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 1st Semester

Semester I / M.Sc. Computer Science

Sl. No.	Sub-Code	Subject	Hours per Week			Credits
			L	T	P	C
Theory						
1	MCS182101	Operating System	3	1	0	4
2	MCS182102	Digital Logic and System Design	3	1	0	4
3	MCS182103	Computer Organization and Architecture	3	1	0	4
4	MCS182104	Programming Techniques-I (C, C++)	3	1	0	4
Practical						
1	MCS182114	Lab I: Programming Techniques-I (C,C++)	0	0	4	2
		Total	12	4	4	**18**
Total Contact Hours per week : 20						
Total Credit: 18						

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182101	**Operating System**	**3-1-0**	**4**

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:

1. A. S. Tanenbaum and A. S. Woodhull, “Operating Systems Design and Implementation” PHI
2. Stallings, Unix Network programming, PHI.
3. Kerninghan and Pike, The Unix programming Environment, PHI.
4. M. Bach, “The Design of the Unix Operating System”, PHI
5. A. S. Tanenbaum, “Design of Operating System”, Addison Wesley
6. J. L. Peterson and A. Silberschatz, “Operating System concepts” Addison – W

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182102	Digital Logic and System Design	3-1-0	4

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, Trensistor-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. 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

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182103	Computer Organization and Architecture	3-1-0	4

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

Register Transfer, Bus and Memory Transfers, Tree-State Bus Buffers, Memory Transfer, Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations.

MODULE 3: Computer Arithmetic

Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm, Hardware Algorithm, Divide Overflow, Floating-Point Arithmetic Operations, Basic Considerations, Register Configuration, Addition and Subtraction, Decimal Arithmetic Operations, BCD Adder, BCD Subtraction.

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:

1. M. Moris Mano, Computer System Architecture, Pearson Education.
2. William Stallings, Computer Organisation and Architecture, Pearson Education.
3. David A Patterson, Computer Architecture, Pearson Education.
4. P. Pal Choudhri, Computer Organisation and Design, PHI.
5. J. P. Hayes, Computer System Architecture, Pearson Education.
6. Kai Hawang, Advanced Computer Architecture, Tata McGraw Hill.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182104	**Programming Techniques-I (C, C++)**	**3-1-0**	**4**

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 arguments.

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:

1. Kerninghan & Richied, “The C Programming Language”, PHI
2. Programming in Ansi C by E. Balaguruswamy, TMH, 2004
3. Let us C Yaswant Kanetkar, BPB publications
4. Gottfried: “Problem solving in C”, Schaum Series
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++

The Main Function, Function Prototyping, call by reference, Return by Reference, Inline Functions, Default Arguments, Constant Arguments, Function Overloading, Friend and Virtual Function.

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.
3. Insights into OOPS & C++, Rajeshwar Shukla, Pragya Publications.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182114	**Lab I: Programming Techniques-I (C, C++)**	**0-0-4**	**2**

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 $1/1^2 + 1/2^2 + + \ldots\ldots\ldots + 1/n^2$
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 demonstrates 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.

****

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. COMPUTER SCIENCE

2nd Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

M.Sc. Computer Science 2nd Semester

Semester II / M.Sc. Computer Science

Course Structure

Sl. No.	Sub-Code	Subject	Hours per Week			Credits
			L	T	P	C
Theory						
1	MCS182201	Data Structures	3	1	0	4
2	MCS182202	Database Management System/ RDBMS	3	1	0	4
3	MCS182203	Data Communication & Computer Networks	3	1	0	4
4	MCS182204	Theory of Computation	3	1	0	4
Practical						
1	MCS182215	Lab II: Python Programming and SQL	0	0	4	2
Total			12	4	4	**18**
Total Contact Hours per week : 20						
Total Credit: 18						

Detailed Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182201	**Data Structures**	**3-1-0**	**4**

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, binomial heap, fibonacci heap and its amortized analysis.

Module 5: Graphs

Representation and Traversal, Basic Algorithms.

Text Books:

1. Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, “Data Structures Using C and C++”, PHI
2. Seymour Lipschutz, “Data Structures”, Schaum’s Outlines

Reference Books:

1. Reema Thareja, “Data Structures Using C”, Oxford University Press
2. A A Puntambekar, “Data Structures”, Technical Publications, Pune

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182202	Database Management System/RDBMS	3-1-0	4

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:

1. R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Pearson Education.
2. C. J. Date, "An Introduction To Database Systems", Pearson Education.
3. D. Stamper and W. Price, "Database Design And Management- An Applied Approach", McGraw Hill.
4. C. S. R. Prabhu, "Object-Oriented Database Systems- Approaches And Architectures", PHI.
5. J. D. Ullman, "Principles of Database Systems", Galgotia.

Course Code	Course Title	Hours per week L-T-P	Credit C
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:
Evolution of computer networks: Circuit switching, Development of packet switching: 1961-1972, Proprietary networks and internetworking: 1972-1980, Proliferation of networks: 1980-1990. The internet explosion: 1990s.

Module 4:
Network standards and protocols: The IEEE standards, OSI 7 layer model, TCP/IP protocol suit. Data Link Layer: Frame design, Flow control, Error handling, HDLC, PPP, Sliding window protocol.

Module 5:
Network Layer: IP, X.25, Frame Relay, ATM, Routing, Queuing theory. Transport Layer: TCP, UDP, Congestion control, Flow control, Socket interface. Application Layer: SNMP, Authentication, Encryption, Web and HTTP, FTP, Email, DNS, Network File System (NFS) and File sharing, Remote Procedure Calling (RPC).

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:
VSAT technology, Wireless LAN: Technologies, IEEE standards and protocols. Basics of Network management and Security, Infrastructure for network management and security.

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

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182204	**Theory of Computation**	**3-1-0**	**4**

Module 1: Theory of Automata
Description of an Automaton, Definition of a Finite Automaton, Transition System, Properties of a Transition Function, Acceptability of a String by a Finite Automaton, Nondeterministic Finite State Machines, Equivalence of DFA and NDFA, Mealy and Moore Model of Automaton, Minimization of a Finite 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
Context-free Languages and Derivation tree, Ambiguity in Context-free Grammars, Simplification of Context-free Grammars, Normal Forms for Context-free Grammars: Chomsky Normal Form & Grebaich Normal Form, Pumping Lemma for Context-free Languages, Decision Algorithms for Context-free Languages.

Module 4: Pushdown Automata Turing Machine and Linear Bounded Automata
Pushdown Automata: Definition, Acceptance by pushdown automata, Pushdown Automata and Context-free Languages, Parsing and Pushdown Automata; Turing machine Model: Representation of Turing Machine, Language Acceptability by Turing Machine, Design of Turing Machines, Universal Turing Machine and Other Modification, The Model of Linear Bounded Automaton, Turing Machines and Type 0 Grammars, Linear Bounded Automata and Languages, Halting Problem of Turing Machine.

Recommended Books

1. Mishra, K. L. P.; N. Chandrasekaran, Theory of Computer Science (Latest Edition), New Delhi: BPB Publications, Prentice-Hall of India, 1998

2. Hopcraft, H. E.; J. D. Ullman**,** Introduction to Automata Theory, Languages and Computation, New Delhi: Narosa Publications, 2001

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182215	**Lab II: Python Programming and SQL**	**0-0-4**	**2**

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

Using PYTHON

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:
    1/2 + 2/3+ …… + 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 al 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.**

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:
9, 'Zaheer', 36, 'computer', '12-Mar-95', 230, 'M'.
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:
11, 'VIJAY', 29300, 'Finance', '2008-07-13', 38, 'M'.
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.

****

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

Sl. No.	Sub-Code	Subject	Hours per Week			Credits
			L	T	P	C
Theory						
1	MCS182301	Computer Graphics & Multimedia	3	1	0	4
2	MCS182302	Design and Analysis of Algorithm	3	1	0	4
3	MCS182303	Web Programming Technologies	3	1	0	4
4	MCS18230E1*	Elective – I	3	1	0	4
5	MCS182315	Seminar and Viva	0	0	0	2
Total			12	4	0	**18**
Total Contact Hours per week : 16						
Total Credit: 18						

Elective-I Subjects		
Sl. No.	**Subject Code**	**Subject**
1	MCS18230E11	Digital Signal Processing
2	MCS18230E12	Ethical Hacking
3	MCS18230E13	Operations Research & Queueing Theory
4	MCS18230E14	Embedded Systems
5	MCS18230E15	Network Security
6	MCS18230E1*	Any other subject offered from time to time with the approval of the university

Detailed Syllabus

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182301	**Computer Graphics & Multimedia**	**3-1-0**	**4**

Module 1: Basics of Computer Graphics

Introduction, Definition of Computer Graphics, Types of Computer Graphics, Area of Computer Graphics, Classification of Applications, Programming Language, Graphics and Operating Software, Graphic System Configuration.

Module 2: Graphics Systems

Introduction, Cathode Ray Tube (CRT) Basics, Refresh Display, Direct View Storage Tube (DVST), Raster Display, Input and Output Devices, Computer Graphics Software, Graphical User Interface.

Module 3: Output Primitives

Introduction, Representing Image, Straight Line, Line Drawing Algorithms, Differential Digital Analyser (DDA) Algorithm, Bresenham's Line Algorithm, Circle-Generating Algorithm, Midpoint Circle Algorithm, Ellipse-Generating Algorithm, Midpoint Ellipse Algorithm, Polygon Filling Algorithm, Character /Text Generation, Aliasing and Ant-aliasing.

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-Dimesional 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

Introduction, Need for Hidden Surface Removal, The Depth - Buffer Algorithm, Properties that help in reducing efforts, Scan Line Coherence Algorithm, Span - Coherence algorithm, Area-Coherence Algorithms, Warnock's Algorithm, Priority Algorithms.

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

Introduction Animation, Types of Animation, Computer Animation Software, Introduction to Multimedia, Concept of Hypertext and Hypermedia, Multimedia Applications, Basics of Animation, Music and Sounds, Audio Basic Concepts, Digital And Analog Basic Concepts, MIDI Hardware, MIDI messages, MIDI Files, Video Basic Concepts, Analog and Digital Video, Imaging and Graphics, Image Formats, Graphic Formats, File Format, Image Quality and Graphic Systems, Compression, Image Compression, Sound Compression, Video Compression.

Recommended Books:

Text Books:

1. Computer Graphics: Hearn ID and Baker. P.M., PHI
2. Principles of Interactive Computer Graphics: Newman W. Sproule, R.F. Mcgraw Hill
3. Multimedia Systems: John F. Koegel Buford

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182302	Design and Analysis of Algorithm	3-1-0	4

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

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182303	**Web Programming Technologies**	**3-1-0**	**4**

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
3. ASP.net Using VB.net by Cornes, Goode, Sussman, Krishnamoorthy, Miller.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18230E11	**Digital Signal Processing**	**3-1-0**	**4**

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:

Discrete Fourier transform: Definition, inverse discrete Fourier transform (IDFT) Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, Fast Fourier transform (FFT), FFT algorithm, Radix 2 algorithm. Decimation-in-time and decimation-in- frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm, MATLAB examples

Module 4:

Digital filter realization: Principle of digital filter realization, structures of All-zero filters. Design of FIR (Finite impulse response) filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman. Design of infinite impulse response filters (IIR) from analog filters. Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimisation method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples

Recommended Books:

Text Books:

1. Ifeachor, Digital Signal Processing, Pearson, 2nd Edition, 2002.
2. R. G. Lyons, Understanding Digital Signal Processing, Prentice Hall, 2010
3. L.R. Rabiner & B.Gold, Theory and Application of Digital Signal Processing, PHI, 2009.

4. J.G. Proakis & D.G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, PHI , 2008.
5. S. Salivahanan et al., Digital Signal Processing, TMH

Reference Books:

1. Chen, Digital Signal Processing, OUP
2. Meyer-Basse U, Digital Signal Processing with FPGA, Spriger India, 2007.
3. Ingle, Digital Signal Processing using MATLAB, Vikas Publishing House, 2001.
4. Babu R, Digital Signal Processing, Scitech Publications, 2010.
5. S. K. Mitra, Digital Signal Processing - A Computer based approach, TMH, 2006.
6. Xavier, Digital Signal Processing, S. Chand, 2003
7. Pradhan, Digital Signal Processing Applications, Jaico

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18230E12	**Ethical Hacking**	**3-1-0**	**4**

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:

Introduction and objectives, Commands and tools (Windows), Commands and tools (LINUX), Basic commands equivalances for Windows/Linux, Exercises in Windows and Linux. Backdoor Overview**: Backdoor Process and Functions, Backdoor Gaining Access, Backdoor Maitaining Access, Command Prompt Backdoor.**

Ports and Protocols: Introduction, Basic concepts of networks- devices and topologies, TCP/IP model-Layers, Protocols, IP Addresses, PORTS, Encapsulation, Exercises.

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.

Malware – Introduction, Viruses – Boot sector viruses, executable file virus, terminate and stay resident virus, Polymorphic virus, macro virus. WORMS – Introduction, description, Trojans and spyware, Rootkits and Backdoors, Logicbombs and timebombs, Countermeasures – Introduction, Antivirus, NIDS, HIDS, Firewalls, SandBoxes. Good safety Advice.

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

Digital Forensic – Introduction, Forection Principles – Avoid contamination, Act methodically, Chain of evidence. Stand alone Forensic – Hard drivre and storage media basics, Encrypton, Decrypton and file formats. Needle in a Haystack, NETWORK Forensics – Firewall Logs, Mail Headers.

Email Security – Introduction, Working principle, Email accounts, POP and SMTP, WEB Mail, security at Receiving – S pam, Phising and fraud, HTML Email, Attachment security, Forged headers, Security at Sending – Digital certificates, Digital signature, Encryption, Decryption. Connection security, Introduction To Cryptography, **Basic Concepts On Cryptography,** Hash Function and Oracle Method, Pros and Cons Of Cryptography.

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.

Introduction To ICMP redirection, ICMP redirection Visual Chart, IMPC redirection Process and Functions, Killing a Network, DDoSing Unauthorised Network, Driftnet, Introducing EvilGrade.

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 encrypton, password cracking.

Introduction To SQL injection, SQL Injection To Google Dorks

Reference Books:

1. Nikhalesh Singh Bhadoria,"First Step to Ethical Hacking",Rigi Publication
2. Sai Satish, "Hacking Secrets- A Practical Guide to learn Hacking",Indian Servers

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18230E13	**Operations Research and Queueing Theory**	**3-1-0**	**4**

Module 1: Basics of Operations Research
Development of Operation Research , Definition of Operation Research , Scope/ Applications of Operation Research , Limitations of Operations Research.

Module 2: Linear Programming Problem (LPP)
Introduction , Mathematical Formulation of Linear Programming Problem , Statements of Basic Theorems and Properties , Graphical Solutions to a Linear Programming Problem , Simpkex Method , The Big-M Method Two Phase simplex Method .

Module 3: Advanced Topics in Linear programming
Dual Theory , Dual simplex Method , Revised simplex Method , Integer Programming Problem (IPP) : Introduction , Formulation of IPP , Gromory's cutting plane Method , Branch and Bound Technique ,Limitations of Linear programming problem .

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): $(\infty: FIFI)$, Model II : (M/M/s): $(\infty: FIFI)$,Model III : (M/M/ 1) : (N/FIFO) , Model IV : (M/M/s): $(N: FIFI)$.

Recommended Books:

Text Books:

1. J . K . Sharma , Operation Research – Theory and Application , MacMillan India Ltd.
2. G . Hadley ; Linear Programming , Narosa Publishing House , New delhi .
3. Bronson , Richard , Operational Research , McGraw Hill .

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18230E14	Embedded Systems	3-1-0	4

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:

1. Daniel W. Lewis, Fundamentals of Embedded Software, where C and assembly meet, Pearson Education 2001.
2. John B. Peatman, Design with PIC Microcontrollers, Pearson Education, 1997.
3. Robert B. Reese, Microprocessors: From assembly language to C using PIC18Fxx2, Shroff Publishers and Distributors Pvt Ltd. 2005.
4. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Elsevier Publication 2000.
5. Michael Juntao Yuan, Enterprise, J2ME – Developing Mobile Java Applications, Pearson Education, 2003.
6. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM System Developer's Guide – Designing and Optimizing System Software, Elsevier Publications, 2007.
7. A. Silberschatz, P.B.Galvin and G. Gagne, Operating System Concepts (6th ed.), John Wiley & Sons, Inc., 2001
8. K.V.K.K.Prasad, Embedded/Real Time Systems: Concepts, Design and Programming,Dreamtech Press, New Delhi, India, 2003.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18230E15	**Network Security**	**3-1-0**	**4**

Module 1: Overview and Classical Encryption Techniques

Overview: Services, mechanisms and attacks; Security architecture – security services, authentication, data confidentially, 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.

Hash Functions: Authentication Requirements, Message authentication codes; Hash functions – Requirements, Simple hash functions, Birthday attack, Block chaining, Brute Force attack, Cryptanalysis.

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:

1. Stallings, W**.,** Cryptography and Network Security: Principles and Practice, Latest Edition, New Delhi: Prentice-Hall India, 2006.
2. Cheswick, W.; S. Bellovin, Firewalls and Internet Security. Repelling the Wiley Hacker, (Second Edition), New Delhi: Addison-Wesley, 1998.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182315	**Seminar and Viva**	**0-0-0**	**2**

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.

****

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

Sl. No.	Sub-Code	Subject	Hours per Week			Credits
			L	T	P	C
Theory						
1	MCS182401	Cryptography	3	1	0	4
2	MCS18240E2*	Elective-II	3	1	0	4
3	MCS18240E3*	Elective-III	3	1	0	4
Practical						
1	MCS182424	Project work	-	-	-	4
Total			9	3	0	**16**
Total Contact Hours per week : 12						
Total Credit: 16						

Elective-II Subjects		
Sl. No.	**Subject Code**	**Subject**
1	MCS18240E21	Natural Language Processing
2	MCS18240E22	Distributed Database Management Systems
3	MCS18240E23	Data Warehousing & Data Mining
4	MCS18240E24	Artificial Intelligence/ Expert System
5	MCS18240E25	Cloud Computing
6	MCS18240E26	Computer Vision
7	MCS18240E27	Advanced Computer Architecture
8	MCS18240E2*	Any other subject offered from time to time with the approval of the university

Elective-III Subjects		
Sl. No.	**Subject Code**	**Subject**
1	MCS18240E31	Mobile Computing
2	MCS18240E32	Speech Processing
3	MCS18240E33	Pattern Recognition
4	MCS18240E34	Big Data Analytics
5	MCS18240E35	Supply Chain & Logistics Management
6	MCS18240E3*	Any other subject offered from time to time with the approval of the university

Detailed Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182401	Cryptography	3-1-0	4

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.

Module 4:

Public Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards.
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:
Kerberos V4 and V5, X.509 Authentication Service. Digital Watermarking and Stegnanography.

Recommended Books:

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, 4th Edition, Prentice Hall Publisher, 2005.
2. Bruce Schneier, Applied Cryptography: protocols, algorithms, and source code in C, 2nd Edition, Wiley, 1996.
3. Alfred J. Menezes , Handbook of Applied Cryptography, CRC Press, 1996.
4. Michael Welschenbach , Cryptography in C and C++ , Apress, 2001.

5. Douglas R. Stinson, Cryptography: Theory and Practice, 3rd Edition, Chapman & Hall /CRC, 2005.

Reference Books:

1. William Stallings, Cryptography and Network Security, 4th.Ed, Prentice Hall PTR, Upper Saddle River, NJ, 2006
2. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
3. Richard A. Mollin, An Introduction to Cryptography, Chapman and Hall/CRC, 2001

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E21	Natural Language Processing	3-1-0	4

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:
Morpholgy & 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:

1. James Allan, Natural Language Understanding, Pearson Education, 1995.
2. Jurafsky and Martin, Speech and Language Processing, Pearson Education, 2000.
3. Manning and Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
4. Bharati *et al*., Natural Language Processing, PHI, 1996

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E22	**Distributed Database Management Systems**	**3-1-0**	**4**

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:
Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Lock based Concurrency Control Mechanisms, Time Stamp-Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management, Relaxed Concurrency Control.

Module 11: Distributed DBMS Reliability
Reliability Concepts & Measures, Failures & Fault Tolerance in Distributed systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols, Dealing with site failures, Network Partitioning.

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:

1. Principles of Distributed Database Systems by M. Tamer Ozsu, Patrick Valduriez (Pearson Publication)
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)

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E23	Data Warehousing & Data Mining	3-1-0	4

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:

1. Reema Thareja, "Data Warehousing", Oxford.
2. Jiawei Han and Micheline Kambler, "Data Mining Concepts and Techniques", Second Edition, Elsevier
3. Arun K Pujari, "Data Mining Techniques", Second Edition, Orient Longman Publishers
4. Margaret H. Dunham, "Data Mining Introductory and Advanced Topics", Prentice Hall India

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E24	**Artificial Intelligence/ Expert System**	**3-1-0**	**4**

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

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E25	Cloud Computing	3-1-0	4

Module 1: Cloud Computing Fundamentals
Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

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
Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Recommended Books:

1. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978- 0521137355], 2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.
3. Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539],2010.
4. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E26	Computer Vision	3-1-0	4

Module 1:

Fundamentals, Image Formation, Sampling and Quantization, Mathematical Preliminaries, Image Transformation, Image Enhancement and restoration.

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

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E27	Advanced Computer Architecture	3-1-0	4

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:
Functional Structures, Interconnection networks, parallel memory organizations; Multiprocessor Control and Algorithms, lnterprocess Communication Mechanism. System Deadlocks and Protection, Multiprocessor Scheduling Strategies, Parallel algorithms for multiprocessor - synchronous and asynchronous.

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

Recommended Books:

Text Books:

1. Hawang , K., Briggs, F.A. : Computer Architecture and Parallel Processing, McGraw Hill , 1985
2. Evans , D.J. : Parallel Processing System, Cambridge Univ. , 1982.
3. Stone , H.S. & Others : Introduction to computer Architecture, 2nd
4. Edition. , Galgotia Publ. Ltd . 1987.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E31	Mobile Computing	3-1-0	4

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
2. Mehrotra, GSM System Engineering.
3. M V D Heijden, Understanding WAP, Artech House, 2000.
4. Charles Perkins, Mobile IP, Addison Wesley, 1999.
5. Charles Perkins, Ad hoc Networks, Addison Wesley, 2000

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E32	Speech Processing	3-1-0	4

Module 1: Signals and Systems:
Energy & power signals, FT, FFT, STFT, Sampling Theorem, Discrete-Time Signals and Systems, Discrete-Time Fourier Transform, FIR, IIR filters, LPF, HPF and BPF filters, Hamming Window, Weigner window.

Module 2: Analogy and Physiology of Speech Production mechanism:
Lungs, Larynx, vocal Tract, Categorization of Speech Sounds, Elements of a language: vowels, Nasals, Fricatives, plosives. Speech perception; Voiced and Unvoiced sounds, Spectral Analysis of Speech: Formant Frequency, Cepstral Frequency, Mel-cepstra, Fundamental frequency, Power spectral analysis, PSD, Energy Spectra.

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, Dyanamic 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:

1. Speech Signal Processing-T.E. Quatieri, Pearson LPE.
2. Speech and Language Processing-Daniel Jurafsay, Tames H. Mrtian.
3. Digital Processing of Speech Signal-Lawrence R. Rabiner, Ronald w. Schafer
4. Fundamentals of Speech Recognition- Lawrence R. Rabiner, Biing-Hwang Tuong

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E33	Pattern Recognition	3-1-0	4

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:

1. R.O. Duda, P.E.Hart and D.G. Stork, Pattern Classification, John Wiley, 2001
2. K. Fukunaga, Statistical pattern Recognition; Academic Press,2000
3. Devi V.S., Murty, M.N., Pattern Recognition: An Introduction, University Press, Hyderabad,2011

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E34	Big Data Analytics	3-1-0	4

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:

1. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012
2. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
3. Bart Baesens, "Analytics in a Big Data World- The essential guide to Data Science and its Applications", Wiley
4. Pranhari Talukdar, "Big Data and Cloud Computing"

Reference Books:

1. Tom White, Hadoop: The Definitive Guide, O"Reilly Media, Third Edition, 2012.

2. Bill Franks, Taming The Big Data Tidal Wave: Finding OpportModuleies in Huge Data Streams with Advanced Analytics, Wiley, 2012.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS18240E35	Supply Chain & Logistics Management	3-1-0	4

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:
Financial statement analysis, valuation, capital budgeting, Risk and Return, Long Term and short term Financial Planning , Financial Engineering
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 od 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, busjeting 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:

1. Ross, Stephen. A., Westerfield, Randolph W. and Bradford D. Jordan, "Fundamentals of Corporate Finance"; Tata McGraw-Hill; Latest edition.

2. Kotler, Philip, "A Framework for Marketing Management"; Pearson Education India, Latest Edition.

Course Code	Course Title	Hours per week L-T-P	Credit C
MCS182424	**Project Work**	**0-0-0**	**4**

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.

****