Assam Science and Technology University (ASTU)
Master of Technology Degree in
Computer Science & Engineering

Details of Course Structure of Semester I:

Sl No	Course Number	Subjects	Teaching Scheme			Examination Scheme			Credits
			L	T	P	ESE	MT	CE	
1	CSE132101	Advance Data Structure and Algorithms	4	0	0	100	50	20	4
2	CSE132102	Design of Computerized Systems	4	0	0	100	50	20	4
3	CSE132103	Mathematical Foundation For Computer Science	4	0	0	100	50	20	4
4	-	Elective - I	4	0	0	100	50	20	4
5	-	Elective - II	4	0	0	100	50	20	4
6	CSE132111	Laboratory - I	0	0	6	100	50	20	3
8	CSE132121	Seminar - I	0	0	4	100			2
		Total	**20**	**0**	**10**	**600**	**350**	**120**	**25**

* There shall be end semester examinations in all the subjects
** Internal assessment marks shall be awarded by the subject teacher.
*** Laboratory examinations will be conducted by External Examiner.
**** The list of elective subjects is attached separately.

Details of Course Structure of Semester II

Sl No.	Course Number	Subjects	Teaching Scheme			Examination Scheme			Credits
			L	T	P	ESE	MT	CE	
1	CSE132201	Distributed Systems	4	0	0	100	50	20	4
2	CSE132202	Cryptography& Network Security	4	0	0	100	50	20	4
3	CSE132203	Software Engineering Methodologies	4	0	0	100	50	20	4
4	-	Elective - III	4	0	0	100	50	20	4
5	-	Elective - IV	4	0	0	100	50	20	4
6	CSE132211	Laboratory – II	0	0	6	100	50	20	3
7	CSE132121	Seminar - II	0	0	4	100			2
		Total	**20**	**0**	**8**	**600**	**350**	**120**	**25**

* There shall be end semester examinations in all the subjects
** Internal assessment marks shall be awarded by the subject teacher.
*** Laboratory examinations will be conducted by External examiner .
**** The list of elective subjects is attached separately.

Details of Course Structure of Semester III

Sl No	Course Number	Subjects	Teaching Scheme			Examination Scheme			Credits
			L	T	P	ESE	MT	CE	
1	-	Elective - V	4	0	0	100	50	20	4
2	-	Elective - VI	4	0	0	100	50	20	4
	CSE132321	Seminar - III	0	0	6	100			3
3	CSE132322	Project – I (Stage – I)	-	-	8		100		4
		Project – I (Stage – II)			20	100			10
		Total	**8**	**0**	**38**	**400**	**200**	**40**	**25**

* There shall be end semester examinations in all the subjects
** Internal assessment marks shall be awarded by the subject teacher.

The student will start on a project which will be supervised by a member of the teaching staff. If the student chooses to do the project outside the Institute (where he/she is enrolled) then he/she shall be guided by some responsible individual of that organization where the student will be working. Project evaluation will be done in 2 stages. The first Stage will be during the mid of the semester and will be evaluated by internal faculties. The Second stage will be at the end of the semester and will be evaluated by a committee formed by H.O.D. & internal faculties.

Details of Course Structure of Semester IV

Serial Number	Course Number	Subjects	Teaching Scheme			Examination Scheme		Credits
			L	T	P	ESE	CE	
1	CSE132421	Project – II	-	-	50	200	200	25

There shall be no course work in the fourth semester. The student shall continue with his/her III semester project work and this work should normally be completed at the end of the IVth Semester. If the project is not completed by then, then the student shall request for more time from his HOD. The project work shall be examined by the Department of Computer Science and Engineering and marks will be awarded by the Department. The project will, also, be examined by an external examiner, appointed by the Assam Science and Technology University, and he/she shall award marks based on his/her assessment.

List of Elective Subjects for Semester I :

(ELECTIVE – I & II)

Sl. No.	Course Code	Elective Subjects
1	CSE1321011	Web Technology
2	CSE1321012	Natural Language Processing
3	CSE1321013	Artificial Intelligence
4	CSE1321014	Multimedia System
5	CSE1321015	Cloud Computing
6	CSE1321016	Embedded System
7	CSE1321017	Data Mining & Warehousing

List of Elective Subjects for Semester II:

(ELECTIVE – III & IV)

1	CSE1322011	Advanced Operating System
2	CSE1322012	Mobile Computing
3	CSE1322013	Object Oriented Analysis & Design
4	CSE1322014	Image Processing
5	CSE1322015	Advanced Database
6	CSE1322016	Protocol Engineering
7	CSE1322017	Soft Computing

List of Elective Subjects for Semester III:

(ELECTIVE – V & VI)

1	CSE1323011	Advanced Design & analysis of Algorithm
2	CSE1323012	Software Testing and Quality Assurance
3	CSE1323013	Game Theory
4	CSE1323014	Fault tolerant systems
5	CSE1323015	Advanced Networks
6	CSE1323016	Advanced Computer Architecture

Assam Science and Technology University

SYLLABUS

M.Tech. (Computer Science & Engineering)

SEMESTER – I

Course Code	Course Name	L	T	P	C
CSE132101	**Advance Data Structure and Algorithms**	**4**	**0**	**0**	**4**

Basic concepts of object oriented programming - Abstract Data types - List - Implementation - Arrays - Cursors, Pointers.
Stack, Queue - Implementation - Applications. Trees - Traversals - General - Binary - Expression Search Tree - AVL Trees - Splay Trees - B trees.
Set - Basic operations - Advanced Set representations - Priority Queue - Applications - Graphs – Traversals.
Representation.
Issues - Storage allocation - Dynamic - Compaction, Garbage collection - Buddy systems.
Algorithm Analysis - Sorting - Searching . Design Techniques - Divide & Conquer - Greedy - Dynamic Programming - Backtracking - Branch and Bound Knapsack - Traveling Salesman Problem - Graph coloring- 8
Queens problem.

References:

1. Aho, Hopcroft, Ullman, Data Structure & Algorithms, Addison Wesley pub Company 1985.
2. M.A. Weiss, Data Structures & Algorithm analysis in C++, Benjamin Cummings, 1994.
3. Sara Baase, Computer algorithms - Introduction to design and analysis, AW, 1988.
4. Sahni, Data Structures, Algorithms and applications in Java, McGraw Hill, 2000.

Course Code	Course Name	L	T	P	C
CSE132102	**Design of Computer Systems**	**4**	**0**	**0**	**4**

Prerequisites: Operating Systems, Computerized communication networks, Database management systems, Computer architecture.

Recap of OS: Process, threads, interprocess communication, scheduling, memory management, computer networks and various protocols.

Advanced concepts of distributed network systems: Virtualization, distributed file systems, mass storage systems, recovery and fault tolerance, content networking and multimedia software.

Suggested Texts:

1. A. Silberschatz et al : Operating System Concepts – John Wiley & Sons 7th edition or later.

2. J. Kurose and K. W. Ross: Computer Networking – A Top Down Approach. Pearson India, 3rd edition.

Course Code	Course Name	L	T	P	C
CSE132103	**Mathematical Foundation For Computer Science**	**4**	**0**	**0**	**4**

B**a**sic Mathematical notation and Technique - Mathematical Induction and recursive definitions – Chomsky hierarchy of languages - Recognizers - Introduction. Finite Automata and Regular languages - Regular expressions and Regular languages - Memory required to recognize a language - Non-determinism and Kleenes theorem - Pumping lemma - Decision problems.

Push down Automata and context free languages - Context free grammars - Definition - Examples - Operations - Derivation trees - Ambiguity - PDA & CFG - Context Free and non - context free languages.

Turing machines - Church Turing hypothesis - TM as language acceptors - Partial function - Non-deterministic TM Universal Turing Machines - Applications.

-

Unsolvable problems and computable functions - Rice Theorem - Halting Problem - Post's correspondence Problem - Primitive recursive functions - Godel Numbering - Recursive and recursively enumerable languages.

References:

1.John C. Martin, Introduction to Languages and the Theory of Computation, 2nd Edition, McGraw Hill, 1997.

2. Hopcroft and Ullman, Introduction to Automata, Languages and Computation, Narosa Publishers, 1986.

3. K.L.P Mishra, N. Chandrasekaran, Theory of Computation, EEE, Prentice Hall of India, 2nd Edition, 1998

ELECTIVE SUBJECTS FOR SEMESTER – I

Course Code	Course Name	L	T	P	C
CSE1321011	**Web Technology**	**4**	**0**	**0**	**4**

Internet Principles - Basic Web Concepts - Client/Server model - Retrieving data from Internet - HTML and
Scripting Languages - Standard Generalized Markup Language - Next Generation Internet - Protocols and applications.
HTML forms - CGI Concepts - HTML tags Emulation - Server-Browser communication - E-mail generation -
CGI Client side Applets - CGI Server Side Applets - Authorization and security.
Streaming - Networking principles - sockets - protocol handlers - content handlers - multicasting - Remote Method Invocation - activation - Serialization - Marshal streams.
Dynamic web content - cascading style sheets - XML - Structuring Data - VRML - Server side includes - communication - Active and Java Server Pages - Firewalls - proxy servers - XML with HTML
Simple applications - On-line databases - monitoring user events - plug-ins - database connectivity - Internet
Information Systems - EDI application in business - Internet commerce - Customization of Internet commerce.

References:

1. Jason Hunter, William Crawford, Java Servlet Programming, O' Reilly Publications, 1999.
2. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic Commerce, Addison Wesley, 1996.
3. Eric Ladd, Jim O' Donnel, Using HTML 4, XML and Java, Prentice Hall of India - QUE, 1999.
4. Jeffy Dwight, Michael Erwin and Robert Niles, Using CGI, Prentice Hall of India - QUE, 1999.
5. Scot Johnson, Keith Ballinger, Davis Chapman, Using Active Server Pages, Prentice Hall of India, 1999.

Course Code	Course Name	L	T	P	C
CSE1321012	**Natural Language Processing**	**4**	**0**	**0**	**4**

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars, Hold mechanisms in ATNs. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser

Ambiguity Resolution: Statistical Methods, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References

1. James Allen, Natural Language Understanding, 2/e, Pearson Education, 2003.
2. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education, 2002.
3. Christpher G. Manning, Hinrich Schütze, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts.1999.

Course Code	Course Name	L	T	P	C
CSE1321013	**Artificial Intelligence**	**4**	**0**	**0**	**4**

Introduction to Artificial Intelligence: Introduction to AI languages – LISP and PROLOG.
Basic problem solving techniques: Search and Heuristics, search algorithms, space search, AND/OR graph, game tree search.
Logic and theorem solving techniques. Forward chaining, backward chaining, resolution and deduction.
Structured knowledge representation: Schemata, context-layered databases, truth maintenance and procedural attachment.
Inference methods, predicate logic, semantic networks, frame, scripts. Programming in PROLOG. Machine learning, planning, natural language processing, computer vision and neural networks.
Introduction to expert systems.

References :

1. Nilsson, N. J, Principle of AI, Narosa Publ. House.
2. Pitterson, D.N, Introduction to AI & Expert Sys.
3. Jacson, P., Intro. To Ex. Sys., Addision Werley Publ. Co.
4. Clocksm & Mellish, Programming in PROLONG, Narosa Publ. House.
5. Norvig, Peter, Paradigms of AI Programming, Morgan Kauffman, 1992.
6. Rusell, Stuart & Norvig, Peter, Artificial Intelligence, Prentice Hall, 1995.
7. Rich & Knight, Artificial Intelligence, 2nd edition, TMH, 1991.

Course Code	Course Name	L	T	P	C
CSE1321014	**Multimedia System**	**4**	**0**	**0**	**4**

Multimedia applications - System architecture - Objects of Multimedia Systems -Multimedia databases. Types of compression - Image compression - CCITT - JPEG - Video image compression - MPEG-DVI Technology - Audio compression - RTF format - TIFF file format - RIFF file format - MIDI - JPEG DIB - TWAIN.

Traditional devices - Pen input - Video display systems - Scanners - Digital audio - Video images and animation.

Magnetic Media - RAID - Optical media - CD-ROM - WORM - Juke box - Cache management.

Application classes - Types of systems - Virtual reality design - Components - Databases - Authoring Systems -

Hyper media - User interface design - Display/Playback issues - Hypermedia linking and embedding.

References:

1. Andleigh PK and Thakrar K, Multimedia Systems Design, Prentice Hall, 1996.
2. Vaughan T, Multimedia, Tata McGraw Hill, 1999.
3. Koegel Buford JFK, Multimedia Systems, Addison Wesley Longman, 1999.
4. Mark J.B., Sandra K.M., Multimedia Applications Development using DVI technology, McGraw Hill, 1992.

Course Code	Course Name	L	T	P	C
CSE1321015	**Cloud Computing**	**4**	**0**	**0**	**4**

Introduction - SaaS - PaaS - HaaS - IaaS - Google Cloud Infrastructure - Google File System – Search engine - MapReduce - Amazon Web Services - REST APIs - SOAP API - Query API - User Authentication - Connecting to the Cloud - OpenSSH Keys - Tunneling / Port Forwarding - Simple Storage Service - S3, EC2 - Amazon Elastic Block Storage - EBS - Ubuntu in the Cloud - Apache Instances in EC2 – Amazon Cloud Services, EC2 Applications - Web application design - AWS EC2 Capacity Planning – Apache Servers - Mysql Servers - Amazon Cloud Watch - Monitoring Tools.

References:

1. Judith Hurwitz, R Bloor, M Kanfman, F Halper, Cloud Computing for Dummies, 1st Edition, Wiley Publishers, 2009.
2. Gautam Shroff, Enterprise Cloud Computing, Cambridge, 2010.
3. Ronald Krutz and Russell Dean Vines, Cloud Security, 1st Edition, Wiley, 2010.

Course Code	Course Name	L	T	P	C
CSE1321016	Embedded System	4	0	0	4

1. Embedded Architecture :
Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design- Structural Description, Behavioral Description,
Design Example: Model Train Controller

2. Embedded Processor And Computing Platform :
ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging,
Design Example : Alarm Clock.

3. Networks :
Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, ethernet, Myrinet, Internet, Network-Based design- Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.

4. Real-Time Characteristics :
Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, challenges in validating timing constraints in priority driven systems, Off-line Versus On-line scheduling.

5. System Design Techniques :
Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example: Telephone PBX- System Architecture, Ink jet printer- Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

References :
1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997 Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, 2000.5. Fred Halsall: Data Communication Computer Networks, And Open Systems:
Addison Wesley
6. Kershanbaum : Telecommunication Network Design Algorithms: MGH
7. William Stallings: ISDN And BISDN
8. William Stallings: High Speed Network

Course Code	Course Name	L	T	P	C
CSE1321017	**Data Mining & WareHousing**	**4**	**0**	**0**	**4**

Relation to statistics, databases, machine learning - Taxonomy of data mining tasks - Steps in data mining process
Overview of data mining techniques.

Visualization - Dimension reduction techniques - Data summarization methods - Statistical Perspective – Probabilistic - Deterministic models - Clustering - Regression analysis - Time series analysis - Bayesian learning. Predictive Modelling - Classification - Decision trees - Patterns - Association rules - Algorithms. Design - Dimensional Modeling - Meta data - Performance issues and indexing -VLDB issues - Development life cycle - Merits. Tools - Applications - Case Studies.

References:

1. Usama M.Fayyad, Geogory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in
Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
2. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kauffmann Publishers,2000.
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
4. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.

SEMESTER - II

Course Code	Course Name	L	T	P	C
CSE132201	**Distributed Systems**	**4**	**0**	**0**	**4**

Distributed Systems- Design issues and user requirements. Inter Process communication.
File Services – Design issues, Implementations and case studies, Name services and the Domain Name System.
Time and Co-ordination – Physical & Logical Clocks - verifying clock algorithms, Mutual Exclusion, Mutual exclusion using timestamps, tokens ad Quorums. Leader elections, Global state, Termination Detection.
Distributed Transactions: Flat and nested distributed transactions, Concurrency control, Distributed deadlocks, Transaction recovery, and Fault-tolerant services

Security- Design issues and case studies.

References:

1. Coulouris, Dollimore and Kindberg, Distributed Systems-Concepts and Design, Pearson Education Asia
2. P K Sinha, Distibuted Operating System, PHI, IEEE Press
3. Singhal and Shivaratri, Advanced Concepts in Operating Systems, TMH
4. Tanenbaum, Distributed Systems: Principles and Paradigms, Pearson Education

Course Code	Course Name	L	T	P	C
CSE132202	**Cryptography& Network Security**	**4**	**0**	**0**	**4**

Attacks - Services - Mechanisms - Conventional Encryption - Classical and Modern Techniques – Encryption

Algorithms - Confidentiality.

RSA - Elliptic Curve Cryptography - Number Theory Concepts

Hash Functions - Digest Functions - Digital Signatures - Authentication protocols.

Authentication, Applications - Electronic Mail Security - IP Security - Web Security.

FireWalls - Current Standards**.**

References:

1. Stallings, Cyptography & Network Security - Principles & Practice, Prentice Hall, 1998.
2. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.
3. Douglas R. Stinson, Cryptography - Theory and Practice, CRC Press, 1995.

Course Code	Course Name	L	T	P	C
CSE132203	Software Engineering Methodologies	4	0	0	4

1. Software Process Models:
Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Process Assessment, CMMI, Impact of Processes and Outcomes, Process Selection and applicability.

2. Requirements Engineering
Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization.

3. UML 2.0 Concepts
Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Metamodel, Extensibility Mechanisms and its usage, Introduction to OCL ,Specification techniques of diagrams in UML.

4. Behavioral Model
Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes , CRC Cards.

5. Dynamic Behavior:
Sequence diagrams, object lifelines and message types, Refining sequence diagrams, Implementing memory in objects using state machines, States, events and actions, Nested machines and concurrency, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Drilling Down, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization, Communication Diagram,
Timing Diagrams

6. Design Engineering :
Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles: Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural
Design, User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation

7. Object Oriented Design : Design of Objects, Design and Factoring , Design of Software Objects ,Features and Methods, Cohesion of Objects , Coupling between Objects , Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs.

design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving reusability, Reuse through delegation , Identifying and using service packages.

8. Principles of Testing :

Testing Concepts: Purpose of Software Testing, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures, Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Testing, Debugging & Root Cause Analysis, Software Items, Component & Units, Verification & Validation, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Benefits of Formal Test Documentation White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing

Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis, Equivalence Partitioning, State Based Testing, Compatibility Testing, User Documentation Testing, Domain Testing

9. Project Planning and Estimation :

Project Activities, Structures and Frameworks, Developing Realistic Estimates Integrating the Schedule and Critical Path, Introduction to Complex Projects, Assessing Project Viability, Managing Stakeholders, Introduction to Function Points, Empirical Estimation, COCOMO II model, Software Measurement Framework, Ishikawa's Seven tools, Process Assessment and patterns, CMMI –IPPD, Product and Process attributes.

Reference Books:

1. Ian Sommerville, Software Engineering, 7th Edition, Addison-Wesley, 2004,
2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design. ", 2nd Edition, Addison- Wesley.
4. Tom Pender, "UML Bible", John Wiley & sons.
5. Desikan, Ramesh, ' Software Testing: principles and Practices", Pearson Education.
6. Burnstein, "Practical Software Testing", Springer International Edition.
7. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons.
8. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education.

ELECTIVE SUBJECTS FOR SEMESTER – II

Course Code	Course Name	L	T	P	C
CSE1322011	Advanced Operating System	4	0	0	4

1. Introduction to Operating Systems Internals :
Study and comparison of different operating system architectures: Windows, Linux, Solaris

2. Process Management :
Windows: System Mechanisms, Management Mechanisms, Startup and Shutdown, Process, Threads and Jobs
Linux: Process Descriptor and Task Structure, Process Creation, Implementation of threads, Process Termination, Process Scheduling,

3. Memory Management :
Windows: Memory manager & its services, System memory pools, Virtual address space layout, address translation, page fault handling.
Linux: Pages, Zones, kmalloc, vmalloc, slab layer, slab layer allocator, statically allocating on the stack, High memory mapping.

4. File Management :
Windows: Windows file system formats, FS driver architecture, troubleshooting FS problems, NTFS design goal and features, NTFS drivers, NTFS on disk structure.
Linux: Common File system Interface, File Abstraction Layer, Unix File System, VFS, Dentry Object, Super block Object, Inode Object, File Object, Data structure associated with File systems.

5. I/O Management :
Windows: I/O system components, Device drivers, IO processing, PnP manager.
Linux: Anatomy of block device, Buffer & Buffer Heads, the bio structure, Request queue, I/O scheduler.

6. Device driver for printer and network card for linux and windows. :
Study effect of different parameters of setting of TCP/IP for linux and windows OS.Creating device driver for linux and windows

Refernces:

1. Jim Mauro, Richard McDougall: "Solaris Internals: Core Kernel Architecture", 2nd Edition, Pearson Education
2. Robert Love: "Linux Kernel Development", 2nd edition, Pearson Education.
3. Daniel Bovet: "Understanding the Linux kernel", 3rd edition, O'Reilly Publications
4. Mark Russinovich, David Solomon: "Windows Internals", 4th edition, Microsoft Press

Course Code	Course Name	L	T	P	C
CSE1322012	**Mobile Computing**	**4**	**0**	**0**	**4**

Medium access control - Telecommunication systems - Satellite systems - Broadcast systems.

Wireless LAN - IEEE 802.11 - HIPERLAN - Bluetooth.

Characteristics - Performance issues - Routing in mobile hosts.

Mobile IP - DHCP - Mobile transport layer - Indirect TCP - Snooping TCP - Mobile TCP - Transmission / time-out freezing - Selective retransmission - Transaction oriented TCP.

Wireless application protocol - Dynamic DNS - File systems - Synchronization protocol - Context-aware
applications - Security - Analysis of existing wireless network .

References:

1. J. Schiller, Mobile Communications, Addison Wesley,2000.
2. http://www.bluetooth.com/
3. William C.Y.Lee, Mobile Communication Design Fundamentals, John Wiley,1993.

Course Code	Course Name	L	T	P	C
CSE1322013	Object Oriented Analysis and Design	4	0	0	4

1. Introduction, Modeling Concepts: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models.
2. Class Modeling: Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models. Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.
3. State Modeling: State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.
4. Interaction Modeling: Interaction Modeling: Use case models; Sequence models; Activity models; Use case relationships; Procedural sequence models; Special constructs for activity models.
5. Process Overview, System Conception: Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
6. Domain Analysis, Application Analysis: Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.
7. System Design: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
8. Class Design, Implementation Modeling: Class Design: Overview of class design; Bridging the gap; Realizing usecases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations.

References:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modelingand Design with UML, 2nd Edition, Pearson, 2005.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006.
3. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
4. Mark Priestley: Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw-Hill, 2003.
5. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw Hill, 2002.

Course Code	Course Name	L	T	P	C
CSE1322014	Image Processing	4	0	0	4

Digital image processing systems: Image acquisition, storage, processing, communication, display.
Visual Perception: Structure of the human eye, image formation in the human eye, brightness, adaptation and discrimination.
Image Model: Uniform and non-uniform sampling, quantization.
Image Transforms: Introduction to Fourier transform, DFT and two dimensional DFT, some properties of DFT, separability, translation, periodicity, conjugate symmetry, rotation, scaling, average value, convolution theorem, correlation, FFT algorithms, inverse FFT, filter implementation through FFT. Other transforms: Other separable image transforms and their algorithms.
Image Enhancement: Image enhancement in spatial domain and frequency domain, Histogram processing. Spatial Filtering, Frequency Domain Filtering.
Image Restoration: Restoration/Degradation Model, Inverse Filtering, Wiener Filtering.
Edge Detection and Segmentation: Edge detection, Line detection, Segmentation, Texture Analysis and Classification.
Binary Image Processing: Binarisation, Morphological Image Processing, Distance Transform.
Color Image Processing: Color model, Color Image Quantisation, Histogram of a colour image.
Image Compression: Lossy Compression, Loss-less compression, Run-length and Huffman Coding, Transform Coding, Image Compression Standards.

References:

1. R. C. Gonzalez & R. E. Woods - Digital Image Processing, Addison Wesley, 1993.
2. A. K. Jain - Fundamentals of Digital Image Processing, PHI
3. K. R. Castleman - Digital Image Processing, PHI 1996
4. W. K. Pratt - Digital Image Processing, John Wiley Interscience, 1991

Course Code	Course Name	L	T	P	C
CSE1322015	**Advanced Database**	**4**	**0**	**0**	**4**

DATA BASE SYSTEM CONCEPT
File systems - Database systems - Database systems architecture - Data models - Relational model – Hierarchial model - Network model - Entity-Relationship model - Data Dictionary - Database Administration and control.
Codd's rules - Base tables - Views - Domains and key concept - Integrity rules - Relational Algebra – Relational calculus - Commercial query languages - Embedded SQL - Normalization and database design.
File and storage structures - Indexing and Hashing - Query processing - Database recovery - Concurrency control - Transaction processing - Security and Integrity - Triggers.
Centralized versus distributed databases - Fragmentation - Distributed database architecture - Client / Server databases - Distributed transactions - Locking and Commit protocols - Distributed concurrency Control – Securtiy and reliability - Parallel databases.
The World Wide Web - HTML - Architecture -XML, XML/QL - Database Connectivity.

References:

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 3rd Edition, Addison Wesley, 2000.
2. Abraham Silberschatz, Henry. F. Korth, S.Sudharsan, Database System Concepts, 3rd Edition, Tata McGraw Hill, 1997.
3. Stefano Ceri & Giuesppe Pelagatti, Distributed Databases - Principles and Systems, McGraw Hill Book Company, 1987.
4. M.Tamer Ozsu and Patric Valduriez, Principles of Distributed Database Systems, Prentice Hall International Inc, 1999.

Course Code	Course Name	L	T	P	C
CSE1322016	Protocol Engineering	4	0	0	4

1. Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases

2. Error Control, Flow Control: Type of Transmission Errors, Linear Block Code, Cyclic Redundancy Checks, Introduction to Flow Control, Window Protocols, Sequence Numbers, Negative Acknowledgments, Congestion Avoidance

3. Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols.

4. Protocol Specification: Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification, RSVP specification.

5. Protocol Specification Language (SDL): Salient Features. Communication System Description using SDL, Structure of SDL. Data types and communication paths, Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, BGP Multi Protocol Label Switching SDL components.

6. Protocol Verification / Validation: Protocol Verification using FSM, ABP Verification, Protocol Design Errors, Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, Process Algebra based Validation, SDL Based Protocol Verification: ABP Verification, Liveness Properties, SDL Based Protocol Validation: ABP Validation.

7. Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods, Distributed Architecture by Local Methods, Synchronizable Test Sequence, Conformance testing with Tree and Tabular Combined Notation (TTCN), Conformance Testing of RIP, Testing Multimedia Systems, quality of service test architecture(QOS), Performance Test methods, SDL Based Performance Testing of TCP, OSPF, Interoperability testing, Scalability testing protocol synthesis problem

8. Protocol Synthesis and Implementation: Synthesis methods, Interactive Synthesis Algorithm, Automatic Synthesis Algorithm, Automatic Synthesis of SDL from MSC, Protocol Re-synthesis, Requirements of Protocol Implementation, Objects Based Approach To Protocol Implementation, Protocol Compilers, Code generation from Estelle, LOTOS, SDL and CVOPS.

References:

1. Pallapa Venkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.
2. Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

Course Code	Course Name	L	T	P	C
CSE1322017	**Soft Computing**	**4**	**0**	**0**	**4**

Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back
propagation networks - Kohnen's self organizing networks - Hopfield network.
Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing - Evolutionary
computation.
Survival of the Fittest - Fitness Computations - Cross over - Mutation -
Reproduction - Rank method - Rank space method.
AI search algorithm - Predicate calculus - Rules of interference - Semantic
networks - Frames - Objects - Hybrid models - Applications.

References:

1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall 1998.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
3. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
4. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
5. Nih J.Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
6. D.E . Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley.

SEMESTER – III

ELECTIVE SUBJECTS FOR SEMESTER – III

Course Code	Course Name	L	T	P	C
CSE1323011	**Advanced Design and Analysis of Algorithms**	**4**	**0**	**0**	**4**

Mathematical Background - Design and Analysis of algorithms - Basic concepts.
Internal sort algorithms - Analysis - Worstcase - Average case - Sorting in Linear Time - Medians and order statistics - Augmenting Data Structures - Red Black Trees - Dynamic - Order Statistics - FFT - Algorithm - Implementation. Divide and Conquer - Dynamic Programming - Greedy method - Backtracking -- Branch & Bound – Classical examples - Analysis. Graphs - Representation - Traversals - Topological sort - Minimum spanning tree - Shortest paths - Biconnected
and strongly connected components - Parallel algorithms - Sorting - Matrix multiplication - Numerical - Graph. NP Completeness - Approximation alogorithms - Matrices - Transitive closure - Warshall's - Kronrod's algorithm; Computaional Geometry.

References:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, Introduction to Algorithms, McGraw Hill Book Company, 1994.
2. Sara Baase, "Computer Algorithms : Introduction to Design and Analysis, Addison Wesley Publishing Company, 1998.
3. M.J. Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw Hill Book Company, 1998.

Course Code	Course Name	L	T	P	C
CSE1323012	**Software Testing and Quality Assurance**	**4**	**0**	**0**	**4**

1. Introduction to software testing and software development life cycle models.
2. Software quality assurance and software testing
3. White Box testing techniques
4. Black Box testing techniques
5. Integration testing
6. System and acceptance testing
7. Performance testing
8. Regression testing
9. Ad hoc testing
10. Usability and accessibility testing
11. Automated testing I
12. Automated testing II
13. Testing software security
14. Test process and management
15. Goals of software quality assurance, software quality assurance components and models.

References:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
2. Aditya P Mathur: Foundations of Software Testing, Pearson, 2008.
3. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, John Wiley & Sons, 2008.
4. Srinivasan Desikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 2 nd Edition, Pearson, 2007.
5. Brian Marrick: The Craft of Software Testing, Pearson, 1995.

Course Code	Course Name	L	T	P	C
CSE1323013	**Game Theory**	**4**	**0**	**0**	**4**

Introduction to Non Co-operative Game Theory: Extensive Form Games, Strategic Form Games, Pure Strategy Nash Equilibrium. Non co-operative Game Theory (in detail), Mixed Strategies, Existence of Nash Equilibrium, Computation of Nash Equilibrium, Two Player Zero-Sum Games, Bayesian Games

Mechanism Design : An Introduction, Dominant Strategy Implementation of Mechanisms, Vickrey-Clorke-Groves Mechanisms, Bayesian Implementation of Mechanisms, Revenue Equivalence Theorem, Design of Optimal Mechanisms Cooperative Game Theory, Correlated Strategies, Correlated Equilibria, The Two Person Bargaining Problem, Games in Coalitional Form, The Core Shapley Value, Other Solution Concepts for Co-operative Games .

References:

1. Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V. Vazirani, Algorithmic Game Theory, Cambridge University Press, 2007.
2. Ronald Cohn Jesse Russell, Algorithmic Game Theory, VSD Publishers, 2012
3. Roger B. Myerson. Game Theory: Analysis of Conflict. Harvard University Press, September 1997.
4. Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green. Microeconomic Theory. Oxford University Press, New York, 1995.
5. Martin J. Osborne, Ariel Rubinstein. A Course in Game Theory. The MIT Press, August 1994.
6. Philip D. Straffin, Jr. Game Theory and Strategy. The Mathematical Association of America, January 1993.
7. Ken Binmore, Fun and Games : A Text On Game Theory, D. C. Heath & Company, 1992.
8. Paul Klemperer, Auctions: Theory and Practice, The Toulouse Lectures in Economics, Princeton University Press, 2004

Course Code	Course Name	L	T	P	C
CSE1323014	Fault Tolerant Systems	4	0	0	4

1. Introduction: Fault classification; Types of Redundancy; Basic measures of FaultTolerance.

2. Hardware Fault Tolerance: The rate of hardware failures; Failure rate, Reliability, and Mean Time To Failure; Canonical and Resilient Structures; Other Reliability Evaluation Techniques; Fault-Tolerance – Processor-Level techniques; Byzantine Failures.

3. Information Redundancy: Coding; Resilient Disk Systems; Data Replication; Algorithm-Based Fault Tolerance.

4. Fault-Tolerant Networks: Measures of Resilience; Common Network Topologies and Their Resilience; Fault-Tolerant Routing.

5. Software Fault Tolerance: Acceptance Tests; Single-Version Fault Tolerance; N-Version Programming; Recovery Block Approach; Preconditions, Post conditions, and Assertions; Exception Handling; Software Reliability Models; Fault-Tolerant Remote Procedure Calls.

6. Check pointing: What is Check pointing? Checkpoint Level; Optimal Check pointing – An Analytical Model; Cache-Aided Rollback Error Recovery; Check pointing in Distributed Systems; Check pointing in Shared Memory Systems; Check pointing in Real-Time Systems; Other uses of Check pointing.

7. Defect Tolerance in VLSI Circuits: Manufacturing Defects and Circuit Faults; Probability of Failure and Critical Areas; Basic Yield Models; Yield Enhancement through Redundancy.

8. Fault Detection in Cryptographic Systems: Overview of Ciphers; Security Attacks through Fault Injection; Countermeasures.

9. Case Studies: Non-Stop Systems; Stratus Systems; Cassini Command and Data Sub-System; IBM G5; IBM Sysplex; Itanium.

Refernces:

1. Israel Koren, C. Mani Krishna: Fault-Tolerant Systems, Elsevier, 2007.
2. D. K. Pradhan (Ed): Fault Tolerant Computer Systems Design, Prentice Hall, 1996.
3. K. S. Trivedi: Probability, Statistics with Reliability, Queuing and Computer Science Applications, John Wiley, 2002.

Course Code	Course Name	L	T	P	C
CSE1323015	Advanced Networks	4	0	0	4

1. Network Performance analysis :
Objectives and requirements for Quality of Service (QoS) in high performance networks. Architecture of high performance networks (HPN), design issues, protocols for HPN, VHF backbone networks, virtual interface architectures, virtual interface for networking, High-speed switching and routing - internet and PSTN IP switching techniques, SRP protocols, SRP authentication, and key exchange, comparison of TCP/IP, FTP, TELNET, queuing systems, network modeling as a graph

2. Gigabit Ethernet :
Architecture, standards, interface, applications, network design

3. High speed networks :
A. Frame relay: Frame relay protocols and services, frame relay congestion control
B. ATM: Architecture, protocol, switching, traffic and congestion control, flow control, error detection and control, traffic management, ATM service categories, ATM in LAN environment, classical IP over ATM
C. ISDN: ISDN overview, interfaces and functions, physical layer, Network layer, ISDN services
D. B-ISDN: Driving forces and need, B-ISDN standards and services, B-ISDN Functional Architecture, B-ISDN Transmission structure, B-ISDN protocol architecture

4. ADSL and DSL Technologies : Background and technological capabilities, Standards and associations, Architecture, Conceptual overview of VDSL, Deployment Case study, Market status and future.

5. Fiber Optics Communication: GPON (Gigabit capable Passive Optical Network), SONET/SDH and comparison with other available standards, SAN (Storage Area Networks) and Fiber Channel, DWDM, and CWDM

6. Wireless Networks: Overview of GSM & CDMA, 3G mobile technologies, UMTS, EDGE, WiFi, WiMax.

References:

1. Jochetl Schiller: Mobile Communication: Addison Wesley.
2. Tanenbaum: Computer Networks: PHI
3. M Shwartz: Telecommunication Network Protocol Modeling And Analysis:
Addison Wesley
4. Gallangar: Data Networks: Prentice Hall
5. Fred Halsall: Data Communication Computer Networks, And Open Systems:
Addison Wesley
6. Kershanbaum : Telecommunication Network Design Algorithms: MGH
7. William Stallings: ISDN And BISDN
8. William Stallings: High Speed Network

Course Code	Course Name	L	T	P	C
CSE1323016	**Advanced Computer Architecture**	**4**	**0**	**0**	**4**

CPU, Memory, I/O Design - Performance evaluation.

Instruction sets of different machines - CISC Vs RISC - Pipelining issues - Super Scalar Architectures.

Virtual memory - Cache design for different architectures and multiprocessor environments - Evaluating Memory
Performance.

Speed limits - Interfacing to different types of I/O devices - Performance measures.
Data flow - Vector processors - EPIC - Case Studies.

References:

1. D.A Patterson and J.L. Hennessy, Computer Architecture - A Quantitative Approach, Morgan Kaufmann Publishers, 2nd edition 1996.
2. Vincent P. Heuring, Harry F. Jordan Computer Systems Design and Architecture, Addison Wesley, 1999.