters, Synchronous counters, Modulo-n counter, Ring counters. Classification of sequential circuits – Moore and Mealy, Design of asynchronous and synchronous counters – State diagram, Circuit implementation. Shift registers and its applications.   [7]

Memory Devices: Classification of memories, RAM organization, Static RAM cell, MOSFET RAM cell, Dynamic RAM cell. ROM organization, PROM, EPROM, EEPROM and EAPROM.Introduction to programmable logic devices - Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA).
[5]

Signal Conversions: Analog and digital signals, Types of A/D and D/A converters and characteristics, A/D and D/A conversion techniques – Weighted type, R-2R Ladder type, Counter type, Dual slope type, Successive approximation type.   [5]

Recommended Books:
1. M. Morris Mano, "Digital Design", Prentice Hall of India Pvt. Ltd./Pearson Education (Singapore) Pvt. Ltd., New Delhi.

2. John F.Wakerly, "Digital Design", Pearson/PHI.
3. John M. Yarbrough, "Digital Logic Applications and Design", Thomson Learning.
4. Charles H.Roth., "Fundamentals of Logic Design", Thomson Learning.
5. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", TMH.
6. William H. Gothmann, "Digital Electronics", PHI.
7. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI.
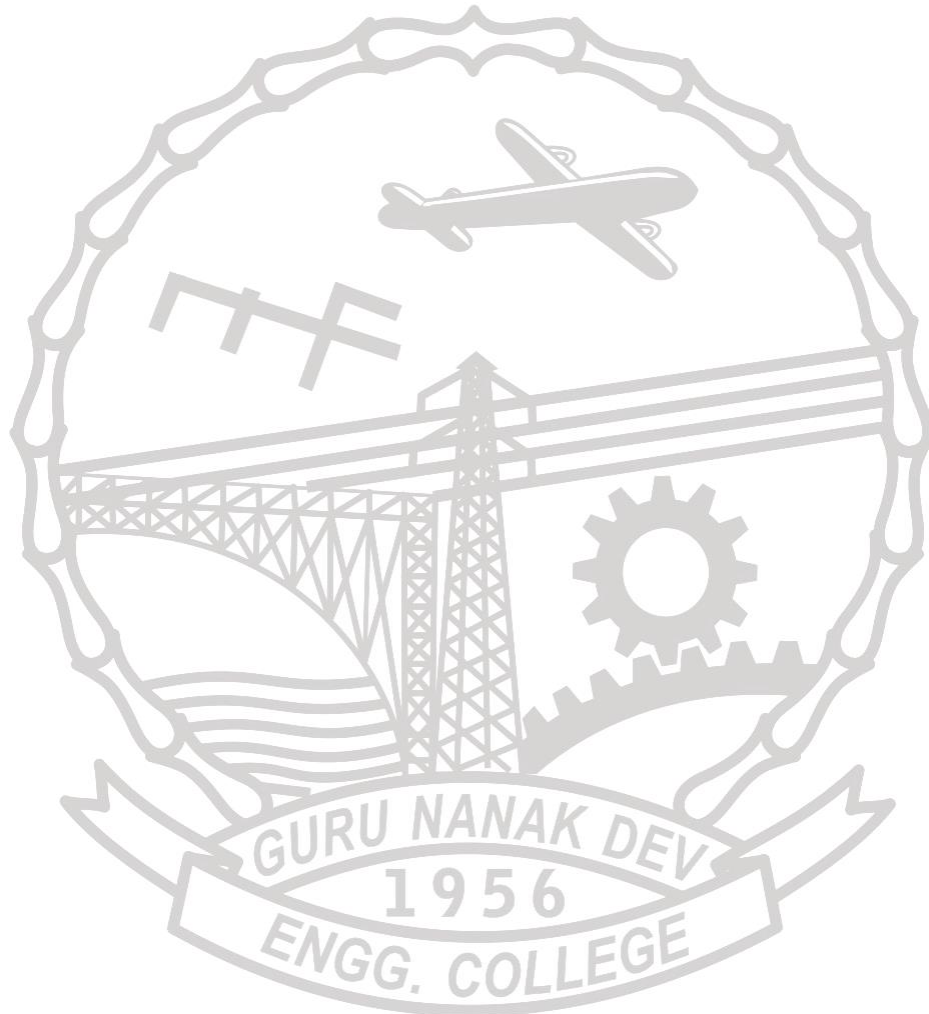
CS-14304 Data Structures and Algorithms

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Basic concepts: Concept of data type, Linear and non-linear data structures, Data structures versus data types, Operations on data structures, Algorithm complexity andasymptotic notations.
[2]

Arrays: Linear and multi-dimensional arrays and their representation, Operations on arrays, Sparse matrices and their storage.   [3]

Stacks: Sequential representation of stacks, Operations on stacks, Application of stacks – parenthesis checker, Evaluation of postfix expressions, Conversion from infix to postfix, Conversion from infix to prefix representation, Tower of Hanoi problem, Implementing recursive functions.   [7]

Queues: Sequential representation of queue, Linear queue, Circular queue, Operations on linear and circular queue, Deque, Priority queue, Applications of queues.   [4]

Linked List: Linear linked list, Doubly linked list, Circular linked list and Header linked list and their operations, Application of linked lists, Garbage collection and compaction, Linked representation of Stack and Queues.   [8]

Trees: Basic terminology, Sequential and linked representations of trees, Traversing a binary tree using recursive and non-recursive procedures, Binary search tree and its operations, Introduction to Threaded binary trees, AVL trees and B-trees.   [7]

Heaps: Representing a heap in memory, Operations on heaps, Application of heap in implementing priority queue and Heap sort algorithm.   [2]

Graphs: Basic terminology, Representation of graphs – Adjacency matrix, Adjacency list. Operations on graph, Traversal of a graph – Breadth first search, Depth first search. Shortest path algorithms – Dijkstra's and Floyd.Minimum spanning tree – Prim and Kruskal.Applications of graphs.   [6]

Hashing and Hash Tables: Introduction to hash table, Hash functions, Concept of collision and its resolution using open addressing and separate chaining, Double hashing, Rehashing.   [3]

Searching and Sorting: Linear and binary search techniques, Sorting methods – Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Shell sort and radix sort. Complexities of searching and sorting algorithms.   [6]

Recommended Books:
1. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, Tata McGraw Hill.

2. SartajSahni, "Data Structures, Algorithms and Applications in C++", Tata McGraw Hill.
3. Michael T. Goodrich, Roberto Tamassia, & David Mount, "Data Structures and Algorithms in C++", Wiley India.
4. Kruse, "Data Structures & ProgramDesign", Prentice Hall of India.
5. Y. Langsa, M.J. Augenstein, A.M. Tanenbaum, "Data structures using C and C++", Prentice-Hall of India.
6. Vishal Goyal, Lali Goyal, Pawan Kumar, " Simplified Approach to Data Structures", Shroff Publications and Distributors.
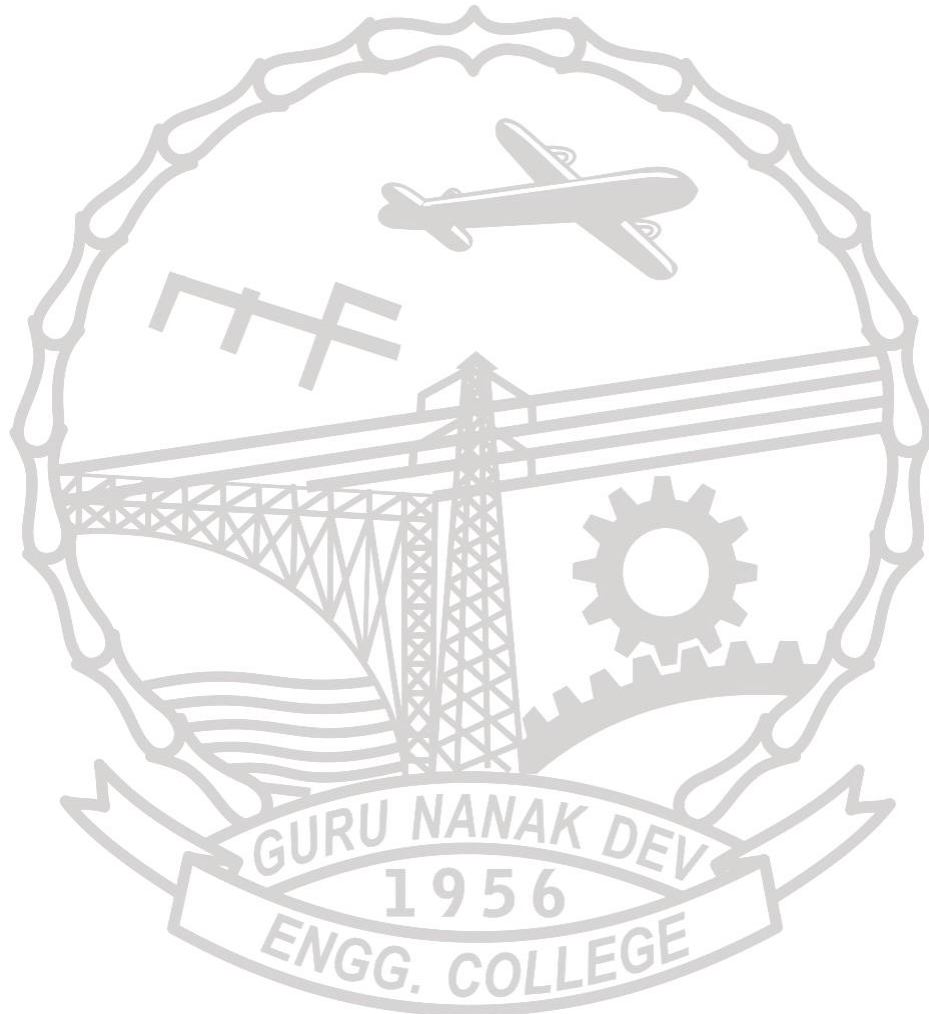
CS-14305 Object Oriented Programming using C++

Internal Marks: 40   L   T   P

External Marks: 60   3   1   0

Total Marks: 100

Object-Oriented Programming Concepts: Introduction, Comparison between procedural programming paradigm and object-oriented programming paradigm, Basic data types, Derived data types, Constants, Tokens, Keywords, Identifiers and variables, Concepts of an object and a class, Abstraction, Encapsulation, Data hiding, Inheritance, Overloading, Polymorphism, Messaging. [4]

Control Structures: Input and Output statements in C++, Various operators, Operator precedence, if statement, switch-case, break, goto, continue, for, while and do-while loops, Dynamic initialization, Type modifiers, Type casting. [4]

Classes and Objects: Implementation of a class, Operations on objects, Relationship among objects, Specifying a class, Creating class objects, Accessing class members, Access specifiers, Static members, Use of const keyword, Friends of a class, Empty classes, Nested classes, Local classes, Abstract classes, Container classes, Bit fields and classes. [5]

Functions and Arrays: Function components, Passing parameters, Call by reference, Call by value, Return by reference, Inline functions, Default arguments, Function prototyping, Overloaded function, Recursion, Array of objects, Dynamic allocation operators, Dynamic objects, String handling. [4]

Dynamic Memory Management using Pointers: Declaring and initializing pointers, Accessing data through pointers, Pointer arithmetic, Memory allocation –Static and Dynamic, Dynamic memory management using new and delete operators, Pointer to an object, this pointer, Pointer related problems – Dangling/wild pointers, Null pointer assignment, Memory leak and Allocation failures.[5]

Constructors and Destructors: Need for constructors and destructors, Copy constructor, Dynamic constructors, Explicitconstructors, Destructors, Constructors and destructors with static members, Initializer lists, Order of execution of constructors and destructors. [3]

Operator Overloading and Type Conversion: Overloading operators, Rules for overloading operators, Overloading of various operators, Type conversion – Basic type to class type, Class type to basic type, Class type to another class type. [4]

Inheritance: Introduction, Defining derived classes, Forms of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Objects slicing, Overriding member functions, Object composition and delegation. [5]

Virtual Functions and Polymorphism: Concept of binding – Early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes, Virtual destructors, Function overloading, Friend function. [4]

Exceptions Handling: Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception, Specifying exceptions. [3]

Standard Input/Output: Concept of streams, Hierarchy of console stream classes, Input/output using overloaded operators >> and << and member functions of I/O stream classes, Formatting output, Formatting using ios class functions and flags, Formatting using manipulators, File streams, File pointer manipulation, File open and close. [3]

Templates: Template concepts, Function templates, Class templates, Illustrative examples. [2]

Files Handling: File streams, Hierarchy of file stream classes, Error handling during file operations, Reading/writing of files, Accessing records randomly, Updating files. [3]

Recommended Books:
1. R. Lafore, "Object Oriented Programming in C++", Waite Group.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill.
3. P YashavantKanetkar, "Let Us C++", BPB Publications.
4. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.
5. Herbert Schildt, "The Complete Reference to C++ Language", McGraw Hill-Osborne.
6. B.F.Lippman, "C++ Primer", Addison Wesley.
7. Farrell, "Object Oriented using C++", Cengage Learning.
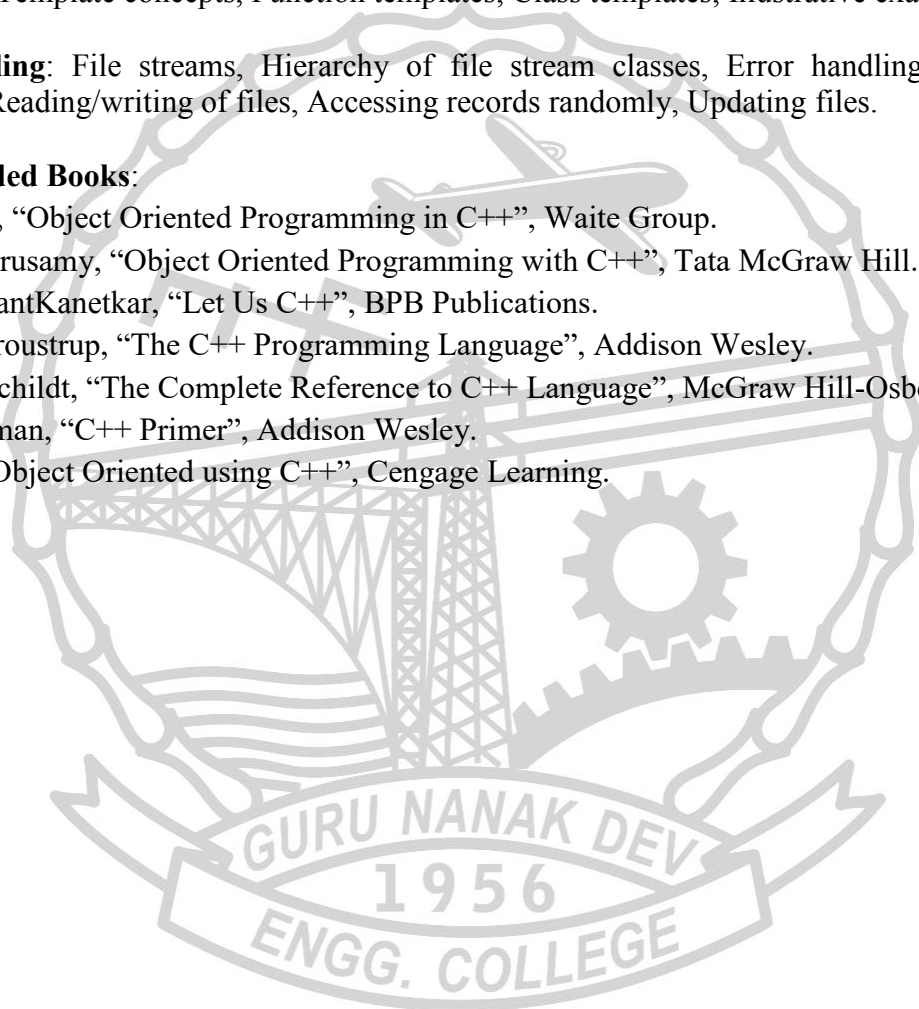
CS-14306 Digital Circuits and Logic Design Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
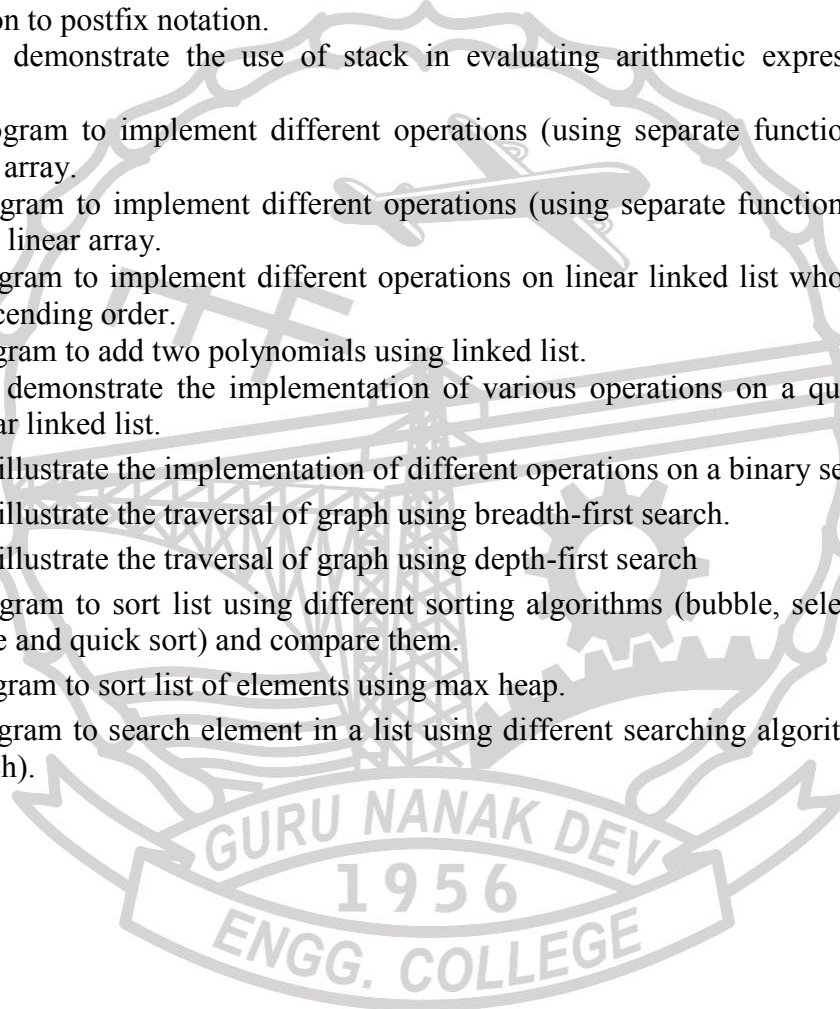Total Marks: 50

1. Study of various Integrated Circuits SSI, LSI, MSI, VSLI.
2. Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates using various IC's.
3. Realization of OR, AND, NOT and XOR functions using universal gates IC's 7400 and 7402.
4. Half adder / Full adder: Realization using basic and XOR gates IC's.
5. Half subtractor / Full subtractor: Realization using IC's 7400 and 7402.
6. Realization of IC7483 as Parallel adder/subtractor.
7. 4-Bit Binary-to-Gray and Gray-to-Binary Code Converter: Realization using basic, XOR gates and universal gates.
8. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
9. Multiplexer: Truth-table verification and realization of half adder and full adder using IC74153 chip.
10. Demultiplexer: Truth-table verification and realization of halfsubtractor and full subtractor using IC74139 chip.
11. Flip Flops: Truth-table verification of JK master slave FF, T-type and D-type FF using IC7476 chip.
12. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 & IC7493 chip.
13. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter using IC74192 and IC74193 chip.
14. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO and shift left operations using IC7495 chip.
15. DAC Operation: Study of 8-bit DAC (IC 08/0800 chip), Obtain staircase waveform using IC7493 chip.
16. ADC Operations: Study of 8-bit ADC.
17. To conduct an experiment to store a set of data in RAM using IC2114.

CS-14307 Data Structures and Algorithms Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

	L	T	P
	0	0	4

1. Write a program to implement different operations (using separate functions) on a linear array.
2. Write a program to implement different operations (using separate functions) on a Stack.
3. Write a program to demonstrate the use of stack in converting arithmetic expression from infix notation to postfix notation.
4. Program to demonstrate the use of stack in evaluating arithmetic expression in postfix notation.
5. Write a program to implement different operations (using separate functions) on a queue using linear array.
6. Write a program to implement different operations (using separate functions) on a circular queue using linear array.
7. Write a program to implement different operations on linear linked list whose elements are stored in ascending order.
8. Write a program to add two polynomials using linked list.
9. Program to demonstrate the implementation of various operations on a queue represented using a linear linked list.
10. Program to illustrate the implementation of different operations on a binary search tree.
11. Program to illustrate the traversal of graph using breadth-first search.
12. Program to illustrate the traversal of graph using depth-first search
13. Write a program to sort list using different sorting algorithms (bubble, selection, insertion, radix, merge and quick sort) and compare them.
14. Write a program to sort list of elements using max heap.
15. Write a program to search element in a list using different searching algorithms (linear and binary search).

CS-14308 Object Oriented Programming Lab

Internal Marks: 30   L   T   P

External Marks: 20   0   0   4

Total Marks: 50

1. Program to find the area and circumference of the circle
2. Program to interchange the values of two numbers.

[Control statements]
3. Program to find all roots of quadratic equations.
4. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C++ program to find the 2's complement of a binary number.
5. Program to reverse an integer number.
6. A program that read any line of text & display number of upper case, lower case, digit, space & other character.
7. Write a program that will read the value of x and evaluate the following function:
    $Y= 2$ for $x>0$, $Y=0$ for $x=0$. Use nested statements with the conditional control statement.
8. Program to display the different colors using the switch statement.

[Arrays and Strings]
9. Program to find the minimum and maximum element of an array.
10. Program to use various string handling functions.
11. Program to find the sum of two matrices.

[Classes and Objects]
12. Program to illustrate the concept of classes and object.
13. Program to illustrate the concept of nesting of member functions.
14. Program to illustrate the concept of inline function within a class.
15. Program to illustrate the concept of friend function in a class.
16. Program to show the working of static members in a class.

[Constructors and Destructors]
17. Program to illustrate the concept of default constructor, parameterized constructor and copy constructor.
18. Program to illustrate the concept of destructors.

[Overloading and Type Conversions]
19. Program to overload the unary operator and binary operator.
20. Program to illustrate the concept of type conversions basic to class type, class to basic type, class to class type.

[Inheritance]

21. Program to illustrate the concept of inheritance.
22. Program to illustrate the concept of ambiguity in multiple inheritance.
23. Program to illustrate the concept of virtual base class in inheritance.
24. Program to illustrate the order of execution of constructors and destructors in inheritance.

[Polymorphism]

25. Program to illustrate the concept of overloaded function having different number of arguments in the different overloaded forms.
26. Program to illustrate the concept of virtual functions and pure virtual functions.

[Exception handling]

27. Program to illustrate the throwing and catching of an exception.

[File handling and Templates]

28. Program to illustrate the concept of file pointers.
29. Program to perform read and write operations on a file.
30. Program to illustrate the concept of templates.

Any one project

Banking System Project

Description: The C++ program on BANKING SYSTEM has **account class** with data members like account number, name, deposit, withdraw amount and type of account. Customer data is stored in a **binary file**. A customer can deposit and withdraw amount in his account. User can create, modify and delete account.

or

Library Management System Project

Description: The C++ menu driven program on LIBRARY MANAGEMENT SYSTEM has **book and student class** with data members like book no, bookname, authorname. Books record is stored in a **binary file**. A student can issue book and deposit it within 15 days. Student is allowed to issue only one book. Student Records are stored in binary file. Administrator can add, modify or delete record.

CS-14401 Discrete Structures

Internal Marks: 40
External Marks: 60
Total Marks: 100

	L	T	P
	3	1	0

Fundamentals of Sets, Relations and Functions: Sets – Operations on sets, Subsets, Types of sets, Ordered pairs, Proofs of general identities of sets, Classes of sets and partitions. Relations – Representations of relations, Types of relations, Composition of relations, Closure properties of relations, Equivalence relations, Compatibility relations, Partial order relations. Functions – Introduction and types of functions, Hashing functions, Recursively defined functions.   [8]

Prepositional and Predicate Logic: Prepositions and compound prepositions, Logical connectives, Truth tables, Logical implication and logical equivalence, Normal forms– Conjunctive and Disjunctive, Validity of well-formed formula, Propositional inference rules– Modus ponens and modus tollens. Predicate logic, Universal and existential quantification, Limitations of propositional and predicate logic.   [4]

Algebraic Systems: Introduction, Operations, Semi groups, Monoids, Groups, Subsemigroups and submonoids, Sub groups, Cyclic groups, Cosets, Normal subgroups, Dihedral groups, Homomorphism and isomorphism of groups, Applications of groups. Rings – Introduction, Abelian ring, Ring with unity, Multiplicative inverse, Subrings, Homomorphism of rings, Integral Domain, Ideals, Quotient rings and Euclidean domains.   [10]

Boolean Algebra: Boolean algebra, Boolean sub-algebra, Boolean rings, Application of Boolean algebra (Logic implications, Logic gates, Karnaugh-map).   [2]

Combinatorial Mathematics: Basic counting principles, Permutations and combinations, Pigeonhole principle, Inclusion and exclusion principle, Recurrence relations – Solving homogeneous and non-homogeneous recurrence relations, Sequences, Generating function.   [8]

Graph Theory: Graphs – Graph terminology, Directed and undirected, Connectivity, Eulerian chains and cycles, Hamiltonian chains and cycles, Shortest paths algorithms – Dijkstra's algorithm, Warshall's algorithm. Spanning tree algorithms – Kruskal's algorithm, Prim's algorithm. Graph coloring, Chromatic number, Planar graphs, Euler's formula, Isomorphism and homomorphism of graphs, Applications of graph theory.   [8]

Recommended Books:
1. S. Lipschutz , "Discrete Mathematics", Schaum series McGraw Hill.
2. Alan Doerr and Kenneth Levarseur, "Applied Discrete Structures for Computer Science", Pearson Education, Inc.
3. K.H. Rosen, "Discrete Mathematics and its applications", Mc Graw hill.
4. C.L. Liu , " Elements of Discrete Mathematics" , Tata McGraw Hill.

CS-14402 Operating Systems

Internal Marks: 40   L T P

External Marks: 60   3 1 0

Total Marks: 100

Introduction: Introduction to Operating systems, Different types of operating systems – Batch, Multiprogrammed, Time sharing, Real time, Distributed, Parallel. Functions of kernel and shell, General structure of Operating System, O/S services, System calls. [5]

Process Management: Concept of processes and threads, Process states, Process control block, Process scheduling, Scheduling Algorithms, Inter Process Communication, Process synchronization – Critical sections, Mutual Exclusion, Semaphores. [8]

Deadlocks: Introduction to deadlocks, Conditions for deadlock, Resource allocation graphs, Deadlock prevention and avoidance, Deadlock detection and recovery. [5]

Memory Management: Background, Overlays, Logical versus physical address space, Memory management policies, Fragmentation types, Partitioned memory managements, Paging, Segmentation, Segmentation with paging, Need of Virtual memories, Demand paging, Page replacement algorithms – FIFO, Optimal, LRU. Thrashing, Cause of thrashing, Local and Global page replacement. [9]

Secondary Storage: Disk structure**,** Disk scheduling – FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK. Disk management, Disk formatting, Boot blocks, Bad blocks. [4]

File Management: Concept of files, File types, Access methods, File attributes, File operations, Allocation methods – Contiguous, Linked, Indexed. File System Architecture, Layered Architecture, Protection mechanisms. [5]

Case Studies: Windows, UNIX and LINUX. [4]

Recommended Books:
1. A.Silberschatz and Peter B. Galvin, "Operating System Concepts", Addison Wesley.
2. Dhamdhere, "Systems Programming & Operating Systems", Tata McGraw Hill.
3. GaryNutt, "Operating Systems Concepts"**,** Pearson Education Ltd.
4. Tanenbaum A.S., "Operating System Design & Implementation", Pearson Education.
5. Pramod Chandra and P. Bhatt, "An introduction to operating systems concepts & Practices", Prentice Hall of India Publication.
6. A. Godbole, "Operating systems", Tata McGraw Hill.

CS-14403 Computer Networks

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Data communication system and its components, Data flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks. Network topologies, Network devices – Hosts, Router, Hub, Switch, Bridge, Access point, Firewall, ISPs.Network layers, Protocols, Interfaces and services, ISO-OSI reference model, TCP/IP reference model and their comparison.   [7]

Physical Layer: Concept of analog and digital signal, Bandwidth, Transmission impairments – Attenuation, Distortion, Noise. Data rate limits – Nyquist formula, Shannon formula. Multiplexing – Frequency division, Time division, Wavelength division. Transmission media – Twisted pair, Coaxial cable, Fiber optics, Wireless transmission –Radio, Microwave, Infrared. Switching – Circuit, Message and Packet switching.   [6]

Data Link Layer: Design issues, Framing, Error detection and correction codes – Checksum, CRC, Hamming code. Data link protocols for noisy and noiseless channels, Sliding Window Protocols – Stop and Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols – HDLC, PPP and SLIP.   [6]

Medium Access Sub-Layer: Static and dynamic channel allocation, Random Access – ALOHA, CSMA protocols, Controlled access: Polling, Token passing, IEEE 802.3 frame format, Ethernet cabling, Manchester coding, collision detection in 802.3, Binary exponential back off algorithm.   [6]

Network Layer: Design issues, IPv4 addressing, Subnetting, Internetworking, Routing algorithms – Distance vector and link state routing. Congestion control – Principles of congestion control, Congestion prevention policies, Leaky bucket and token bucket algorithm [5]

Transport Layer: Design issues, Elements of transport protocols – Addressing, Connection establishment and release, Flow control and buffering, Multiplexing and de-multiplexing, Crash recovery. Introduction to TCP/UDP protocols.   [3]

Session, Presentation and Application Layers: Session Layer – Design issues, remote procedure call. Presentation Layer – Design issues, Data compression techniques, Cryptography. Application Layer – Distributed application (client/server, peer to peer, cloud etc.), World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), HTTP as an application layer protocol, Remote login – Introduction to protocol specification.   [6]

Recommended Books:
1. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
2. Behrouz A. Forouzan, "Data Communication &Networking",Tata McGraw Hill.
3. James F. Kurose and Keith W. Ross, "Computer Networking",Pearson Education.
4. Douglas E. Comer, "Internetworking with TCP/IP", Volume-I, Prentice Hall, India.
5. W. Stallings, "Data and Computer Communication", Prentice Hall of India

CS-14404 Microprocessor Architecture and Programming

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Microprocessor Architecture: Introduction to microprocessors, 8085 microprocessor architecture – Bus structure, Register organization, Timing and control module. Timing diagrams – Memory and instruction execution sequence, T-states, Machine cycle, Instruction cycle.   [8]

Programming with 8085: Addressing modes, Instruction classification, Instruction formats, Data transfer operations, Arithmetic operations, Logical operations, Branch operations, Stack and subroutine operations, looping, counting and indexing operations.   [10]

Interfacing: Memory and I/O mapped I/O, Programmable interfaces – 8255 programmable peripheral interface, 8251 USART, 8253 counter/timer, 8259 interrupt controller, 8237 DMA controller and 8279 keyboard controller.   [8]

Higher order Microprocessors: 8086 microprocessor architecture, Programming model, Addressing modes. Introduction to features and architecture of Motorola 68000 and Pentium Processors.   [6]

Microprocessor Applications: Interfacing of keyboards and seven segment LED display, Microprocessor controlled temperature system (MCTS), Study of traffic light system, stepper motor controller.   [8]

Recommended Books:
1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publishing (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", Tata McGraw Hill.
3. Ayala Kenneth, "The 8086 Microprocessor Programming and Interfacing", Cengage Learning.
4. M. Rafiquzzaman "Microprocessor Theory and Applications with 68000/68020 and Pentium", Wiley Publications.
5. Charles M. Gilmore, "Microprocessors: Principles and Applications", McGraw Hill.
6. A.P. Mathur, "Introduction to Microprocessors", Tata McGraw Hill.
7. P.K. Ghosh and P.R. Sridhar, "0000 To 8085: Introduction to Microprocessors for Engineers and Scientists", PHI Learning.

CS-14405 Java Programming

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: History of Java,Importance of Java to the internet, Java's Magic – The Bytecodefeatures of Java, Overview of Java. [2]

Java Basics: Data-types, Variables, Arrays, Operators, Expressions, Control statements, Type conversion, Concepts of classes and objects, Constructors, Methods, Access control, this keyword, Garbage collection, Overloading methods and constructors, Parameter passing, Recursion, Understanding static, Introducing nested and inner classes, Using command line arguments, Introduction to string handling. [9]

Inheritance: Basics of inheritance, Types of inheritance, Member access rules, Using super, Using final with inheritance, Method overriding, Dynamic method dispatch, Using abstract classes. [5]

Packages and Interfaces: Defining a package, Accessing a package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, implementing interface, Variables in interface, Extending interfaces. [4]

Exception Handling: Concepts of exception handling, Exception types, Using try, catch, throw, throws and finally, Java's built in exceptions, Creating own exception subclasses. [3]

Multithreading: Java thread life cycle, Creating threads, Using isAlive() and join(), Synchronization, Interthread communication, Suspending, resuming, stopping threads. [4]

Event Handling: Delegation event model,Event classes, Sources of events, Event listeners, Handling mouse and keyboard events, Adapter classes, Inner classes. The AWT class hierarchy, User interface components – Labels, Button, Canvas, Scrollbars, Text components, Check box, Check box groups, Choices. Lists panels – Scrollpane, Dialogs, Menubar, Graphics. Understanding layout managers – Flow Layout, BorderLayout, GridLayout and CardLayout. [5]

Applets: Basics of applets, Differences between applets and applications, Life cycle of an applet, Types of applets, The HTML applet tag, Creating applets, Passing parameters to applets. [4]

Networking: Networking basics, Java and the Net, TCP/IP client sockets URL, URL connection, TCP/IP server sockets, Database connectivity. [4]

Recommended Books:
1. Herbert Schildt , "The Complete Reference Java 2" , Tata McGraw-Hill.
2. Joyce Farrell, "Java for Beginners", Cengage Learning.
3. J. Nino and F.A. Hosch, "An Introduction to programming and OO design using Java", John Wiley & Sons.
4. Y. Daniel Liang, "Introduction to Java programming", Pearson education.

CS-14406 Operating System Lab

Internal Marks: 30
External Marks: 20
Total Marks: 50

	L	T	P
	0	0	4

1. Installation process of various Operating Systems.
2. Virtualization, Installation of virtual machine software and installation of Operating System on virtual machine.
3. Execute various basic Linux commands, commands for files and directories, creating and viewing files, File comparisons, Disk related commands.
4. Execute Linux commands for processes in Linux, connecting processes with pipes, background processes, managing multiple processes.
5. Study and usage of vi Editor.
6. Basics of Shell programming, various types of shell, Shell Programming in bash.
7. Study and implementation of shell variables, shell keywords.
8. Implement conditional statements, looping statement and case statement in Shell programming.
9. Implement parameter passing and arguments in Shell programming.
10. Implement Shell programs for automate system tasks and report printing.
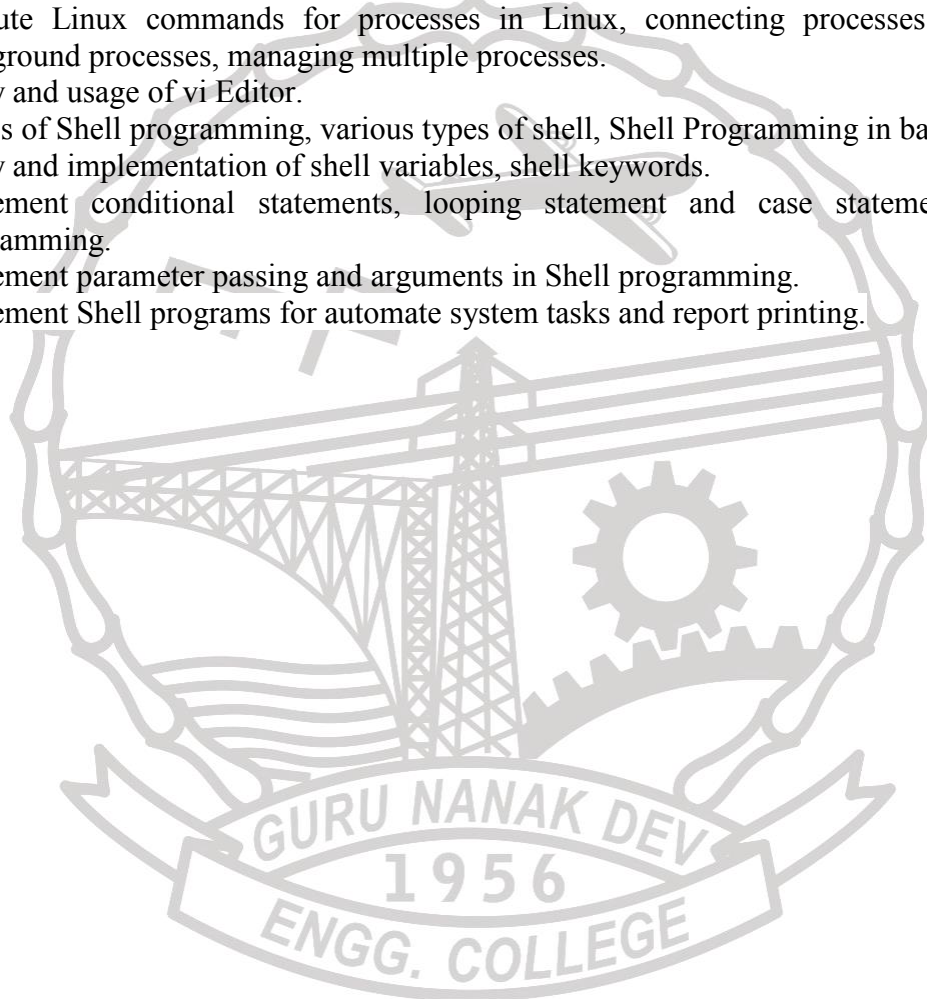
CS-14407 Computer Networks Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
Total Marks: 50

1. Familiarization with networking components and devices: LAN Adapters, Hubs, Switches, Routers etc.
2. Familiarization with transmission media and tools: Coaxial cable, UTP cable, Crimping tool, Connectors etc.
3. Preparing straight and cross cables.
4. Study of various LAN topologies and their creation using network devices, cables and computers.
5. Configuration of TCP/IP Protocols in Windows and Linux.
6. Implementation of resource (file, printer, etc.) sharing.
7. Designing and implementing class A, B and C networks.
8. Subnet planning and its implementation.
9. To configure dynamic IP address for a computer connected to a LAN.
10. Use of commands like ping, ipconfig for trouble shooting network related problems.
11. Develop a program to compute the Hamming Distance between any two code words.
12. Installation of ftp server and client.
13. To configure proxy server.
14. Familiarisation with network simulation tools.
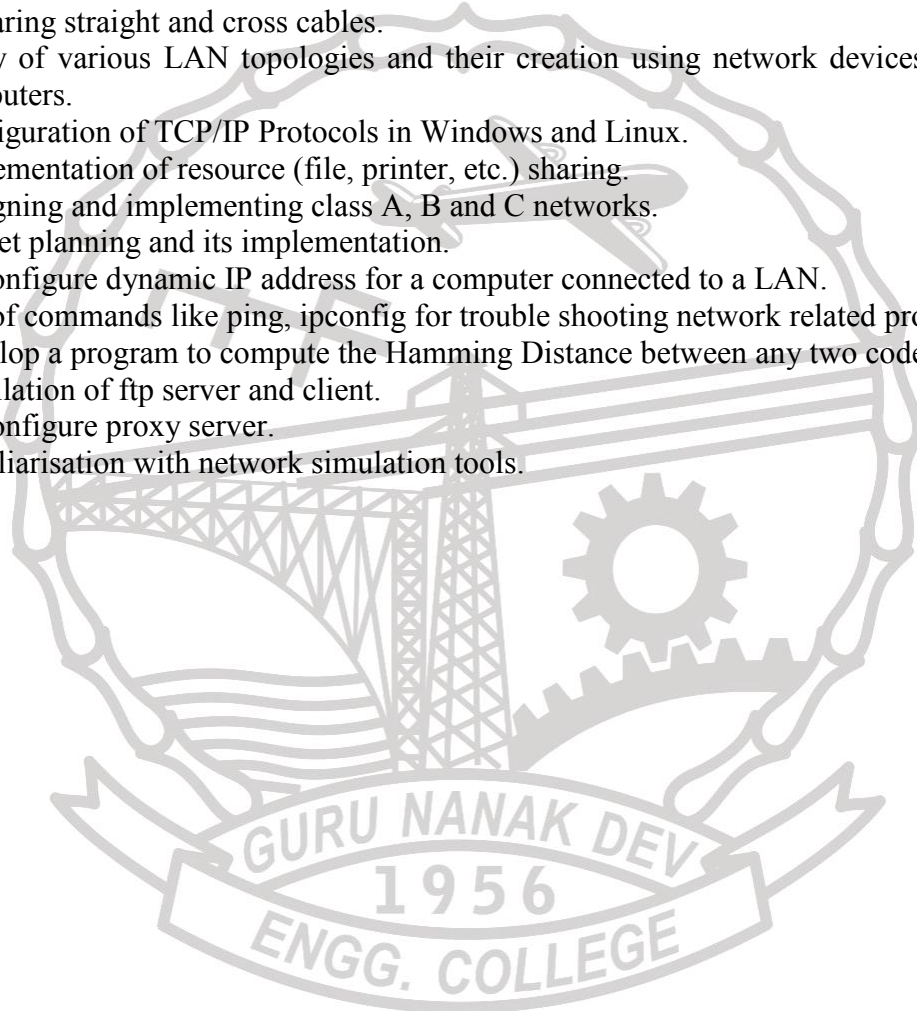
CS-14408 Microprocessor Architecture and Programming Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Introduction to 8085 microprocessor kit.
2. Write a program to perform addition operation for two 8-bit numbers, sum is 8 bit.
3. Write a program to perform addition operation for two 8-bit numbers, sum is 16bit.
4. Write a program to perform addition operation for two 16-Bit numbers , sum is 16-bit
5. Write a program to perform decimal addition of Two 8-Bit numbers, sum is 8-bit.
6. Write a program to perform subtraction of two 8 bit numbers.
7. Write a program to perform subtraction of two 16 bit numbers.
8. Write a program to find 1's complement of 8 bit number.
9. Write a program to find 2's complement of 8 bit number.
10. Write a program to shift an 8 bit no. by one bit.
11. Write a program to perform multiplication of two 8 bit numbers.
12. Write a program to find largest of two 8 bit numbers.
13. Write a program to find largest among an array of ten numbers (8 bit).
14. Write a program to perform ascending order operation on an array of 10 numbers.
15. Write a program to find sum of series of 8 bit numbers.
16. Write a program to find out Square Root of 0, 1, 4, 9, 16, 25, 36, 49, 64 and 81 using Look up Table.
17. Write a program to control the traffic light system using 8085 and 8255.
18. Write a program to seven segment display using 8085 and 8255.
19. Introduction to 8086 microprocessor kit.
20. Write a program to perform addition operation for two 16 bit numbers, sum 16 bit.
21. Write a program to perform subtraction of two 16 bit numbers.
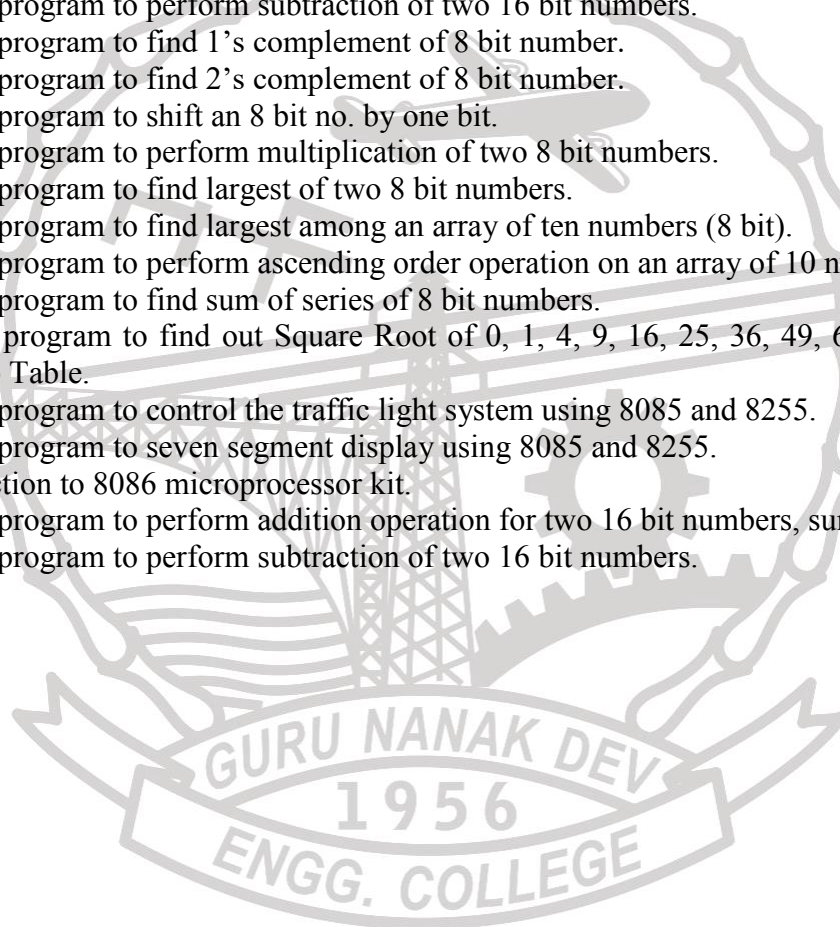
CS-14409 Java Programming Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
Total Marks: 50

1. Implementation of basic Java programs.
2. Implementation of control structures.
3. Implementation of classes and objects.
4. Using constructors and overloaded methods.
5. Reading and writing Console Input / Output.
6. Implementing Inheritance concepts.
7. Implementation of Packages and Interfaces.
8. Using Exception handling mechanism.
9. Implementation of multithreading concepts.
10. Implementing mouse events and keyboard events.
11. Implementation of Applets.
12. Using basic networking features.
13. Connecting to database using JDBC
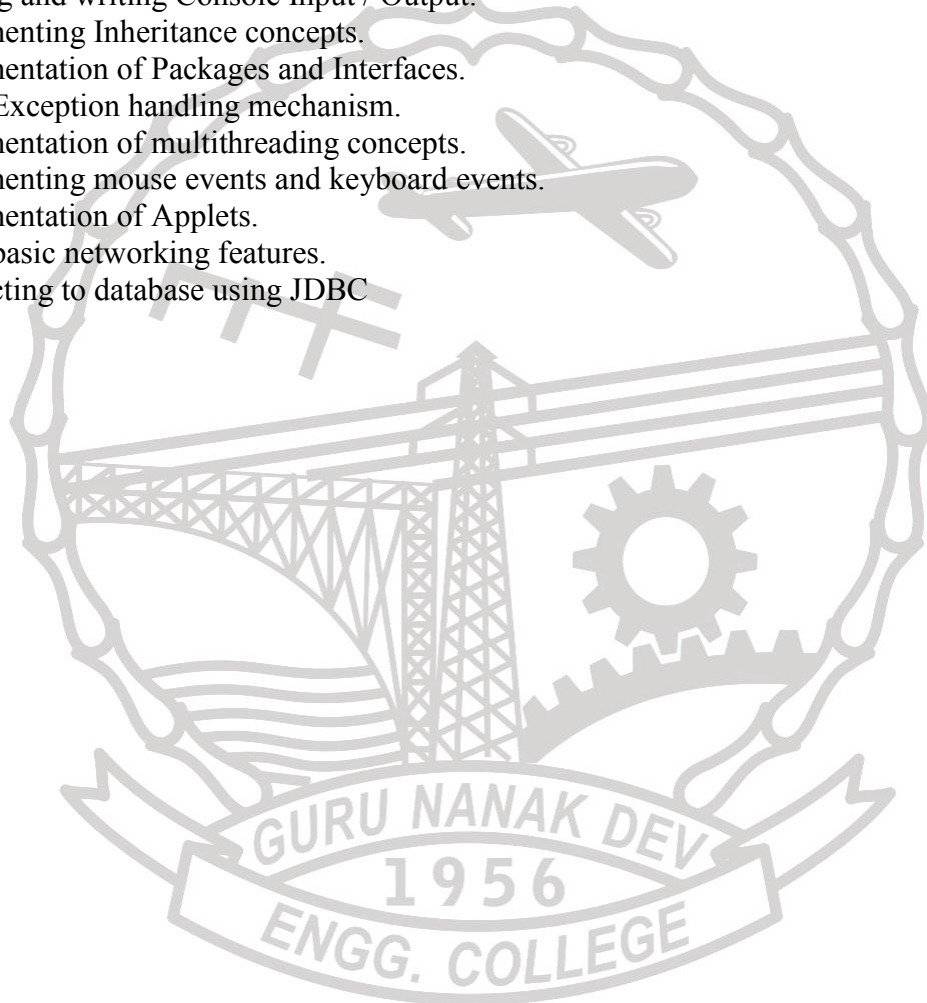
CS-14501 Relational Database Management System

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Database System: Database systems versus file systems, Characteristics of the Database approach, Database users and administrators, Advantages and disadvantages of using DBMS approach, Data models, Data independence, Database languages, Classification of DBMS, Client- Server architecture. [5]

Entity Relationship Model: Entity types, Entity sets, Attributes and keys, Relationship types, Relationship sets, Roles and structural constraints, Weak entity types, Design choices for ER conceptual design, UML class diagrams. [4]

Relational Model: Relational model concepts, Constraints, Update operations, Transaction and dealing with constraint violations. Relational Algebra –Unary relational operations, Operations from Set theory, Binary relational operations, DIVISION operation and additional relational operations. Relational Calculus – Tuple relational calculus and Domain relational calculus, Queries related to Relational Algebra and Relational Calculus. [7]

SQL: SQL Data Definition and data types, Specifying constraints in SQL, Schema change statements , Basic queries in SQL, Set operations, Aggregate functions and views, Complex queries in SQL, Additional features of SQL, Query processing and optimization. [7]

Relational Database Design: Informal design guidelines for Relational Schemas, Functional dependencies, Inference rules for functional dependencies, Equivalence of set of functional dependencies, Minimal cover, Normal forms based on primary keys– (NF, 2NF, 3NF, 4NF and 5NF, Decomposition into normalized relations. Physical Database Design – File structures (Sequential files, Indexing, B tree). **[7]**

Transaction Management and Concurrency Control: Need of concurrency control, ACID properties, Schedules, Characterizing schedules based on recoverability and serializability, Two -phase locking techniques for concurrency control. [4]

Database Recovery and Security: Need of recovery, Recovery concepts, Recovery techniques-Deferred update, Immediate update, Shadow paging. Database security – Threats to databases, Control measures, Database security and DBA, Discretionary access control based on granting and revoking privileges, Mandatory access control, Introduction to Statistical Database Security, Encryption and decryption. [7]

Recommended Books:
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw Hill Education.
2. RamezElmasri, Shamkant B Navathe, "Fundamentals of Database Systems", Pearson Education.

3. Connolly, "Specifications of Database Systems: A Practical Approach to Design, Implementation and Management", Pearson India.
4. Alexis Leon, Mathews Leon, "Database Management Systems" Leon Press.
5. S.K. Singh, "Database Systems Concepts, Design and Applications, Pearson Education.
6. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems" Tata McGraw-Hill.
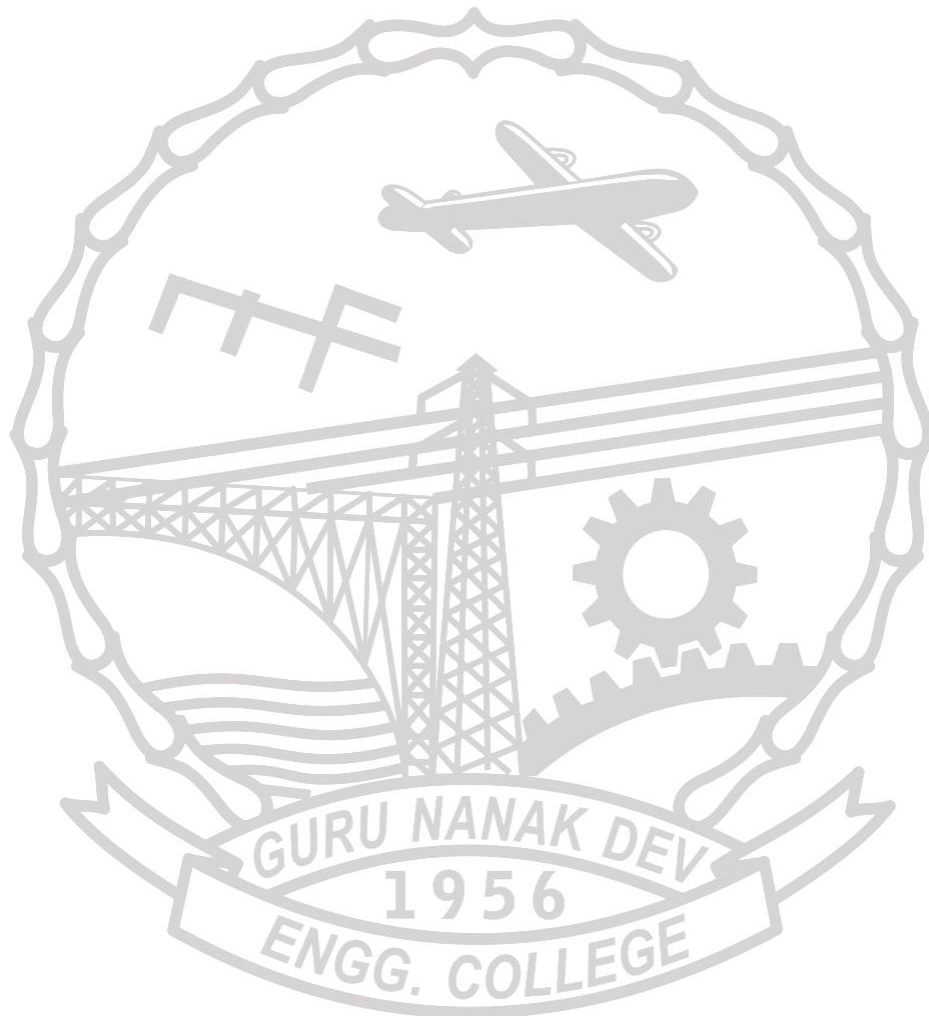
CS-14502 Computer Graphics

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Overview of computer graphics, Computer graphics applications, Different I/O devices with specialized graphics features, Display technologies- Storage tube graphic displays, Raster scan systems, Random scan systems, LCD and LED displays, Cathode ray tube, Color CRT, Video basics – Video controller, Random-scan display processor. [5]

2D Primitives: Scan conversion basics, Algorithm for scan converting a point, Scan converting a line – Digital differential analyser algorithm, Bresenham's line algorithm, Scan converting circle – Bresenham's circle drawing algorithm, Midpoint circle drawing algorithm, Scan converting ellipse. [6]

2D Viewing: Window to viewport transformations, 2D transformations– Scaling, Translation, Rotation, Reflection, Shear, Matrix representations and homogeneous coordinates, Composite transformations. [5]

Clipping and Filling Techniques: Algorithm for point clipping, Line clipping (Cohen Sutherland, Weiler Atherton, Liang Barsky algorithms), Polygon clipping, Text clipping. Boundary fill, Floodfill, Edgefill and Fencefill algorithms. [5]

3D Concepts and Object Representation: Representation of 3D transformations, 3D viewing, Viewing pipeline, Viewing coordinates, Parallel and perspective transformations with their classifications. [5]

Visible-Surface Determination: Techniques for efficient visible-surface algorithms, Categories of algorithms, Back face removal, The z-Buffer algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-surface ray tracing, Comparison of the methods. [5]

Rendering Methods: Light sources, Illumination and shading models for polygons, Ray tracing, Reflectance properties of surfaces, Types of reflections- Ambient, Specular and Diffuse reflections, Phong's model, Gouraud shading. [5]

Advanced Topics: Image Processing – Purpose and types, Animation basics – Methods of controlling animation, Principles of animation, Multimedia applications. [4]

Recommended Books:
1. D. Hearn and M.P. Baker, "Computer Graphics", PHI/Pearson Education.
2. Zhigand Xiang, Roy Plastock, **"**Computer Graphics", Tata Mc-Graw Hill.
3. C. Foley, VanDam ,Feiner and Hughes, "Computer Graphics Principles & Practice", Pearson Education.
4. Amarendra N Sinha, Arun D Udai, "Computer Graphics", Tata Mc-Graw Hill.
5. Rogers, Adams, "Mathematics Elements for Computer Graphics", Tata Mc-Graw Hill.

CS-14503 Design and Analysis of Algorithms

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Algorithm and its importance, Mathematical foundations– Growth functions, Complexity analysis of algorithms.   [4]

Divide and Conquer: Basic technique and its application on Binary Search, Finding maximum and minimum and on sorting techniques such as merge sort, Quick sort.   [4]

Greedy Algorithms: General method, Using greedy algorithm to solve Knapsack problem, Minimum-cost spanning tree problem, Single source shortest path problem and Travelling salesperson problem.   [6]

Dynamic Programming: Introduction to dynamic programming and application of the algorithm to solve multistage graphs, All pairs shortest path problem and Knapsack problem. [6]

Backtracking: General backtracking algorithm, Application of backtracking to 8 Queens' problem, Sum of subsets, Graph coloring, Hamiltonian cycles and Knapsack problem.   [6]

String Matching Algorithms: Introduction, Brute Force algorithm, Rabin-Karp algorithm, KMP algorithm, Boyer-Moore algorithm.   [5]

NP-completeness and Approximation Algorithms: Introduction to P, NP, NP-hard and NP-complete problems, Examples of NP-complete problems, Introduction to approximation algorithms, Absolute approximations, E-approximations   [7]

Recommended Books:
 1. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Fundamentals of Computer Algorithms" Galgotia Publications.
 2. Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, and Clifford Stein, "Introduction to Algorithms", MIT Press.
 3. SanjoyDasgupta, Christos Papadimitriou, and UmeshVazirani, "Algorithms", McGraw-Hill Education.
 4. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Wiley.
 5. Alfred V. Aho, John E. Hopcroft, and Jeffrey. D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
 6. John Kleinberg and Eva Tardos, "Algorithm Design", Pearson Education.

CS-14504 Web Technologies

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Internet and Web: History and evolution of internet protocols, Internet addressing, Internet Service Provider (ISP), Introduction to WWW, DNS, URLS, HTTP, HTTPS, SSL, Web browsers, Cookies,Web servers, Proxy servers, Web applications   [6]

HTML and DHTML: Introduction to HTML and DHTML, Basic structure of an HTML document, Working with – Text, Lists, Tables, Frames, Hyperlinks, Images and multimedia, Forms and controls, Audio and video, Creating Style Sheet, Style definitions, CSS font properties, Text formatting, Types of CSS – Inline, Internal and External CSS style sheets.   [8]

Java Script: Introduction, JavaScript's history and versions, Basic syntax, Variables, Data types, Statements, Operators, Functions, Arrays, Objects, Dialog boxes, JavaScript DOM.   [6]

PHP: Introduction, Syntax, Data types, Variables, Constants, Expressions, Strings, Control structures, Functions, Arrays, Operators, Super-global arrays, Sessions, E-mail, PHP and MySQL, PHP and AJAX.   [8]

JSON: Concepts and Terminology, JSON– Syntax, Schema, Data types, Objects, Reading and writing JSON on client and server. Using JSON in AJAX applications.   [6]

Advanced Topics: Deploying a website on server, Search engine optimisation, Web application testing and security, Web APIs.   [6]

Recommended Books:
1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education.
2. Ivan Bayross, "Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl, CGI", BPB Publications.
3. Rajkamal, "Internet and Web Technology", Tata McGraw Hill.
4. Steven M. Schafer, "HTML, XHTML and CSS", Wiley Publishing.
5. Peter Moulding, "PHP Black Book", Coriolis.
6. Ray Rischpater, "JavaScript JSON Cookbook", Packt Publishing.

DECS-14505 Advanced Computer Architecture

Internal Marks: 40
External Marks: 60
Total Marks: 100

L   T   P
3   1   0

Introduction: Elements of modern computers, Taxonomy of MIMD computers, Speedup performance laws − Amdahl's law for a fixed workload, Gustafson's law for scaled problems, Memory-bounded speedup model. [4]

Pipelining: Basic concepts, Pipelining hazards− Data, control and structural, Techniques for resolution of hazards, Pipeline performance analysis, Arithmetic pipelines, Instruction pipelines, Instruction level parallelism, Pipeline collision prevention and pipeline chaining, Case study of pipelined systems. [6]

Hierarchical Memory Technology: Inclusion, Coherence and locality properties, Cache memory − Cache performance, Reducing cache miss penalty and miss rate, Techniques for reducing cache misses, Virtual memory organization, Mapping and management techniques, Memory replacement policies. [8]

Vector processor: Basic vector architecture, Issues in Vector Processing, Vector performance modeling, Memory to memory vector architectures, Vector register architecture, Vector length and stride issues. [5]

Array processors: Array processing, SIMD array processors, SIMD interconnection networks, Algorithms for array processing, Comparison with vector processors. [4]

Parallel Programming Techniques: Message passing program development, Synchronous and asynchronous message passing, Message passing parallel programming, Shared memory Programming, Data parallel programming. [7]

Multiprocessing: Processor organizations- mesh, Binary tree, Shared memory and message passing systems, Mapping and scheduling − Embedding of task graphs in processor graphs, Dilation and loading, Load balancing, Models for static and dynamic scheduling. [6]

Recommended Books:
1. K. Hwang, "Advanced Computer Architecture", Tata McGraw-Hill.
2. Patterson D.A. and Hennessy, J.L. "Computer Architecture A Quantitative Approach", Morgan Kaufman.
3. H.S. Stone, "Advanced Computer Architecture", Addison Wesley.
4. Hwang & Briggs, "Computer Architecture & Parallel Processing", Tata McGraw-Hill.

DECS-14506 Cryptography and Network Security

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Network Security: Essentials of network security, Architecture, Security – Attacks and various types of attacks, Services and mechanism, Crypt analysis, Steganography, Applications of network security.   [5]

Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Block cipher– DES, Triple DES, AES. Stream ciphers – RC4.   [5]

Public Key Cryptography and RSA: Principles of public key cryptosystems, RSA algorithm, Key management, Diffie Hellman key exchange.   [5]

Data Integrity: Message authentication, Authentication requirements, Authentication functions, Hash functions – SHA-1, Keyed hash functions. Message authentication codes, MD5 message digest algorithms, Digital signatures and Digital signature standards.   [7]

Authentication Applications: Kerberos, X.509 Directory authentication service. Electronic mail security – Pretty good privacy. IP Security – Overview, IP security architecture, Authentication header, Encapsulation security payload. Web security – Web security requirements, Secure sockets layer. Transport layer security, Secure electronic transaction.   [10]

System Security: Intruders, Malicious software, Viruses and related threats, Counter measures, Firewalls and their design principles.   [4]

Recommended Books:
1. William Stallings, "Network Security Essentials, Applications and Standards ", Pearson Education.
2. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education.
3. Behrouz A. Forouzan, "Cryptography & Network Security", McGraw-Hill Education.
4. AtulKahate," Cryptography & Network Security", Tata Mc Graw Hill.
5. Trappe & Washington, "Introduction to Cryptography with Coding Theory", Prentice-Hall.

DECS- 14507 Wireless Networks

Internal Marks: 40   L T P

External Marks: 60   3 1 0

Total Marks: 100

Introduction: History and evolution, Types of wireless networks, IEEE Standards for wireless, benefits, Applications, Problems and challenges.   [5]

Wireless Principles: Electromagnetic spectrum, Attenuation and multipath fading, Antenna and propagation models, Signal encoding, Spread spectrum, Coding and multiple access techniques.
                                                                                            [5]

Wireless Networking: Satellite communications, Cellular wireless networks, Cordless systems and wireless local loop, Mobile communications, Mobile IP and Wireless Access Protocol.   [6]

Wireless LAN: Introduction, Benefits, WLANs configurations and standards, Security, IEEE 802.11 standard– Physical and MAC layer, RTS/CTS, CDMA/CA, Infrastructure vs Adhoc, Routing protocols –AODV and DSR, QoS, Voice over WLAN, HIPERLAN, WiMax standard.
                                                                                            [8]

Cellular Concept and Networks: Design and principles of cellular operation, Cellular telephony operations, Frequency re-use, Channel assignment, Hand-off, Interference, Improving quality. Networks example–1G (AMPS, NMT), 2G (D-AMPS, GSM, CT), 3G, 4G and 5G networks. Introduction to cellular technology and its protocols and applications– GSM, Adhoc and Sensor Networks.   [7]

Personal Area Networks: Architecture of Bluetooth systems, Physical and MAC layer details, Standards.   [4]

Security Issues: Attacks, WEP, WPA: History of WAP, Architecture and Components.   [5]

Recommended Books:
1. Theodore S. Rappaport, "Wireless Communication: Principles and Practices", Pearson Education.
2. Stallings, "Wireless Communications & Networks", Pearson Education.
3. Rogers, "Introduction to Wireless Technology", Pearson Education.
4. Gilbert Held, "Data Over Wireless Networks: Blue tooth, WAP and Wireless LANs", Tata McGraw Hill.

DECS-14508 Ethical Hacking

Internal Marks: 40   L T P

External Marks: 60   3 1 0

Total Marks: 100

Introduction: Understanding the importance of security, Concept of hacking – Threat, Attack, Types of hackers, Ethical hacking, Phases involved in hacking. [6]

Foot Printing: Introduction to foot printing, Understanding the information gathering methodology of the hackers, Web tools for foot printing, Trojans and backdoors, Virus and worms, Proxy and packet filtering. [7]

Scanning: Detecting live systems on the target network, Discovering services running on target systems, Understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting. [7]

Data Security: Physical Security – Attacks and protection. Steganography – Methods, Attacks and measures. Cryptography – Understand the use of cryptography over the internet through PKI, RSA, MD-5, Secure hash algorithm and secure socket layer. [7]

System Hacking: Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke loggers, Understanding sniffers,Comprehending active and passive sniffing, ARP spoofing and redirection, DNS and IP sniffing, HTTPS sniffing. [7]

Hacking Wireless Networks: Introduction to IEEE 802.11, Role of WEP, Cracking WEP keys, Sniffing traffic, Securing wireless networks. [6]

Recommended Books:
1. Thomas Mathew, "Ethical Hacking", OSB Publisher.
2. RajatKhare, "Network Security and Ethical Hacking", Luniver Press.
3. Stuart McClure, Joel Scambray and George Kurtz, "Hacking Exposed: Network Security Secrets & Solutions", McGraw-Hill.

DECS-14509 Network Protocols

Internal Marks: 40   L   T   P

External Marks: 60   3   1   0

Total Marks: 100

Review of Networking: Technologies & Internetworking concepts and Architectural model – Application level and Network level interconnection, Internet architecture, Interconnection through IP routers. [5]

Internet Addressing: Universal identifiers, Original classful addressing schemes, Network and broadcast addresses, Limited broadcast, Dotted decimal Notation, Weakness in internet addressing, Loopback addresses. [5]

Address Resolution Protocols Address resolution problem, Two types of physical addresses, Resolution through direct mapping and Dynamic binding, Address Resolution cache, ARP to other protocols. Reverse address resolution protocol, Timing RARP transaction, Primary and backup RARP severs. [6]

Connectionless Data Gram Delivery Protocols: Routing IP datagram's– Conceptual service organization, Connectionless delivery system, Purpose of the internet protocol. The internet datagram. Routing in an internet, Direct and indirect delivery, Table driven IP routing, Next hop routing, Default routes, Host specific routes, The IP routing Algorithm, Handling incoming datagrams, Establishing routing tables. [7]

Error & Control Messages Protocols: The internet control message protocols (ICMP), Error reporting versus error detection. ICMP message format, Detecting and reporting various network problems through ICMP. Transparent Router, Proxy ARP, Subset addressing, Implementation of subnets with masks representation, Routing in the presence of subsets, A unified algorithm. [7]

User Datagram Protocol (UDP): Format of UDP message, UDP pseudo-header, UDP encapsulation and Protocols layering and the UDP checksum computation. UDP multiplexing, De-multiplexing and Ports. [5]

Reliable Stream Transport service (TCP): The Transmission Control Protocol, Ports, Connections and Endpoint, Passive and active opens, TCP segment format, TCP implementation issues. [5]

Recommended Books:
1. Douglas E.Comer, "Internetworking with TCP/IP: Principles", Protocols.
2. Forouzan, "TCP-IP, Protocol Suit", TMH.
3. Comer, "Internetworking with TCP-IP", Vol. 3.

DECS-14510 Embedded Systems

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Embedded System: Definition of embedded system, Embedded system vs. general computing system, History and recent trends of embedded systems, Classification, Major application areas, Purpose of embedded systems.   [5]

Core of the Embedded System: General purpose and domain specific processors, ASICs, PLDs, Commercial off-the-shelf components (COTS), ROM, RAM, Memory according to the type of Interface, Memory shadowing, Memory selection for embedded systems, Sensors and actuators, Communication Interface – On-board and external communication interfaces.   [5]

Characteristics and Quality Attributes of Embedded System: Characteristics embedded systems, Operational, and non-operational quality attributes of embedded systems. Examples of application and domain specific embedded system.   [5]

Embedded System with 8051: Factors for selecting microcontroller, 8051 Microcontroller, Architecture of 8051, Memory organisation, Register, Oscillator unit, Ports, Interrupts, 8051 interrupt system.   [6]

Embedded Firmware: Analog electronics components and Digital electronics components, Printed circuit board layout design, Embedded firmware design approaches and Development languages.   [6]

RTOS Based Embedded System Design: Operating system basics, Types of operating systems, Tasks, Process and threads, Multiprocessing and multitasking, Task scheduling.   [7]

Task Communication: Shared memory, Message passing, Remote procedure call and sockets, Task synchronization – Task communication/synchronization issues, Task synchronization techniques. Device drivers, How to choose an RTOS.   [6]

Recommended Books:
1. Shibu K V, "Introduction to Embedded Systems", McGraw Hills.
2. Rajkamal, "Embedded Systems", TataMcGraw-Hill.
3. Frank Vahid, Tony Givargis, "Embedded System Design", Wiley.
4. Lyla, "Embedded Systems", Pearson.
5. David E. Simon, "An Embedded Software Primer", Pearson Education.

CS-14511 Relational Database Management Systems Lab

Internal Marks: 30   L   T   P

External Marks: 20   0   0   4

Total Marks: 50

1. Write the queries for Data Definition (create, drop, alter and rename) and Data Manipulation Language (select, insert, update and delete).
2. Write SQL queries using logical operators (<,>,=etc).
3. Write SQL queries using SQL operators (between, and, or, in, like, null).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra (union, intersect, and minus, etc.).
6. Write SQL queries for extracting data from more than one table (equi-Join, non-equi-join, outer join).
7. Write SQL queries for sub queries, nested queries.
8. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
9. Queries (along with sub Queries) using any, all, in, exists, notexists, union, intersect, constraints. Example - Select the roll number and name of the student who secured fourth rank in the class.
10. Queries using aggregate functions (count, sum, avg, max and min), group by, having and creation and dropping of views.
11. Queries using conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
12. Write SQL queries to create views and also apply different operations on views.
13. **Minor Project**: By using standard database design rules, database has to be designed for a specific assigned problem to a group of two to three students. ER diagram related to project must also be preparedwith an open source database tool like MYSQL workbench. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

CS-14512Computer Graphics Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
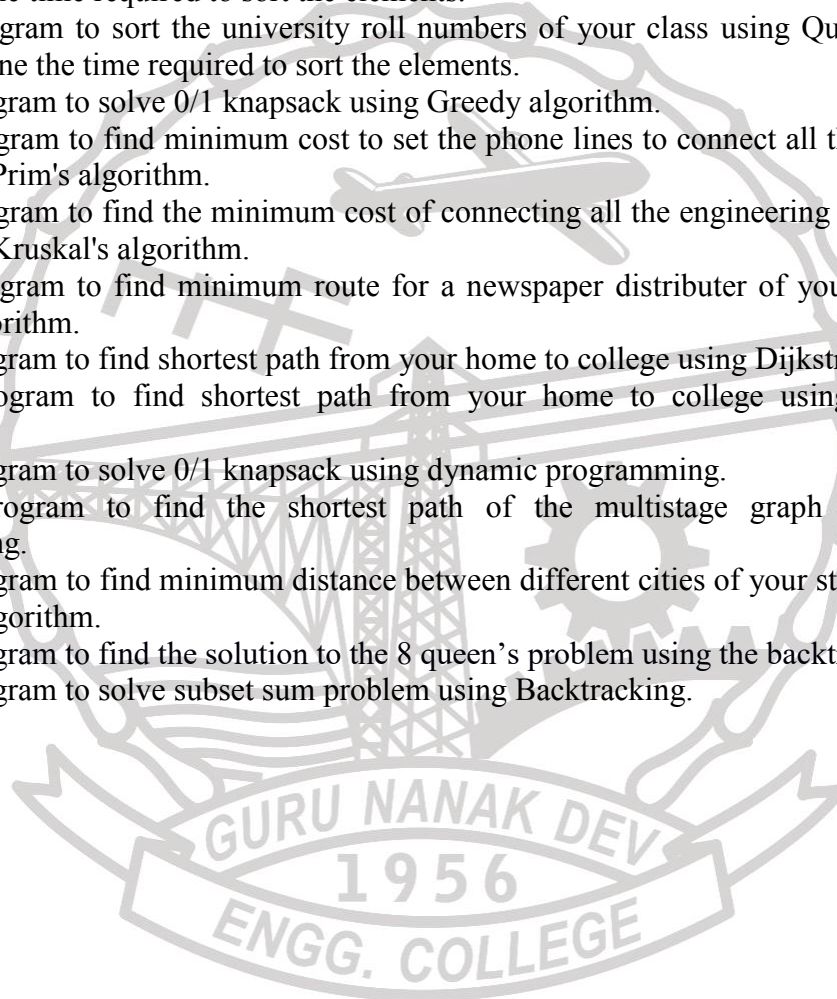Total Marks: 50

1. Write a program to plot a pixel on the screen in a particular color.
2. Write a program for creating a simple two-dimensional shape of any object using lines, circle, etc.
3. Using different graphics functions available for text formatting, write a program for displaying text in different sizes, different colors, font styles.
4. Implement the DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants)
5. Write a program to input the line coordinates from the user to generate a line using Bresenham'smethod and DDA algorithm. Compare the lines for their values on theplotted line.
6. Write a program to generate a complete moving wheel usingMidpoint circle drawing algorithm and DDA line drawing algorithm.
7. Write a program to draw an ellipse using the Midpoint ellipse generation algorithm for both the regions.
8. Write a program to draw any 2-D objectand perform the transformations on it according to the input parameters from the user, namely: Translation, Rotation or Scaling.
9. Write a program to rotate a triangle about any one of its end coordinates.
10. Write program to draw a house like figure and perform the following operations.
    a.Scalingabout the origin followed by translation.
    b.Scaling with reference to an arbitrary point.
11. Write a program for filling a given rectangle with some particular color using boundary fill algorithm.
12. Write a program for filling a polygon using Scanline Polygon fill algorithm.
13. Write a program to perform clipping on a line against the clip window using any line clipping algorithm. The output must be twofold showing the before clipping and after clipping images.
14. Write a program to implement the Sutherland Hodgeman Polygon Clippingalgorithm for clipping any polygon.

CS-14513 Design and Analysis of Algorithms Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Write a program to find out a roll number from college database using binary search algorithm.
2. Write a program to sort the class roll numbers of your class using merge sort algorithm and determine the time required to sort the elements.
3. Write a program to sort the university roll numbers of your class using Quick sort method and determine the time required to sort the elements.
4. Write a program to solve 0/1 knapsack using Greedy algorithm.
5. Write a program to find minimum cost to set the phone lines to connect all the cities of your state using Prim's algorithm.
6. Write a program to find the minimum cost of connecting all the engineering colleges in your state using Kruskal's algorithm.
7. Write a program to find minimum route for a newspaper distributer of your locality using Greedy algorithm.
8. Write a program to find shortest path from your home to college using Dijkstra's algorithm.
9. Write a program to find shortest path from your home to college using Bellman-Ford algorithm.
10. Write a program to solve 0/1 knapsack using dynamic programming.
11. Write a program to find the shortest path of the multistage graph using dynamic programming.
12. Write a program to find minimum distance between different cities of your state using Floyd-Warshall algorithm.
13. Write a program to find the solution to the 8 queen's problem using the backtracking.
14. Write a program to solve subset sum problem using Backtracking.

CS-14514 Web Technologies Lab

Internal Marks: 30   L   T   P

External Marks: 20   0   0   2

Total Marks: 50

1. Configuration and administration of IIS and Apache Web Server.
2. Develop an HTML page to demonstrate the use of basic HTML tags.
3. Create an HTML file to link to different HTML page and also link within a page.
4. Write an HTML file to demonstrate the insertion of images.
5. Demonstrate the creation of tables and frames in a web page using HTML.
6. Develop a registration form by using various form elements like input box, text area, radio buttons, check boxes etc.
7. Implement login page contains the user name and the password of the user to authenticate.
8. Design an HTML page by using the concept of internal, inline, external style sheets.
9. Create an HTML file to implement the styles related to text, fonts, links using cascading style sheets.
10. Develop an HTML file to implement the styles related to lists, table using cascading style sheets.
11. Create an HTML file to implement the concept of document object model using JavaScript.
12. Create an HTML file to display the various arithmetic operations on variables using JavaScript.
13. Create an HTML file to implement alert box, confirm box, dialog box using JavaScript.
14. Create an HTML file to implement concept of functions and arrays using JavaScript.
15. Implement a user defined function in JavaScript to get array of values and sort them in ascending order.
16. Demonstrate the use of control statements and loops in JavaScript.
17. Demonstrate string and math object's predefined methods using JavaScript.
18. Create a PHP file to print any text using variable.
19. Demonstrate the use of statements, operators and functions in PHP.
20. Demonstrate the use of Loops and arrays in PHP
21. Create a PHP file using GET and POST methods.
22. Implement the concept of sessions in PHP.
23. Develop the concept of E-mail in PHP.
24. Implement the concept of PHP and MySQL.
25. Implement the concept of PHP and AJAX.
26. Demonstrate the use of web site designing tools such as joomla, wordpress.
27. Minor project using different technologies studied.

CS-14601 Theory of Computation

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Finite Automata: Deterministic Finite Automata, Acceptance by Finite Automata, Transition systems, Non-Deterministic Finite Automata, Equivalence of DFA and NDFA, Moore and Mealy machines, Equivalence of Moore and Mealy machine, Minimization of Finite Automata, Applications and limitations of Finite Automata. [6]

Formal Languages: Basics of strings, Alphabets, grammar, Formal language, Chomsky classification of languages, Languages and their relation, Operations on languages, Closure properties of language classes. [4]

Regular Grammar: Regular grammars, Regular expressions, Algebraic method using Arden's theorem, Equivalence of Finite Automata and Regular expressions, Properties of regular languages, Pumping lemma. [5]

Context Free Language: Derivation, Ambiguity, Simplification of context free grammar, normal forms– Chomsky Normal Form, Greibach Normal Form, Pumping lemma. [5]

Push Down Automata: Description and definition, Acceptance by Push Down Automata, Equivalence of Push Down Automata and context free grammars and languages. [6]

Turing Machine: Definition and Model, Representation of Turing Machine, Design of Turing Machine, Variants of Turing Machine, Decidability and recursively enumerable languages, Halting problem, Post correspondence problem. [6]

Context Sensitive Language: Context sensitive language, The model of linear bounded automata, Relation between linear bounded automata and context sensitive language. [5]

Recommended Books:
1. Daniel, A.Cohen, "Introduction to Computer Theory", Wiley India Pvt Ltd.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
3. M. Sipser, "Introduction to the Theory of Computation", Second Edition, Cengage Learning.
4. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science, Third Edition", PHI Learning Private Limited.
5. K. V. N. Sunitha , N. Kalyani, "Formal Languages and Automata Theory", McGraw-Hill.
6. M. A. Harrison, "Introduction to Formal Language Theory", Addison-Wesley.

CS-14602 Advanced Database Systems

Internal Marks: 40   L   T   P

External Marks: 60   3   1   0

Total Marks: 100

PL/SQL Concepts: Overview, Environment, Basic syntax, Data Types, Variables, Constants, Operators, Conditions, Loops, Strings, Arrays, Procedures, Functions, Cursors, Records, Exceptions, Triggers, Packages, Collections, Transactions, Date & Time, DBMS Output. [4]

Transaction Processing and Concurrency Control: Transaction processing concepts, Concurrency control techniques – Two-phase locking, Timestamp ordering, Multiversion, Validation, Multiple granularity locking. [4]

Query Processing and Optimization: Query processing, Syntax analyzer, Query decomposition, Query optimization, Heuristic query optimization, Cost estimation, Cost functions for Select, Join, Query evaluation plans. [6]

Distributed DBMS Concepts and Design: Introduction, Functions and architecture of a DDBMS, Distributed relational database design, Transparencies in a DDBMS, Date's Twelve rules for a DDBMS, Distributed design concepts – Transaction management, Concurrency control, Deadlock management, Database recovery, Query optimization. [7]

Object-Oriented DBMS: Introduction, Advanced database applications, Weakness of RDBMS, Storing objects in a relational database, Next-generation database systems, OODBMS perspectives, Persistence, Issues in OODBMS, Advantages and disadvantages of OODBMS, Object-oriented database design, Comparison of ORDBMS and OODBMS. [6]

Data Warehousing Concepts, OLAP and Data mining: Evolution of data warehousing, Data warehousing concepts, ETL, Data Warehouse design benefits and problems of data warehousing, Comparison of OLTP systems and data warehousing, On-Line Analytical Processing, Introduction to data mining. [6]

Recommended Books:
1. Korth, Sudarshan, Silberschatz, "Database System Concepts".
2. Elmasri, Navathe, "Fundamentals of Database Systems".
3. Raghu Ramakrishnan, Gehrke, "Database Management Systems.
4. Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management by Data Mining: Concepts Techniques".

CS-14603 Software Engineering

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Evolution and impact of software engineering, Software myths, Software application domains, Software crisis – Problem and causes.   [4]

Software Process Models: Software process, Software process models – Waterfall model, Prototype model, Spiral model, Evolutionary model, RAD model, Concurrent development model and Component based model.   [6]

Requirements Engineering: Feasibility study, Problem analysis, Requirement elicitation and specification, Functional and non-functional requirements, Software requirements specification document, Requirement validation and management.   [4]

Project Management and Risk Analysis: Project planning, Cost estimation techniques– Size metrics, Empirical estimation, Heuristic estimation and analytical estimation, Project monitoring and control– Work breakdown structure, Activity chart, Gantt charts, PERT charts, Critical path method, Manpower management, Risk management- Identification, Analysis, Planning and monitoring.   [8]

Software Design: Modular design– Coupling, Cohesion and abstraction, Function oriented design– Data flow diagrams, Structure chart, Object oriented design–Objects and object classes, Relationships between classes, User interface design, Component based design, IEEE recommended practice for software design description.   [8]

Coding & Testing: Coding standards and code reviews, Testing – Need of testing, Unit testing, Integration testing, System testing, Alpha, Beta and acceptance testing, Smoke testing, Sanity testing. Verification and validation.   [5]

Maintenance and Re-engineering: Software maintenance, Software re-engineering, Reverse engineering, Forward engineering, PSP and Six sigma.   [5]

Recommended Books:
1. Roger S. Pressman R., "Software Engineering, A Practitioner's Approach", McGraw Hill International.
2. Ian Sommerville , Software Engineering, Addison-Wesley Publishing Company .
3. Rajib Mall, "Fundamentals of Software Engineering", PHI.
4. Jalote P., "An Integrated Approach to Software Engineering", Narosa.

DECS-14604 Simulation and Modeling

Internal Marks: 40   L T P
External Marks: 60   3 1 0
Total Marks: 100

Introduction: Introduction to simulation and modeling, Application areas, System and system environment, Components of a system, Discrete and continuous systems, System models and its types, Discrete-event simulation, Steps in a simulation study, Simulation examples.Monte-Carlo method, Types of system simulations, Real timesimulation, Stochastic variables, Discrete probability functions.Proprietary and open source simulation software.   [6]

General Principles: Concepts in discrete event simulation, Event scheduling/time advance algorithms, World views, List processing using dynamic allocation and linked list.   [4]

Statistical Models in Simulation: Terms and concepts, Statistical models, Discrete and continuous distributions, Poisson distributions, Empirical distributions, Little's equation.   [4]

Queuing Models: Characteristics of queuing systems, Queuing notation, Long- Run measures of performance of queuing systems, Steady state behavior of infinite and finite calling population models, Use of network of queues.   [5]

Random Number Generation: Pseudo random numbers, Techniques for generation of pseudo random numbers, Tests for random numbers, Random variate generation, Maximum likelihood estimation, Confidence intervals and hypothesis testing, Stochastic processes and Markov models.   [6]

Input Modeling and Output Analysis of a Single Model: Data collection, Identifying the distribution of data – Histograms and quantile plots, Parameter estimation, Goodness of fit tests applied to simulation inputs, Verification and validation of simulation models, Output analysis and measures of performance and estimation.   [6]

Comparison and Evaluation of Alternative System Designs: Comparison of two system designs, Sampling with equal and unequal variances, Common random numbers, Comparison of several system designs, Linear regression, Random number assignment for regression.   [5]

Recommended Books:
1. Jerry Banks, John S. Carson II, Barry L.Nelson and David M.Nicol, "Discrete- event system and simulation", Prentice Hall of India.
2. Averill M.Law, "Simulation modeling and analysis (SIE)", Tata McGraw Hill India.
3. David Cloud, Larry Rainey, "Applied Modeling and Simulation", Tata McGraw Hill.
4. Gabriel A. Wainer, "Discrete-event modeling and simulation: a practitioner's approach", CRC Press.
5. Bernard P. Zeiger, Herbert Praehofer, Tag Gon Kim, "Theory of modeling and simulation: integrating discrete event and continuous complex dynamic systems", Academic Press.
6. Walter J. Karplus, George A. Bekey, Boris YakobKogan, "Modeling and simulation: theory and practice", Springer.

DECS-14605 Digital Image Processing

Internal Marks: 40
External Marks: 60
Total Marks: 100

L   T   P
3   1   0

Introduction: Fundamental steps in digital image processing, Components of an image processing system, Applications of image processing, Sampling, Quantization. [4]

Digital Image Processing Operations: Pixel relationships and distance metrics – Imagecoordinate system, Image topology, Connectivity, Relations, Distance measures. Classification of image processing Operations – Arithmetic, Logical, Geometrical (Translation, Scaling, Zooming, Linear Interpolation, Mirror or Reflection, Shearing, Rotation, Affine and Inverse transformation) Operations, Image interpolation Techniques (Down-sampling and up-sampling), Set operations, Statistical operations, Convolution and Correlation operations. [9]

Image Enhancement in Spatial Domain: Image enhancement point operations– Linear and non-linear functions, Piecewise linear functions, Histogram processing. Spatial filtering – Basics of filtering in the spatial domain, Smoothing linear and non-linear filters, sharpening filters. [7]

Image Enhancement in Frequency Domain: Basics of filtering in the frequency domain, Image smoothing and sharpening using frequency domain filters [4]

Image Compression: Image compression model, Compression measures, Compression algorithm and its types (Entropy, Predictive, Transform and layered coding), Types of redundancy (Coding, Inter-pixel, Psycho-visual and Chromatic), Lossless compression algorithms – Run-length, Huffman, Bit-plane, Lossy compression algorithms – Lossy predictive, Block transform coding. [7]

Image Segmentation: Classification of image segmentation algorithms, Point, Line and Edge detection, Global thresholding, Otsu's method, Region-based segmentation [5]

Color Image Processing: Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship between different models [4]

Recommended Books:
1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing", Pearson Education.
2. S. Sridhar, "Digital Image Processing", Oxford University Press.
3. M. Sonka, V. Hlavac and Roger Boyle, " Image Processing, Analysis and Machine Vision", Thomas Learning.
4. K. R. Castleman, "Digital Signal Processing", Pearson Education.

DECS-14606 Artificial Intelligence

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Intelligence, Foundations of artificial intelligence (AI). History of AI, Agents and their architecture, Communication among agents, Problem Formulation and solution, Problem types, States and operators, State space, Search strategies. Informed Search Strategies– Best first search, A* algorithm, Heuristic functions, Iterative deepening A*(IDA), Small memory A*(SMA); Game playing – Perfect decision game, Imperfect decision game, Evaluation function, Minimax algorithm, Alpha-beta pruning.   [9]

Logical Reasoning: Inference, Propositional logic, Predicate logic (first order logic), Resolution, Logical reasoning, Forward chaining, Backward chaining; Knowledge representation techniques: semantic networks, Frames, Python for AI   [8]

Planning: Basic representation of plans, Partial order planning, Planning in the blocks world, Hierarchical planning, Conditional planning, Representation of resource constraints, Measures, temporal constraints.   [5]

Uncertainty: Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making– Utility theory, Utility functions, Decision theoretic expert systems.   [7]

Inductive learning: Decision trees, Rule based learning, Current-best-hypothesis search, Least-commitment search, Neural networks, Reinforcement learning, Genetic algorithms.   [6]

Applications: Areas of AI, Natural language processing, Case study of existing expert systems.   [5]

Recommended Books:
1. Stuart Russel and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education Press.
2. Kevin Knight, Elaine Rich, B. Nair, "Artificial Intelligence" McGraw Hill.
3. George F. Luger, "Artificial Intelligence", Pearson Education.
4. Nils J. Nils on,"Artificial Intelligence: A New Synthesis", Morgan KaufmannPublishers,Inc.

DECS-14607 Advanced Java

	L	T	P
Internal Marks: 40			
External Marks: 60	3	1	0
Total Marks: 100			

Graphical User Interface (GUI) Programming: The Applet class, Event handling, Adapter classes, Inner classes, Introduction to AWT and working with windows, Using AWT controls, Layout managers and menus, A tour of swings.   [9]

Networking: Internet addressing, InetAddress, TCP/IP client sockets, URL, URL connection,TCP/IP server sockets, Datagrams.   [5]

Java Database Connectivity (JDBC): Introduction to JDBC, JDBC drivers and architecture, Different database connectivity approaches, Establishing a database connection and executing SQL statements, CURD operation using JDBC, Connecting to non-conventional databases.   [5]

Servlets: The life cycle of servlet, Java servlet development kit, Servlet API, Reading the servlet parameters, Reading initialization parameters, Handling HTTP requests and responses, Using cookies, Session tracking and security issues.   [5]

Java Server Pages (JSP): JSP architecture, Life cycle of JSP, JSP syntax basics– Directives, Declarations, Scripting, Standard actions, Custom tag libraries, Implicit objects, Object scope. Synchronization issues, Session management.   [5]

Enterprise Java Bean: The bean developer kit (BDK), Use of JAR files, The java beans API, Creating a JavaBean, Types of beans, Stateful session bean, Stateless session bean, Entity bean.
                                            [5]
Remote Method Invocation: Defining the remote interface, Implementing the remote interface, Compiling and executing the server and the client.   [3]

Common Object Request Broker Architecture (CORBA): Overview of technical architecture, CORBA basics, CORBA services.   [3]

Recommended Books:
1. Herbert Schildt , "The Complete Reference Java 2" , Tata McGraw -Hill.
2. H.M. Deital, P.J. Dietal and S.E. Santry, "Advanced Java 2 Platform HOW TO PROGRAM", Prentice Hall.
3. Grey Cornell and Hortsmann Cay S., "Core Java", Sun Microsystems Press.
4. Philip Hanna, "JSP: The Complete Reference", Tata McGraw –Hill.

DECS-14608 .NET Technologies

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: .NET framework and fundamentals, Building blocks of the .NET platform (CLR, CTS, CLS), Managed code, Microsoft intermediate language (MSIL), Just in time compiler (JIT), Assembly and its types, Garbage collection, Strong name, Global assembly cache (GAC), .NET framework development goals, Overview of .NET technologies (WPF, ASP.NET, WCF, LINQ, EF, MVC4).   [5]

.NET Programming using C#: Introduction to Visual Studio .NET IDE, Introduction to debugging, Structure of a C# Program, Data types, Control structures, Classes and objects, Arrays, This keyword, Static, Properties and indexer, Inheritance overloading (Compile Time Polymorphism), Overriding and runtime polymorphism, Abstract class , Interface, Namespaces, Structures, System object, Boxing and unboxing, Typecasting, Memory management, Exception handling, Collection, Basic windows controls, Delegates, Events and event handling, Assembly, Attributes, File handling, Serialization.   [7]

Object Oriented Programming with VB.NET: Structure of a VB program, Namespaces , Data structure and language highlights , Classes and inheritance , Structured error handling, Exploring the base class library, The .NET type system, Threads, Creating classes in VB.NET, Overloading, Constructors, Inheritance, Controlling scope and visibility, Dispose and finalization, Debugging.   [5]

Introduction to ADO.NET: Brief introduction of ADO.NET solution architecture, Data access models, Dissecting ADO.NET, Working with ADO.NET in connected and disconnected mode, Data centric application architecture, Data binding XML integration in ADO.NET, Transactions in ADO.NET, DB concurrency exception – Disconnected mode.   [5]

ASP.NET and Web Services: Introduction to web applications, services and ASP.NET, ASP.NET web forms, ASP.NET controls, User controls and custom controls, Error handling and tracing, Data binding, ASP.NET built in objects.   [4]

Recommended Books:
1. Andrew Troelsen, Philip Japikse, "C# 6.0 and the .NET 5 Framework", Tata McGraw - Hill Education.
2. Deitel et al. "Visual C# 2012 How to program" Prentice-Hall.
3. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework" Apress.
4. Matt J.Crouch, "ASP.NET and VB.NET Web Programming" Pearson Education.

DECS-14609 Linux Administration

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Linux Operating System: Linux operating system,Features,Architecture of Linux operatingsystem and shell interface, Linux system calls, Linux shared memory management, Device and diskmanagement in Linux,Swapspaceanditsmanagement.File systemanddirectory structureinLinux.Multi-Processing,LoadsharingandMulti-threading inLinux,Typesofusersin Linux, Linux distributions, Introduction of GNOME and KDE. [7]

Boot Loaders, File Systems and Core SystemServices: LILO and GRUB–ConfiguringLILO, AdditionalLILOoptions,Addinganew kerneltoboot,RunningLILO,The stepsofbooting, Enablingand disabling services. The makeup file systems, Managing file systems, Adding and partitioning a disk, Network files ystems, Quota management, The initservice, The inetd and xinetd p rocesses, The syslogd daemon, The cronprogram. [8]

Single Host Administration: Managing users–Introduction, User management tools, User and access permission. An introduction to BASH, Files, File types, File ownership and file permission, File management and manipulation, Moving a user and its home directory. [6]

Security and Networking: TCP/IP for system administrators, ARP, Hosts and networks, Subnetting, Netmasks. Networking configuration- Modules and networks Interfaces, Managing routes. IP tables. [6]

Internet Services: DNS–Working, Configuration, Records types, Setting up BIND database Files. FTP– Mechanics, Obtaining and installing vsftpd, Customizing FTP server. Configuring and running Apache web server, SMTP - Introduction, Post fix server, Configuration. Secure shell (SSH)– Public key cryptography, SSH versions and distributions. [8]

Intranet Services: Introduction to NFS, NIS and SAMBA. [6]

Recommended Books:
1. Steve Shah and Wale Soyinka, "Linux Administration: A Beginner's Guide", McGraw-HillEducation.
2. Galvin, "Operating System Concepts", John Wiley and Sons.
3. Bible, "Linux Command Line & Shell Bible", Wiley India.
4. Mark G. Sobell. "A Practical Guide to Linux", Addison- Wesley Profess.

OECS-14601 Software Project Management

Internal Marks: 40   L   T   P
External Marks: 60   3   0   0
Total Marks: 100

Project Evaluation and Planning: Activities in Software project management, Project evaluation – Cost benefit analysis, Cash flow forecasting, Cost benefit evaluation techniques, Risk evaluation. Project planning – Stepwise project planning, Software processes and process models. Project costing, COCOMO II, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb. [8]

Project Scheduling and Risk Management: Project sequencing and scheduling activities, Scheduling resources, Critical path analysis, Network planning, Risk management – Nature and types of risks, Risk planning and control, Risk assessment, Hazard identification, Hazard analysis, PERT and Monte Carlo simulation techniques. [6]

Monitoring and Control: Collecting data, Review techniques, Project termination review, Visualizing progress, Cost monitoring, Earned value analysis, Change control, Software Configuration Management (SCM), Managing contracts and acceptance. [8]

People Management: Introduction, Understanding behaviour, Organizational behaviour, Recruitment process, Motivation, The Oldman – Hackman Job Characteristics model, Stress, Health and safety. Working in teams, Decision making, Leadership, Organization and team structures. [8]

Software Quality Management: ISO Standards, Process capability models, Testing and software reliability, Quality plans, Test automation, Overview of project management tools. [6]

Recommended Books:
1. Bob Hughes, Mike Cotterell, "Software Project Management", Tata McGraw Hill.
2. Royce, "Software Project Management", Pearson Education.
3. Robert K. Wysocki, "Effective Software Project Management", Wiley.
4. Ian Sommerville, "Software Engineering", Pearson Education.
5. R.S. Pressman, "Software Engineering: A Practitioner's Approach", Tata McGraw Hill.
6. Kassem, "Software Engineering", Cengage Learning.

OECS-14602 Object Oriented Programming using Java

Internal Marks: 40   L   T   P
External Marks: 60   3   0   0
Total Marks: 100

Introduction to Object Oriented Programming: Difference between procedural and object oriented programming, Object oriented programming concepts – Class, Object, Data abstraction, Encapsulation, Data hiding, Inheritance and polymorphism.   [4]

Basics of Java: Importance of Java to Internet, Bytecode, Java Virtual Machine, Difference between Java and C++, Data types, Declaration of variable, Scope and lifetime of variable, Operators – Arithmetic, Bit-wise, Relational, Boolean. Operator precedence, One dimensional and multidimensional arrays, Type conversion and casting, Control statements.   [7]

Classes, Methods and Objects: Introduction to classes,Declaring objects**,** Methods, Constructors, this keyword, Overloading constructors, Garbage collection, Passing parameters to methods, Recursion, Nested and inner classes, Exploring string class.   [7]

Inheritance and Polymorphism: Types of inheritance, Access modifiers – Private, Public, Protected; Overriding, Super and this keyword, Final variable, Final classes and methods, Static variable, Static method, Abstract methods and classes, Packages and interfaces, importing packages, Polymorphism, Overloading.   [7]

Exception Handling: Exception handling mechanism, Exception types, Uncaught exceptions, try and catch, throw and throws, finally, Built in exceptions, Creating own exception subclasses.
                                                                                         [3]
Multithreading: Multithreaded programming, Thread priorities, Synchronization, Inter-thread communication, Thread class methods, Runnable interface, Suspending, Resuming and Stopping threads.   [4]

Recommended Books:
1. Patrick Naughton, Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Edition.
2. Balagurusamy, "Programming in JAVA", BPB Publications.
3. Dietel and Dietal, "Java: How to Program", Pearson Education.
4. T. Budd, "An Introduction to OOP", Pearson Education.
5. Y. Daniel Liang, "Introduction to Java programming", Pearson Education.

CS-14610 Advanced Database Systems Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
Total Marks: 50

1. Write PL/SQL code blocks for the following:
   i. to display the word "HELLO"
   ii. which will get the salary of an employee with particular id from `emp` table and display it on the screen
   iii. which creates two variables in the outer block and assign their product to the third variable created in the inner block.
   iv. which will increase the salary of the employees by 25%, you can declare a constant and use it throughout the program.
   v. to declare a record called *employee_rec* based on a user-defined type.
   vi. a procedure that has four sections. Each section should output a statement. Use labels and the Goto command to output the section messages in the following order:
   Section 3
   Section 2
   Section 1
   Section 4
   vii. whichuse the relational operators to compare character values for equality or inequality.
   viii. to demonstrate the use of "IF" statement.
   ix. to demonstrate the use of 'Simple loop'
   x. to demonstrate the use of ' FOR loop'
   xi. to demonstrate the use of 'WHILE loop'
   xii. to demonstrate the use of 'Nested loop'
   xiii. to demonstrate the use of ' Labelling loop'
   xiv. to demonstrate the use of 'GOTO statement'
   xv. which uses simple FOR loop to insert ten rows into a database table.
   xvi. Which uses a cursor to select the five highest paid employees from the emp table.
   xvii. that uses implicit cursor attributes to update the salary of employees in emp table.
   xviii. to illustrate the use of different types of Explicit cursors
   xix. to illustrate the use of Triggers.
   xx. to illustrate the use of Packages
   xxi. to handle exceptions
2. Study and usage of query Optimization techniques.
3. Case study of any object oriented or object relational database management system.
4. Case study of any distributed and parallel database management system.
5. Study and usage of open source data mining tool: Weka.
6. Development of a project by making use of tools studied above.

CS-14611 Software Engineering Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
Total Marks: 50

1. Conduct feasibility study for some given problem.
2. Preparation of software requirement specification document.
3. Preparation of software configuration management and risk management related documents
4. Study of OpenProj or similar software.
5. Usage of OpenProj or similar software to draft project plan and to track the progress of a project.
6. Getting familiar with function oriented design tools for making data flow diagrams.
7. Generate the test cases using boundary value analysis for some problems.
8. Getting familiar and hands on practice with testing tools like win runner, selenium etc.
9. Perform debugging using bug tracking tool like Bugzilla or Bug bit.
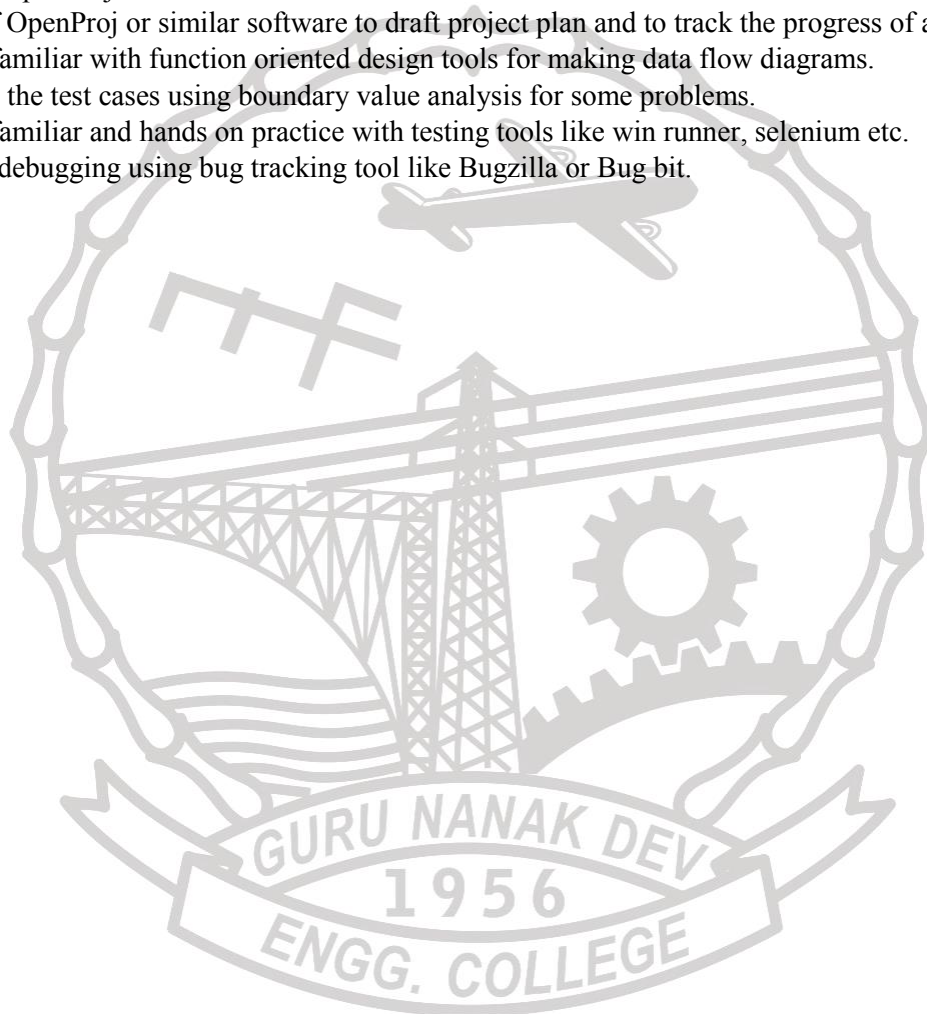
DECS-14613 Simulation and Modeling Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Implementation of Basic Operations on Matrices.
2. Implementation of Chi-square goodness-of-fit test.
3. Practical implementation of Queuing Models.
4. Design Inventory System.
5. Implementation of Monte-Carlo Simulation method.
6. Analysis of Discrete and Continuous Distributions.
7. Generation of Random Numbers using Linear Congruential Method.
8. Generation of Random Numbers using Combined Linear Congruential Method.
9. Evaluation of system design using Regression Analysis.
10. Simulate a network using any network simulator.
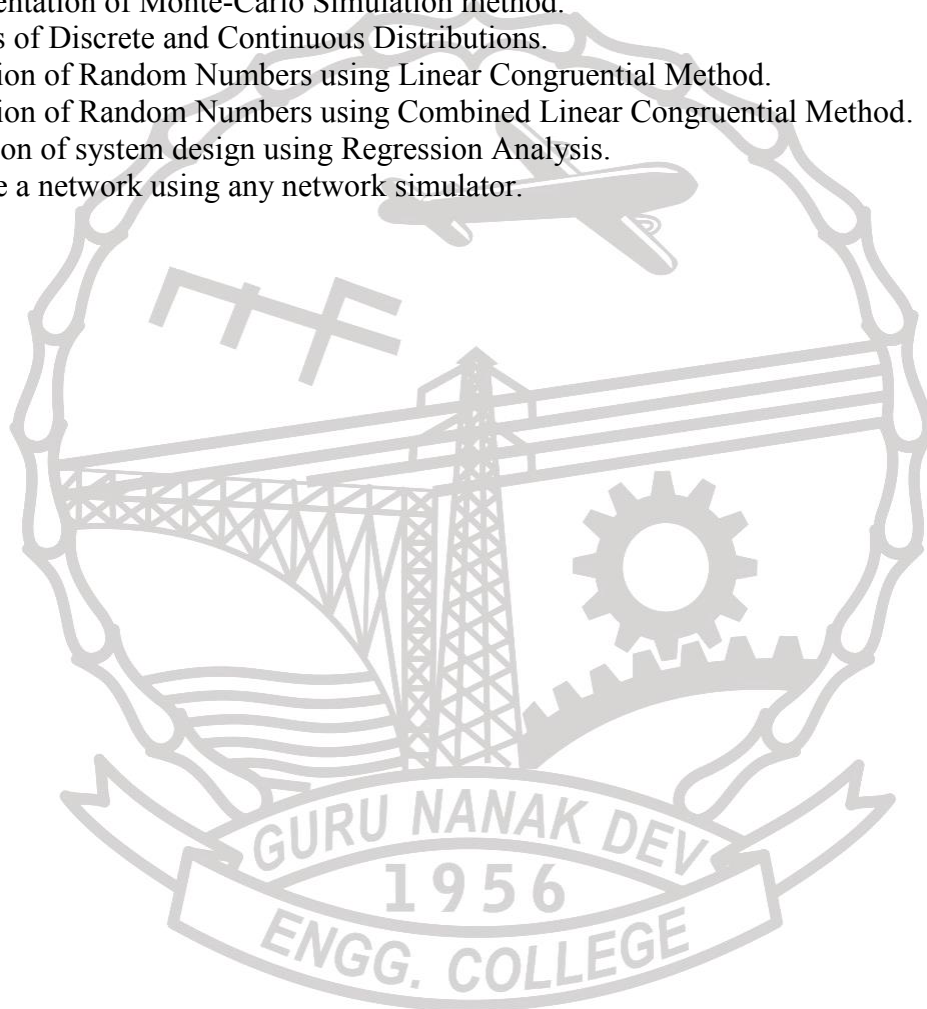
DECS-14614 Digital Image Processing Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Familiarity with Image processing toolbox like MATLAB, Octave, Scilab etc.
2. Generation of array, matrix and image and use of image processing operations.
3. Learning and building functions and scripts.
4. Implementation of various arithmetic, logical and geometrical operations.
5. Implementation of various image enhancement techniques in spatial domain.
6. Implementation of various image enhancement techniques in frequency domain.
7. Implementation of various image compression techniques.
8. Implementation of various 2-D image segmentation techniques.
9. Implementation of various color image processing techniques.
10. Mini Project: By using various concepts of image processing, students are required to prepare a project in a group of two to three students. The group of students must submit a project report of 10 to 20 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.
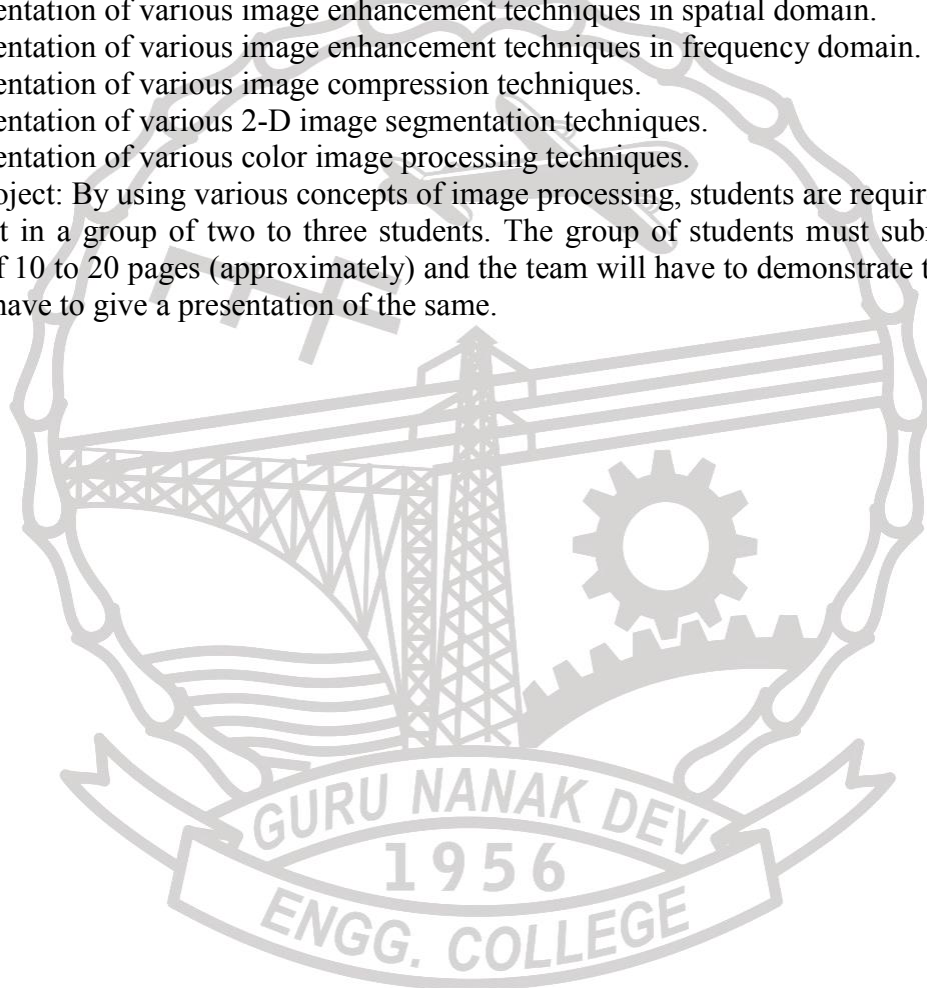
DECS-14615 Artificial Intelligence Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Write a program to create the string "HELLO WORLD" using the A* algorithm using Python.
2. Write a program to find the sum of all numbers stored in a list.
3. Write a program to find factorial of a number.
4. Write a program to display formatted text calendar and entire calendar for a year.
5. Write a Program For Best First Search.
6. Write a program by creating objects to display student information.
7. Write a program to convert Celsius into Fahrenheit.
8. Write a program to find resolution of JPEG image.
9. Write a program to implement A*algorithm.
10. Write a Python function to check whether a string is pangram or not. For example: "the quick brown fox jumps over the lazy dog". Import the package to see whether the input string is pangram or not.
11. Write a program to solve water jug problem.
12. Write a Program For tic tac toe game for 0 and X.
13. Write a Program to create an animated banner program.
14. Students are required to develop an expert system for real life problems/games, Expert system; implement a production system, medical diagnosis expert system, agriculture expert system, troubleshooting of computer systems, and implementation of neural/fuzzy network.
15. Familiarization with NLTK using python.
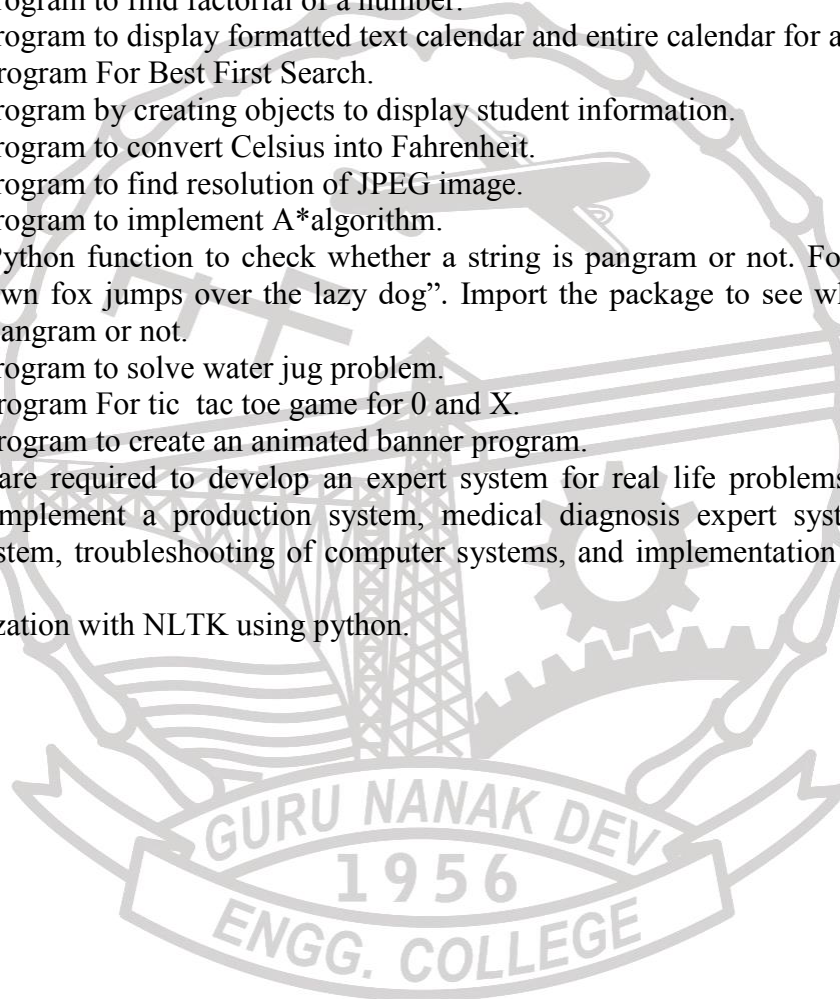
DECS-14616 Advanced Java Lab

Internal Marks: 30
External Marks: 20
TotalMarks:50

L	T	P
0	0	2

1. Implementation of GUI programming using Applets
2. Using AWT controls, Layout Managers and Menus.
3. Create GUI programs using Swings.
4. Implementation of Socket Programming.
5. Using JDBC to execute SQL queries.
6. Create a Servlet to handle HTTP Requests and Responses.
7. Implementation of the concept of Cookies and Session Tracking.
8. Illustrate the concept of JavaServer Pages (JSP).
9. Create a JavaBean by using Bean Developer Kit(BDK).
10. Implementation of various types of beans like Session Bean and Entity Bean.
11. Implementation of the concept of Remote Method Invocation(RMI).
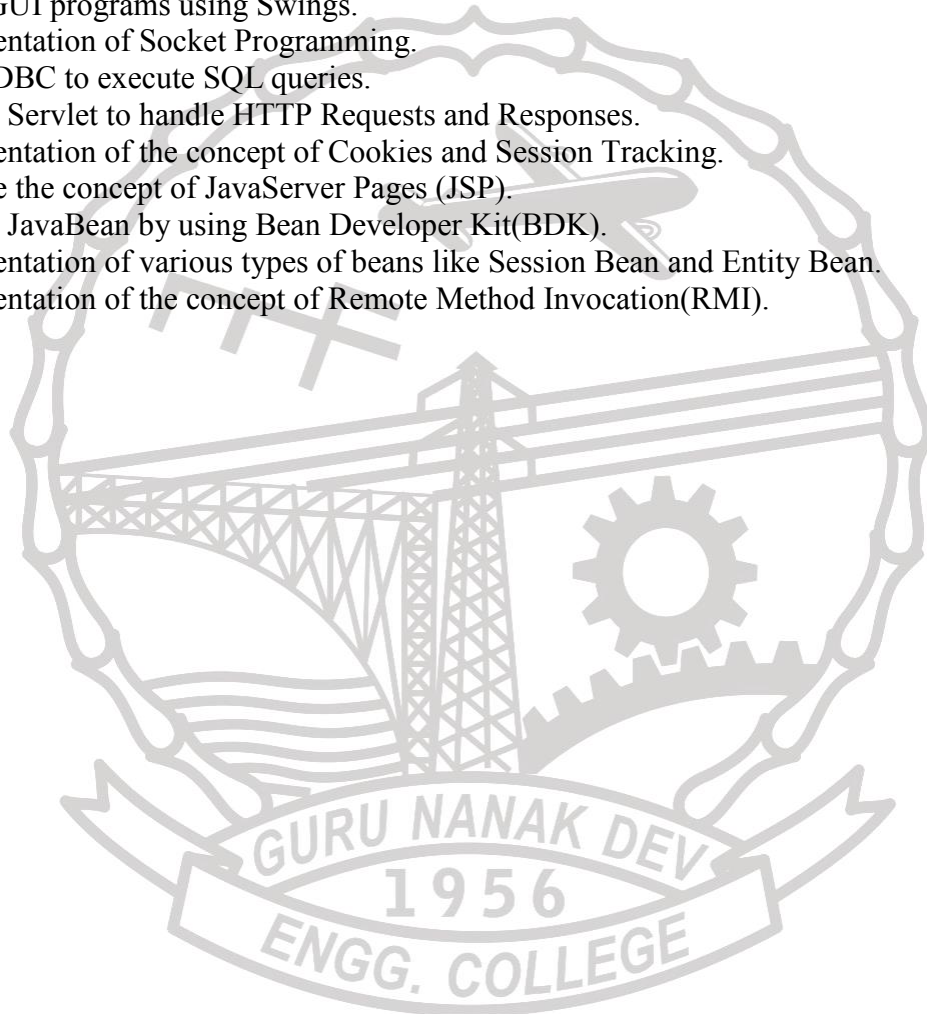
DECS-14617 .NET Technologies Lab

Internal Marks: 30   L   T   P

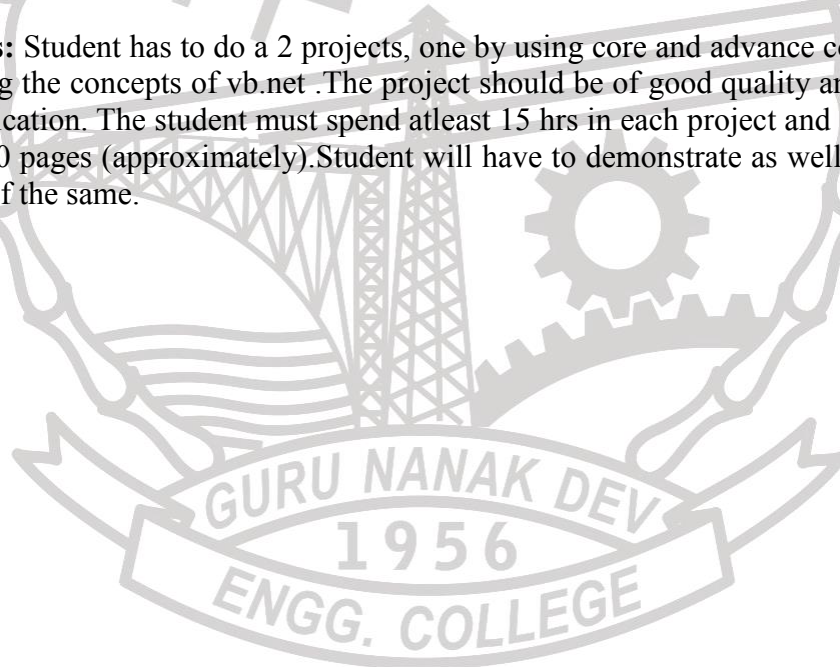External Marks: 20   0   0   2

Total Marks: 50

1. Write a program to perform boxing and unboxing operation using C#.
2. Write a C# program to implement the concept of arrays.
3. Write a program to demonstrate the concept of inheritance, inheritance overriding .
4. Create a VB.Net window form application and Usage of LINQ in SQL clauses in c#.
5. Write a program in c# to display the student details using select, from and where clause LINQ.
6. Write a program to c# perform sorting operation.
7. Write a program in c# to implement delegates and exception handling
8. Write a program to perform addition with MOUSEUP event.
9. Write a program to illustrate exception handling for invalid typecasting in unboxing in c#..
10. Write a program to demonstrate the conditional and looping statement in VB.NET.
11. Write a Program to implement different ways to access database in ADO.NET.
12. Write a Program to bind GridView using SqlDatasourceandDropdownlist in ASP.NET.

Minor Projects: Student has to do a 2 projects, one by using core and advance concepts c# and another by using the concepts of vb.net .The project should be of good quality and may be used in real life application. The student must spend atleast 15 hrs in each project and submit a project report of 8 to 10 pages (approximately).Student will have to demonstrate as well as have to give a presentation of the same.
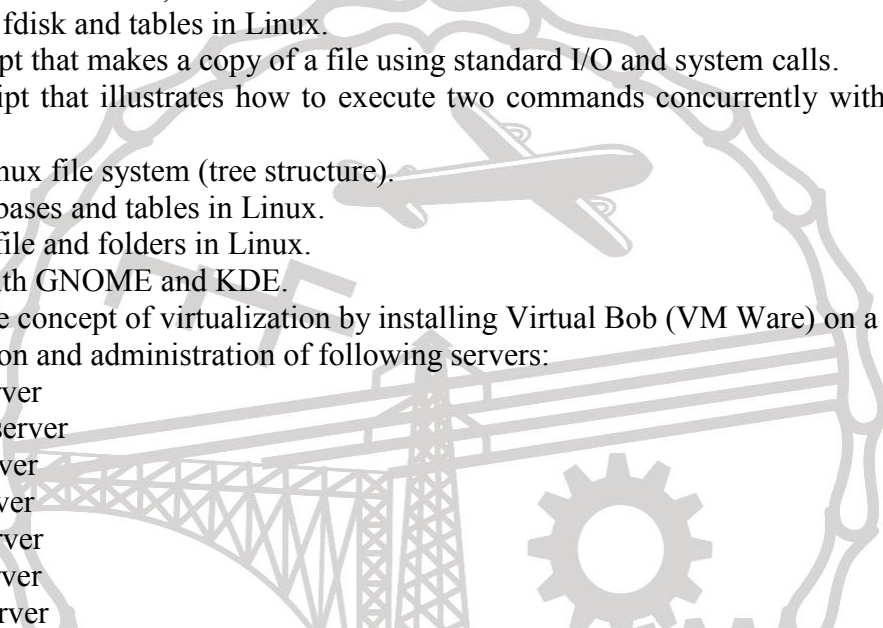
DECS- 14618 Linux Administration Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Installation of Linux operating system and Packages.
2. Study of LILO and GRUB loaders.
3. Working with Bash shell, Bourne shell and C shell in Linux operating system.
4. Configuration of .bashrc, /etc/bashrc and Environment variables.
5. How to use fdisk and tables in Linux.
6. Write a script that makes a copy of a file using standard I/O and system calls.
7. Write a script that illustrates how to execute two commands concurrently with a command pipe.
8. Study of Linux file system (tree structure).
9. Create databases and tables in Linux.
10. Mange the file and folders in Linux.
11. Working with GNOME and KDE.
12. Illustrate the concept of virtualization by installing Virtual Bob (VM Ware) on a system.
13. Configuration and administration of following servers:
    (a) SSH server
    (b) DHCP server
    (c) FTP server
    (d) NIS server
    (e) Web server
    (f) NFS server
    (g) NAT server

CS-14701 Advanced Computer Networks

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Internetworking: Half and full duplex ethernet, Ethernet at the data link layer, Ethernet at the physical link layer, Ethernet cabling–Straight-through, Crossover and rolled Cable, Data encapsulation, Three-layer hierarchical network model.   [4]

TCP Protocols: Internet layer protocols–IP,ICMP, ARP, RARP; Host to host layer protocols: TCP, UDP; Application layer protocols– Telnet, FTP, TFTP, NFS, SMTP, LPD, X Window, SNMP, DNS, and DHCP.   [6]

Switching: Overview of switch, Unmanaged and managed switches, Switch administrative configurations, Viewing, Saving and erasing configurations, Spanning tree protocol, VLAN Basics, Static VLAN, Dynamic VLAN, Frame tagging, Trunking protocol, Routing between VLANs, Configuring VLANs, Configuring VLAN trunk ports, Configuring Inter-VLAN routing.   [10]

Network Routing: Overview of router, Static and dynamic routing, Introduction to classless routing, Distance vector routing Protocols, Router administrative configurations, Router interfaces, Viewing, Saving and erasing configurations, Routing Information Protocol, Configuration of EIGRP (Enhanced IGRP) and OSPF (Open Shortest Path First).   [10]

Adhoc Networks: Features, Advantages and applications, Adhoc versus cellular networks, Network architecture, Protocols –MAC protocols, Routing protocols, Technologies, Applications of mobile adhoc networks.   [8]

Recommended Books:
1 Sunil Kumar, S. Manvi, Mahabaleshwar, S. Kakkasageri, "Wireless and Mobile Networks: Concepts and Protocols", Wiley India Pvt. Ltd.
2. Andrew S. Tanenbaum, "Computer Networks", Pearson Education.
3. Behrouz A. Forouzan, "Data Communication & Networking", Tata McGraw Hill.
4. James F. Kurose, Keith W. Ross, "Computer Networking", Pearson Education.
5. Douglas E. Comer, "Internetworking with TCP/IP", Volume-I, Pearson Education.
6. W. Stallings, "Data and Computer Communication", Prentice Hall of India.

CS-14702 Compiler Design

Internal Marks: 40
External Marks: 60
Total Marks: 100

L   T   P
3   1   0

Introduction to Compiler: Compilers, Analysis of the source program, Cousins of the compiler, Analysis – Synthesis model of compilation, Phases of compilation, Grouping of phases, Phases of translation. [3]

Lexical Analysis: Role of lexical analyser – Issues in lexical analysis, Tokens, Patterns, Lexemes. Input buffering – Buffer pairs, Sentinels. Specification of tokens, Token recognition, Transition diagrams, Introduction to lexical analysis tool – LEX. [4]

Syntax Analysis: Role of the parser, Top down parsing –Backtracking, LL(1), Recursive descent parsing, Predictive parsing. Bottom-up parsing – Shift reduce parsing, Operator precedent parsing, LR parsers, SLR parser, Canonical LR parser, LALR parser. [12]

Symbol Tables: Symbol table format, Storage allocation information, List data structure for symbol tables, Hash tables, Representation of scope information, Runtime environment-Activation tree, Activation record, Parameter passing. Storage allocation strategies 1 – Static allocation, Stack allocation and Heap allocation. [6]

Intermediate Code Generation: Intermediate languages, Declarations, Assignment statements, Boolean expressions, Case statements. [4]

Code Generation: Issues in the design of code generator, The target machine, Runtime storage management, Basic blocks and flow graphs, Next-use information, DAG representation of basic blocks, Peephole optimization. [5]

Code Optimization: Introduction, Principal sources of optimization, Optimization of basic blocks, Global data flow analysis – Reaching definitions and Live variable analysis. [4]

Recommended Books:
1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia.
2. C. Fischer and R. LeBlanc., "Crafting a Compiler", Benjamin Cummings.
3. S. Chattopadhyay, "Compiler Design", PHI.
4. C. Holub., "Compiler Design in C", Prentice Hall Inc..
5. Appel, "Modern Compiler Implementation in C: Basic Design", Cambridge Press.

CS-14703 Cyber Laws and IPR

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Cyber World and Security: Introduction to Cyberspace and Cyber law, Different components of cyber laws, Cyber law and Netizens. Attacks and Malware – The Zero-Day Attack and Mutation in delivery, Crimeware Toolkits and Trojans, Sophisticated Malware. Defensive measures for Cybersecurity – The Firewall, The Intrusion Detection System (IDS) and The Intrusion Prevention System (IPS), Virtual Private Networks (VPN) and Access control, Integrated defence for an enterprise network   [6]

E-commerce: Introduction to e-commerce, Different e-commerce models, E-commerce trends and prospects, E-commerce and taxation, Legal aspects of e-commerce.   [6]

Intellectual Property Rights: IPR regime in the digital society, International treaties and conventions, Business software patents, Domain name disputes and resolution, Intellectual property issues in cyber space – Domain names and related issues, Copyright in the digital media.   [6]

Patents: Objectives, Rights, Assignments, Defences in case of infringement, Copyright – Objectives, Rights, Transfer of copyright. Work of employment infringement, Defences for infringement. Trademarks – Objectives, Rights, Protection of Goodwill, Infringement, Passing off, Patents in the cyber world.   [6]

IT ACT 2000: Aim and objectives, Overview of the Act, Information Technology Act-2000-1 Information Technology Act-2000-2, Information Technology Act-2000-3, Information Technology Act-2000-4, Information Technology Act-2000-5, Information Technology Act-2000-6, Amendments in IT Act. Jurisdiction, Role of certifying authority, Regulators under IT Act, Cyber crimes – offences and contraventions. Grey areas of IT Act.   [9]

Case Study: Case studies of infringement of cyber laws and IPR in Government sector, Corporate sector, Financial sector.   [6]

Recommended Books:
1. Nandan Kamath, "Guide to information technology act, rules and regulations", Universal Law Pub.
2. Chwan-Hwa (John) Wu, J. David Irwin, "Introduction to Computer Networks and Cyber Security", CRC Press.
3. VikasVashishth , "Bharat's law & practice of intellectual property in India", Bharat Law House.
4. William Rudolph Cornish, David Llewelyn, Tanya Aplin, "Intellectual property: patents, copyrights, trade marks and allied rights" Thomson Reuters, Sweet and Maxwell.
5. Deepti Chopra, Kieth Merrill, "Cyber cops, cyber criminals and the Internet", I.K. International.

6.   Vakul Sharma, "Handbook of cyber laws", Macmillan India.
7.   P. Narayanan, "Intellectual Property Law", Eastern Law House.
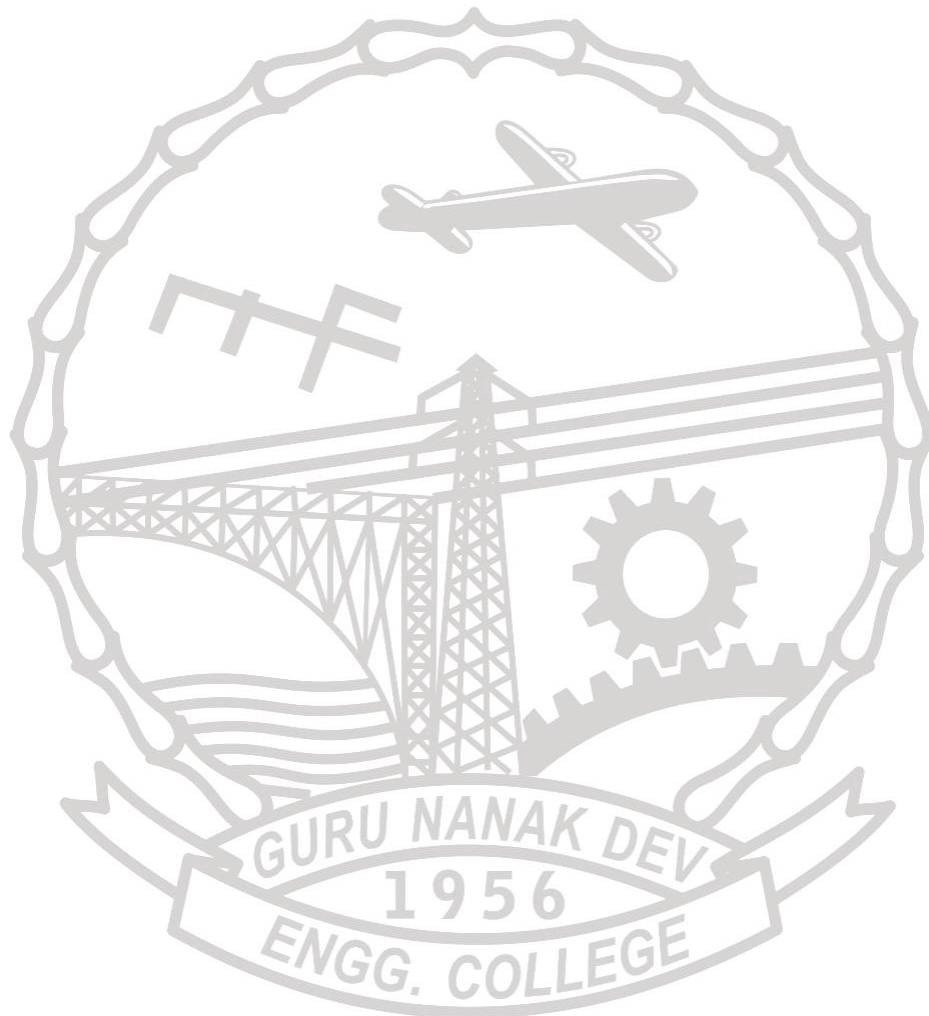
DECS-14704 Parallel Computing

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Paradigms of parallel computing, Synchronous– vector/array, SIMD, Systolic. Asynchronous – MIMD, Scope and issues of parallel computing.   [4]

Parallel Architecture: Interconnection networks, Multicores and multiprocessors, Centralized multiprocessors, Distributed multiprocessors, Cache hierarchy and coherence, Flynn's taxonomy.
                                                                                                                                    [7]

Principles of Parallel Algorithm Design: Decomposition techniques, Characteristics of tasks and interactions, Parallel algorithm models, Parallel algorithmic patterns – Divide and conquer, pipelined, Parallel algorithms – Floyd's algorithm, Matrix multiplication, Merge sort, Quick sort.
                                                                                                                                    [9]

Performance Analysis: Metrics – Speedup, Efficiency, Utilization. Amdahl's law, Performance issues, Cost-performance trade-off.   [4]

Parallel Programming: Models of parallel programming – Shared memory, Distributed memory, Message passing, Object oriented, Functional and dataflow. Scheduling and synchronization – Scheduling parallel programs, Loop scheduling, Lock free synchronization, Load balancing.   [9]

Parallel Programming Support Environments: Introduction to Message Passing Interface (MPI), OpenMP and its directives, CUDA.   [6]

Recommended Books:
1. M. J. Quinn, "Parallel Computing: Theory and Practice", McGraw Hill.
2. Peter S Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann.
3. AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Pearson Publication.
4. M. Sasi Kumar, Dinesh Shikhare, P. Raviprakash, "Introduction to Parallel Processing", PHI Publication.
5. T. G. Lewis and H. El-Rewini, "Introduction to Parallel Computing", Prentice Hall, New Jersey.

DECS-14705 Mobile Computing

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Mobile Communications and Computing: Introduction to MC, Novel applications, Limitations and architecture. Introduction to wireless network, Mobile computing v/s wireless network, Characteristics of mobile computing. Medium Access Control– Motivation for a specialized MAC –Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, CDMA.   [6]

Mobile Network Layer: Mobile IP goals, Assumptions, Entities and terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunnelling and encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP).   [7]

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit and fast recovery, Transmission and time-out freezing, Selective retransmission, Transaction oriented TCP.   [6]

Protocols, Tools and Services: Wireless Application Protocol – WAP (Introduction, protocol architecture), Bluetooth –Architecture, Network and protocol, Mobility and location based services.   [6]

Challenges and Security: Coping with uncertainties, Resource poorness, Bandwidth etc., Wireless Security – Traditional security issue, Mobile and wireless security issues.   [6]

Recommended Books:
1. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Cambridge University Press.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer.
4. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech.

DECS-14706 Cloud Computing

Internal Marks: 40   L T P
External Marks: 60   3 1 0
Total Marks: 100

Cloud Computing Fundamentals: Evolution of cloud computing, Overview of computing paradigms – Distributed computing, Cluster computing, Grid computing, Utility computing, Autonomic computing, and Cloud computing. NIST model of cloud computing, Benefits and challenges of cloud computing, Big Data, Internet of things (IOT). [8]

Cloud Concepts and Technologies: Virtualization – Definition, Characteristics and benefits of virtualization, Virtualization and cloud computing, Types of virtualization, Load balancing. Hypervisors, Multitenancy, Scalability and elasticity, Billing and metering of services, Application programming interfaces (APIs), and Service level agreement (SLA). [9]

Cloud Architecture and Services: Cloud computing reference model architecture, Common cloud management platform, Cloud service models – Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Cloud-based services and applications – Healthcare, Energy systems, Transportation systems, Manufacturing industry, Government, Education. Cloud deployment models – Public, Private, Community, and Hybrid cloud. [9]

Security in Clouds: Cloud security issues and challenges, Cloud security reference model, Encryption techniques – Symmetric key encryption, Asymmetric key encryption. Identity and key management, Digital signature, Secure Socket Layer (SSL). [6]

Cloud Computing Platforms: Study and comparison of various open source and commercial cloud platforms, Open source cloud platforms – Openstack, Eucalyptus, Nebula. Commercial cloud platforms – Amazon Elastic Compute Cloud (EC2), Google App engine, MS Azure. [8]

Recommended Books:
1. Raj Kumar Buyya, JamesBroberg, Andrezei M. Goscinski, "Cloud Computing: Principles and paradigms", Wiley India Pvt. Ltd.
2. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd.
3. John Rittinghouse, JamesF.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press Taylor and Francis Group.
4. Anthony Velte, Toby Velte, Robert Elsenpeter, "Cloud Computing: A practical Approach" , Tata McGraw Hill.
5. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, "Cloud Computing for dummies", Wiley India Pvt. Ltd.

DECS-14707 Big Data and Business Analytics

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction to Big Data: Big data overview, V's of big data, Data structures, State of the practice in analytics, Current analytical architecture, Drivers of big data, Big data ecosystem and a New Approach to Analytics, Key roles for the new big data ecosystem, Data at rest v/s data at motion, Examples of big data analytics tools.   [5]

Apache Hadoop: Understanding distributed system and Hadoop, Comparing SQL databases and Hadoop, MapReduce building blocks of Hadoop –Namenode, Datanode, Secondary namenode, Job-Tracker, Task-Tracker, Introducing and configuring Hadoop cluster – Local, Pseudo-distributed mode, Fully distributed mode, Handling web-based Cluster, and Configuring XML files.   [8]

Working with Hadoop: Interacting with HDFS, Steps to read and write into HDFS. Anatomy of MapReduce Program – Hadoop data type, Mapper and Reducer, Partitioner, Combiner, Reading and writing format, Word count with predefined mapper and reducer. Introduction to with Hive and Spark.   [8]

Big Data Management: In-database Analytics – Introduction to NoSQL– Aggregate data models, Graph databases, Graph-less databases, Distribution models, Introduction to HBase, MongoDB, and Cassandra.   [8]

Business Analytics: Decision making in business analytics, Business analytics in practice – Financial analytics, Healthcare analytics, Sport and web analytics. Categorization of analytics methods and models – Descriptive analytics, Predictive analytics, Perspective analytics. Advanced Analytical Theory and Methods– Linear regression, Logistic regression, K-menas clustering, Decision tree classification.   [8]

Case studies: Social data analytics, Recommendation engines, Customer analytics.   [3]

Recommended Books:
1. Chuck Lam, "Hadoop in Action", Dreamtech Press/Wiley India.
2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC2
3. Jeffrey D Camm, "Essentials of Business Analytics" CENGAGE Learning.
4. Jared Dean,"Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley Publication.
5. Eric Siegel, Thomas H. Devanport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Willey.
6. Holden Karau and Andy Kowinski ,"Learning Spark", Kindle Edition.

DECS-14708 Data Warehouse and Data Mining

	L	T	P
Internal Marks: 40			
External Marks: 60	3	1	0
Total Marks: 100			

Introduction: Features of a data warehouse, Data granularity, The information flow mechanism, Metadata, Two classes of data, Life cycle of data, Data mining concepts, Data mining process, Data mining techniques, Data warehouse v/s data mining, OLAP v/s data mining, Data mining functionalities, Data pre-processing – Descriptive data summarization, Data cleaning, Integration and Transformation, Reduction, Discretization and Concept hierarchy generation. [7]

Physical Architecture of a Data Warehouse and Data Mart Issues: Data warehouse architectural goals, Data warehouse architecture, Distinguishing characteristics of data warehouse architecture, Data warehouse and Data marts, Building data marts, Data mart issues. [6]

Data Warehouse Schema: Introduction, Building the fact tables and Dimension tables, Characteristics of a dimension table, Characteristics of a fact table, The factless fact table, Updates to dimension tables, Cyclicity of data – Wrinkle of time, Dimensional modeling, The star schema, The snowflake schema, Aggregate tables, Fact constellation schema or Families of star, Strengths of dimensional modeling, Data warehouse and the data model, Keys in the data warehouse schema, Enhancing the data warehouse performance, Data warehousing and the technology. OLAP vs OLTP. [8]

Classification and Prediction: Introduction, Issues regarding classification and prediction, Classification by decision tree induction, Bayesian classification, Rule-based classification, Classification by Back-propagation, Prediction – Prediction techniques, Linear and Non-Linear regression. [8]

Clustering: Introduction, Applications of clustering, Types of data in cluster analysis, Categorization of major clustering methods – Partitioning methods, Hierarchical methods, Density-Based methods, Grid-Based methods, Outlier analysis, Data visualization. [7]

Applications and Trends: Applications and trendsof data Warehousing– Multiple data types, Data visualization.Applications and trends of data mining – Retail industry, Telecommunication industry and Intrusion detection. [4]

Recommended Books:
1. ReemaThareja, "Data Warehousing", Oxford University Press.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts & Techniques", Elsevier Pub.
3. PaulrajPonniah, "Data Warehousing Fundamentals",John Wiley & Sons, Inc.
4. Berson, "Data Warehousing & Data Mining & OLAP", TMH.
5. N.P Gopalan, "Data Mining Technique & Trend", PHI.

DECS-14709 Natural Language Processing

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Introduction to natural language and speech processing, Steps for processing natural languages, Issues and challenges for processing of natural languages, Elements of information theory, Brief history of natural language processing. [6]

Morphological Analysis: Inflectional and Derivational morphology, Morphological parsing, Lexicon and Morphotactics, Finite state transducers, N-gram language models, N-gram smoothing, Entropy. [8]

Part-of-Speech Tagging: Word classes, Part-of-speech tagging, Tagsets, POS tagging Techniques – Rule-based, Stochastic, Transformation-based. [6]

Syntactic Analysis: Introduction to parsing, Basic parsing strategies, Top-down parsing, Bottom-up parsing, Issues in basic parsing methods, Parsing with context-free grammars, Earley algorithm, Finite-state parsing methods. [7]

Semantic Analysis: Lexical semantics, Lexemes, Relations among lexemes and their senses, WordNet, Word Sense Disambiguation. [5]

Pragmatics: Discourse, Discourse structure. Dialogue – Acts, structure, conversational agents. Language generation, Architecture for generation. [5]

Applications: Different applicationareas of natural language processing – Machine translation, Machine learning, Text categorisation and summarisation, Speech synthesis, Speech recognition, Optical character recognition, Database access, etc. [3]

Recommended Books:

1. D. Jurafsky and J. H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.
2. J. Allen, "Natural Language Understanding", Addison Wesley.
3. T. Siddiqui and U.S. Tiwary, "Natural Languauge Processing and Information Retrieval", Oxford University Press.
4. J. Handke, "The Structure of the Lexicon: Human Versus Machine (Natural Language Processing)", Mouton de Gruyter.
5. A. Bharati, V. Chaitanya and R. Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall of India.

DECS-14710 Machine Learning

Internal Marks: 40

External Marks: 60

Total Marks: 100

L   T   P

3   1   0

Introduction: Designing a learning system, Perspectives and issues in machine learning, Types of machine learning – Supervised learning, Unsupervised learning. [3]

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, ID3 learning algorithm, Issues in decision tree learning – Overfitting, Pruning, Noisy data. [5]

Hidden Markov Model: Markov processes, Elements of HMM. Probability evaluation – Forward and backward procedures. Viterbi algorithm, Parameter estimation, Baum-Welch algorithm. [4]

Bayesian Learning: Probability theory and Bayes rule, Bayes theorem and Concept learning, Maximum likelihood estimation, Maximum A Posteriori (MAP) estimation, Bayesian estimation, Naive Bayes classifier, Parameter smoothing, Logistic regression. [5]

Instance Based Learning: Introduction, k-nearest Neighbor learning, Distance weighted nearest neighbor algorithm, Case based learning. [4]

Artificial Neural Networks: Introduction – Neurons and biological motivation. Neural network representations, Appropriate problems for neural network learning, Perceptron's – Representational power, Perception training rule, Gradient descent and delta rule. Multilayer networks and Back propagation algorithm, Introduction to deep learning. [7]

Support Vector Machines: Introduction, Hyper-plane, Optimal hyper-plane, Maximum margin classifier, Kernel function and Kernel SVM, Multiclass SVM. [4]

Clustering and Unsupervised Learning: Learning from unclassified data, Hierarchical clustering- Hierarchical agglomerative clustering. Non Hierarchical clustering – K-means, Expectation maximization (EM) algorithm. [5]

Applications: Machine learning applications for Feature extraction, Pattern recognition, Data mining, Fraud detection, Search engines and recommendation systems. [3]

Recommended Books:
1. Tom Mitchell, "Machine Learning", McGraw-Hill.
2. Christopher D. Manning, HinrichSchiitze "Foundations of Statistical Natural Language Processing", MIT Press.
3. Richard Duda, Peter Hart and David Stork, "Pattern Classification," John Wiley & Sons.
4. C.Bishop, "Pattern Recognition and Machine Learning", Berlin: Springer-Verlag.
5. EthemAlpaydin, "Introduction to Machine Learning", PHI.
6.

DECS-14711 Software Testing and Quality Assurance

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Overview of software engineering, Software process, Process models, Overview of project management process and its phases. Software testing – Myths and facts, Goals of software testing, Software testing as a process. Software quality – Core components of quality, Software Quality Management. [5]

Testing Principles and Basic Concepts: Test strategies for conventional and object oriented software, System testing, Recovery testing, Security testing, Stress testing, Performance testing, Basis path testing, Flow graph notation, Independent program paths, Graph matrices, Control structure testing, Condition testing, Data flow testing, Loop testing, Graph based testing methods. Equivalence partitioning, Boundary value analysis. [9]

Test Planning and Execution: Test plan development – Forming a test team, Requirement phase, Develop test plan review, Test case design strategies and program phase testing, Test estimation, Test standards, Testing for real time systems, Testing security, Build test data, Life cycle of defect, Defect management, Debugging process and Debugging strategies. Test automation – Need for automation, Categorization of testing tools, Selection of testing tools, Cost incurred in testing tools. [9]

Quality Assurance: Quality concepts – Quality, Quality control, Quality assurance, Cost of quality. Software quality assurance – SQA activities, Software reviews, Inspections, Audits, Software reliability. Quality attributes – Correctness, Reliability, Usability, Integrity, Portability, Maintainability, Interoperability. Software reliability models. Quality Standards – Study of ISO 9000 & 9001, Six sigma. [8]

Software Quality Metrics: Scope of software metrics, Classifying software measures, Measurement basics – Representational theory, Scales, Meaningfulness. What to measure – GOM technique. Control flow structure, Product quality metrics – MTTF, Customer problems, Customer satisfaction. Function point, Metrics for software maintenance, In-process quality metrics. [8]

Recommended Books:
1. Stephen H. Kan "Metrics and Models in Software Quality Engineering", Pearson Education.
2. R.S. Pressman, "Software Engineering: A Practitioner's Approach", Tata McGraw-Hill.
3. Ian Sommerville, "Software Engineering", Pearson Education.
4. M.G. Limaye, "Software Testing: Principles, Techniques and Tools", McGraw Hill.

DECS -14712 Information Security

Internal Marks: 40
External Marks: 60
Total Marks: 100

L T P
3 1 0

Introduction: Defining security, Need for security, Cyber security v/s Information security, Information security statistics, Three pillars of Security, Security myths, Security services – Confidentiality, Authentication, Integrity, Non-repudiation, Access control and Availability. Security mechanisms, Model for internetwork security, Approaches to information security implementation, Security Systems Development Life Cycle. [6]

Information Security Hurdles: Recognizing security threats and security attacks, Interruption, Interception, Modification and fabrication, Virus, Trojan Horse, Worms, Spyware, Adware, Key logger, Denial of Service, Spamming, Port scanning, Password cracking, Buffer overflow and format string vulnerabilities, TCP session hijacking, UDP hijacking, ARP attacks, Route table modification, Man-in-the-middle attack, Sniffing network traffic, Phishing and its counter measures. Security measures. [10]

Approaches to Information Security: Identity of a web site, http v/s https, Operating system fingerprinting, Hardening operating system, Updates, Patches, Host based firewall v/s Network based firewall, Deploying firewall. [8]

Cryptography: Introduction to Public key cryptography, Number theory, RSA Cryptosystem, Attacks on RSA, Key management – Session and Interchange keys, Key exchange and generation, PKI, Diffie-Hellman Key exchange. ElGamal Cryptosystem, Elliptic curve cryptography, Digital signature algorithm. [8]

Advanced Approaches to Information Security: Creating isolated network presence using virtualization, Hosting different operating systems virtually and networking amongst these, Finding and understanding CVEs, Understanding phishing using NMAP, netcat, Using tcpdump and Wireshark, Understanding CAs, Generating digital certificates. [8]

Recommended Books:
1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education.
2. AtulKahate, "Cryptography and Network Security", Tata Mc Graw Hill.
3. Behrouz A. Forouzan," Cryptography and Network Security", Tata Mc Graw Hill.
4. Mark Merkow,"Information Security Principles and Practices", Pearson Education.
5. Michael E. Whitman, "Principles of Information Security", Cengage Learning.

DECS-14713 Soft Computing

Internal Marks: 40   L   T   P

External Marks: 60   3   1   0

Total Marks: 100

Introduction: Introduction to soft computing– Definition and importance, Evolution of soft computing, Usefulness and applications. [6]

Neural Networks: Model of an artificial neuron, Comparison of artificial neural network and Biological neural network. Neural network architectures. Learning methods–Hebbian, competitive, Boltzmann. Neural network models– Perceptron, Adaline and medaline networks, Single layer, Back propagation, Radial basis function network and multi-layer networks. [9]

Fuzzy Logic: Crisp and fuzzy sets.Fuzzy sets– Membership functions, Basic operations, Properties and fuzzy relations. Fuzzy rule based system–Linguistic hedges, Aggregation of fuzzy rules, Fuzzy inference system. Applications of fuzzy logic. [8]

Genetic Algorithms: Working principle– Crossover, Mutation, Encoding, Fitness function and Reproduction. Classification of genetic algorithm, Multi-objective genetic algorithm. Genetic Programming,Application of GA in search and optimization. [8]

Optimization Techniques: Simulated annealing, Particle Swarm Optimization, Bee Colony Optimization, Ant Colony Optimization, Tabusearch, Teaching-learning based optimization. [8]

Recommended Books:
1. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy logic and Genetic Algorithms", Prentice Hall of India.
2. Xin-She Yang , "Nature-Inspired Metaheuristic Algorithms", Luniver Press.
3. D.E. Goldberg, "Genetic Algorithms in Search and Optimization, and Machine Learning", Addison-Wesley.
4. V. Kecman, 'Learning and Soft Computing", MIT Press.
5. S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley India.

DECS-14714Agile Software Development

Internal Marks: 40   L   T   P
External Marks: 60   3   1   0
Total Marks: 100

Introduction: Need of Agile software development,Agile context– Manifesto, Principles, Methods, Values, Roles, Artifacts, Stakeholders, and challenges.Business benefits of software agility.   [6]

Project Planning: Recognizing the structure of an Agile team– Programmers, Managers, Customers. User stories– Definition, Characteristics and content.Estimation– Planning poker, Prioritizing and selecting user stories with the customer, Projecting team velocity for releases and iterations.   [8]

Project Design: Fundamentals, Design principles–Single responsibility, Open-closed, Liskov-substitution, Dependency-inversion, Interface-segregation.   [8]

Design Methodologies: Need of scrum, Scrum practices –Working of scrum, Project velocity, Burn down chart, Sprint backlog, Sprint planning and retrospective, Daily scrum, Scrum roles– Product Owner, Scrum Master, Scrum Team. Extreme Programming- Core principles, values and practices. Kanban, Feature-driven development, Lean software development.   [8]

Testing: The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories,writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation.   [8]

Recommended Books:
1. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", Pearson.
2. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall.
3. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley.

CS-14715 Advanced Computer Networks Laboratory

Internal Marks: 30   L   T   P
External Marks: 20   0   0   4
Total Marks: 50

1. Installing Wireshark.
2. Packet Capturing with Wireshark.
3. Working with captured packets (Saving, exporting, marking, printing, capture settings, display
   options using filters)
4. Analyzing lower Layer Protocols ARP, IP, TCP, UDP, ICMP.
5. Configuring different types of switches.
6. Configuring VLANs
7. Configuring Trunk Ports
8. Configuring a Router.
9. Working on Network Management Software (NMS).
10. Configuring Adhoc Network
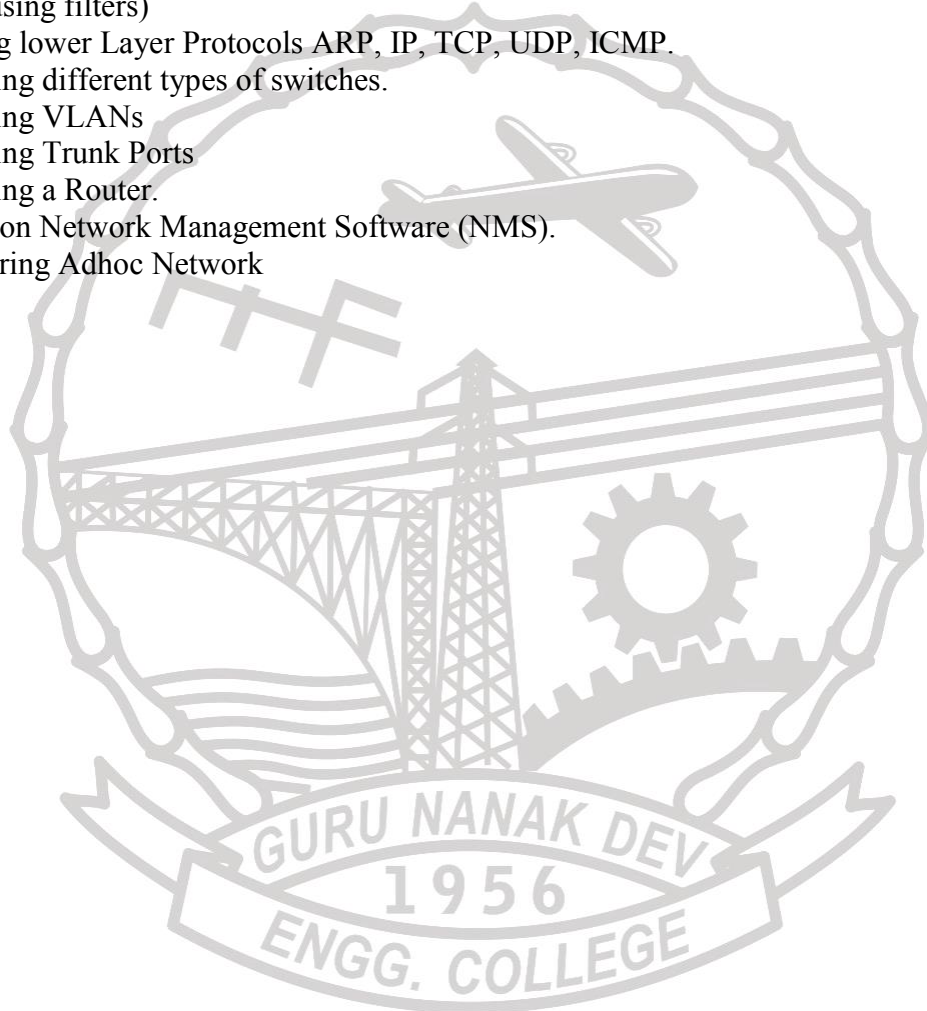
DECS-14717 Parallel Computing Lab

Internal Marks: 30   L   T   P

External Marks: 20   0   0   2

Total Marks: 50

1. Installation process and basics of MPI (Message Passing Interface).
2. Write a parallel program to calculate the sum of given numbers.
3. Write a parallel program to implement communication between MPI processes using MPI_Send and MPI_Recv.
4. Write a parallel program to synchronize a group of processes using MPI_barrier.
5. Write a parallel program implementing the hyper quicksort Algorithm.
6. Write a parallel version of merge sort.
7. Write a parallel program to find the kth largest element in an unsorted list of n elements.
8. Installation process and basics of OpenMP API (Open Multi-Processor API).
9. To get familiarized with OpenMP Directives.
10. Write a program to obtain the number of each thread executing the parallel region.
11. Use OpenMP directives to implement a parallel program for Floyd's algorithm.
12. Use OpenMP directives to implement a parallel version of matrix-vector multiplication.
13. Write a parallel program to calculate sum of two arrays and store the sum in third array using CUDA.
14. Implement parallel version of sparse matrix multiplication using CUDA.
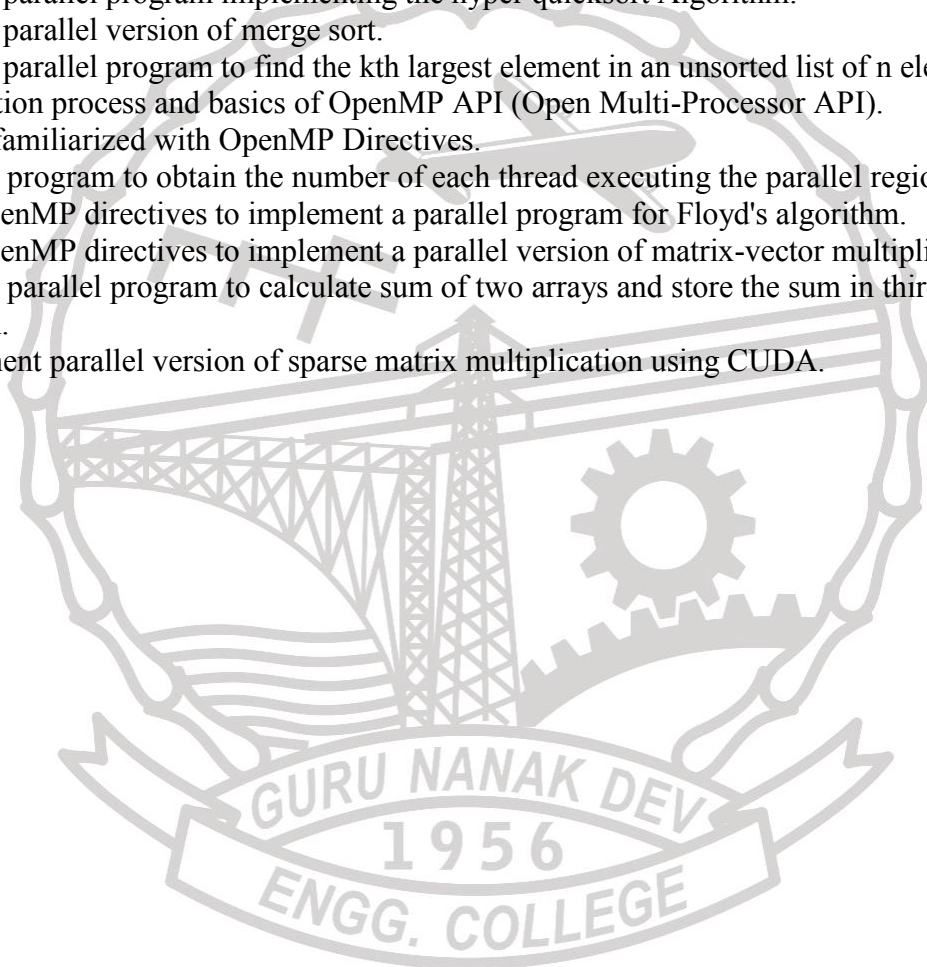
DECS-14718 Mobile Computing Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Write a program to implement mobile network using any tool.
2. Write a program to implement simple simulation example.
3. Write a program to implement network components.
4. Write a program to understand the concept of Event scheduler and Tracing.
5. Write a program for simulation with two nodes.
6. Write a program for simulation with four nodes.
7. Create a Wireless Simulation on tool to analyze the effects error on one link v/s behavior of Sliding Window Size.
8. Implement initialization and termination aspects of any tool.
9. Apply TCP agent between n0 to n3 and UDP n1 to n3. Apply relevant applications over TCP and UDP agents changing the parameters and determine the number of packets sent by TCP/UDP.
10. Simulate the different type of internet traffic such as FTP and TELNET over a network and analyze the throughput.
11. Simulate a transmission of ping message over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
12. Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare the throughput.
13. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and determine the collision across different nodes.
14. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source/destination.

DECS-14719 Cloud Computing Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

I. Use CloudSim Toolkit and do the following:

1. To create a datacenter with one host and run one cloudlet on it.
2. To create two datacenters with one host each and two cloudlets on them.
3. To create two datacenters with one host each and run cloudlets of two users on them.
4. To create a datacenter with one host and a network topology and run one cloudlet on it.
5. To create two datacenters with one host each and run cloudlets of two users with network topology on them.

II. Use CloudAnalyst Simulation tool and do the following:

1. Set up a simulation with one datacenter and one userbase.
2. Set up a simulation with multiple datacenters and multiple userbases in various regions of the world.
3. Use closest data center service broker policy and throttled load balancing algorithm to set up a simulation.
4. Configure the simulation tool to analyse the performance of social networking App.

III. Installation and configuration of Green Cloud simulation tool.

IV. Installation and configuration of CloudReports.
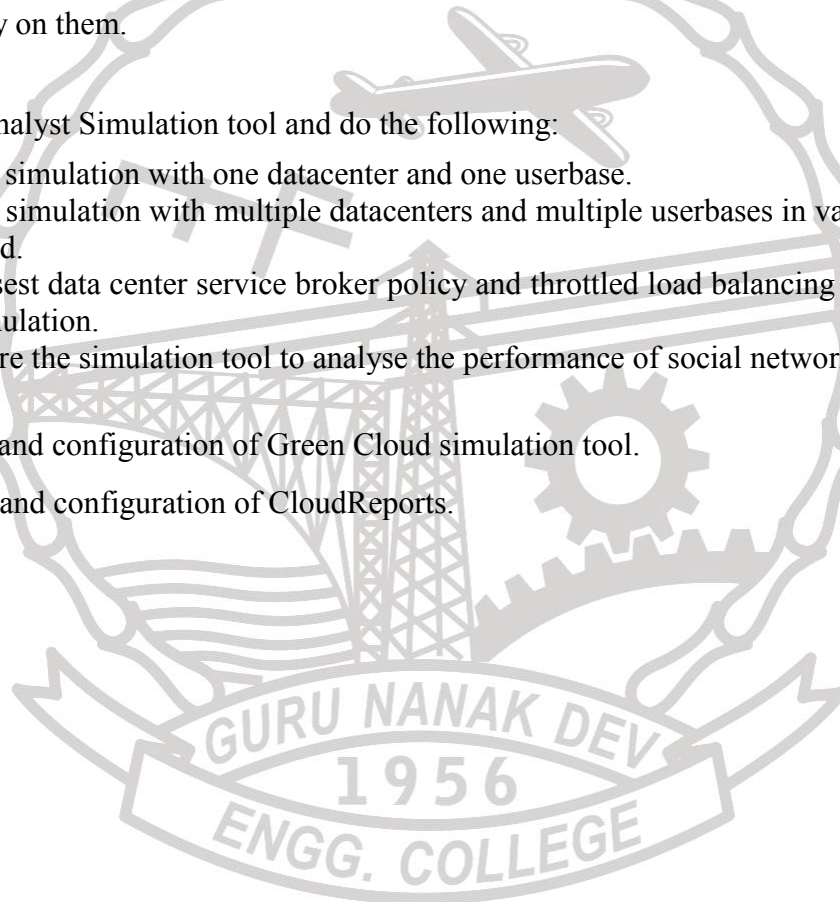
DECS-14720 Big Data and Business Analytics Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

1. Perform setting up and installing Hadoop in its three operating modes:
   a. Standalone
   b. Pseudo distributed
   c. Fully distributed.
2. Working with Hadoop Ecosystem
   a. Hands On HDFS commands
   b. HDFSfile I/O with Python/R/ Java
   c. Understand the basic Data types of MapReduce
   d. Writing a Program to count number of words in a file.
3. Implement the following file management tasks in Hadoop:
   a. Adding files and directories
   b. Retrieving files
   c. Deleting files

   (Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.)

4. Use web-based tools to monitor your Hadoop cluster and perform tasks.
5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
6. Implement Matrix Multiplication with Hadoop Map Reduce
7. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes
8. Working with Apache Spark and write a "hello world" MapReduce jobs in PySpark / RSpark.
9. NoSQL Databases
   a. Working with Document Database MongoDB
   b. Working with Wide Column Store HBase
   c. Working with Cassandra
10. **Mini Project**: By using various concepts of Big Data and Machine learning, students are required to prepare a project in a group of two to three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate the project as well as have to give a presentation of the same.

DECS-14721 Data Warehouse and Data Mining Lab

Internal Marks: 30   L   T   P
External Marks: 20   0   0   2
Total Marks: 50

Prerequisites: A basic understanding of any of the programming languages

1. Installation of R, R-studio, R Packages for windows
2. Basic introduction to R-Language: Data types, Objects, Control Structures, useful R-packages.
3. Write codes in R-Lang for following :
   a. sum of natural numbers without using a formula.
   b. find the factorial of a number using recursion
   c. to compute GCD using Euclidean algorithm.
   d. to Check Leap Year.
   e. to implement K-means algorithm.
   f. to implement EM(expectation-maximization) algorithm.
   g. to implement Apriori algorithm.
   h. to implement kNN(k-Nearest Neighbors) algorithm.
4. CASE STUDIES
   Case Study I: Analysis and Forecasting of House Price Indices
   Case Study II: Customer Response Prediction and Profit Optimization