ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

Computer Science and Engineering (CSE)

Semester VIII/ CSE/ B.TECH

Sl No	Sub-Code	Subject	Hrs			Credits
			L	T	P	C
		Theory				
1	CS131801	Artificial Intelligence	3	0	0	3
2	CS131802	Compiler Design	3	0	0	3
3	CS1318E03	Elective III(Departmental)	3	0	0	3
4	CS1318E04	Elective IV(Departmental)	3	0	0	3
5	**1318E05	Elective V(Open)	3	0	0	3
		Practical				
6	CS131812	Compiler Design Lab	0	0	2	1
7	CS131816	Project	0	0	10	5
8	CS131821	Comprehensive Viva	0	0	0	4
		Total	15	0	12	**25**
Total Contact Hours: 27						
Total Credits : 25						

Elective-III Subjects		
Sl No	**Subject Code**	**Subject**
1	CS1318E03(I)	Multimedia Computing
2	CS1318E03(II)	Game Theory
3	CS1318E03(III)	Any other subject offered from time to time with the approval of the university

Elective-IV Subjects		
Sl No	**Subject Code**	**Subject**
1	CS1318E04(I)	Cloud Computing
2	CS1318E04(II)	Web Service and Service Oriented Architecture
3	CS1318E04(III)	Any other subject offered from time to time with the approval of the university

Elective-V Subjects		
Sl No	**Subject Code**	**Subject**
1	**1318E05(I)	Engineering System Analysis and Design
2	**1318E05(II)	Planning for Sustainable Development
3	**1318E05(III)	Disaster Management
4	**1318E05(IV)	Any other subject offered from time to time with the approval of the university

Course Title: ARTIFICIAL INTELLIGENCE
Course Code: CS131801
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.	6
2.	**INFORMED SEARCH STRATEGIES**	Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning	7
3.	**REASONING**	Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS	5
4.	**PLANNING**	Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints	4
5.	**UNCERTAINTY**	Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert systems.	4
6.	**INDUCTIVE LEARNING**	Decision trees, rule based learning, current-best-hypothesis search, least-commitment search , neural networks, reinforcement learning, genetic algorithms; Other learning methods - neural networks, reinforcement learning, genetic algorithms.	7
7.	**COMMUNICATION**	Commiunication among agents, natural language processing, formal grammar, parsing, grammar	3

Text Books:

1 .Stuart Russell and Peter Norvig. *Artificial Intelligence – A Modern Approach*, Pearson Education Press
2 .Kevin Knight, Elaine Rich, B. Nair, *Artificial Intelligence, McGraw Hill*

Reference Books:

1. George F. Luger, *Artificial Intelligence*, Pearson Education
2 .Nils J. Nilsson, *Artificial Intelligence: A New Synthesis*, Morgan Kauffman

Course Title: COMPILER DESIGN
Course Code: CS131802
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**OVERVIEW OF COMPILATION**	The structure of a compiler and applications of compiler technology; Lexical analysis - The role of a lexical analyzer, specification of tokens, recognition of tokens, hand-written lexical analyzers, LEX, examples of LEX programs.	4
2.	**INTRODUCTION TO SYNTAX ANALYSIS**	Role of a parser, use of context-free grammars (CFG) in the specification of the syntax of programming languages, techniques for writing grammars for programming languages (removal left recursion, etc.), non- context-free constructs in programming languages, parse trees and ambiguity, examples of programming language grammars.	4
3.	**TOP-DOWN PARSING**	FIRST & FOLLOW sets, LL(1) conditions, predictive parsing, recursive descent parsing, error recovery. LR-parsing - Handle pruning, shift-reduce parsing, viable prefixes, valid items, LR(0) automaton, LR-parsing algorithm, SLR(1), LR(1), and LALR(1) parsing. YACC, error recovery with YACC and examples of YACC specifications.	4
4.	**SYNTAX-DIRECTED DEFINITIONS (ATTRIBUTE GRAMMARS)**	Synthesized and inherited attributes, examples of SDDs, evaluation orders for attributes of an SDD, dependency graphs. S-ttributed and L-attributed SDDs and their implementation using LR-parsers and recursive descent parsers respectively.	4
5.	**SEMANTIC ANALYSIS**	Symbol tables and their data structures. Representation of "scope". Semantic analysis of expressions, assignment, and control-flow statements, declarations of variables and functions, function calls, etc., using S- and L-attributed SDDs (treatment of arrays and structures included). Semantic error recovery.	7
6.	**INTERMEDIATE CODE GENERATION**	Different intermediate representations – quadruples, triples, trees, flow graphs, SSA forms, and their uses. Translation of expressions (including array references with subscripts) and assignment statements. Translation of control-flow statements – it- then-else, while-do, and switch. Short-circuit code and control-flow translation of Boolean expressions. Back patching. Examples to illustrate intermediate code generation for all	7

		constructs.	
7.	**RUN-TIME ENVIRONMENTS**	Stack allocation of space and activation records. Access to non-local data on the stack in the case of procedures with and without nesting of procedures.	3
8.	**INTRODUCTION TO MACHINE CODE GENERATION AND OPTIMIZATION**	Simple machine code generation, examples of machine-independent code optimizations.	3

Text Books:

1. Compilers: Principles, Techniques, and Tools, by A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman
2. K.D. Cooper, and Linda Torczon, Engineering a Compiler, Morgan Kaufmann

Reference Books:

1. K.C. Louden, Compiler Construction: Principles and Practice, Cengage Learning
2. D. Brown, J. Levine, and T. Mason, LEX and YACC, O‟Reilly Media

Course Title: ELECTIVE III (Departmental)
Course Code: CS1318E03(I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MULTIMEDIA COMPUTING

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION TO MULTIMEDIA**	Media and Data Streams; Sound/Audio, Images and Graphics, Video and Animation	6
2.	**DATA COMPRESSION**	Optical Storage Media; Computer Technology, Multimedia Operating Systems	8
3.	**NETWORKING SYSTEMS**	Multimedia Communication Systems; Database Systems	6
4.	**MULTIMEDIA ARCHITECTURE**	Multimedia Documents, Hypertext and MHEG	4
5.	**USER INTERFACES**	Synchronization, Abstractions for Programming; Multimedia Application Development	8
6.	**VIRTUAL REALITY**	Future Directions	4

Text Books:

1."Multimedia Computing Communications & Applications " by Ralf Steinmetz, Klara Nahrstedt , , Pearson
2. Principles of Multimedia by Parekh Ranjan,Tata McGraw-Hill

Reference Books:

1. Multimedia Systems, By John E Koegal, Buford, IIBK
2. Virtual Reality Systems, John Vince, ACM Press
3. Computer Networks, A S Tanenbaum, Fourth Edition.
4. http://pet.ece.iisc.ernet.in/course/E0262/

Course Title: ELECTIVE III (Departmental)
Course Code: CS1318E03(II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

GAME THEORY

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	What is Game Theory? Definition of Games. Actions, Strategies, Preferences, Payoffs. Examples**;** Strategic Form Games - Strategic form games and examples: Prisoner's Dilemma, Bach or Stravinsky, Matching Pennies, Tragedy of Commons, Braess Paradox.	5
2.	**DOMINANT STRATEGY EQUILIBRIUM**	Strongly dominant strategies, weakly dominant strategies, dominant strategy equilibrium; Examples of Prisoner‟s Dilemma and Vickrey Auction.	4
3.	**PURE STRATEGY NASH EQUILIBRIUM**	Best response strategies; Notion of pure Strategy Nash equilibrium. Examples of Nash Equilibrium. Examples of Nash Equilibrium in popular games. Symmetric Games and Symmetric Equilibria; Mixed Strategy Nash Equilibrium- Randomization of Actions, Mixed strategy Nash equilibrium, Necessary and sufficient conditions for a Nash equilibrium. Examples of mixed strategy Nash equilibrium. Computing mixed strategy Nash equilibria. Related algorithmic issues.	8
4.	**TWO PLAYER ZEROSUM GAMES (MATRIX GAMES)**	Max-minimization and Minmaximization. Saddle points. Nash equilibrium in matrix games. Mini-max theorem. Solution via linear programming. Examples; Extensive games with Perfect Information- Extensive games, Strategies and outcomes, Nash equilibrium, Subgame perfect equilibrium, finding subgame perfect equilibria using backward induction. Allowing for simultaneous moves. Examples.	8
5.	**BAYESIAN GAMES**	Motivational Examples. Definition of a Bayesian Game and Bayesian Nash Equilibrium and examples.	3
6.	**MECHANISM DESIGN**	Social choice functions. Direct and indirect mechanisms. Notion of incentive compatibility. Revelation theorem. Properties of social choice functions, Gibbard Satterthwaite theorem. Quasi-linear utilities. Vickrey auction. Clarke mechanisms. Groves mechanisms. Examples of VCG (Vickrey-Clarke-Groves) mechanisms. Different types of auctions. Revenue equivalence theorem.	4

7.	**COOPERATIVE GAME THEORY**	Correlated strategies and correlated equilibrium. The two person Nash bargaining problem and its solution with examples. Games in characteristic form and examples.The Core of a characteristic form game. Shapley value and its implications. Examples.	4

Text Books:

1. Martin Osborne. *An Introduction to Game Theory*. Oxford University Press
2. Y. Narahari. *Essentials of Game Theory and Mechanism Design*. IISc Press

Reference Books:

1 .Phiip D. Straffin, Jr. *Game Theory and Strategy*. The Mathematical Association of America
2 .Ken Binmore, *Fun and Games: A Text On Game Theory*, D. C. Heath & Company

Course Title: ELECTIVE IV (Departmental)
Course Code: CS1318E04 (I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

CLOUD COMPUTING

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment	6
2.	**CLOUD COMPUTING TECHNOLOGY**	Client systems, Networks, server systems and security from services perspectives; Accessing the cloud with platforms and applications; cloud storage	8
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	8
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.	8
5.	**CASE STUDIES**	Microsoft Azure, Google App Engine and Open source clouds- Open-Nebula and Eucalyptus , Current trends and research	6

Text Books:

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

Course Title: ELECTIVE IV (Departmental)
Course Code: CS1318E04 (II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

WEB SERVICE AND SERVICE ORIENTED ARCHITECTURE

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Service Oriented Enterprise – Service Oriented Architecture (SOA) – SOA and Web Services – Multi-Channel Access – Business Process management – Extended Web Services Specifications – Overview of SOA – Concepts – Key Service Characteristics – Technical Benefits – Business Benefits	8
2.	**SOA AND WEB SERVICES**	Web Services Platform – Service Contracts – Service- Level Data Model – Service Discovery – Service-Level Security – Service-Level Interaction patterns – Atomic Services and Composite Services – Proxies and Skeletons – Communication – Integration Overview – XML and Web Services - .NET and J2EE Interoperability – Service-Enabling Legacy Systems – Enterprise Service Bus Pattern	12
3.	**MULTI-CHANNEL ACCESS**	Business Benefits – SOA for Multi Channel Access – Tiers – Business Process Management – Concepts – BPM, SOA and Web Services – WSBPEL – Web Services Composition	8
4.	**JAVA WEB SERVICES**	JAX APIs – JAXP – JAX-RPC – JAXM – JAXR – JAXB	4
5.	**METADATA MANAGEMENT**	Web Services Security – Advanced Messaging – Transaction Management	4

Text Books:

1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education
2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture"

Reference Books:

1. Thomas Erl, "Service Oriented Architecture", Pearson Education
2. Frank Cohen, "FastSOA", Elsevier

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

ENGINEERING SYSTEM ANALYSIS AND DESIGN

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Systems, Elements of a system, Types of systems, Subsystems, Super systems, Need for system analysis and design, CASE tools for analysis and its limitations.	9
2.	**SYSTEM ANALYSIS**	Methods of system analysis, system development life cycle, structured approach, development tools, data base and networking techniques.	9
3.	**SYSTEM DESIGN**	Design technologies, Design principles, Design tools and methodologies, feasibility survey, conversion and testing tools, design management and maintenance tools .	9
4.	**OBJECT ORIENTED ANALYSIS AND DESIGN**	Introduction, Object modeling, Dynamic modeling, functional modelling, UML diagrams and tools.	9

Text Books:

1. Perry Edwards, "System analysis and design", McGraw Hill international edition
2. Len Fertuck, "System analysis and design with CASE tools", Wm C. Brown Publishers

Reference Books:

1. Er. V.K. Jain, "System analysis and design ", Dreamtech Press.
2. Kenneth E.Kendall and Julie E.Kendall, "System analysis and design", Prentice Hall, India

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

PLANNING FOR SUSTAINABLE DEVELOPMENT

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**SUSTAINABLE DEVELOPMENT**	Explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.	12
2.	**INNOVATION FOR SUSTAINABLE DEVELOPMENT**	Environmental management and innovation strategies.	6
3.	**SOCIETAL TRANSFORMATIONS**	Institutional theory.	6
4.	**GOVERNANCE FOR SUSTAINABLE DEVELOPMENT**	Policy responses to environmental degradation.	6
5.	**CAPACITY DEVELOPMENT FOR INNOVATION**	Research methods	6

Text/Reference Books:

1. Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics 48(4): 369-384.
3. Hjorth, P. and A. Bagheri Navigating towards Sustainable Development: A System Dynamics Approach, Futures 38: 74-92.
4. Mog, J.M. „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
5. Arundel, A., R. Kemp, and S. Parto Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
6. Douthwaite, B. Enabling Innovation. A practical guide to understanding and fostering innovation, London, Zed Books.

Additional References:

http://www.sustainability.com/developing-value/definitions.asp

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (III)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

DISASTER MANAGEMENT

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation).	4
2.	**DISASTERS**	Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.	10
3.	**DISASTER IMPACTS**	Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	6
4.	**DISASTER RISK REDUCTION (DRR)**	Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.	12
5.	**DISASTERS, ENVIRONMENT AND DEVELOPMENT**	Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	4

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

PRACTICALS

Course Title: COMPILER DESIGN LAB
Course Code: CS131812
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF EXPERIMENT	HOURS
1	Familiarization with LEX by writing simple specifications for tokens such as, identifiers, numbers, comments in C/C++, etc. All LEX specifications must be compiled and executed with appropriate inputs.	4
2	LEX specification for tokens of the small language	2
3	Complete the specifications in Experiment No. 2 above to make a complete lexical analyzer.	2
4	Familiarization with YACC by writing simple specifications for desk calculator, variable declarations in C (only numbers and array). All YACC specifications must be compiled and executed with appropriate inputs. Note that this exercise also requires LEX specifications of the tokens involved.	4
5	YACC specifications for the syntax of the small language	2
6	Adding error recovery to Experiment No. 5 above to make a complete parser.	2
7	S-attributed specification of the semantics of the small language to be incorporated into YACC specifications produced in Experiment No. 6 above.	6
8	Adding semantic error recovery to the semantic analyzer in Experiment No. 7 above to make a complete semantic analyzer.	2
9	Intermediate code generation for the constructs of the small language to be incorporated into the semantic analyzer of Experiment No. 8 above.	6
	Total	30

CS131816	**PROJECT**	L = 0 T = 0 P = 10 C = 5
GUIDELINES WILL BE UPLOADED BY THE UNIVERSITY FROM TIME TO TIME		
CS131821	**COMPREHENSIVE VIVA**	L = 0 T = 0 P = 0 C = 4
GUIDELINES WILL BE UPLOADED BY THE UNIVERSITY FROM TIME TO TIME		