SCHEME OF EXAMINATION
AND
COURSE OF STUDY

of subject

Computer Science

Under

Choice Based Credit System

for

B.Sc. Physical Science
(Physics, Mathematics & Computer Science)

(*w.e.f. Session 2015- 16*)

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF TECHNOLOGY
GURUKULA KANGRI VISHWAVIDYALAYA HARIDWAR
(***Deemed to be university u/s 3 of UGC Act 1956***)

JULY 2015

DEPARTMENT OF COMPUTER SCIENCE

Gurukula Kangri Vishwavidyalaya, Haridwar

SCHEME OF EXAMINATION

COURSE TYPE	PAPER CODE	PAPER NAME	PERIODS PER WEEK			EVALUTION SCHEME		
			L	P	C	CIA	ESE	TOTAL
SEMESTER - I								
DSC-1C	BCS-C101	Object Oriented Programming in C++	4	-	4	30	70	100
	BCS-C151	C++ Programming Lab	-	4	2	30	70	100
SEMESTER - II								
DSC-2C	BCS-C201	Data Structures and File Processing	4	-	4	30	70	100
	BCS-C251	Data Structures and File Processing Lab	-	4	2	30	70	100
SEMESTER - III								
DSC-3C	BCS-C301	Numerical Computing	4	-	4	30	70	100
	BCS-C351	Numerical Computing Lab	-	4	2	30	70	100
SEC-1		**Choose any One** 1. Logic and Sets* 2. Analytical Geometry* 3. Number Theory*	2	-	2	30	70	100
SEMESTER - IV								
DSC-4C	BCS-C401	Design and Analysis of Algorithms	4	-	4	30	70	100
	BCS-C451	Design and Analysis of Algorithms Lab	-	4	2	30	70	100
SEC-2*		**Choose any One** 1. Vector Calculus* 2. Transportation and Game Theory* 3. Probability and Statistics*	2	-	2	30	70	100
SEMESTER - V								
DSE-1C	**Choose any One theory paper and its corresponding lab**							
	BCS-E501A	Operating Systems	4	-	4	30	70	100
	BCS-E551A	Operating Systems Lab	-	4	2	30	70	100
	BCS-E501B	Data Mining	4	-	4	30	70	100
	BCS-E551B	Data Mining Lab	-	4	2	30	70	100
	BCS-E501C	Cryptography	4	-	4	30	70	100
	BCS-E551C	Cryptography Lab	-	4	2	30	70	100
SEC-3	**Choose any One theory paper and its corresponding lab**							
	BCS-S502A	Computer Graphics	1	-	1	30	70	100
	BCS-S552A	Computer Graphics Lab	-	2	1	30	70	100
	BCS-S502B	Electronic Commerce	2	-	2	30	70	100
		Combinatorial Optimization*						
SEMESTER - VI								
DSE-2C	**Choose any One theory paper and its corresponding lab**							
	BCS-E601A	Information Security	4	-	4	30	70	100
	BCS-E651A	Information Security Lab	-	4	2	30	70	100
	BCS-E601B	Database Applications	4	-	4	30	70	100
	BCS-E651B	Database Applications Lab	-	4	2	30	70	100
	BCS-E601C	Computer Networks	4	-	4	30	70	100
	BCS-E651C	Computer Networks Lab	-	4	2	30	70	100
SEC-4	**Choose any One**							
	BCS-S602	Modeling and Simulation	2	-	2	30	70	100
		Graph Theory*						
		Boolean Algebra*						

DSC - Discipline Specific Core **DSE** - Discipline Specific Elective **SEC** - Skill Enhancement Course

L- Lecture **P** - Practical **C**- Credit **CIA** - Continuous Internal Assessment **ESE** - End Semester Examination

*****_The syllabi of these papers are approved by the Board Of Studies of Department of Mathematics held on 30.07.2015 and to be taught by the faculty of the Department of Mathematics._

DSC-1C	BCS-C101	OBJECT ORIENTED PROGRAMMING IN C++	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	No prior knowledge about C++ is required, but students are expected to have some basic knowledge about computers, some knowledge in programming language is preferred.
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	After successfully completing this course, students should be able to: • design, analyze and evaluate computer programs using the C++ programming language. • apply object-oriented programming principles and techniques using C++.

NOTE: The question paper shall consist of **three sections** (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain **10** *Objective/ Multiple Choice Questions* of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain **10** *Short Answered Questions* (maximum 100 words) of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain **8** *Long Answered / Descriptive Questions* of ten marks each and student shall be required to attempt any four questions. ***Questions shall be uniformly distributed from the entire syllabus.*** The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Program: Program Definition, Program development cycle, Programming Languages, Low Level language, High Level Language, Features of a good programming language. **2L**

4L

Algorithm and Flow chart: Algorithm: Definition, Properties of an Algorithm, Classification of Algorithms, Algorithm logic, Flow Chart, Importance of Flowchart, Flow chart symbols, Advantages of flow chart, Limitation of flow charts.
Algorithm and flow chart for the problems: to find area & circumference of circle, to find the product of first n natural numbers , largest of 3 numbers, the check whether the number is odd or even, to find factorial of a given number

Programming using C++:

Primitive Data types, Variables, Arithmetic and Logical Expressions, Assignment	**5L**
Input/output Methods, Operators	**3L**
Control Structures, Arrays	**10L**
Functions, Recursion,	**7L**
Pointers, Basic File Handling	**7L**

OOPs concepts:

Procedural Abstractions, Data Abstraction and Encapsulation	**8L**
Inheritance; Polymorphism	**8L**
Exception Handling	**6L**

RECOMMENDED BOOKS:

1. H. Schildt C++, "The Complete Reference Book", (4th ed.), Tata McGraw Hill
2. E. Balaguruswamy, "Object Oriented Programming with C++", (4th ed.), Tata McGraw Hill
3. H. Schildt, C++, "A Beginner's Guide" (2nd ed.), McGraw Hill
4. J. R. Hubbard, "Programming with C++", (2nd ed.), Schaum's Outlines, Tata McGraw Hill
5. R. Albert and T. Breedlove, C++, "An Active Learning Approach", Jones and Bartlett India Ltd.

DSC-1C (LAB)	BCS-C151	C++ PROGRAMMING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

1. Write a menu driven program to perform the following :
   a. Calculate the factorial of a given number.
   b. Calculate the power of y to x, x and y given by the user.
   c. Calculate the n^{th} term of the Fibonacci series.
   d. Print the n^{th} prime number.
   e. Calculate the sum of the digits of a number.
   f. Reverse a number (without treating it as a string).

2. Create an array of structure called employee that contains employee code, employee name, designation and salary. Get the data for any number of employees as per user's choice. Display the details of only those employees who earn more than Rs.20000.

3. An electricity board charges the following rates to domestic users to discourage large consumption of energy:
   a. For the first 100 units - 60 paisa per unit
   b. For the next 200 units - 80 paisa per unit
   c. Beyond 300 units - 90 paisa per unit
   d. All the users are charged a minimum of Rs. 50.00. If the total amount is more than Rs, 300 then an additional surcharge of 15% is added.

   Write a program to read the names of users and number of units consumed and print out the charges with names.

4. Write a program to store sale (in rupees) of three salesmen of five products in a matrix. Calculate and display the average sale of each salesman as well as average sale of each product.

5. Write a menu driven program to perform the following operations on matrices. Tionhe matrix is an object with the following operations defined over it. The constructor takes *N*, the size of the matrix and returns the object.
   a. Addition of two matrices.
   b. Subtraction of two matrices.
   c. Multiply two matrices.
   d. Determine the transpose of a matrix.

6. Write a menu driven program to do the following computations, using recursion
   a. Multiplication of two integer numbers given by the user.
   b. Greatest Common Divisor (GCD) of any two given numbers.
   c. n^{th} term of the Fibonacci series.

7. Write a program to maintain accounts in a bank using an array of objects. The program should allow the following four operations :
   a. Create a new account
   b. Withdrawal from an account.
   c. Deposit in an account
   d. Show the balance of the account

8. Define a class Mystring with functions for the following string operations:
    a. Concatenate two strings
    b. Compute the length of a string
    c. Compare two strings
    d. Copy one string on to another
    e. Count the number of occurrences of a substring in a string
    f. Replace a substring
    g. Delete a substring

9. Write a program to create a text file and display the contents using basic file handling operations.

10. Write a program to simulate an arithmetic calculator for integers. The program should be able to produce the last result calculated and the number of arithmetic operations performed so far. Any wrong operation is to be reported. (demonstrate the use of static variable and static function)

11. Write a program that uses a function to check whether a given number is divisible by another number or not. However if the second number is missing, the function checks whether the given number is prime or not

12. Create a class complex having real and imaginary part of complex number as data members. Write a default constructor and parameterized constructor to initialize the complex numbers and write methods to add, subtract, multiply and display complex numbers

13. Write a menu driven program to compare and swap the private data members of two objects from two different classes. Display the result accordingly

14. Create two classes DM and DB which store the value of distances in metres, centimetres and feet, inches respectively. Write a program that can read values for the class objects and add one object of DM with another of DB. The object that stores the results may be a DM or DB object, depending on the units in which the results are required.

15. Write a program that calculates the area of a circle, rectangle and triangle using function overloading. Accept the dimensions of the figure as command line parameters.

16. Create a class Complex having real and imaginary part of a complex numbers as data members. Overload the binary operators +, - and * to perform d on the complex number objects. Write methods for input and output of complex numbers. Overload the binary operators using friend function.

17. Define the given class hierarchy (Three levels) and write functions.

DSC-2C	BCS-C201	DATA STRUCTURES AND FILE PROCESSING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	Knowledge of C++ programming language for implementation the algorithms
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	After successfully completing this course, students should be able to: • Able to understand the concepts of data structure, data type and array data structure. • Able to implement linked list data structure to solve various problems. • Able to understand and apply various data structure such as stacks, queues and trees and graphs to solve various computing problems • Able to implement internal & external sorting techniques • Able to understand the concept of memory management and file organization

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Basic Data Structures: Abstract data structures- stacks, queues, linked lists and binary trees. **25L**
Sets: Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, sets with merge-find operations.

Searching: Internal and external searching, use of hashing and balancing techniques. **12L**

Memory Management: Garbage collection algorithms for equal sized blocks, storage allocation for objects with mixed size, buddy systems. **6L**

Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering. Basic File System Operations: Create, open, close, extend, delete, read-block, write-block, protection mechanisms. **5L**

File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems, Indexing using B-tree, B+ tree and their variants, hashing – hash function, collision handling methods, extendible hashing. **12L**

BOOKS RECOMMENDED :

1. M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley and Sons, Inc., 2004.
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
3. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.
4. B. Stroupstrup, The C++ Programming Language, Addison Wesley, 2004
5. D.E. Knuth, Fundamental Algorithms (Vol. I), Addison Wesley, 1997

DSC-2C (LAB)	BCS-C251	DATA STRUCTURES AND FILE PROCESSING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

NOTE : All programs must be implemented in C++.

1. Write a program to sort an array using insertion sort.
2. Write a program to sort an array using bubble sort.
3. Write a program to sort an array using selection sort.
4. Write a program to search an element using linear search.
5. Write a program to search an element using binary search
6. Write a menu driven program to implement a stack using array to perform push, pop, empty and full stack operations.
7. Write programs to perform the following operations using recursion:
   - (i) Factorial of a number
   - (ii) Fibonacci Series up to n
   - (iii) Multiplication of two numbers
   - (iv) GCD of two numbers
   - (v) Binary Search
8. Write a program to implement a circular queue using array (perform insert, delete, empty and full queue operations).
9. Write a program to handle the following operations on a singly linked list :
   - (i) Create a list
   - (ii) Add a node before a given node
   - (iii) Add a node after a given node
   - (iv) Delete a node
   - (v) Count the no of nodes
   - (vi) Concatenate two lists
   - (vii) Display the list
10. Write a program for linked implementation of stack.
11. Write a program for linked implementation of queue.

DSC-3C	BCS-C301	NUMERICAL COMPUTING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	Knowledge of C/C++ programming, Data Structure, Linear Algebra and Calculus
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	Upon completion of this course, the student will be able to: • obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis • demonstrate a basic knowledge of the techniques for accurate and efficient solution of models based on linear and nonlinear systems of equations, ordinary differential equations and partial differential equations. • apply these techniques to practical problems in Engineering

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Solution to Transcendental and Polynomial Equations: Iterative methods, bisection method, secant method, Newton-Raphson method, fixed point iteration, methods for finding complex roots. **12L**

Matrices and Linear System of Equations: LU decomposition method for solving systems of equations, Symmetric positive definite matrices and least square approximation, iterative algorithms for linear equations. **10L**

Interpolation: Polynomial interpolation, Newton-Gregory, Stirling's, Bessel's and Lagrange's interpolation formula, Newton's divided differences interpolation formulae. **10L**

Curve fitting: B-spline and Approximation: Fitting linear and non-linear curves, weighted least square approximation, method of least square for continuous functions. **10L**

Numerical Differentiation and Integration: Numerical differentiation and errors in numerical differentiation, Newton-Cotes formulae, trapezoidal rule, Simpson's rule, Gaussian integration. **8L**

Numerical Solutions of Ordinary Differential Equations: Picard's and Taylor's series, Euler's and Runge-Kutta (RK) methods. **5L**

Finite Element Method: Boundary value problems, Rayleigh and Galerkin methods of approximation, applications. **5L**

BOOKS RECOMMENDED :

1. K.E. Atkinson, W. Han, Elementary Numerical Analysis, 3rd Ed., Wiley, 2003.
2. C. Xavier, S.S. Iyengar, Introduction to Parallel Algorithms, Wiley-Interscience, 1998.
3. A. Kharab, R.B. Guenther, An Introduction to Numerical Methods: A MATLAB Approach, 1st Ed., Chapman and Hall/CRC, 2001.
4. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007.
5. S.R. Otto and J.P. Denier, An Introduction to Programming and Numerical Methods in MATLAB, Springer, 2005.
6. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 7th Ed., New Age International Publishers, 2007.

DSC-3C (LAB)	BCS-C351	NUMERICAL COMPUTING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

Write Programs in C/C++ Language:

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula–Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tri diagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the initial value problem using Euler's method and compare the result with the exact solutions.
10. Solve the boundary value problem using finite difference method.

DSC-4C	BCS-C401	DESIGN AND ANALYSIS OF ALGORITHMS	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	Knowledge of C/C++ programming, Data Structure, Discrete Mathematical Structures
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	Upon successful completion of this course, the student will be able to: • Analyze and compare complexity for different types of algorithms for different types of problems. • Apply mathematical preliminaries to the analyses and design stages of different types of algorithms • Recognize the general principles and good algorithm design techniques for developing efficient computer algorithms.

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Introduction: RAM model, O(log n) bit model. **3L**

Review of data structures: Balanced trees, Mergeable sets. **3L**

Algorithm Design Techniques: Iterative techniques, Divide and conquer, dynamic programming, greedy algorithms. **14L**

Searching and Sorting Techniques: Review of elementary sorting techniques-selection sort, bubble sort, insertion sort, more sorting techniques-quick sort, heap sort, merge sort, shell sort, external sorting. **8L**

Lower bounding techniques: Decision Trees, Adversaries. String Processing: KMP, Boyre-Moore, Robin Karp algorithms. **8L**

Introduction to randomized algorithms: Random numbers, randomized Qsort, randomly Built BST Number Theoretic Algorithms: GCD, Addition and Multiplication of two large numbers, polynomial arithmetic, Fast-Fourier Transforms. **10L**

Graphs: Analysis of Graph algorithms Depth-First Search and its applications, Breadth-First Search and its applications, minimum Spanning Trees and Shortest Paths. **8L**

Introduction to Complexity Theory: Class P, NP, NP-Hard, NP Completeness. Introduction to Approximation Algorithms **6L**

BOOKS RECOMMENDED :

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 2006.
2. J. Kleinberg and E. Tardos, Algorithms Design, Pearson Education, 2006.
3. S. Baase, Computer Algorithms: Introduction to Design and Analysis, Addison Wesley, 1999.
4. A.V. Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education, 2006.

DSC-4C (LAB)	BCS-C451	DESIGN AND ANALYSIS OF ALGORITHMS LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

Write Programs in C/C++ Language:

1. To implement Insertion Sort (The program should report the number of comparisons)
2. To implement Merge Sort (The program should report the number of comparisons)
3. To implement Heap Sort (The program should report the number of comparisons)
4. To implement Randomized Quick sort (The program should report the number of comparisons)
5. To implement Shell Sort.
6. To implement Knapsack Problem. (Greedy Method)
7. To Implement Largest Common Subsequence. (Dynamic Programming)
8. To Implement Strassen's matrix multiplication Algorithm. (Divide and Conquer Method)
9. To implement Breadth-First Search in a graph.
10. To implement Depth-First Search in a graph.
11. To implement Dijkstra's Algorithm.
12. To implement Prim's Algorithm.
13. To implement Kruskal's Algorithm.
14. To implement Naïve String Matching Algorithm.
15. To implement Rabin Karp String Matching Algorithm

NOTE : For the algorithms at S.No 1 to 5 test run the algorithm on 100 different inputs of sizes varying from 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph.

DSE-1C	BCS-E501A	OPERATING SYSTEMS	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
PREREQUISITES		:	Knowledge of computer architecture and assembly language				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	After successfully completing this course, students should be able to: • understand key mechanisms in design of operating systems modules • understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks • compare performance of processor scheduling algorithms • produce algorithmic solutions to process synchronization problems				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Introduction: Operating System as a resource manager, operating system classification, system calls, traps, architectures for operating systems. **6L**

Device Management: Goals of I/O software, Design of device drivers. **4L**

Processor Management: Process overview, process states and state transition, multiprogramming, multi-tasking, levels of schedulers and scheduling algorithms. **10L**

Process Synchronization - Critical section and mutual exclusion problem, classical synchronization problems, deadlock prevention. **14L**

Multithreading Memory Management: Classical memory management techniques, paging, segmentation, virtual memory. **12L**

File Management: Overview of file management system, disk space management, directory structures. **8L**

Protection domains, access control lists, protection models. **6L**

BOOKS RECOMMENDED :

1 A.S. Tanenbaum, Modern Operating Systems, 3rd Ed., Prentice-Hall of India, 2008.

2 William Stallings, Operating Systems: Internals and Design Principles, 5th Ed., Prentice-Hall of India, 2006.

3 Gary Nutt, Operating Systems: A Modern Approach, 3rd Ed., Addison Wesley, 2004.

4 D.M. Dhamdhere, Operating Systems: A Concept Based Approach, 2nd Ed., Tata McGraw-Hill, 2007.

DSE-1C (LAB)	BCS-E551A	OPERATING SYSTEMS LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

Following exercises can be performed using Linux or Unix

1. Introduction to Operating Systems, Operating System Services, shell
2. Usage of following commands:

   ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.

3. Usage of following commands:

   cal, cat(append), cat(concatenate), mv, cp, man, date.

4. Usage of following commands: chmod, grep, tput (clear, highlight), bc.

Following exercises are to be implemented using C/C++

1. Write a program to implement and compare the following CPU Scheduling Algorithms

   (i) FCFS (ii) SJF (iii) SRJF

   (iv) Priority (Pre Emptive) (v) Priority (Non Pre Emptive) (vi) Round Robin

   For each of the above take input as follows: Process id, Time of arrival and Expected CPU time. Program should calculate response time, waiting time and turnaround time for each process and average for each scheme.

   For round robin scheme In the event that a process completes its time quantum at the same time that another process arrives, the process just completing its quantum is queued ahead of the arriving process.

2. Write a program to implement and compare the following memory allocation algorithms

   (i) First Fit (ii) Best Fit (iii) Worst Fit

3. Write a program to map logical addresses to physical addresses in a paging scheme. Use structure to create a page table and implement memory (address, contents). Page size and physical memory size should be taken as input from user. Also Process id and size are taken as input and memory allocation is performed. Make an interactive program to perform the following

   (i) Accept a process id and page no and display frame no for a valid page.

   (ii) Accept a process id to de-allocate and display memory contents in tabular form.

DSE-1C	BCS-E501B	DATA MINING	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.

PREREQUISITES	:	Knowledge of Database Management System (DBMS)
COURSE OBJECTIVES/ LEARNING OUTCOMES	:	Upon successful completion of this course, the student will be able to: • Identify data mining functionalities • Identify data warehousing functionalities • Apply data preprocessing techniques - data cleaning, data integration and transformation, data reduction, discretization, and concept hierarchy generation • Describe data warehousing and data mining architectures

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Overview: The process of knowledge discovery in databases, predictive and descriptive data mining techniques, supervised and unsupervised learning techniques. **15L**

Techniques of Data Mining: Link analysis, predictive modeling, database segmentation, score functions for data mining algorithms, Bayesian techniques in data mining. **20L**

Issues in Data Mining: Scalability and data management issues in data mining algorithms, parallel and distributed data mining, privacy, social, ethical issues in KDD and data mining, pitfalls of KDD and data mining. **25L**

BOOKS RECOMMENDED :

1. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson, 2002.
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, 2nd Ed., Morgan Kaufmann, 2006.
3. Arun Pujari, Data Mining Techniques, University Press, 2001.
4. D. Hand, H. Mannila and P. Smyth, Principles of Data Mining, Prentice-Hall of India, 2006.
5. G.K. Gupta, Introduction to Data Mining with Case Studies, Prentice-Hall of India, 2006.

DSE-1C (LAB)	BCS-E551B	DATA MINING LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

Practical List: Practical are to be done using **Weka**, and a report prepared as per the format*. The operations are to be performed on built-in dummy data sets of **Weka** and/or the downloadable datasets mentioned in references below. Also wherever applicable, the parameter values are to be varied (upto 3 distinct values). The 'Visualize' tab is to be explored with each operation.

1. **Preprocessing : Apply the following filters –**
   - **a.** **weka>filter>supervised>attributed>**
     AddClassification, AttributeSelection, Discretize, NominalToBinary
   - **b.** **weka>filter>supervised>instance:**
     StratifiedRemoveFolds, Resample
   - **c.** **weka>filter>unsupervised>attribute>**
     Add, AddExpression, AddNoise, Center, Discretize, MathExpression, MergeTwoValues, NominalToBinary, NominalToString, Normalize NumericToBinary, NumericToNominal, NumericTransform, PrincipalComponent, RandomSubset, Remove, RemoveType, ReplaceMissingValues, Standardize
   - **d.** **weka>filter>unsupervised>instance>**
     Normalize, Randomize, Standardize, RemoveFrequentValues, RemoveWithValues, Resample, SubsetByExpression

2. **Explore the 'select attribute' as follows**
   weka>attributeSelection>, FilteredSubsetEval, WrapperSubsetEval

3. **Association mining**
   weka>associations>, Apriori, FPGrowth

4. **Classification****
   weka>classifiers>bayes>, NaïveBayes, weka>classifiers>lazy>: IB1, IBk
   weka>classifiers>trees , SimpleCart, RandomTree , ID3

5. **Clustering****
   weka>clusters>, SimpleKMeans , FarthestFirst algorithm, DBSCAN, hierarchicalClusterer

DSE-1C	BCS-E501C	CRYPTOGRAPHY	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
PREREQUISITES		:	Knowledge of Data Structure				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	• To impart an essential study of computer security issues • To develop basic knowledge on cryptography • To impart an essential study of various security mechanisms				

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Elementary number theory: Prime numbers, Fermat's and Euler's theorems, Testing for primality, Chinese remainder theorem, discrete logarithms. **10L**

Finite fields: Review of groups, rings and fields; Modular Arithmetic, Euclidean Algorithms, Finite fields of the form GF(p), Polynomial Arithmetic, Finite fields of the form GF(2). **12L**

Data Encryption Techniques: Algorithms for block and stream ciphers, private key encryption – DES, AES, RC4; **12L**

Algorithms for public key encryption – RSA, DH Key exchange, KERBEROS, elliptic curve cryptosystems. **12L**

Message authentication and hash functions, Digital Signatures and authentication protocols, Public key infrastructure, Cryptanalysis of block and stream ciphers. **14L**

BOOKS RECOMMENDED

1 W. Stallings, Cryptography and Network Security Principles and Practices, 4th Ed., Prentice-Hall of India, 2006.

2 C. Pfleeger and S.L. Pfleeger, Security in Computing, 3rd Ed., Prentice-Hall of India, 2007.

3 M.Y. Rhee, Network Security, John Wiley and Sons, NY, 2002.

DSE-1C (LAB)	BCS-E551C	CRYPTOGRAPHY LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

1. Implement the encryption and decryption of 8-bit data using 'Simplified DES Algorithm' in 'C'.

2. Implement 'Linear Congruential Algorithm' to generate 5 pseudo-random numbers in 'C'.

3. Implement Rabin-Miller Primality Testing Algorithm in 'C'.

4. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.

5. Implement RSA algorithm for encryption and decryption in 'C'.

6. Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.

7. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.

8. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:

(i) Two neighborhood IP addresses on your LAN
(ii) All ICMP requests
(iii) All TCP SYN Packets

SEC-3	BCS-S502A	COMPUTER GRAPHICS	L	C	CIA	ESE	Time for ESE
			1	1	30	70	3Hrs.
PREREQUISITES		:	Knowledge of data structures, C/ C++ programming language, linear algebra and co-ordinate geometry				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	By the end of the semester students are expected to have a general understanding of the following: • The basic elements of computer graphics and graphics hardware • Basic modeling techniques • State of the art in 2D computer graphics				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Development of computer Graphics: Raster Scan and Random Scan graphics storages, displays processors and character generators, colour display techniques, interactive input/output devices. **3L**

Points, lines and curves: Scan conversion, line-drawing algorithms, circle and ellipse generation, conic-section generation, polygon filling anti aliasing. **6L**

Two-dimensional viewing: Coordinate systems, linear transformations, line and polygon clipping algorithms. **6L**

BOOKS RECOMMENDED :

1 D. Hearn and M.P. Baker, Computer Graphics, 2nd Ed., Prentice–Hall of India, 2004.

2 J.D. Foley, A van Dam, S.K. Feiner and J.F. Hughes, Computer Graphics: Principals and Practices, 2nd Ed., Addison-Wesley, MA, 1990.

3 D.F. Rogers, Procedural Elements in Computer Graphics, 2nd Ed., McGraw Hill Book Company, 2001.

SEC-3 (LAB)	BCS-S552A	COMPUTER GRAPHICS LAB	P	C	CIA	ESE	Time for ESE
			2	1	30	70	3Hrs.

Write Programs in C/C++ Language:

1. To plot a point (pixel) on the screen.
2. To draw a straight line using DDA Algorithm.
3. To draw a straight line using Bresenham's Algorithm.
4. Implementation of mid-point circle generating Algorithm.
5. Implementation of ellipse generating Algorithm.
6. To translate an object with translation parameters in X and Y directions.
7. To scale an object with scaling factors along X and Y directions.
8. To rotate an object with a certain angle about origin.
9. Perform the rotation of an object with certain angle about an arbitrary point.
10. To perform composite transformations of an object.

SEC-3	BCS- S502B	ELECTRONIC COMMERCE	L	C	CIA	ESE	Time for ESE
			2	2	30	70	3Hrs.
PREREQUISITES		:	Knowledge basics of Internet Technologies and Commerce				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	Upon completion of the subject, students will be able to: • comprehend the underlying economic mechanisms and driving forces of E-Commerce; • understand the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders; • understand global E- commerce and cyber laws				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Building Blocks of Electronic Commerce: Introduction, internet and networking technologies, Internet and network protocols, web server scalability, software technologies for building E-commerce applications, distributed objects, object request brokers, component technology, web services, web application architectures. **12L**

Design of auction, optimization algorithms, for market places, multi-agent systems. **8L**

Global E-commerce and Law: Cyber law in India. Comparative evaluation of Cyber laws of certain countries. **10L**

BOOKS RECOMMENDED :

1 E.M. Awad, Electronic Commerce from Vision to Fulfillment, 3rd Ed., Prentice-Hall of India, 2006

2 P.T. Joseph, E-Commerce: An Indian Perspective, Prentice-Hall of India, 2007.

Scott Bonneau, Tammy Kohl, Jeni Tennison, Jon Duckett and Kevin Williams, XML Design Handbook,

3 Wrox Press Ltd., 2003.

4 Michael Cheshar, Ricky Kaura, and Peter Linton, Electronic Business and Commerce, Springer, 2003.

DSE-2C	BCS-E601A	INFORMATION SECURITY	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
PREREQUISITES		:	NIL				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	Upon successful completion of this course, the student will be able to: • understand the basics of Information Security • know the legal, ethical and professional issues in Information Security • know the aspects of risk management • know the technological aspects of Information Security				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Overview of Security: Protection versus security; aspects of security–data integrity, data availability, privacy; security problems, user authentication, Orange Book. **10L**

Security Threats: Program threats, worms, viruses, Trojan horse, trap door, stack and buffer overflow; system threats- intruders; communication threats- tapping and piracy. **10L**

Cryptography: Substitution, transposition ciphers, symmetric-key algorithms-Data Encryption Standard, advanced encryption standards, public key encryption - RSA; Diffie-Hellman key exchange, ECC cryptography, Message Authentication- MAC, hash functions. **20L**

Digital signatures: Symmetric key signatures, public key signatures, message digests, public key infrastructures. **10L**

Security Mechanisms: Intrusion detection, auditing and logging, tripwire, system-call monitoring; **10L**

BOOKS RECOMMENDED :

1. W. Stallings, Cryptography and Network Security Principles and Practices, 4th Ed., Prentice-Hall of India, 2006.
2. C. Pfleeger and SL. Pfleeger, Security in Computing, 3rd Ed., Prentice-Hall of India, 2007.
3. D. Gollmann, Computer Security, John Wiley and Sons, NY, 2002.
4. J. Piwprzyk, T. Hardjono and J. Seberry, Fundamentals of Computer Security, Springer-Verlag Berlin, 2003.
5. J.M. Kizza, Computer Network Security, Springer, 2007.
6. M. Merkow and J. Breithaupt, Information Security: Principles and Practices, Pearson Education, 2006.

DSE-2C (LAB)	BCS-E651A	INFORMATION SECURITY LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

DSE-2C	BCS-E601B	DATABASE APPLICATIONS	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
PREREQUISITES		:	Knowledge of concepts of DBMS and Internet technologies				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	After successful completion of this course, students are expected to be able to • Understand client-server architecture • Perform basic website design • Perform basic client side programming • Perform basic server side programming				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Application Design and Development: User interfaces and tools, web interfaces to Databases Web Fundamentals: HTML, static vs. dynamic web pages, client (Java script/VB) and server side scripting (JSP/ASP/PHP/VB), web servers and sessions, two level & three level architecture, Real Life Application Development using Popular DBMS: SQL, procedures & functions, exception handling, triggers, large objects, user defined data types, collection types, bulk loading of data. **30L**

Query Optimization: Query Processing, query tree, query plans, measures of query cost, estimates of basic operations, equivalent relational algebra expressions, evaluation of expressions. **15L**

Authorizations in SQL: System and user privileges, granting and revoking privileges, roles, authorization on views, functions and procedures, limitations of SQL authorizations, audit trails Application Security: Encryption techniques, digital signatures and digital certificates. **15L**

BOOKS RECOMMENDED :

1. A. Silberschatz, H. Korth and S. Sudarshan, Database System Concepts, 5th Ed., Tata McGraw Hill, 2006.
2. J. Morrison, M. Morrison and R. Conrad, Guide to Oracle 10g, Thomson Learning, 2005.
3. Loney and Koch, Oracle 10g: The Complete Reference, Tata McGraw Hill, 2006.
4. David Flanagan, Java Script, The Definitive Guide, O'Reilly Media, 2006.
5. Marty Hall, Larry Brown, and Yaakov Chaikin, Core Servlets and Java Server Pages: Core Technologies (Vol. II), 2nd Ed., Sun Microsystems Press, 2006.
6. S.K. Singh, Database Systems Concepts, Design and Applications, Pearson Education 2006.

DSE-2C (LAB)	BCS-E651B	DATABASE APPLICATIONS LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

I. List of practicals using Javascript :

Create event driven program for following using JSP:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers.
3. Find the factorial of a number n.
4. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
5. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

II. HTML Programming

1. Create an HTML document with the following formatting options:
   - (i) Bold
   - (ii) Italics
   - (iii) Underline
   - (iv) Headings (Using H1 to H6 heading styles)
   - (v) Font (Type, Size and Color)
   - (vi) Background (Colored background/Image in background)
   - (vii) Paragraph
   - (viii) Line Break
   - (ix) Horizontal Rule
   - (x) Pre tag

2. Create an HTML document which consists of:
   - (i) Ordered List
   - (ii) Unordered List
   - (iii) Nested List
   - (iv) Image

3. Create Form with Input Type, Select and Text Area in HTML.

4. Create an HTML containing Roll No., student‘s name and Grades in a tabular form.

5. Create a form using HTML which has the following types of controls:
   - (i) Text Box
   - (ii) Option/radio buttons
   - (iii) Check boxes
   - (iv) Reset and Submit buttons

III. SQL Programming

1. Create a database having two tables with the specified fields, to computerize a library system of a Delhi University College.

LIBRARYBOOKS (Accession number, Title, Author, Department, PurchaseDate, Price)
ISSUEDBOOKS (Accession number, Borrower)

a) Identify primary and foreign keys.
b) Create the tables and insert at least 5 records in each table.
c) Delete the record of book titled 'Database System Concepts',
d) Change the Department of the book titled Discrete Maths to Computer Science.
e) List all books that belong to Computer Science department.
f) List all books that belong to Computer Science department and are written by author 'Navathe'.
g) List all computer (Department='Computer Science') that have been issued.
h) List all books which have a price less than 500 or purchased between 01/01/1999 and 01/01/2004.

2. Create a database having three tables to store the details of students of Computer Department.

STUDENT (Roll_number, StudentName, DateOfBirth, Address, 12_th_Marks, Phone_number)
PAPER(PaperCode, Papername)
DETAILS (RollNumber, PaperCode, Attendance, Marks_in_home_examination).

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper 2.
c) List all students who live in 'Delhi' and have marks greater than 60 in paper 1.
d) Find the total attendance and total marks obtained by each student.
e) List the name of student who has got the highest marks in paper 2.

3. Create the following tables and answer the queries given below:

CUSTOMER (CustID, email, Name, Phone, ReferrerID)
BICYCLE (BicycleID, DatePurchased, Color, CustID, ModelNo)
BICYCLEMODEL (ModelNo, Manufacturer, Style)
SERVICE (StartDate, BicycleID, EndDate)

a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
b) List all the customers who have the bicycles manufactured by manufacturer 'Honda'.
c) List the bicycles purchased by the customers who have been referred by customer 'C1'.
d) List the manufacturer of red colored bicycles.
e) List the models of the bicycles given for service.

4. Create the following tables, enter at least 5 records in each table and answer the queries given below.

EMPLOYEE (Person_Name, Street, City)
WORKS (Person_Name, Company_Name, Salary)
COMPANY (Company_Name, City)
MANAGES (Person_Name, Manager_Name)

a) Identify primary and foreign keys.
b) Alter table employee, add a column —email of type varchar(20).
c) Find the name of all managers who work for both Samba Bank and NCB Bank.
d) Find the names, street address and cities of residence and salary of all employees who work for 'Punjab National Bank' and earn more than Rs. 50,000.

e) Find the names of all employees who live in the same city as the company for which they work.
f) Find the highest salary, lowest salary and average salary paid by each company.
g) Find the sum of salary and number of employees in each company.
h) Find the name of the company that pays highest salary.

5. Create the following tables, enter at least 5 records in each table and answer the queries given below.

SUPPLIERS (SNo, Sname, Status, SCity)
PARTS (PNo, Pname, Colour, Weight, City)
PROJECT (JNo, Jname, Jcity)
SHIPMENT (Sno, Pno, Jno, Qunatity)

a) Identify primary and foreign keys.
b) Get supplier numbers for suppliers in 'Delhi' with status>20.
c) Get suppliers details for suppliers who supply part P2. Display the supplier list in increasing order of supplier numbers.
d) Get suppliers names for suppliers who do not supply part P2.
e) For each shipment get full shipment details, including total shipment weights.
f) Get all the shipments where the quantity is in the range 300 to 750 inclusive.
g) Get part nos. for parts that either weigh more than 16 pounds or are supplied by suppliers S2, or both.
h) Get the names of cities that store more than five red parts.
i) Get full details of parts supplied by a supplier in London.
j) Get part numbers for part supplied by a supplier in 'Mumbai' to a project in 'Mumbai'.
k) Get the total number of project supplied by a supplier (say, S1).
l) Get the total quantity of a part (say, P1) supplied by a supplier (say, S1).

DSE-2C	BCS-E601C	COMPUTER NETWORKS	L	C	CIA	ESE	Time for ESE
			4	4	30	70	3Hrs.
PREREQUISITES		:	Knowledge of operating system and basic electrical principles				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	Upon completion of this module, students will be able to: • analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies; • analyze, specify and design the topological and routing strategies for an IP based networking infrastructure				

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Basic Concepts: Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks. **3L**

OSI and TCP/IP Models: Layers and their functions, comparison of models. **4L**

Digital Transmission: Interfaces and Modems: DTE-DCE Interface, modems, cable modems. **3L**

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity. **5L**

Telephony: Multiplexing, error detection and correction, Many to one, one to many, WDM, TDM, FDM, circuit switching, packet switching and message switching. **5L**

Data Link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols overview. **5L**

ISDN: Services, historical outline, subscriber's access, ISDN, Layers, and broadband ISDN. **5L**

Devices: Repeaters, bridges, gateways, routers, The Network Layer, Design Issues, Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function);Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing);Distance Vector Protocol, Link State protocol. **20L**

Transport and upper layers in OSI Model: Transport layer functions, connection management, Functions of session layers, Presentation layer, and Application layer. **10L**

BOOKS RECOMMENDED :

1. A.S. Tenanbaum, Computer Networks, 4th Ed., Pearson Education Asia, 2003.
2. Behrouz A. Forouzan, Data Communication and Networking, 2nd Ed., Tata McGraw Hill.
3. D. E. Comer, Internetworking with TCP/IP, Pearson Education Asia, 2001.
4. William Stallings, Data and Computer Communications, 7th Ed., Pearson education Asia, 2002.

DSE-2C (LAB)	BCS-E651C	COMPUTER NETWORKS LAB	P	C	CIA	ESE	Time for ESE
			4	2	30	70	3Hrs.

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

SEC-4	BCS-S602	MODELING AND SIMULATION	L	C	CIA	ESE	Time for ESE
			2	2	30	70	3Hrs.
PREREQUISITES		:	Knowledge of programming and basics of mathematics				
COURSE OBJECTIVES/ LEARNING OUTCOMES		:	Upon completion of the subject, students will be able to: • Develop the theoretical skills necessary to design and analyze Continuous-time and Discrete-time systems • Cover the basic theory of random numbers and their generation				
NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). **Sec.-A** shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. **Sec.-B** shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. **Sec.-C** shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.								

Systems and environment: Concept of model and model building, model classification and representation, Use of simulation as a tool, steps in simulation study. **8L**

Continuous-time and Discrete-time systems: Laplace transform, transfer functions, state space models, order of systems, z-transform, feedback systems, stability, observability, controllability. Statistical Models in Simulation: Common discrete and continuous distributions, Poisson process, empirical distributions. **12L**

Random Numbers: Properties of random numbers, generation of pseudo random numbers, techniques of random number generation, tests for randomness, random variate generation using inverse transformation, direct transformation, convolution method, acceptance-rejection. **10L**

BOOKS RECOMMENDED :

1. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall of India, 1999.
2. Averill Law, Simulation Modeling and Analysis, 3rd Ed., Tata McGraw-Hill, 2007.
3. G. Gordan, System Simulation, 2nd Ed., Pearson Education, 2007.
4. A.F. Seila, V. Ceric and P. Tadikamalla, Applied Simulation Modeling (International Student Edition), Thomson Learning, 2004.
5. Jerry Banks, Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice, Wiley Inter Science, 1998.
6. J. Banks, J.S. Carson, B.L. Nelson, Discrete Event System Simulation, 4th Ed., Prentice Hall of India, 2004.
7. N.A. Kheir, Systems Modeling and Computer Simulation, Marcel Dekker, 1988.
8. B.P. Zeigler, T.G. Kim, and H. Praehofer, Theory of Modeling and Simulation, 2nd Ed., Academic Press, 2000.

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