BTECH IV Semester **COMPUTER SCIENCE & Engg.**							
COURSE CONTENTS (UEC SCHEME)							
CS4801	**Analysis & Design of Algorithm**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	6 Hours	3	1	2	5	70	22

Course Description

The course emphasizes the relationship between algorithms and programming, and introduces basic performance measures and analysis techniques for these problems. Also it introduces the classic algorithms in various domains.

Course Objectives:

- To learn the fundamental techniques for effective problem solving in computing.
- To Understand the different algorithmic design strategies
- To analysis the performance of algorithms using time and space complexity theory .
- To explain different computational models (e.g., divide-and-conquer), order notation and various complexity measures (e.g., running time, disk space) .

Syllabus :

Unit - I Introduction

Algorithm specification and performance analysis, asymptotic notations

Divide-and-Conquer: The general method, application to binary search, finding the maximum and minimum, merge sort, quick sort, the problem of selection and Strassen's matrix multiplication.

Unit – II The Greedy Method

Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum weight spanning trees, knapsack problem, job sequencing with deadlines.

Unit - III Dynamic Programming

The general method, application to multistage graphs, all pairs shortest paths, optimal binary search trees,0/1-Knapsack and travelling salesman problem, Flow shop scheduling

Unit - IV Backtracking & Branch and Bound:

The general method, application to 8- puzzle problem, 8- queen problem and sum of subsets.
Branch and Bound: The method, application to 0/1 Knapsack traveling salesman problems, and efficiency considerations.

Unit - V NP-Hard and NP-Complete Problems:

Introduction and basic concepts, non-deterministic Turing machine, the classes of P and NP, NP-hard graph problems, NP-completeness of the satisfiability problem, and polynomial- space-bounded problem.

Course Outcomes:

After the completion of this course, students will be able to:

- Analyze the asymptotic performance of algorithms.
- Understand basic algorithm designing techniques with their strength and weaknesses.
- Analyze and compare the efficiency of algorithms with space requirement for the same.
- Explore various research problems in algorithm like NP-hard and NP-complete problems
- Synthesize efficient algorithms in common engineering design situations.

Text Book :

i. Algorithms , by Dasgupta ,TMH, 1st edition.

ii. Algorithms Design and Analysis by Udit Agarwal ,Dhanpat Rai Publications, 6th edition.

References Book :

i. Introduction to Algorithms ,by Coremen Thomas,Leiserson CE, Rivest RL, PHI, 3rd edition.

ii. Analysis & Design of Algorithm , by Ullmann , 1st edition.

iii. Algorithm Design ,by Michael T Goodrich, Robarto Tamassia, Wiely India , 3rd edition.

iv. Analysis & Design of Algorithm, by Horowitz & Sahani , 2nd edition.

List of Experiments:

1. To implement the following using array as data structure and analyze its time complexity
   - Insertion sort
   - Selection sort
   - Bubble sort
   - Quick sort
   - Merge sort
   - Bucket sort
   - Shell sort
   - Radix sort
   - Heap sort
2. To implement Linear and Binary search and analyze its time complexity
3. To implement Matrix Chain Multiplication and analyze its time complexity
4. To implement Longest Common Subsequence problem and analyze its time complexity
5. To implement Huffman coding and analyze its time complexity
6. To implement Dijkstra's algorithm and analyze its time complexity
7. To implement Bellman Ford algorithm and analyze its time complexity
8. To implement DFS and BFS and analyze their time complexities.

*These are the General List of Experiments & the list of Experiments may vary as per course Instructor.

BTECH IV Semester **COMPUTER SCIENCE & Engg.**							
COURSE CONTENTS (UEC SCHEME)							
CS4302	**Computer Organization & Architecture**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	4 Hours	3	1	0	4	70	22

Course Description:
Students will learn the concepts of computer organization for several engineering computing systems .The course emphasizes on instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems.

Course Objectives:

- Understand the basic principles on which computers work, analyze their performance and appreciate the issues affecting modern processors.
- Understand concepts of register transfer logic and different operations.
- Explain different types of addressing modes and memory organization
- Summarize the Instruction execution stages and Pipelining

Syllabus:

Unit I:

Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer. 8085 microprocessor organization.

Unit-II:

Control Unit Organization: Hardwired control unit, Micro and nano programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, Arithmetic and Logic Unit: Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic units, design of arithmetic unit.

Unit-III:

Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor, 8085 I/O structure, 8085 instruction set and basic programming. Data transfer – Serial / parallel, synchronous/asynchronous, simplex/half duplex and full duplex.

Unit-IV:

Memory organization: Memory Maps, Memory Hierarchy, Cache Memory - Organization and mappings. Associative memory, Virtual memory, Memory Management Hardware.

Unit V:

Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

Course Outcomes:

- Understand the theory and Basic architecture of CPU.
- Understanding of different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- Analysis of different mode of transfer.
- To explain the function of each element of a memory hierarchy.
- Learn the concepts of parallel processing, pipelining and interprocessor communication.

Reference Books:

1. Morris Mano: Computer System Architecture, PHI.

2. Tanenbaum: Structured Computer Organization, Pearson Education

3. J P Hayes, Computer Architecture and Organisations, Mc- Graw Hills, New Delhi

4. Gaonkar: Microprocessor Architecture, Programming, Applications with 8085; Penram Int.

5. William Stallings: Computer Organization and Architecture, PHI

6. ISRD group; Computer orgOrganization; TMH

7. Carter; Computer Architecture (Schaum); TMH 8. Carl Hamacher: Computer Organization, TMH

BTECH IV Semester **COMPUTER SCIENCE & Engg.**							
COURSE CONTENTS (UEC SCHEME)							
CS4303	**Data Base Management System**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	5 Hours	2	1	2	4	70	22

Course Descriptions:

A database management system (DBMS) is designed to manage a large body of information. This course is Emphasis on data dictionaries, normalization, data integrity, data modeling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, and reports.

Course Objectives:

The objective of the course are:

- how to organize, maintain and retrieve information from DBMS in a efficient, and effective way.
- To introduce the concepts of transaction and transactions processing
- To present the issues and techniuques relaed to concurrency control and recovery in multiuser environment.
- To understand the concept of normalizarion to normalize the database
- To present the techniques of SQL engine for query processing.

Syllabus:

Unit I: DBMS Concepts and architecture Introduction, Database approach v/s Traditional file accessing approach. Review of file organization techniques. Database schemas and Instances, Data independence. Database users, functions of DBA and database Designer. Various data models, basic concepts of Hierarchical data model, Network data model, and Relational data model, Comparison between the three types of models.

Unit II: ER data model: Entitles and attributes, Entity types, Defining the E-R diagram, Concept of Generalization, Aggregation, and Specialization. transforming the ER diagram into the tables. Relational Data models: Domains, Tuples, Attributes, Relations, Characteristics of relations, Keys, Key attributes of relation, Relational database schemas, Integrity constraints, Referential integrity, Intension, and Extension.

Unit III : Relational algebra and relational calculus, Relational algebra operations like select, Project, Join, Division, outer union. Types of relational calculus i.e. Tuple oriented and domain oriented relational calculus and its operations. Relational Query languages: SQL-DDL, DML, Complex queries, various joins, indexing, triggers and views.

Unit IV: DataBase Design: Introduction to normalization, Normal forms, Functional dependency, Decomposition, Dependency preservation, and lossless join.Transaction Processing Concepts: Transaction System, Testing of Serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction

failures. Log-based recovery. Checkpoints deadlock handling. Concurrency Control Techniques: - Concurrency Control, locking Techniques for concurrency control, time-stamping protocols for concurrency control, validation based protocol,Recovery with the concurrent transaction.

Unit V: Data Storage and indexing: Single level and multi level indexing, Dynamic Multi level indexing using B Trees and B+ Trees, Query processing and Query Optimization, Introduction to database security,data mining and data warehousing.

Text Books:

i. Date C J, "An Introduction to Database System", Pearson Educations
ii. Korth, Silbertz,Sudarshan, "Fundamental of Database System", McGraw Hill

Reference Books:

i. Understanding SQL by Martin Gruber, BPB
ii. An introduction to Database Systems, C J Date, Addition-Wesley.

Course Outcome:

After learning the course the students should be able to :

- Evaluate business information problem and find the requirements of a problem in terms of data.
- Understand the uses of the database schema and the need for normalization.
- Design the database schema with the use of appropriate data types for storage of data in the database.
- Apply and relate the concept of transaction, concurrency control and recovery in database
- Identify the purpose of query processing and optimization and also demonstrate the basis of query evaluation.

LIST OF EXPERIMENTS:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a sql statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the following functions: MAX(),MIN(),AVG(),COUNT().
6. Write the query to implement the concept of Intergrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers
9. Perform the following operation for demonstrating the insertion, updation, and deletion using the referential integrity constraints
10. Write the query for creating the users and their role.

*These are the General List of Experiments & the list of Experiments may vary as per course Instructor.

BTECH IV Semester **COMPUTER SCIENCE & Engg.**							
COURSE CONTENTS (UEC SCHEME)							
CS4304	**Operating System**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	5 Hours	2	1	2	4	70	22

Course Descriptions:

This course will provide an introduction to operating system design and implementation. The course starts with evolution and then covers the major components of operating systems. The discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping) and file systems. Linux / Unix is studied at the end as a case study.

Course Objectives:

- To learn the fundamentals of Operating Systems functions, features and services.
- To understand the concepts of process and resource management.
- To understand the memory hierarchy, memory technologies and memory management.
- To apply the commands on Linux/Unix system.
- To analysis the operating system performance through appropriate abstraction of CPU, memory, files, processes etc.

Syllabus:

Unit – I Operating System Introduction:

Operating systems objectives, functions, architecture, structures, operations, Evolution , services, Design and Implementation issues System calls , system Programs, virtual machine.

Unit - II Process Management:

Process concept, Inter process communication, multithreading –concepts, issues, examples.
CPU scheduling: concepts, performance, criteria, algorithms, multiprocessor scheduling.

Unit - III Process Coordination:

Critical section problem, software and hardware solutions, semaphores, monitors, atomic transactions, classical synchronization problems.
Deadlock: characterization, Prevention, Avoidance and Detection, Recovery, combined approach to handle deadlocks.

Unit - IV Memory and File Systems:

Memory management - Virtual Memory concepts Partitioning, Paging, Segmentation, performance, page Replacement algorithms, cache memory organization.
File system: File Concepts – File organization and Access mechanism, File Directories, File sharing, Implementation issues.

Unit - V LINUX/UNIX Systems:

History and evolution, Design Principals, Process management, scheduling, memory management, file systems, IPC, System calls.

Course Outcomes:

At the end of the course students will:

- Gain an insight into how programming languages, operating systems, and architectures interact and provide an environment to the user.
- Analysis the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system.
- Demonstrate about different functions of operating system i.e. Process Management, resource management.
- Be able to conceptualize the components involved in designing a contemporary Operating system.

Text Books:

i. Operating System Concepts, By Silberschatz and Galvin, Wiley India, 8th edition.
ii. Operating System, By William Stalling, Pearson Education, 6th edition.

Reference Books:

i. Modern Operating Systems, By Andrew S. Tanenbaum, Pearson Education, 4th Edition.
ii. Operating System, By Achyut S Godbole and Atul Kahate, TMH, 3rd edition.
iii. Operating Systems a Concept Based Approach, By Dhananjay Dhamdhere, TMH, 3rd edition.

LIST OF EXPERIMENTS:

1. Basics of UNIX commands.
2. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
3. Implement all file allocation strategies
4. Implement Semaphores
5. Implement ll File Organization Techniques a
6. Implement Bankers algorithm for Dead Lock Avoidance
7. Implement an Algorithm for Dead Lock Detection
8. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
9. Implement Shared memory and IPC
10. Implement Paging Technique f memory management.

*These are the General List of Experiments & the list of Experiments may vary as per course Instructor.

BTECH IV Semester **COMPUTER SCIENCE &Engg.**							
COURSE CONTENTS (UEC SCHEME)							
BS 4301	**Probability and Statistics**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Duration	4 Hours	3	1	0	4	70	22

Course Description: This course aims to provide an understanding of the basic concepts in probability, conditional probability and independent events. It will also focus on the random variable, mathematical expectation, and different types of distributions, sampling theory and estimation theory.

Course Objectives:
The objective of the course is:

- To design a statistical hypothesis about the real world problem and
- To conduct appropriate test for drawing valid inference about the population characteristics.
- To have the knowledge of hypothesis testing for any research work.
- Opportunity to learn R programming to substantial extent.

Syllabus:

Module 1: Basic Probability (9 lectures, 3 tutorials) [Weightage 14 marks]
Probability of Events: Introduction, Counting Techniques, Probability Measure, Some Properties of the Probability Measure, Conditional Probability and Bayes' Theorem. Random Variables and Distribution Functions: Introduction, Distribution Functions of Discrete Variables, Distribution Functions of Continuous Variables, Bivariate Discrete Random Variables, Bivariate Continuous Random Variables, Conditional Distributions, Independence of Random Variables.

Module 2: Probability Distributions (9 lectures, 3 tutorials) [Weightage 14 marks]
Moments of Random Variables and Chebychev Inequality: Moments of Random Variables, Expected Value of Random Variables, Variance of Random Variables, Chebychev Inequality, Moment Generating Functions. Some Special Discrete Distributions: Bernoulli distribution, Binomial Distribution, Poisson distribution. Some Special Continuous Distributions: Normal Distribution. Product Moments of Bivariate Random Variables: Covariance of Bivariate Random Variables, Independence of Random Variables.

Module 3: Estimation (9 lectures, 3 tutorials) [Weightage 14 marks]
Introduction, Point estimation: Moment and maximum likelihood methods, The unbiased, relatively efficient, minimum variance unbiased, sufficient and inconsistent estimators, Interval estimation: Interval Estimators and Confidence Intervals for Parameters, Confidence Interval for Population Mean, Confidence Interval for Population Variance, Approximate Confidence Interval for Parameter with MLE.

Module 4: Basic Statistics (9 lectures, 3 tutorials) [Weightage 14 marks]
Measures of Central tendency: Moments, Skewness and Kurtosis, Curve fitting by the method of least squares- fitting of straight lines, Second degree parabolas and more general curves.

Correlation and Regression, Rank correlation.

Module 5: Applied Statistics (9 lectures, 3 tutorials) [Weightage 14 marks]
Tests of significance: Introduction, Sampling and standard error. Test of significance for large samples: Null and alternate hypothesis, critical region, critical value, and level of significance, confidence interval, Errors in testing of hypothesis. Tests of significance for small samples: Student's t-distribution, Snedecor's F- distribution. Chi-Square distribution: Properties, applications, test for goodness of fit, independence of attributes, test for population variance.

Suggested Text/Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. R. K. Jain, S. R. K. Iyenger, Advanced Engineering Mathematics, Narosa Publications.
3. Ramanna B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
6. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
7. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Course Outcomes:
On successful completion of this course students will be able to:
CO1: Understand the concepts of probability, discrete and continuous random variables and their distribution functions and be able to apply them to solve social and physical problems.
CO2: Understand the concepts of moments and moment generating functions of random variables and be familiar with some common probability distribution like Binomial, Poisson and Normal distributions and their properties to solve social and physical problems.
CO3: Understand the concepts of point and interval estimations and will be able to find confidence intervals under different situations of the given parameter.
CO4: Understand and apply the concepts of Moments, Skewness and Kurtosis, fit different curves by least square method, understand and apply the concepts of correlation and regressions.
CO5: Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.