ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

B.TECH

COMPUTER SCIENCE AND ENGINEERING

7th Semester

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure

(From Academic Session 2018-19 onwards)

B.Tech 7th Semester: Computer Science and Engineering

Semester VII/ B.TECH/CSE

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	CSE1817PE4*	Program Elective-4	3	0	0	3	30	70
2	CSE1817OE2*	Open Elective-2	3	0	0	3	30	70
3	CSE1817OE3*	Open Elective-3	3	0	0	3	30	70
4	HS181704	Principles of Management	3	0	0	3	30	70
Practical								
1	CSE181722	Project-1	0	0	12	6	50	50
2	SI181721	Internship-III (SAI-Industry)	0	0	0	2	-	200
TOTAL			**12**	**0**	**12**	**20**	**170**	**530**
Total Contact Hours per week : 24								
Total Credit: 20								

Program Elective-4

Sl. No.	Subject Code	Subject
1	CSE1817PE41	Cloud Computing
2	CSE1817PE42	Computational Complexity
3	CSE1817PE43	Principles of Programming Languages
4	CSE1817PE4*	Any other subject offered from time to time with the approval of the University

Open Elective-2

Sl. No.	Code	Subject
1	CSE1817OE21	Machine Learning
2	CSE1817OE22	Human Computer Interaction
3	CSE1817OE23	Computer Vision and its Applications
4	CSE1817OE2*	Any other subject offered from time to time with the approval of the University

Open Elective-3

Sl No	Code	Subject
1	CSE1817OE31	Distributed Systems
2	CSE1817OE32	Computational Geometry
3	CSE1817OE33	Embedded Systems
4	CSE1817OE3*	Any other subject offered from time to time with the approval of the University

Detail Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817PE41	**Cloud Computing**	**3-0-0**	**3**

MODULE 1:
Introduction - Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IAAS, PAAS, SAAS; service oriented computing and cloud environment

MODULE 2:
Cloud Computing Technology - Client systems, Networks, server systems and security from services perspectives; accessing the cloud with platforms and applications; cloud storage

MODULE 3:
Working with Cloud- Infrastructure as a Service – conceptual model and working Platform as a Service – conceptual model and functionalities Software as a Service –conceptual model and working Technologies and Trends in Service provisioning with clouds

MODULE 4:
Using Cloud Services- Cloud collaborative applications and services – technology, applications and case studies with calendars, schedulers and event management; cloud applications in project management

MODULE 5:
Case Studies-Microsoft Azure, Google App Engine and Open source clouds-Open-Nebula and Eucalyptus, Current trends and research

Textbooks/Reference Books:

1. Anthony T.Velte, Toby J.Velte and Robert E, Cloud Computing – A Practical Approach, TMH, 2010
2. Michael Miller, Cloud Computing – Web based Applications, Pearson Publishing, 2011

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817PE42	**Computational Complexity**	**3-0-0**	**3**

MODULE 1: Introduction: Turing machines, equivalence of reasonable models of computation, non-determinism, algorithms, decision versus optimization problems, reduction between problems.

MODULE 2: Time Complexity: The complexity classes P, NP, Co-NP and Exp, completeness for NP, Cook's theorem, some well-known NP-complete problems, classes FP, FNP, TFNP and FNP-Complete, approximation algorithms.

MODULE 3: Space Complexity: Classes PSPACE, NSPACE and PSPACE-complete, Savitch's theorem, logarithmic space, classes PolyL, L, NL, Co-NL and NL-complete.

MODULE 4: Intractability: Space and time hierarchy, EXPSPACE-completeness, alternating Turing machines and the polynomial hierarchy, relativization and oracle Turing Machines.

MODULE 5: Randomized Computation: Classes RP, ZPP, PP and BPP.

MODULE 6: Parallel Computation: Circuit complexity, classes NC and RNC, P-completeness.

MODULE 7: Cryptography: One-way functions, public-key cryptography, interactive protocols.

Textbooks/Reference Books:

1. Bernard M E Moret, The Theory of Computation, Addison-Wesley, 1998.
2. Christos H Papadimitriou, Computational complexity, Addison-Wesley, 1994.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing Company 1997.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817PE43	Principles of Programming Languages	3-0-0	3

MODULE 1: History and Need of Various types of Programming Languages, Types of PL, Characteristics of programming languages, Syntax, Semantics- various types of semantics, Pragmatics Analysis

MODULE 2: Concurrent Programming Languages: Concurrency structure for message passing, loosely coupled system, shared memory, PRAM, monitor, semaphore, Example: Java RMI, Parallel Java, Parallel C.

MODULE 3: Logic Programming: Predicate calculus- Logical operators, Propositional forms, Rules of inference, Logical equivalence, Quantification, Well-formed formula, PROLOG - Syntax, Lists, Operators and arithmetic, Control, i/o, data structures.

MODULE 4: Functional Programming: Lambda calculus- Lambda expressions, Variables, Substitutions, Arithmetic, Conditionals, Recursion, Lambda reduction, Type assignment, Polymorphism, Lambda calculus and computability

LISP - Control constructs, List processing, Files and i/o, Generic functions, Objects, Exceptions.

Textbooks/Reference Books:

1. Programming Languages: Concepts and Constructs by Ravi Sethi, Pearson Education.
2. Programming Language Concepts by Carlo Ghezzi and Mehdi Jazayeri, John Wiley & Sons.
3. Programming Languages: Paradigm and Practices by Doris Appleby and J. J. Vandekopple, McGraw Hill.
4. Concepts of Programming Languages by Robert W. Sebesta, Pearson Education.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE21	**Machine Learning**	**3-0-0**	**3**

MODULE 1: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

MODULE 2: Linear regression, Decision trees, over fitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation, Bias Variance Trade-off, Generalization errors, model selection, evaluation metrics

MODULE 3: Basic Probabilistic Modelling, Learning via Probabilistic Modelling, Probabilistic Models for Supervised Learning- Discriminative Approaches and Generative Approaches: Naïve Bayes, Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM

MODULE 4: Neural Network: Perceptron, multilayer network, gradient descent and back propagation, Convolutional Neural Networks, Recurrent Neural Networks, Deep Unsupervised Learning, Dynamic memory networks

MODULE 5: Computational learning theory, PAC learning model, Linear Discriminant Analysis, Sample complexity, VC Dimension, Ensemble learning: Boosting and bagging, random forest, reinforcement learning

MODULE 6: k-means clustering, Gaussian mixture model and EM algorithm

Textbooks/Reference Books:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997
2. Introduction to Machine Learning Edition 2, by Ethem Alpaydin

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE22	Human Computer Interaction	3-0-0	3

MODULE 1: Introduction: The human, The computer, The interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories

MODULE 2: Design Process: Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support

MODULE 3: Models and Theories Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design, Models of the system, Modeling rich interaction

MODULE 4: Interaction Styles- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation

MODULE 5: Design Issues- Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization

MODULE 6: Outside the Box- Group ware, Ubiquitous computing and augmented realities, Hypertext, multimedia, and the World Wide Web

Textbooks/Reference Books:

1. "Human Computer Interaction" by Alan Dix, Janet Finlay, ISBN: 9788131717035, Pearson Education (2004)
2. "Designing the User Interface - Strategies for Effective Human Computer Interaction", by Ben Shneiderman ISBN: 9788131732557, Pearson Education (2010).
3. Usability Engineering: Scenario-Based Development of Human-Computer Interaction, by Rosson, M. and Carroll, J. (2002)
4. The Essentials of Interaction Design, by Cooper, et al., Wiley Publishing (2007)
5. Usability Engineering, by Nielsen, J. Morgan Kaufmann, San Francisco, 1993. ISBN 0-12-518406-9
6. The Resonant Interface: HCI Foundations for Interaction Design, by Heim, S., Addison-Wesley. (2007)
7. Usability engineering: scenario-based development of human-computer interaction, By Rosson, M.B & Carroll, J.M., Morgan Kaufman. (2002)

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE23	Computer Vision and its Applications	3-0-0	3

MODULE 1: Introduction- Machine vision systems, optics and lenses, image sensors, human vision and Neuro-visual model, Imaging geometry - world co-ordinate system and camera coordinate system, co-ordinate transformations, projection geometry, camera model, camera calibration, radiometry. Open and manipulate images using NumPy.

MODULE 2: Introduction to Object Detection, template matching, concept of edge detection, edge linking, corner detection, Harris Corner detection, contour detection, feature matching, grid detection techniques using OpenCV and Python, introduction to face detection using OpenCV.

MODULE 3: Range measurement and recovering scene geometry: Binocular technique stereo pair, epi polar line and plane, stereo matching, photogrammetry, monocular technique -texture processing and shape from texture, depth from focusing and symmetry, different range finder (active) - laser range finder, light-stripe method.

MODULE 4: Introduction to object tracking, motion field, optical flow - smoothness, boundary conditions, discontinuities of optical flow, block-based method, pre-recursive method, Bayesian method, motion segmentation method, motion from points and lines, token tracking, stereo and motion tracking, use of Kalman filter, optical flow coding with OpenCV.

MODULE 5: Representation and analysis of polyhedral scene: understanding line drawings, gradient and dual space, generalized cylinder, volumetric representation, edge and junction labeling; labeling and recognition of scene objects; construction of model-base and visual learning, model-based recognition system - acronym, model-based recognition from sparse range data, 3D model based vision system, scene understanding, special systems for computer vision: visual information processing architecture, language and control, applications

Textbooks/Reference Books:

1. Computer Vision: A Modern Approach, by Forsyth / Ponce, Pearson Education India; 2nd edition, 2015
2. D. H. Ballard and C. M. Brown: Computer Vision, Prentice Hall, New York,1986.
3. R. M. Haralick, L. G. Shapiro: Computer and Robot Vision, Addison-Wesley Pub Co., 1992.
4. Hands-On Algorithms for Computer Vision: Amin Ahmadi Tazehkandi, Packt Publishing Limited, 2018
5. Programming Computer Vision with Python: Techniques and Libraries for Imaging and Retrieving Information, Jan Erik Solem, O'Reilly; 1st edition, 2012
6. Y. Shirai: Three-Dimensional Computer Vision, Springer-Verlag Berlin, 1988.
7. B. K. P. Horn: Robot Vision, MIT Press, Cambridge, 1986.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE31	**Distributed Systems**	**3-0-0**	**3**

MODULE 1: Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Issues in Distributes Operating Systems, Resource sharing and the Web Challenges.
System Models: Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamppost's & vectors logical clocks, Causal ordering of messages, global state, termination detection, distributed Mutual Exclusion: classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non-token based algorithms, performance metric for distributed mutual exclusion algorithms.

MODULE 2: Distributed Deadlock Detection: system model, resource Vs. communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms, Agreement Protocols: Introduction, System models, classification of Agreement Problem-Interactive Consistency Problem, Applications of Agreement algorithms.

MODULE 3: Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study, message passing communication, group communication

MODULE 4: Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, distributed shared memory – Design and Implementation issues, consistency models, CORBA Case Study: CORBA RMI, CORBA services.

MODULE 5: File service components, design issues, interfaces, implementation techniques, Sun Network File System – architecture and implementation, other distributed file systems – AFS, CODA. Name services – SNS name service model.

MODULE 6: Load scheduling and balancing techniques

Textbooks/Reference Books:

1. Distributed System: Concepts and Design, by Coulouris, Dollimore, Kindberg, Pearson Education, 2006
2. Advanced Concepts in Operating Systems, by Mukesh Singhal & Niranjan G Shivaratri,Tata McGraw Hill, 2001
3. Tenenbaum, S., Distributed Operating Systems, Pearson Education, 2005
4. P K Sinha, Distributed System: Concepts and Design, PHI, 2004

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE32	**Computational Geometry**	**3-0-0**	**3**

MODULE 1: Introduction: historical perspective, geometric preliminaries

MODULE 2: Convex hulls algorithms in 2d and 3d, Gift Wrapping and Graham Scan, lower bounds, Divide-and-Conquer

MODULE 3: Triangulations: polygon triangulations, representations, point-set triangulations, The Flip Graph of the set of triangulations

MODULE 4: Voronoi diagrams: algorithms, closest pair problems. Delaunay triangulations: algorithms (divide-and-conquer, flip, incremental), duality of Voronoi diagrams, properties (min-max angle)

MODULE 5: Geometric searching: point-location, 2d linear programming with prune and search

Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems. Arrangements of lines: 2d arrangements, zone theorem, many-faces complexity, algorithms.

MODULE 6: Sweep techniques: plane sweep for segment intersections, Fortune s sweep for Voronoi diagrams, topological sweep for line arrangements

MODULE 7: Combinatorial geometry: Ham-sandwich cuts, Helly's theorems, k-sets. Rectilinear geometry: intersection and union of rectangles, rectangle searching. Robust geometric computing. Applications of computational geometry

Textbooks/Reference Books:

1. Mark de Berg, Otfried Schwarzkopf, Marc van Kreveld and Mark Overmars, Computational Geometry: Algorithms and Applications, Springer.
2. F. P. Preparata and Michael I. Shamos, Computational Geometry: An Introduction, Springer.
3. Joseph O Rourke, Computational Geometry in C, Cambridge University Press.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1817OE33	Embedded Systems	3-0-0	3

MODULE1: Hardware Concepts -Application and characteristics of embedded systems, Overview of Processors and hardware units in an embedded system, General purpose processors, Microcontrollers, Application- Specific Circuits (ASICs), ASIP, FPGA, ARM-based System on a Chip (SoC), Network on Chip (NoC), levels of hardware modelling, Verilog/VHDL, Sensors, A/D-D/A converters, Actuators, Interfacing using RS-232,UART, USB, I2C, CAN bus, Flexray, SRAM and DRAM, Flash memory.

MODULE 2: Real-Time Operating Systems- Real-Time Task Scheduling: Some important concepts, Types of real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Commercial Real-time operating systems: Time services, features of a Real-time operating system, Unix-based Real-time operating systems, POSIX-RT, A survey of contemporary Real- time operating systems, Microkernel based systems, benchmarking real-time systems.

MODULE 3: Embedded Application Development - UML 2.0, State charts, General language characteristics, Hardware/Software Co-design, Hardware/software partitioning, Testing embedded systems, Design for testability and Self-test.

Textbooks/Reference Books:

1. Frank Vahid and Tony Givargis, Embedded Systems Design – A Unified Hardware /Software Introduction, John Wiley, 2001
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, 1999
3. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication – 2002
4. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005
5. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007
6. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

Course Code	Course Title	Hours per week L-T-P	Credit C
HS181704	Principles of Management	3-0-0	3

MODULE 1: Introduction

Definition and meaning of management, Characteristics of management, importance of management, functions of management-planning, organising, directing, staffing, coordination and controlling etc., principles of management, Difference between administration and management

MODULE 2: Financial Management

Definition and management of financial planning, importance and characteristics of sound financial plan, concepts of capital- fixed capital and working capital, source of finance, fund flow statement.

MODULE 3: Marginal costing

Definition and meaning of marginal costing, advantages, marginal cost equation, contribution, profit-volume ratio, break even analysis, margin of safety.

MODULE 4: Cost Accounting

Cost Accounting- Concept and benefit, elements of cost, preparation of cost sheet with adjustment of raw materials, work-in-progress and finished goods.

MODULE 5: Capitalisation

Definition and meaning of capitalisation, over and under capitalisation.

MODULE 6: Motivation

Introductory observation, definition of motivation, motivational technique, features of sound motivational system.

MODULE 7: Leadership

Concept of leadership, principles of leadership, functions of leadership, qualities of leadership, different styles of leadership.

Textbooks/Reference Books:

1. Principle of Business Management: RK Sharma, Shashi K.Gupta
2. Business Organisation and Management: SS Sarkar, RK Sharma, Shashi K.Gupta
3. Industrial Organisation and Management: SK Basu, KC Sahu, B Rajviv
4. Principles of Management by Dr. A. K. Bora: Chandra Prakash, Guwahati.
5. Management Accounting: RK Sharma, Shashi K Gupta
6. Cost Accounting: SP Jain, K I Narang

7. Cost Accounting, RSN Pillai, V Bhagawati
8. Principles of Management: RN Gupta
9. Principles of Management: RSN Pillai, S. Kala
10. Principles of Management: Dipak Kumar Bhattacharjee

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181722	Project-1	0-0-12	6
GUIDELINES WILL BE ISSUED BY THE UNIVERSITY FROM TIME TO TIME			

Course Code	Course Title	Hours per week L-T-P	Credit C
SI181721	Internship-III (SAI - Industry)	0-0-0	2
GUIDELINES WILL BE ISSUED BY THE UNIVERSITY FROM TIME TO TIME			

****