ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. COMPUTER SCIENCE

1st Semester
ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. Computer Science 1\textsuperscript{st} Semester

Semester I / M.Sc. Computer Science

<table>
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<th>Subject</th>
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Total Contact Hours per week : 20

Total Credit: 18
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</table>

**MODULE 1: Review of computer organization**
Major subsystems, instruction sets, I/O organization.

**MODULE 2: Memory architecture**
Address protection, segmentation, virtual memory, paging, page replacement algorithms, cache memory, hierarchy of memory types, associative memory.

**MODULE 3: Support for concurrent process**
Mutual exclusion, shared data, critical sections, busy form of waiting, lock and unlock primitives, synchronization block and wakeup.

**MODULE 4: Scheduling**
Process states, virtual processors, interrupt mechanism, scheduling algorithms, implementation of concurrency primitive.

**MODULE 5: System deadlock**
Prevention, detection and avoidance.

**MODULE 6: Multiprogramming system**
Queue management, I/O supervisors, memory management. File system, disk and drum scheduling.

**MODULE 7: Case Study**
Some real operating system– semaphores, messages, shared memory.

**MODULE 8: Advanced Topics**
Secondary storage management, Security, Distributed operating system.

**Reference Books:**
2. Stallings, Unix Network programming, PHI.
3. Kerninghan and Pike, The Unix programming Environment, PHI.
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**MODULE 1: Electronic Devices**

Passive and Active Components, Resistor, Capacitor, Inductor etc. Diode, Zener Diode, Diode and Zener Diode Characteristic, Diode as rectifier (Full wave and Half Wave), Concept of Power Supply, Transistor-CE, CB Configuration, Transistor Characteristics, Baising of Transistor, Transistor as Switch.

**MODULE 2: Representation of Information Number System**

Binary, Octal, Hexadecimal, Positive and Negative Number, 1’s and 2’s complement, Arithmetic Operations: Addition, Subtraction, etc. Character codes: ASCII and BCD. Error detection and correction, parity codes and Hamming codes, etc.

**MODULE 3: Logic Design**

Logic Gates and their electronic realization, Boolean Algebra, Boolean variables and functions-canonical and standard forms, minimization of Boolean functions – Karnaugh Map.

**MODULE 4: Combinational Design**

Implementation of Boolean function and logic gates, concept of combinational Design-Adder, Subtractor, Multiplexer, decoders, encoders, simple arithmetic and logic circuits.

**MODULE 5: Sequential Design**

Concept of latch, Clock, Study of Flip-Flop- S-R, J-K, D, T etc. counters- synchronous and asynchronous, Modes of counter, shift registers, etc.

**MODULE 6: Digital ICs**

Digital Logic families- Study the Characteristics like Fan-out, Fan-in etc of TTL CMOS logic, study of AND, OR, NOT in TTL and CMOS families.

**MODULE 7: Memory Devices**

Semiconductor memory- RAM, ROM, Magnetic core and surface memory-disk, drum, tape, Access time and cost considerations: concept and volatility, random access, serial access, direct access, online and backup storage, PAL, FPGA.

**MODULE 8: Basic CPU Organization**

Simple functional block diagram of a CPU, instruction execution process.

**Reference Books:**
1. Millman & Halkisius Mc Graw Hill
2. Digital Principal and Application TMH
3. Digital Logic and Computer Design PHI
4. An introductory to computer design-PHI
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<td>Computer Organization and Architecture</td>
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MODULE 1: Introduction to Computers

Basic of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution.

MODULE 2: Register Transfer and Micro operations


MODULE 3: Computer Arithmetic


MODULE 4: Programming the Basic Computer

Machine language, Assembly language, Assembler, first pass, second pass, Programming Arithmetic and Logic operations, Multiplication Program, Double Precision Addition, Logic operations, Shift operations.

MODULE 5: Organization of a Computer

Central Progressing Module (CPU), Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation. Instruction Formats, Three-Address Instructions, two–Address Instructions, One-Address Instructions, Zero Address Instructions, RISC Instructions, Addressing Modes Reduced Instruction Set Computer, CISC Characteristics RISC Characteristics.

MODULE 6: Input-Output Organization

Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication.

MODULE 7: Memory Organization

Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory. Address Space and Memory Space, Associative Memory, Page Table, Page Replacement.

MODULE 8: Parallel Processing and Vector Processing

Pipelining, Parallel Processing, Pipelining General Consideration, Arithmetic Pipeline Instruction Pipeline, vector processors and array processors. Introduction to parallel processing, Inter
processor communication & synchronization. Vector Operations, Matrix Multiplication, Memory Interleaving.

**Reference Books:**

3. David A Patterson, Computer Architecture, Pearson Education.
4. P. Pal Choudhri, Computer Organisation and Design, PHI.
5. J. P. Hayes, Computer System Architecture, Pearson Education.
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**Using C**

**MODULE 1: An Overview**

Problem Identification, analysis, design, coding, testing & debugging, implementation, modification & maintenance; algorithm & flowcharts; Characteristics of a good program – accuracy, simplicity, robustness, minimum resource & time requirement modularization; Rules / Conventions of coding, documentation, naming variables; Top-down and bottom-up design.

**MODULE 2: Fundamentals of C Programming**

History of C; Structure of a C Program; Data Types; Constant & Variables, naming variables; Operators & Expressions; Control Statements – if-else, for, while, do-while, Case switch statement; break, continue, exit (), go to & labels, Arrays; Formatted & unformatted I/O; Type modifiers & storage classes; Ternary operator; Type conversion & type casting; Priority & associativity of operators.

**MODULE 3: Modular Programming**

Functions; Arguments; Return Value; Parameter passing – call by value, call by reference; return statement; scope, visibility and life time rules for various types of variable, static variable; calling a function; Recursion – basics, comparison with iteration, types of recursion – direct, indirect, tree and tail recursion, when to avoid recursion, examples.

**MODULE 4: Advanced Programming Techniques**

String; Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter; Structure – basic, declaration, membership operator, pointer to structure, referential operator, self-referential structures, structure within structure, array in structure, array of structures; Union – basic, declaration; Enumerated data type; Type def. command line argument.

**MODULE 5: Miscellaneous Features**

File handling and related function; printf & scanf family; C pre-processor – basics, #include, #define, #undef, conditional computation directive like #if, #else, #elif, #endif, #ifdef and #ifndef; Variable argument list functions.

**Reference Books:**
2. Programming in ANSI C by E. Balaguruswamy, TMH, 2004
3. Let us C Yawant Kanetkar, BPB publications
5. How to solve it by Computer by R.G. Dromey (P.H.I) 1994
Using C++

MODULE 1: Principles of Object Oriented Programming
Object Oriented Programming Paradigm, Basic Concepts of Object Oriented Programming, Benefits of OOPs, Object Oriented Languages, Application of OOP, C++ statements, Class, Structures of C++, Program, Creating the Source File, Compiling and Linking.

MODULE 2: Tokens, Expressions and Control Structures
Introduction Tokens, Keywords, Identifiers, Basic Data Types, User Defined Data Types, derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Manipulators, Type Cast Operator, Expressions and Implicit Conversions, Operator Precedence, Control Structures.

MODULE 3: Class and Objects
Specifying a class, Defining Member Functions, making an Outside Function Inline, Nesting of Member Function, Private Member Function, Arrays within a class, Memory Allocation for Objects, Static Data Member, Static Member Functions, Array of Objects, Objects as Function Arguments.

MODULE 4: Constructors and Destructors
Introduction, Constructors, Parameterized Constructors, Multiple Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructors, Dynamic Constructors and Destructors.

MODULE 5: Functions in C++

MODULE 6: Operator Overloading and Type Conversions
Introduction, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings using Operators, Rules for overloading operators, Type conversions

MODULE 7: Inheritance
Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance.
MODULE 8: Polymorphism and Virtual Functions

Compile time Polymorphism, run time Polymorphism, Pointers to Objects, This Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

Text Books:
1. Object Oriented Programming with C++ by E. Balaguruswamy, TMH Publications
2. Object Oriented Programming in C++ by Nabajyoti Barakati SAMS PHI Pvt. Ltd.
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<td>(C, C++)</td>
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**Using C**

**List of Experiments:** (Any 15 Experiments)

1. Write a program to find the sum of two numbers using function in C.
2. Write a program to find the largest of three numbers using C.
3. Write a program to find the roots of a quadratic equation using C.
4. Write a program to find the sum of given range of numbers using C.
5. Write a program to enter a number and then calculate the sum of digits using C.
6. Write a program to check a given number is palindrome or not using C.
7. Write a program to find the addition of two matrices using C.
8. Write a program to check whether a given string is palindrome or not using C.
9. Write a program to find the multiplication of two matrices using C.
10. Write a program to find the sum of diagonal elements of a matrix using C.
11. Write a program to merging the two arrays using C.
12. Write a program to find the factorial of a given number using C.
13. Write a program to generate the Fibonacci series up to 20 terms using C.
14. Write a program to swap the given tow numbers using c.
15. Write a program to determine whether an entered character is a vowel or consonant using C.
16. Write a program to take input from the user and then check whether it is a number or a character. If it is character, determine whether it is in uppercase or lowercase.
17. Write a program to classify a given number as prime or composite.
18. Write a program to enter a decimal number. Calculate and display the binary equivalent of this number using c.
19. Write a program using do-while loop to read the numbers until -1 is encountered. Count the number of prime numbers and composite numbers entered by the user.
20. Write a program to calculate the GCD of two numbers.
21. Write a program to sum of the series $1/1^2 + 1/2^2 + \ldots + 1/n^2$
22. Write a program to find whether the given number is an Armstrong number or not.
Using C++

List of Experiments: (Any 10 Experiments)

1. Write a program to find the sum of two numbers using C++.
2. Write a program to convert Centigrade to Fahrenheit and vice versa using C++.
3. Write a program to find the larger of two numbers using C++.
4. Write a program to enter the code and price of items. The user must feed the quantity in which he wants a product. The program must calculate and display the final bill using C++.
5. Write a program to implement student’s class. The program must demonstrate the use of nested member function, arrays within the class and making a function defined outside the class an inline function.
6. Write a program to enter a rational number, simplify and display it by using c++.
7. Write a program that adds two complex numbers. The object must be passed through reference and the result must be passed by value.
8. Write a program in c++ to display the list of students according to their ranks.
9. Write a program in c++ that uses an overloaded constructor to dynamically allocate memory to an array and thus find the largest of its elements.
10. Write a class that stores a string and all its status details such as number of upper case characters, vowels and consonant using c++.
11. Write a program using c++ to concatenate two strings. The memory for the strings must be allocated dynamically.
12. Write a program in c++ to add two binary numbers of four digits
13. Write a program using c++ to sort an array that has been allocated memory dynamically.
14. Write a program in c++ that define a class Employee and display the personal and salary details of five employees using single inheritance.
15. Define a class student with data member rollno and name. Derive a class Fees from student that has a data member fees and functions to submit fees and generate receipt. Derive another class Result from Student that displays the marks and grade obtained by the student.

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ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. COMPUTER SCIENCE

2nd Semester
# Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

## M.Sc. Computer Science 2nd Semester

### Semester II / M.Sc. Computer Science

#### Course Structure

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Total Credit: 18
Detailed Syllabus:

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Module 1: Basics of Data Structures

Arrays and Strings; Linear Data Structures – Stacks, Queues and Circular Queues: Operations and Applications; Linked Lists - Operations, and Doubly Linked List; Binary Tree, Binary Search Tree; Traversal Circular Linked Lists , Insertion and Deletion in Binary Search Trees

Module 2: Dictionary ADT

Search trees, balancing of search trees – AVL trees, B Trees, Red-Black trees, multi way search trees, 2-3 trees, 2-3-4 trees, Splay trees, Insertion and Deletion in each of the above data structures.

Module 3 : Sorting and Searching Techniques

Insertion Sort, Bubble sort, Merge Sort, Quick Sort, Heap sort, Shell sort, Radix sort, Searching – Linear, Binary, Hashing – hash functions and their computations.

Module 4: Priority Queue ADT

Binary heaps, heap operations, implementation and applications; Priority queue operations, and double-ended priority queues; min (max) heaps, binominal heap, fibonacci heap and its amortized analysis.

Module 5: Graphs

Representation and Traversal, Basic Algorithms.

Text Books:

2. Seymour Lipschutz, “Data Structures”, Schaum’s Outlines

Reference Books:

Module 1: Relational model, relational algebra, and relational calculus:
Relational model concepts, relational databases and schemas; Relational algebra operations, queries in relational algebra; overview of relational calculus; Commercial query language SQL- data definition, constraints, SQL queries, insertion, deletion, updation.

Module 2: Modeling:
introduction, The E-R model, E-R diagrams, design of database with E-R model, Transformation of ER model to relational schema.

Module 3: Normalization and functional dependencies:
design guidelines, functional dependencies – equivalence of sets of functional dependencies, cover, minimal cover; normal forms- 1NF, 2NF, 3NF, BCNF, 4 NF, dependency-preserving property, lossless join property, algorithms to ensure dependency -preserving property and lossless join property.

Module 4: System implementation techniques:
Query processing and optimization- translation between SQL queries and relational algebra ; Transaction processing- transaction and system concepts, desirable properties, schedules and recoverability; Concurrency control- locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques; Database recovery-concepts and techniques, recovery in multidatabase systems; Security and authentication-issues, access control techniques, introduction to multilevel security.

Module 5: Object oriented database systems:
Concepts of object-oriented databases; Standards, languages and design; Object relational database systems.

Module 6: Distributed databases:
Concepts; Data fragmentation, replication, and allocation techniques; Types of distributed database systems; Query processing in distributed databases; Overview of concurrency control and recovery in distributed databases.

Module 7: Image, multimedia, and spatial databases:
Concepts of Image, multimedia, and spatial databases; Content-based indexing and retrieval, Indexing techniques- R trees, R+ trees, KD trees.

Recommended Books:
2. C. J. Date, "An Introduction To Database Systems", Pearson Education.
Course Code | Course Title                | Hours per week | Credit  
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MCS182203    | Data Communication and Computer Networks | 3-1-0          | 4       

**Module 1:**
Data Communication concepts and terminologies: Data representation, Data transmission, Transmission channels, Signal encoding, Transmission impairments, Transmission media: Guided transmission media (*Twisted pair, Coaxial and Optical fiber*); Wireless transmission (*Terrestrial microwave, satellite microwave, Broadcast Radio and Infrared*)

**Module 2:**
Asynchronous and Synchronous transmission, Baseband and Broadband transmission, Modulation methods, Modems, Multiplexing.

**Module 3:**

**Module 4:**

**Module 5:**

**Module 6:**
Local Area Network (LAN): Needs, Architecture and Technology, Ethernet: CSMA/CD operation, parameters and specifications, Cabling: 10Base5, 10Base2, 10BaseT, 10BaseF, Hubs, patch panels and wiring closets. Bridges, Switches, 100BaseT, 100BaseVGANY, Gigabit Ethernet. FDDI, Token Ring, Wireless, ISDN, B-ISDN

**Module 7:**

**Recommended Readings:**
1. Stallings, W.; Data and Computer Communications; Prentice Hall of India.
2. Tanenbaum A.S.; Computer Networks; Prentice Hall of India.
3. Kurose and Ross; Computer Networking; Addison Wesley
4. Prakash C. Gupta; Data Communication; Prentice Hall of India
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<td>Theory of Computation</td>
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**Module 1: Theory of Automata**

**Module 2: Formal Languages, Regular Sets & Regular Grammars**
Definition of formal languages with illustration, Chomsky Classification of Languages, Languages and Their Relation, Recursive and Recursively Enumerable Sets, Various Operations on Languages, Languages and their corresponding Automata; Regular Sets & Regular Grammars: Regular Expressions, Finite Automata and Regular Expressions, Pumping Lemma for Regular Sets, Application of Pumping Lemma.

**Module 3: Context-free Languages**

**Module 4: Pushdown Automata Turing Machine and Linear Bounded Automata**

**Recommended Books**


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Programming Techniques - Python

Module 1:
Structured Programming and Object Oriented Programming paradigms.

Getting started with Python programming

Running code in the iterative shell; Input, Processing and output; Editing, Saving and running a script.

Module 2:
Strings, Assignments and comments, Data types, variables, Docstrings, character sets, Arithmetic expressions, Type conversions

Module 3:
Calling Functions: Arguments and return types; math module, Main module, Program format and Structure;

Module 4:
Control statements: if and if-else statements, multi-way if statements, for and while loop

Module 5: Lists and Dictionaries

Module 6: Design with classes

Recommended Books:
1. Fundamentals of PYTHON, K.A. Lambert and B.L.Juneja, Cencage Publication
2. An introduction to Python, G.V.Rossum, SPD publication

List of Experiments: (Any 15)
1. Write a program to calculate salary of an employee given his basic pay (to be entered by the user), HRA=10% of basic pay, TA=5% of basic pay. Define HRA and TA as constants and use them to calculate the salary of the employee.
2. Write a program to calculate the bill amount for an item given its quantity sold, value, discount and tax.
3. Write a program the distance between two points.
4. Write a program to calculate the roots of a quadratic equation.

5. Write a program to enter the marks of a student in four subjects. Then calculate the total and aggregate, and display the grade obtained by the student. If the student scores an aggregate greater than 75%, then the grade is Distinction. If aggregate is greater than equal 60% and less than 75%, then the grade is First Division. If aggregate is greater than equal 50% and less than 60%, then the grade is Second Division. If aggregate is greater than equal 40% and less than 50%, then the grade is Third Division. Else the grade is Fail.

6. Write a program to calculate tax given the following conditions:
   If income is less than 1, 50, 000 then no tax.
   If income is 1, 50, 001 – 3, 00, 000 then charge 10% tax.
   If income is 3, 00, 001 – 5, 00, 000 then charge 20% tax.
   If income is above 5, 00, 000 then charge 30% tax.

7. Write a program to calculate the sum of numbers from m to n.

8. Write a program to find whether the given number is an Armstrong number.

9. Write a program to enter a binary number and convert it into decimal number.

10. Write a program to calculate the factorial of a number.

11. Write a program to generate calendar of a given month given the start-day and the number of days in that month.

12. Write a program to sum the series:
    \[
    \frac{1}{2} + \frac{2}{3} + \ldots + \frac{n}{(n+1)}
    \]

13. Write a program using function to calculate simple interest. Suppose the customer is a senior citizen. He is being offered 12% rate of interest for all other customers, the rate of interest is 10%.

14. Write a program using function to print the Fibonacci series.

15. Write a program using function to calculate compound interest given the principal, rate of interest and number of years.

16. Write a program to swap two integers using call by reference method of passing arguments to a function.

17. Write a program to create a list of numbers in the range 1 to 10. Then delete all the even numbers from the list and print the list.

18. Write a program to print index at which a particular value exists. If the value exists at multiple locations in the list, then print all the indices. Also, count the number of times that value is repeated in the list.

19. Write a program that creates a dictionary of radius of a circle and its circumference.
20. Write a program that has a class Person storing name and date of birth of a person. The program should subtract the date of birth from today’s date to find out whether a person is eligible to vote or not.

21. Write a program that has classes such as student, course and department. Enroll a student in a course of a particular department.

22. Write a program that has an abstract class polygon. Derive two classes rectangle and triangle from polygon and write methods to get the details of their dimensions and hence calculate the area.

**SQL(using MySQL)**

**Module -1**

Getting started with MySQL: Components of SQL (DDL, DML, DCL, DQL), Using Databases: Creating Database, Show Database command, Use Command, Database ownership, Backing up databases and their content, restoring and destroying database.

**Module -2**

Basic SQL elements and Tables in MySQL, (Table creation rules), Performing operation on table data, Restructuring Tables in MySQL (Adding new columns, Dropping a column, Modify Column, Renaming Columns, Alter table command)

**Module -3**

Running Calculation on table data using Operators

**Module -4**

Joins and Views: Joining Multiple tables using inner join, outer join, cross join, equi join, self join. View creation and Destroying.

**Recommended Books:**

1. Herbert Shield : The complete Reference to Java, Tata McGraw Hill
2. Head First Java, O’Reilly Series
3. Ivan Bayross, Cynthia Bayross, “MySQL 5.1 for Professionals”, SPD

**Using SQL**

**List of Experiments:**

1. Create database TOYSHOP and table TOY using SQL command of the following columns: Sno, Toy_name, Category, Cost, Quantity, Starting_Age and Ending_Age.
1. Create a table TOY under SCIENCE database using SQL command of the following columns: Cost, Starting_Age, Sno, Name, Price.
   a. Take appropriate data types and constraints while creating the table.
   b. Insert at least 5 data records into the TOY table.
   c. Write a command to describe the structure of the table.
   d. Show all records.
   e. Modify the column Cost as Float.
   f. Add one more column in the above table as Discount.
   g. Rename the table column Cost to Price.
   h. Drop the column Starting_Age.
   i. Drop the constraint in the field Sno.
   j. Delete the records from the table.

2. Create a table MEMBER under SOCIETY database using SQL command of the following columns: mem_code, mem_name, mem_add, mem_ph, no_of_bk, no_of_iss.
   a. Take appropriate data types and constraints while creating the table.
   b. Add new field F_no_mem of numeric type and width is 3.
   c. Insert at least 6 records.
   d. Add the following constraints:
       PRIMARY KEY and NOT NULL on the field mem_code.
   e. Show the structure of the table.
   f. List the record of the table.
   g. Drop the primary key.
   h. Delete the column mem_add.
   i. Delete one row.
   j. Display the records from the table.

3. Create a table STUDENTS using SQL command of the following columns: No, Name, Age, Dept, DateOfAdm, Fee and Sex.
   a. Take appropriate data types and constraints while creating the table.
   b. To insert 5/6 records into the table.
   c. To show all information about the students of History department.
   d. To list the names of female students who are in Hindi department.
   e. To list the names of all students with their date of admission in ascending order.
   f. To display student’s name, fee, age for male students only.
   g. To count the numbers of students with age<23.
   h. Modify the rows for computer department’s fees by increasing Rs. 100.
   i. To insert a new row in the STUDENT table with the following data:
   j. To display the No and Name of students whose name started with alphabet ‘R’.

4. Create a table SALARY using SQL command of the following columns: SNo, Name, Basic, Department, DateOfAppointment, Age and Sex.
   a. Take appropriate data types and constraints while creating the table.
b. To insert 5/6 records into the table.
c. List the names of employees who are more than 35 years old.
d. Display the report, listing Name, Basic, Department and Annual Salary.
e. To count the number of employees who is either working in Personnel or Computer Department.
f. To insert a new row in the STUDENT table with the following data:
g. To find the maximum and minimum salary of an employee.
h. To display the name of employee name who’s Annual Salary is not in between 15000 and 25000.
i. To display Name and Annual Salary of an employee who’s SNo are 3, 5 and 7.
j. To display the SNo, Name and Annual Salary whose Name’s second character is an alphabet ‘a’.

5. Create a table MASTER using SQL command of the following columns: No, Name, Age, Department, DateOfJoin, Salary and Sex.

   a. Take appropriate data types and constraints while creating the table.
   b. To insert 5/6 records into the table.
   c. To show all information about History department.
   d. To list the names of female teachers who are in Maths department.
   e. To list names of all teachers with their date of join in ascending order.
   f. To display teacher’s name, salary, age for male teacher only.
   g. To count the number of teachers with age >25.
   h. To list the master’s information that is only in Computer and Maths department.
   i. To show the masters who joined in the year 2008.
   j. Update the salary by Rs. 3000 for male teachers.

6. Create a table PRODUCT_MASTER using SQL command of the following columns: ProductNo, Description, ProfitPerCent, UnitMeasure, QtyOnHand, ReorderLevel, SellPrice and CostPrice.

   a. Take appropriate data types and constraints while creating the table.
   b. To insert 5/6 records into the table.
   c. List the products whose selling price is greater than 500 and less than or equal to 750.
   d. Calculate the average price of all the products.
   e. Find all the products whose QtyOnHand is less than reorder level.
   f. Determine the maximum and minimum price for the product prices.
   g. Listing of products whose selling price is more than 500 with the new selling price calculated as original selling price plus 15%.
   h. Printing the description and total quantity sold for each product.
   i. Finding the value of each product sold.
   j. Finding the non-moving products i.e. products not being sold.

7. Create two tables named EMP_MASTER and BRANCH_MASTER using SQL command of the following columns:
EMP_MASTER: Emp_No, Fname, Mname, Lname, Dept, Desig, Branch_No.  
BRANCH_MASTER: Name, Branch_No. 

a. Take appropriate data types and constraints while creating the table.  
b. To Insert 5/6 records into the table.  
c. List the employee details with branch names to which they belong.  
d. List the employee details of only those employees who belong to the Administration department along with branch names to which they belong.  
e. List the employee details along with the contact details using Left Outer Join.  
f. List the employee details along with the contact details using Right Outer Join.  
g. Retrieve the employees holding the department.  
h. Listing the names of all employees having ‘a’ as the second letter in their names.  
i. Delete the records from both the table having Emp_No= ‘E1234’  
j. Create a view V1 to display the details of Emp_No, Dept, Desig, Branch_No.  

8. Create a table CLIENT_MASTER using SQL command of the following columns: Client_No, Name, City, Pincode, State, BalDue with necessary data types and constraints while creating the table.  
a. Insert at least 6 records into the table.  
b. Find out the names of all clients.  
c. List all the clients who are lived in Mumbai.  
d. Change the city of Client_No ‘C00005’ to ‘Bangalore’.  
e. Change the BalDue of Client_No ‘C00001’ to Rs. 1000.  
f. Delete from Client_Master where the column state holds the value ‘Tamil Nadu’.  
g. Add a column called ‘Telephone’ of data type ‘number’ and size =’10’ to the Client_Master table.  
h. To list names of all clients with their Pincode in ascending order.  
i. Create a view V2 to display the details of Client Master.  
j. Destroy the table Client_Master along with its data.

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ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. COMPUTER SCIENCE

3rd Semester
ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus
(From Academic Session 2018-19 onwards)

M.Sc. Computer Science 3rd Semester

Semester III / M.Sc. Computer Science: Course Structure

<table>
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<td>MCS182302</td>
<td>Design and Analysis of Algorithm</td>
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Total Contact Hours per week : 16

**Total Credit: 18**

**Elective-I Subjects**

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<td>3</td>
<td>MCS18230E13</td>
<td>Operations Research &amp; Queueing Theory</td>
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<td>4</td>
<td>MCS18230E14</td>
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<td>MCS18230E15</td>
<td>Network Security</td>
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<td>6</td>
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Detailed Syllabus

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<tr>
<td>MCS182301</td>
<td>Computer Graphics &amp; Multimedia</td>
<td>3-1-0</td>
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</table>

Module 1: Basics of Computer Graphics


Module 2: Graphics Systems


Module 3: Output Primitives


Module 4: Two – Dimensional Transformations

Introduction, Representation of Points, Matrix Algebra and Transformation, Transformation of Points and Line, Translation and Homogenous Coordinates, Rotation about an origin and an arbitrary Point, Scaling, Shearing, Reflection about an arbitrary Line.

Module 5: Windowing and Clipping

Introduction, Viewing Transformation, Clipping, Point and Line Clipping, Cohen – Sutherland Line Clipping Algorithm, Parametric Liang – Braksy2D Line Clipping Algorithm, Polygon Clipping, Sutherland – Hodgman Algorithm, Curve and Text Clipping.

Module 6: Three Dimensional Graphics

Introduction, Need for 3-Dimensional Imaging, Techniques for 3-Dimensional displaying, Parallel Projections, Perspective projection, Intensity cues, Stereoscope effect, Kinetic depth effect, Shading.
Module 7: **Solid Area Scan Conversion and Three Dimensional Transformations**

Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, 3D transformation, Translations, Scaling, Rotation, Viewing Transformation, The Perspective Transformation, Three Dimensional Clipping, Perspective view of Cube.

Module 8: **Curve and Surfaces**

Introduction, Shape description requirements, Parametric Functions, Bezier Methods, Bezier Curves, Bezier Surfaces, B-Spline Methods.

Module 9: **Solid Area Scan Conversion and Three Dimensional Transformations**

Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, 3D transformation, Translations, Scaling, Rotation, Viewing Transformation, The Perspective Transformation, Three Dimensional Clipping, Perspective view of Cube.

Module 10: **Hidden Surface Removal**


Module 11: **Colour and Illumination Models**

Introduction, Colours, Illumination Model and Light Sources, Shadow, Reflectivity and Refractivity, Surface Texturing, Polygon Shading Methods, Fractals.

Module 12: **Animation and Multimedia**


**Recommended Books:**

**Text Books:**

<table>
<thead>
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<th>Course Code</th>
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<tbody>
<tr>
<td>MCS182302</td>
<td>Design and Analysis of Algorithm</td>
<td>3-1-0</td>
<td>4</td>
</tr>
</tbody>
</table>

Module 1: Introduction:
Introduction to algorithms, analysis, asymptotic notation, mathematical induction.

Module 2: Recurrences:
The substitution, recursion-tree and the master theorem.

Module 3: Randomized algorithms:
Indicator random variables, probabilistic analysis and uses of random variables.

Module 4: Data structures:
Priority queues, binary heaps, binomial and Fibonacci heaps, binary search trees, Cost Amortization

Module 5: Design and Analysis Techniques:
Divide and Conquer, merge sort, finding closest pair of points.

Module 6: Greedy Algorithms:
Coin charging, Kruskal’s, Prim and Dijkstra’s algorithm, Knapsack problem

Module 7: Dynamic Programming:
Coin charging problem, matrix multiplication, longest common subsequence, Floyd and Warshall algorithm.

Module 8: Graph Algorithms:
Topological sort, minimum spanning trees, shortest paths, maximum-flow – Flow networks, Ford-Fulkerson method, Maximum bipartite matching.

Module 9: Problem classes:
P, NP, NP-Complete, Easy vs Hard, Polynomial time, non-deterministic algorithms, reducibility.

Module 10: Approximation Algorithms:
Traveling salesman problem, Parallel and Distributed algorithms.

Recommended Books:
1. Introduction to algorithms ------------------Cormen
2. Algorithms ------------------ Johnsonbaugh & Schaefer
3. Fundamentals of Computer algorithms ----Horowitz’s Sahni
4. Data structure and algorithm analysis in C & C++ ----Mark Allen
<table>
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<th>Hours per week</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS182303</td>
<td>Web Programming Technologies</td>
<td>3-1-0</td>
<td>4</td>
</tr>
</tbody>
</table>

**Module 1:**

Concept of WWW and internet, e-mail, Hypermedia, Web Browsers: Browser architecture, IP Address, DNS, search engines.

**Module 2:**

Web page designing using HTML, Use of Cascading Style Sheet, JavaScript, VB Script, jQuery, SGML - structures, elements, DHTML with DTD concept, Content models, Extensible Markup Language (XML), XSL, Activex, Plugins.

**Module 3:**

Web server: Architecture and functionality, configuration of Apache and IIS, Client-Server Architecture, middleware, Thin Client, Fat Clients, Fat Servers, Client pull, server push.

**Module 4:**

TCP/IP, HTTP, SMTP, MIME, telnet, ftp; Server-side scripting: overview of CGI, ASP, and JSP, PHP; Web database connectivity- ODBC, JDBC; Web services and Related Technologies- AJAX,.NET.

**Module 5:**

Object based models-COM DCOM, CORBA, IIOP, EJB; Web Security: Firewalls, Tunnels, SSI, Digital Signature.

**Recommended Readings:**

1. Web Technologies by Achyut S Godbole and Atul Kahate
2. Web Technology by Deital & Deital
Module 1:
Introduction, Overview of digital signal processing

Review of Discrete – Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system, Classifications of sequence, recursive and non-recursive system

Review of: Mathematical operations on sequences: Convolution, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems, MATLAB examples.

Module 2:
$Z$-transform: Definition, relation between $Z$ transform and Fourier transform of a sequence, properties of $Z$ transform, mapping between S-plane and Z-plane. Module circle, convergence and ROC, Inverse $Z$-transform, solution of difference equation using the one sided $Z$-transform MATLAB examples.

Module 3:

Module 4:

Recommended Books:

Text Books:

5. S. Salivahanan et al., Digital Signal Processing, TMH

**Reference Books:**

1. Chen, Digital Signal Processing, OUP
7. Pradhan, Digital Signal Processing Applications, Jaico
**Introduction to Hacking**, Ethical hacking and penetration testing.

Being a Hacker – Introduction, Resources – books, magazines, newspapers, zines and blogs, forums and mailing lists, newsgroups, websites, chat, P2P.

Internet legalities and ETHICS – Introduction, Foreign crimes vs local rights, crime related to the TIC’s, COMINT, ECHELON, CARNIVORE, Ethical Hacking, most common internet frauds.

Basic Commands in LINUX and WINDOWS:


Services and Connections: Introduction, Services – HTTP and WEB, Email-POP and SMTP, IRC, FTP, Telnet and SSH, DNS, DHCP. Connections – ISPS, Plain OLD telephone Service, DSL, cable Modems.

System Identification – Identifying a server, identifying the IP address of a domain, identifying services – ping and traceroute, banner grabbing, system fingerprinting.


Attack Analysis – Introduction, Netstat, Firewall, Packet sniffers, Honeyspots and honeynets.


NMAP, ZENMAP, Mass mailer Attack, MITM Attack, **ARP Poisoning, DNS Spoofing** vs
DNS Poisoning, DNS Spoofing, Advanced Concepts on DNS Spoofing, DHCP Spoofing, Port Stealing.


Web security and privacy – Fundamentals of web security, Web vulnerabilities, proxy methods for web application manipulation, Firewall, Intrusion detection system, Methods of verification – OSSTMM.

Passwords – **Introduction To Password Cracking**, password history, types of passwords, **Password Cracking Strategy**, windows Password Cracking Overview, Nuts And Bolts Of Windows Password Cracking Strategy, **Introduction To Linux Hash Cracking**, **Linux Hash Cracking Strategy**, password encryption, password cracking.

**Introduction To SQL injection**, **SQL Injection To Google Dorks**

**Reference Books:**

1. Nikhalesh Singh Bhadoria,“First Step to Ethical Hacking”,Rigi Publication
Module 1: Basics of Operations Research  

Module 2: Linear Programming Problem (LPP)  

Module 3: Advanced Topics in Linear programming  

Module 4: Transportation Problem  
Introduction , Mathematical Formulation , Method of finding initial basic feasible solution , MODI Method , Degeneracy of Transportation Problem , Unbalanced Transportation Problems , Maximisation in Transportation Problem.

Module 5: Assignment Problem  
Introduction and formulation , Method for solving an Assignment problem (Hungarian Assignment Algorithm) , Travelling Salesman Problem.

Module 6: Game Theory  
Introduction to Games , Two-person Zero –sum Game: Games with Saddle point , Games without Saddle point: Mixed Strategies , Matrix Method , Graphical Method ( for $2 \times n$ or for $m \times 2$ Games) , Solution of $m \times n$ size games , $n$ –person zero sum game.

Module 7: Queuing Models  
Characteristics of Queuing Models , Transient and Steady states , Role of exponential Distribution , Kendall’s Notation for representing Queuing Models , Classification of queuing Models , Model I : (M/M/1): ($\infty$:FIFO) , Model II : (M/M/s): ($\infty$:FIFO) ,Model III : (M/M/1): (N/FIFO) , Model IV : (M/M/s): (N:FIFO).

Recommended Books:

Text Books:

Module 1: Introduction to Embedded Systems:
Overview of embedded systems, features, requirements and applications of embedded systems, recent trends in the embedded system design, common architectures for the ES design, embedded software design issues, interfacing and communication Links, introduction to development and testing tools.

Module 2: Embedded System Architecture:
Basics of 8–bit RISC microcontroller (PIC), block diagram, addressing modes, instruction set, timers, counters, stack operation, programming using PIC controller, basics of 32–bit microprocessor (ARM), processor and memory organization, data operations, flow of control, pipelining in ARM, ARM bus (AMBA).

Module 3: Embedded Software:
Programming in embedded environment, Programming for microcontrollers such as Intel 8051 and PIC, overview of Java 2 micro edition (J2ME), concept of a MIDLET, applications of J2ME in mobile communication.

Module 4: Applications of Embedded Systems:
Industrial and control applications, networking and telecom applications, DSP and multimedia applications, applications in the area of consumer appliances, concept of smart home.

Recommended Books:

Text Books:
Module 1: Overview and Classical Encryption Techniques
Overview: Services, mechanisms and attacks; Security architecture – security services, authentication, data confidentiality, data integrity, non-repudiation, availability; Security Mechanisms-attacks; Security network model.
Classical Encryption techniques: Symmetric cipher model, Cryptography, Cryptanalysis; Substitution techniques – Caesar Cipher, Mono alphabetic Cipher, Playfair Cipher, Transposition technique.

Module 2: Data Encryption and Symmetric Ciphers
Data Encryption: Simplified DES, DES; Differential & Linear Cryptanalysis; Block Cipher - Stream and Block Ciphers, Feistel Cipher.
Symmetric Ciphers - Double DES, Triple DES, Blowfish; Confidentiality – Placement of functions, Key distribution.

Module 3: Public Key Encryption and Hash Functions
Public Key Encryption: Public Key Cryptosystems, Applications, Requirements, Cryptanalysis; RSA Algorithm; Public Key Distribution; Deffie-Hellman Key Exchange.

Module 4: Digital Signatures and Network Security Applications
Digital Signatures: Requirements, Direct and Arbitrated Digital Signatures; Mutual Authentication, One-way Authentication; DSS, Network Security Applications: Kerberos-Versions 4 and 5; PGP – Operation, Cryptographic Keys; S/MIME; IP Security – IPSec, IPSec Services, Security Associations, Transport and Tunnel Modes, Authentication Header, Security Payload Encapsulation, SSL Architecture; SET; Intrusion Detection – Audit records, Anomaly Detection; Base Rate Fallacy, Distributed intrusion detection, Honeypots; Password Management; Firewalls – Characteristics

Recommended Books:

Text Books:

Seminar and Viva

For this course, each student is required to

i. Select appropriate field of study under the supervision of a faculty of the department.

ii. Present a seminar in the beginning after the selection of the topic in presence of the expert committee (internal).

iii. Deliver a final seminar at the end of the semester course work in presence of the departmental committee and one external examiner as appointed by University.

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<table>
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ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. COMPUTER SCIENCE

4th Semester
ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. Computer Science 4th Semester

Semester IV / M.Sc. Computer Science: Course Structure

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Total Contact Hours per week: 12

Total Credit: 16
## Elective-II Subjects

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<td>MCS18240E21</td>
<td>Natural Language Processing</td>
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<td>2</td>
<td>MCS18240E22</td>
<td>Distributed Database Management Systems</td>
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<tr>
<td>3</td>
<td>MCS18240E23</td>
<td>Data Warehousing &amp; Data Mining</td>
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<td>4</td>
<td>MCS18240E24</td>
<td>Artificial Intelligence/ Expert System</td>
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<td>5</td>
<td>MCS18240E25</td>
<td>Cloud Computing</td>
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<td>MCS18240E26</td>
<td>Computer Vision</td>
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<td>7</td>
<td>MCS18240E27</td>
<td>Advanced Computer Architecture</td>
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## Elective-III Subjects

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<td>Speech Processing</td>
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<td>Big Data Analytics</td>
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<td>MCS18240E35</td>
<td>Supply Chain &amp; Logistics Management</td>
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Detailed Syllabus:

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<th>Hours per week</th>
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<tr>
<td>MCS182401</td>
<td>Cryptography</td>
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Module 1: **Foundations of Cryptography and Security:**
Ciphers and Secret Messages, Security Attacks and Services.

**Mathematical Tools for Cryptography:**
Substitutions and Permutations, Modular Arithmetic, Euclid’s Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms.

Module 2: **Conventional Symmetric Encryption Algorithms:** Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB, CBC, OFB, CFB), Strength (or Not) of DES.

Module 3: **Modern Symmetric Encryption Algorithms:** IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution.
Stream Ciphers and Pseudo Random Numbers: Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad.

**Hashes and Message Digests:** Message Authentication, MD5, SHA, RIPEMD, HMAC.

Module 5: **Digital Signatures, Certificates, User Authentication:**
Digital Signature Standard (DSS and DSA), Security Handshake Pitfalls, Elliptic Curve Cryptosystems.
**Authentication of Systems:**

**Recommended Books:**


**Reference Books:**

2. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
Module 1:
**Introduction to NLP, Linguistic Background:** An outline of English syntax, Grammars and sentence structure, Regular Expressions, Formal Languages, Finite State Automata, Non deterministic Finite State Automata (NFSA), Using an NFSA to accept strings, Relating deterministic and non-deterministic FSA, Elementary probability theory and entropy.

Module 2:
**Morphology & Finite State Transducers:** Survey of (mostly) English morphology, Inflectional morphology, derivational morphology, Introduction to shallow parsing and morphological analyzer: Rule based POS tagger, Stochastic POS tagger, Chunking, Use of Morphological analyzer in POS tagging.

Module 3:
**Introduction to HMM Tagger:** HMM for POS tagging, Viterbi algorithm, Parsing: Top Down Parsing, Bottom up Parsing, Earley Parsing, and Finite-State Parsing Methods.

Module 4:
Application of Bayes Theorem in Statistical NLP – (Spell Checker as a case study), Collocations, Probabilistic Context Free Grammar (PCFG), finding the most likely parse for a sentence, Training a PCFG

Module 5:
**Introduction to Word Sense Disambiguation:** Supervised Disambiguation, Dictionary based disambiguation, Unsupervised disambiguation, clustering in statistical NLP

Recommended Books:

**Text Books/ Reference Books:**

4. Bharati et al., Natural Language Processing, PHI, 1996
Module 1: Introduction:
Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas

Module 2: Overview of RDBMS
Concepts, Integrity, Normalization

Module 3: Distributed DBMS Architecture:
Models- Autonomy, Distribution, Heterogeneity
DDBMS Architecture – Client/Server, Peer to peer, MDBS

Module 4: Distributed Database Design:
Alternative Design Strategies, Distribution Design Issues, Fragmentation, Distribution Transparency, Impact of distribution on user queries, and Allocation

Module 5: Semantic Data Control:
Authentication and Access rights, View Management, Data Security, Semantic Integrity control & its enforcement

Module 6: Overview of Query Processing:
Query Processing Problem, Objective of Query Processing, Complexity of Relational Algebra Operations, Query processing in centralized system, Query processing in distributed system, Characterization of Query Processors, Layers of Query Processing.

Module 7: Query Decomposition & Data Localization:
Query Decomposition, Localization of Distributed Data.

Module 8: Optimization of Distributed queries:
Query optimization, Centralized Query optimization, Join Ordering in Fragmented Queries, Distributed Query Optimization algorithms.

Module 9: Introduction to Transaction Management:
Definition of Transaction, Properties of Transactions, Types of Transactions.

Module 10: Distributed Concurrency Control:
Module 11: Distributed DBMS Reliability

Module 12: Parallel Database Systems
Database Servers, Parallel Architectures, Parallel DBMS Techniques, Parallel Execution problems, Parallel Execution for Hierarchical Architecture.

Module 13: Database Interoperability
Database Integration, Query Processing, Transaction Management, Object Orientation & Interoperability.

Reference Books:

2. Distributed Database Management Systems- A Practical Approach by Saeed K Rahimi, Frank S Haug (Wiley Publication)
3. Distributed Databases Principles and Systems by Stefano Ceri, Giuseppe Pelagatti (Mcgraw Hill Publication)
Module 1: Introduction to Data Warehousing
Concept of data warehouse and its evolution, Capabilities and Limitations, Benefits of Data Warehouse, Features of Data Warehouse, Lifecycle of Data, Information Flow Mechanism, Metadata, Data flow from Warehouse to Operational Systems).

Module 2: Data Warehouse Architecture
Data Warehouse Architecture, Data Warehouse and Data Marts, ETL Process, Process architecture, Warehouse Manager Architecture, Query Manager Architecture, Building Data Warehouse and Data marts, Issues in Data Marts, Planning and Design of Data Warehouse.

Module 3: Data Warehouse Schema
Introduction, Fact data, Dimension data, Partitioning data, Dimensional Modelling, Star Schema, Snowflake Schema, Fact constellation Schema, Strengths of Dimensional Modelling, Aggregation, Data Warehouse and Data Model.

Module 4: Design
Requirements Gathering Methods, Requirement Analysis, Dimensional Analysis, Planning and Project Management, Multidimensional Data model, Data cube, Hypercube, OLAP operations, OLAP Models.

Module 5: Hardware and operational Design
Hardware architecture, physical layout security backup recovery, Capacity planning, Tuning and Testing data warehouse.

Module 6: Introduction to Data Mining
Concept of data mining, Definitions of Data Mining, Learning, KDD and DM, Knowledge Discovery Process and its different stages DBMS and DM, DM techniques, Other Mining Problems, Issues and Challenges in DM, DM Application Areas.

Module 7: Classification and Predictions
Introduction to Classification, Issues regarding in Classification and Prediction, Different Classification Methods including Decision Tree Induction, Bayesian Classification, Neural Network Technology, K – nearest Neighbours Classifier, Case Base Reasoning, Fuzzy Set Theory, Genetic Algorithm; Linear and Multiple Regression, Nonlinear Regression, Other Reasoning Models, Classifier Accuracy, Prediction, Accuracy and Error measures evaluating accuracy of a classifier, model selection.

Module 8: Association Rules
Introduction to Association Rules, Methods to Discover Association Rules, Types of Association Rule Mining Algorithm (A Priori Algorithm, Partition Algorithm, Pincer – Search Algorithm, FP – Tree Growth Algorithm, Border Algorithm).

Module 9: Clustering Techniques
Introduction to Clustering, Clustering Paradigms, Similarity and Distance Measures, Types of data in cluster analysis, Outliers, Partitioning Algorithms (K-Means, K-Medoid), Hierarchical Clustering (Agglomerative Algorithm, Divisive Algorithm), Density Based Algorithm (DBSCAN, BIRCH, CURE).
Module 10: Emerging Trends in Data Mining
Web Mining, Text Mining, Sequence Mining, Mining Time-Series Data, Spatial Data Mining, Neural Network, Support Vector Machine, Rough Set Theory.

Recommended Books:

2. Jiawei Han and Micheline Kambler, “Data Mining Concepts and Techniques”, Second Edition, Elsevier
4. Margaret H. Dunham, “Data Mining Introductory and Advanced Topics”, Prentice Hall India
Module 1: Introduction to the object and goal of artificial intelligence:
Aim and scope of the artificial intelligence, problem space and problem characteristics, state space representation.

Module 2: Problem solving techniques:
Generate and test, hill climbing , search problem reduction techniques, constraint propagation, means-end-analysis, heuristics search techniques and heuristic problem solving.

Module 3: Game playing:
And or graph search, game trees and associated techniques, minimax and alpha beta pruning. Some case studies.

Module 4: Knowledge representation and inferencing:
Procedural and deductive approaches production system formalism, predicate logic (first order and second order), Rule based system, schematics net, conceptual dependencies, conceptual path, frames, scripts associated inferencing mechanism. Resolution in predicate logic, unification, natural deduction theorem proving, forward and backward deduction. Different techniques for reasoning under uncertainty, monotics and non monotic reasoning. Constraint satisfaction problem
Introduction to Natural Language Processing, Grammar, Derivation techniques, parse tree.

Module 5: Rule based system and expert system:
Domain exploration, meta language, expertise, transfer self-explaining system case studies (dendral, mycin), working memory, Knowledge base, inference engine

Module 6: Introduction to neural network:
Definition and representation of artificial neuron and its analogy with biological neuron, basic concepts of three layer neural-net and learning by back propagation.

Recommended Books:
1. Artificial Intelligence By Patrick, Henry, Winston, Pearson Education.
2. Introduction to Artificial Intelligence By Charniak, Mc Dermott, Pearson Education.
3. Artificial Intelligence By Rich and Night
4. Introduction to Artificial Intelligence and Expert system By Dan W. Patterson
Module 1: Cloud Computing Fundamentals

Module 2: Cloud Applications
Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

Module 3: Management of Cloud Services
Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

Module 4: Application Development
Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

Module 5: Cloud It Model
Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)

Module 6: Security In The Cloud

Recommended Books:
Module 1:

Module 2:
Image segmentation, Feature Extraction and Selection, Object representation, Morphological Image processing.

Module 3:
Object Recognition, Pattern Recognition: Statistical, Structural, Neural and Hybrid Techniques, Recent Developments.

Recommended Books:

Text Books:
1. Fundamental of Image Processing by R.C.Gonzalez
2. Digital Image Processing by A.K.Jain

Reference Books:
1. Image Processing and Analysis by Milan Sonka
2. Selected Research papers from International Journal
Module 1: Prerequisite:
Computer Organization, Operating System.

Module 2: Introduction to Parallel Processing:
Parallel Processing Mechanism Parallelism in uniprocessor systems.

Module 3: Parallel Computer Structures:
Architecture classification scheme.

Module 4: Pipeline and Vector Processing:
Instruction and arithmetic pipelines; Vector Processing requirements; Pipeline computers and vectorization methods;

Module 5: Various vector processors:
STAR 1 00, CRAY - 1, CYBER - 205, Fujitsu 200 and their special features.

Module 6: SIMD Array Processors:
Parallel algorithms for array processors; SIMD computers and performance enhancement.

Module 7: Multiprocessor Architectures and Programming:

Module 8: Data Flow Computers:
Data - driven computing and languages; Advantage and potential difficulties, etc.

Recommended Books:

Text Books:
Module 1: Introduction:
Cellular networks, wireless LANs, application adaptation.

Module 2: Cellular Overview:
Cellular concepts, location management, handoffs.

Module 3: Wireless LAN overview:
MAC issues, mobile IP, ad hoc networks, TCP issues.

Module 4: Applications overview:
Wireless applications, disconnected operations, data broadcasting, mobile agents.

Module 5: GSM:
Air-interface, channel structure, timing, architecture.

Module 6: WAP:
Architecture, protocol stack, application environment.

Module 7: TCP:
Asymmetric links, wireless errors, handoffs; i-tcp, snoop, link rxmit, m-tcp.

Module 8: Ad hoc networks:
MAC, routing, transport. Routing: Virtual backbone, Kelpi, mobile-IP.

Module 9: Data broadcasting:
Push-pull, consistency.

Module 10: Location management:
HLR-VLR, hierarchical.

Module 11: Access Technologies:
Blue Tooth, GPRS, IEEE 802.11, CDMA. QoS in Wireless.

Text / Reference Books:
1. Schiller, Mobile Communications, Addison Wesley, 2003
5. Charles Perkins, Ad hoc Networks, Addison Wesley, 2000
Module 1: Signals and Systems:

Module 2: Analogy and Physiology of Speech Production mechanism:

Module 3: Analysis and Synthesis of Pole-Zero Speech Models-
Deterministic signals, Linear Prediction of Speech Signal; Homomorphic signal Processing-Homomorphic Filtering.

Module 4: Speech Coding:
Statistical Model, Vector Quantisation, Frequency Domain coding, Linear predictive Coding (LPC); HMM, Dynamic Time Wrapping; Speech enhancement, Speaker Recognition Algorithms, Application of Neural Network in Speaker recognition, Concept of Classes and clustering in the speech recognition.

Recommended Books:

2. Speech and Language Processing-Daniel Jurafsay, Tames H. Mrtian.
3. Digital Processing of Speech Signal-Lawrence R. Rabiner, Ronald w. Schafer
Module 1:
Introduction: Preliminary concepts and pre-processing phases, coding, normalization, filtering, linear prediction, Feature extraction and representation thresholding, contours, regions, textures, template matching.

Module 2:
Data structure for pattern recognition, statistical pattern recognition, clustering Technique and Application. Study of Pattern classifiers: Supervised and Unsupervised.

Parametric Discriminant Functions: Linear and quadratic discriminants; Shrinkage; Logistic classification; Generalized linear classifiers; Perceptrons; Maximum Margin; Error Correcting Codes;

Module 3:
Pattern classifiers: Naive Bayes, Linear Discriminant Analysis, k-nearest neighbour, Artificial Neural Network etc. And case studies.

Recommended Books:

Module 1: Basics of Data Structures
Introduction – distributed file system – Big Data and its importance, Six Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

Module 2: Technologies and tools for big data analytics
Introduction to MapReduce/Hadoop, Data analytics using MapReduce/Hadoop, Data visualization techniques, Spark

Module 3: Theory and methods for big data analytics
Selected machine learning and data mining methods (such as support vector machine and logistic regression), Statistical analysis techniques (such as conjoint analysis and correlation analysis), Time series analysis D. Big data graph analytics

Module 4: Hive And Hiveql, Hbase
Hive Architecture, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase Concepts-Advanced Usage, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster.

Recommended Books:

Text Books:


Reference Books:

Module 1:
Financial statement analysis of Balance Sheets, Profit and Loss accounts, Cash flow and Funds Flow statements, Elements of Valuation, Capital Budgeting, Risk and Return, Long term and Short term Financial Planning, Overview of Financial services industry
Pedagogy
Problems: Case studies, Presentations, Industry based assignments and Computer based assignments

Module 2:
Marketing concept, Marketing mix, Product, Price, Promotion and Distribution, Marketing Planning, Marketing control and organizing for marketing
Pedagogy
Case studies, Presentation and Industry based assignments

Module 3:
Employee sourcing, recruitment and selection, performance management, reward management, training and development and employee relations
Pedagogy
Case studies, Experimental exercises and Industry based assignments

Module 4:
Perception, personality, attitudes, motivation, learning, interpersonal behaviour, group dynamics, conflicts, stress, power and politics, leadership and communication. New trends in organizational behaviour from academic literature and practice including critical perspectives.
Pedagogy
Case studies, Experimental exercises and Industry based assignments

Module 5:
Pedagogy
Problems, Case studies, Presentations and Industry based assignments

Module 6:
Balance sheets and profit and loss account, Accounting mechanics, Accounting records and Systems, Understanding published accounts of companies. Use of software in accounting
Pedagogy
Problems, Case studies, analysis of published accounts of companies, Computer based exercises

Module 7:
Basic cost concepts, cost classification, allocation and absorption of costs, cost centers etc.; Cost analysis for managerial decisions- Direct costs, Break Even analysis, Relevant costs etc.; Pricing – join costs, Make or buy, relevant fixed costs, sunk costs etc.; Cost analysis and control standard costing, variance analysis, Module and output costing, budgeting and control.
Pedagogy
Problems, Case studies, analysis of published accounts of companies, Computer based exercises and understanding of recording systems of real life organizations.

Module 8:
Role of IS and IT, operational and Strategic, Hardware and Software for IS, types of IS such as TPS, MIS, EIS, DSS, KS etc., DBMS and RDBMS, communication and Networking, Internet, ERP implementation issues.

Pedagogy
Computer based exercises and Industry based assignments to understand IS practices

Reference Books:


**Project Work:** The student has to pursue a major project work in the areas of RDBMS, Web Technology, Image Processing, Data Mining, Speech Processing, NLP etc. under the supervision of a faculty of the department.

During the project work, the student is required to present a seminar in the Synopsis of the project after the selection of the topic in presence of the expert committee (internal). At the end of the semester course work, final seminar cum viva on the project work will be held in presence of the departmental committee and one external examiner as appointed by University.

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<td>Project Work</td>
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