ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

B.TECH

COMPUTER SCIENCE AND ENGINEERING

4th SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure

(From Academic Session 2018-19 onwards)

B. Tech 4th Semester: Computer Science and Engineering

Semester IV/ B. TECH/CSE

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	CSE181401	Discrete Mathematics	3	1	0	4	30	70
2	CSE181402	Computer Organization and Architecture	3	0	2	4	30	70
3	CSE181403	Operating System	3	0	0	3	30	70
4	CSE181404	JAVA Programming	2	0	4	4	30	70
5	CSE181405	Graph Theory	3	0	0	3	30	70
6	MC181406	Environmental Science	2	0	0	0 (PP/NP)	-	100
Practical								
1	CSE181413	Operating System Lab	0	0	4	2	15	35
2	CSE181417	IT Workshop (SciLab/Python)	0	1	2	2	15	35
TOTAL			16	2	12	**22**	**180**	**520**
Total Contact Hours per week : 28								
Total Credit: 22								

N.B. 1. MC181406 is a Mandatory Audit Course (No Credit). It will be evaluated as PP (Pass) or NP (Not Pass)

2. 2-3 weeks Mandatory Academia Internship need to be done in the 4th semester break and the report is to be submitted and evaluated in 5th semester

Detail Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181401	**Discrete Mathematics**	**3-1-0**	**4**

MODULE 1:
Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

MODULE 2:
Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination

MODULE 3:
Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

MODULE 4:
Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

Text / Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics a Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
4. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and Its Application to Computer Science", TMG Edition, Tata McGraw-Hill
5. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press, Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181402	Computer Organization and Architecture	3-0-2	4

MODULE 1:
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

MODULE 2:
Introduction to x86 architecture and instruction set.

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB

MODULE 3:
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards,

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency,

MODULE 4:
Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text / Reference Books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
3. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
4. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
5. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181403	Operating System	3-0-0	3

MODULE 1:
Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine, Case study on UNIX and WINDOWS Operating System.

MODULE 2:
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF, Process management in UNIX

MODULE 3:
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., System V IPC

MODULE 4:
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

MODULE 5:
Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation –Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures –Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, first in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU), Memory Management in UNIX

MODULE 6:
I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Example operating system: Unix/Linux

Text / Reference Books:

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Design of the UNIX Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
6. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181404	JAVA Programming	2-0-4	4

MODULE 1:
Basics of Java language, control structures, classes and objects, inheritance, interfaces, collections

MODULE 2:
Working with User Interfaces – JAVA AWT Package, Basics User Interface Components (Labels, buttons, Check boxes, Radio buttons, choice Menu or Choice Lists, Text fields, Text areas, scrolling list, scroll bars, panels and frames), Layouts(Flow, Grid, Border, Card),event-driven programming-event driven programs, event handling process, Java's event types, JAVA Swings- Comparison between Swing and AWT, Java swing packages, Swing basic containers, Swing components, event handling using Java swing, using dialogs, Joptionpane class, input dialog boxes, Timers and Sliders, Tables, Borders for components.

MODULE 3:
Introduction to Threads in Java, basics of Networking in Java, TCP and UDP sockets, Client server application, connecting to the Web

MODULE 4:
JAVA database connectivity, JDBC/ODBC Bridge, JAVA.SQL package, connecting to remote data base, Data manipulation and Data navigation

Text / Reference Books:

1. Deitel & Deitel, JAVA: How to Program, Pearson education
2. Deitel & Deitel, Internet and World Wide Web How to Program, Pearson education
3. Ivan Bay Ross, Web Enabled Commercial Application using Java 2, BPB publication (1998)
4. David Flanagan, Java Script the Definitive Guide, O"relly, 5e (2006)

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181405	Graph Theory	3-0-0	3

MODULE 1:
Basics – Graphs, degree sequences, distance in graphs, complete, regular and bipartite graphs, basic properties.

MODULE 2:
Structure and Symmetry – Cut vertices, bridges and blocks, auto Orphism groups, reconstruction problem.

MODULE 3:
Trees and connectivity – Properties of trees, Arboricity, vertex and edge connectivity, Mengers theorem

MODULE 4:
Eulerian and Hamiltonian graphs – Characterization of Eulerian graphs -Sufficient conditions for Hamiltonian graphs.

MODULE 5:
Coloring and planar graphs – vertex and edge coloring, perfect graphs, planar graphs, Euler's theorem, Kuratowski's theorem, coloring of planar graphs, Crossing number and thickness.

MODULE 6:
Matching, factors, decomposition and domination

MODULE 7:
Extremal Graph theory – Turan's theorem, Ramsay's theorem, Szemeredi's regularity lemma, applications

Text / Reference Books:

1. Graph Theory, by J. A. Bondy and U. S. R. Murthy, Springer Verlag
2. Introduction to Graph Theory by D. B. West, PHI, 2004
3. Graph Theory, by R. Diestel: Springer Verlag

Course Code	Course Title	Hours per week L-T-P	Credit C
MC181406	Environmental Science	2-0-0	0

MODULE 1: Environment and Ecology

i. Introduction
ii. Environment and Ecology
iii. Objectives of ecological study
iv. Aspects of Ecology
    a) Autecology
    b) Synecology
v. Ecosystem
    a) Structural and functional attributes of an ecosystem
    b) Food chain and food web
    c) Energy flow
    d) Biogeochemical cycles

MODULE 2: Land: Use and Abuse

i. Land use: Impact of land – use on environmental quality
ii. Land degradation
iii. Control of land degradation
iv. Waste land
v. Wet lands

MODULE 3: Water Pollution

a) Introduction
b) Water quality standards
c) Water pollution
d) Control of water pollution
e) Water pollution legislations
f) Water quality management in Rivers

MODULE 4: Air Pollution

i. Introduction
    a) Air pollution system
    b) Air pollutants
ii. Air pollution laws
iii. Control of air pollution
    a) Source correction method
    b) Pollution control equipment

MODULE 5: Noise Pollution

i. Introduction
ii. Sources of noise pollution
iii. Effects of noise
    a) Physical effects
    b) Physiological effects
    c) Psychological effects
iv. controls of Noise pollution

Text / Reference Books:

1. Environmental engineering and management by Dr Suresh Dhameja
2. Environmental studies by Dr B.S. Chauhan
3. Environmental science and engineering by Henry and Hence
4. Environmental studies for undergraduate course by Dr Susmitha Baskar
5. Chemistry for environmental engineering and science by Clair Sawyer

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181413	**Operating System Lab**	**0-0-4**	**2**

LIST OF EXPERIMENTS

1. Write programs for simulation of different CPU scheduling policies and memory management techniques.
2. Write programs to demonstrate use of Fork system call with getpid(), getppid(), and join().
3. Write programs for inter process communication in Linux using:
    a) PIPES
    b) Message queue
    c) Shared memory
4. Write programs for handling of Thread using Pthread library (semaphore and deadlock)
5. Write programs for understanding various features of Shell Scripts
6. Experiment with Makefile and creation of Header file

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181417	IT Workshop (Scilab/Python)	0-1-2	2

LIST OF EXPERIMENTS

1. Write programs on string, list, tuple, array and dictionary
2. Write a program to create a class that performs basic calculator operations
3. Write programs for understanding features like NumPy, SciPy, doctest, os, tkinter
4. Write a program to implement a queue
5. Write program for binomial distribution and normal distribution
6. Write program for finding moment, skewness and kurtosis
7. Write program for performing Chi Square test
8. Write program for performing linear regression
9. A project using Python is to be done in groups.

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