ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

B.TECH
COMPUTER SCIENCE AND ENGINEERING

3rd SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure
(From Academic Session 2018-19 onwards)

B.Tech 3rd Semester: Computer Science and Engineering

Semester III/B.TECH/CSE

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	MA181301B	Mathematics III-B (for branches CSE and ECE/ETE)	2	1	0	3	30	70
2	CSE181302	Object Oriented Programming using C++	3	0	0	3	30	70
3	CSE181303	Digital Systems	3	0	2	4	30	70
4	CSE181304	Data Structure and Algorithms	3	0	0	3	30	70
5	CSE181305	Basics of Signals and Systems	3	0	0	3	30	70
6	MC181306	Constitution of India	2	0	0	0 (PP/NP)	-	100
Practical								
1	CSE181312	Object Oriented Programming using C++ Lab	0	0	4	2	15	35
2	CSE181314	Data Structure and Algorithms Lab	0	0	4	2	15	35
3	SI181321	Internship-I (SAI - Social)	0	0	0	1	-	100
TOTAL			16	1	10	**21**	**180**	**620**
Total Contact Hours per week : 27								
Total Credits: 21								

N.B. MC181306 is a Mandatory Audit Course (No Credit). It will be evaluated as PP (Pass) or NP (Not Pass)

Detailed Syllabus

Course Code	Course Title	Hours per week L-T-P	Credit C
MA181301B	**Mathematics III-B** (for branches CSE and ECE/ETE)	**2-1-0**	**3**

Module 1: (25 hours)

Probability

Probability space, conditional probability, Bayes' Theorem, independence; Discrete random variables, Independent random variables, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Joint Distribution.

Continuous Probability Distributions:

Continuous random variables and their properties with special reference to normal distribution.

Test of significance, Chi-square Test, Elements of Markov Chain.

Module 2: (15 hours)

Statistics:

Measures of Central tendency: Moments, skewness and Kurtosis, Correlation and regression – Rank correlation, Curve fitting by the method of least squares- fitting of straight lines.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
7. Statistical Methods: An Introductory Text- J.Medhi, New Age International Publishers

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181302	**Object Oriented Programming using C++**	**3-0-0**	**3**

Abstract data types and their specification, how to implement an ADT, Concrete state space, concrete invariant, abstraction function, implementing operations

Features of object-oriented programming, Encapsulation, object identity, polymorphism

Inheritance in object oriented design

Design patterns, introduction and classification, the iterator pattern, Model-view-controller pattern

Commands as methods and as objects, implementing object oriented language features

Memory management, Streams, Generic types and collections

The concepts should be practiced using C++

Textbooks/References:

1. C++: The Complete Reference, Herbert Schildt, McGraw Hill Education
2. The C++ Programming Language, Bjarne Stroustrup
3. Object-Oriented Programming with C++, Balaguruswamy, McGraw Hill Education

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181303	Digital Systems	3-0-2	4

MODULE 1: Fundamentals of Digital Systems and logic families
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

MODULE 2: Combinational Digital Circuits
Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Substractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

MODULE 3: Sequential circuits and systems
A 1-bit memory, the circuit properties of Bi stable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

MODULE 4: A/D and D/A Converters
Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

MODULE 5: Semiconductor memories and Programmable logic devices.
Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Textbooks/References:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181304	Data Structure and Algorithms	3-0-0	3

MODULE 1:
Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off, Searching: Linear Search and Binary Search Techniques and their complexity analysis.

MODULE 2:
Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation –corresponding algorithms and complexity analysis, ADT queue, Types of Queue: Simple Queue, Circular Queue, multilevel queue, Priority Queue, double ended queue; Operations on each types of Queues: Algorithms and their analysis.

MODULE 3:
Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and their complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis, Applications of Binary Trees, B Tree, B+ Tree: definitions, algorithms and analysis.

MODULE 4:
Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Textbooks/References:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
3. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181305	Basics of Signals and Systems	3-0-0	3

MODULE 1:
Signals and systems as seen in everyday life and in various branches of engineering and science, Signal properties: periodicity, absolute inerrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, Realizability, examples.

MODULE 2:
Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections, Characterization of causality and stability of LTI systems, System representation through differential equations and difference equations. State-space Representation of systems, State-Space Analysis, Multi-input, multi-output representation, State Transition Matrix and its role, Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

MODULE 3:
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform(DTFT) and the Discrete Fourier Transform (DFT), Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior, the z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

MODULE 4:
The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold, Aliasing and its effects, Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Textbooks/References:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India,1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
5. A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
6. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
7. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

Course Code	Course Title	Hours per week L-T-P	Credit C
MC181306	Constitution of India	2-0-0	0 (PP/NP)

Course Objectives: Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

MODULE 1: History of Making of the Indian Constitution:

a) History
b) Drafting Committee, (Composition & Working)

MODULE 2: Philosophy of the Indian Constitution:

a) Preamble
b) Salient Features

MODULE 3: Contours of Constitutional Rights & Duties:

a) Fundamental Rights
b) Right to Equality
c) Right to Freedom
d) Right against Exploitation
e) Right to Freedom of Religion
f) Cultural and Educational Rights
g) Right to Constitutional Remedies □Directive Principles of State Policy □Fundamental Duties.

MODULE 4: Organs of Governance:

a) Parliament

b) Composition
c) Qualifications and Disqualifications
d) Powers and Functions
e) Executive
f) President
g) Governor
h) Council of Ministers
i) Judiciary, Appointment and Transfer of Judges, Qualifications
j) Powers and Functions

MODULE 5: Local Administration:

a) District's Administration head: Role and Importance,
b) Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
c) Pachayati raj: Introduction, PRI: Zila Pachayat.
d) Elected officials and their roles, CEO Zila Pachayat: Position and role.
e) Block level: Organizational Hierarchy (Different departments),
f) Village level: Role of Elected and Appointed officials,
g) Importance of grass root democracy

MODULE 6: Election Commission:

a) Election Commission: Role and Functioning.
b) Chief Election Commissioner and Election Commissioners.
c) State Election Commission: Role and Functioning.
d) Institute and Bodies for the welfare of SC/ST/OBC and women.

Textbooks/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181312	Object Oriented Programming using C++ Lab	0-0-4	2

LIST OF EXPERIMENTS

I) Define a class in C++ to represent a bank account. Include the following data members:

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions:
1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

Write a main program to test the classe. Modify the program for handling 10 customers.

II) Write a class in C++ to represent a vector (a series of float values). Include member functions to perform the following tasks:
(a) To create the vector
(b) To modify the value of a given element
(c) To multiply by a scalar value
(d) To display the vector in the form (10, 20, 30, ...)
Write a program to test the class. Then, modify this class and also the program so that it can add two vectors and display the resultant vector.

III) A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the required copies are available, the total cost of the requested copies is displayed; otherwise the message "Required copies not in stock" is displayed. Design a system in C++ using a class called “books” with suitable member functions and constructors. Use new operator in constructors to allocate memory space required.

IV) Create a C++ class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT.

V) Assume that a bank maintains two kinds of accounts for customers, one called as Savings account and the other as current account. The savings account gives compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a C++ class **account** that stores customer name,

account number and type of account. From this, derive the classes **curr_acct** and **sav_acct** to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

a) Accept deposit from a customer and update the balance
b) Display the balance
c) Compute and deposit interest
d) Permit withdrawal and update the balance
e) Check for the minimum balance, impose penalty and update the balance

VI) Create a base class in C++ called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class a member function **get_data ()** to initialize base class data members and another member function **display_area ()** to compute and display the area of figures. Make **display_area ()** a virtual function and redefine this function in the derived classes to suit their requirements. Using these classes, design a program that will accept the dimensions of a triangle or a rectangle interactively and display the area.

VII) Implement a template class in C++ for stack data structure and show how it can be used inside main function.

VIII) Write a program in C++ to implement the following design patterns in C++:

a) MVC pattern
b) Iterator pattern

IX) Write a program in C++ that reads a text from keyboard and displays the following information on screen in two columns:

a) Number of lines
b) Number of words
c) Number of characters

Strings should be left justified and numbers should be right justified in a suitable field width.

X) Write a program in C++ to illustrate command design pattern in C++.

XI) Write a C++ program to implement a dynamic array class and illustrate its use inside main function.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181314	Data Structure and Algorithms Lab	0-0-4	2

LIST OF EXPERIMENTS

1. Write a program to implement a stack using array. Moreover, show how this stack can be used to check whether a string is a palindrome or not.
2. Write a program to implement a circular queue using array.
3. Write a program to implement a singly linked linear list along with operations of traversing, insertion, deletion and display.
4. Write a program to implement a priority queue using a linked linear list.
5. Write a program to implement a circular doubly linked linear list along with operations of traversing, insertion, deletion and display.
6. Write a program to implement bubble sort, selection sort, insertion sort and quick sort in a menu driven program.
7. Write a program to create a binary search tree along with the operations of searching and deletion. Moreover, perform a post order traversal of this tree.
8. Write a program to implement (a) heap sort and (b) merge sort on a list of numbers stored in an array.
9. Write a program to represent a graph in memory and then to perform breadth first search and depth first search on this graph.
10. Write a program to perform linear search and binary search on a list of numbers stored in an array.
11. Write a program to perform searching using hashing. Use probing or chaining techniques for resolving collision.
12. Write a program to merge two singly linked non circular lists.

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