JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTAPUR

Course Structure and Syllabi for Pre Ph.D

Computer Science & Engineering (2017-18)

PART - I

Choose any **one** subject of the following

S.No	PAPER	Subject Available in UG/PG	PAPER CODE
1.	Software Engineering	B.Tech.(CSE)	15A05401
2.	Artificial Intelligence	M. Tech (CSE)	17D58107
3.	Database Management Systems	B.Tech.(CSE)	15A05301
4.	Advanced Data Structures & Algorithms	M. Tech (CSE)	17D58101
5.	Computer Organization	B.Tech.(CSE)	15A05402

PART - II

Choose any **one** subject of the following

S.No	PAPER	Subject Available in UG/PG	PAPER CODE
1.	Advances in Software Testing	M.Tech. (SE)	17D25201
2.	Software Patterns	M.Tech. (SE)	17D58103
3.	Model Driven Software Engineering	M.Tech. (SE)	17D25202
4.	Software Reliability	M.Tech. (SE)	17D25204
5.	Machine Learning	M.Tech. (CSE)	17D58206
6.	Speech Processing	M.Tech. (AI)	17PH05201
7.	Digital Image Processing	M.Tech. (AI)	17PH05202
8.	Data Warehousing and Mining	B.Tech.(CSE)	15A05602
9.	Big Data Analytics	M.Tech. (CSE)	17D58201
10.	Internet of Things	M.Tech. (CSE)	17D58203
11.	Cloud Computing	M.Tech. (CSE)	17D58207
12.	Computer Networks	B.Tech.(CSE)	15A05502
13.	Mobile Ad hoc Networks	M.Tech. (CN)	17D08204
14.	Information Security	M.Tech. (CSE)	17D58104
15.	Distributed Computing	M.Tech. (CSE)	17D58204

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(15A05401) SOFTWARE ENGINEERING

Course Objectives

- To understand the software life cycle models.
- To understand the software requirements and SRS document.
- To understand the importance of modeling and modeling languages.
- To design and develop correct and robust software products.
- To understand the quality control and how to ensure good quality software.
- To understand the planning and estimation of software projects.
- To understand the implementation issues, validation and verification procedures.
- To understand the maintenance of software

Course Outcomes

- Define and develop a software project from requirement gathering to implementation.
- Ability to code and test the software
- Ability to plan, Estimate and Maintain software systems

Unit I:

Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models

Unit II:

Understanding Requirements: Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements.

Requirements Modeling (Scenarios, Information and Analysis Classes): Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Requirements Modeling (Flow, Behavior, Patterns and WEBAPPS): Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

Unit III:

Design Concepts: Design with Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Component-Level Design: Component, Designing Class-Based Components, Conducting Component-level Design, Component Level Design for WebApps, Designing Traditional Components, Component-Based Development.

Unit IV:

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation.

WebApp Design: WebApp Design Quality, Design Goal, A Desigin Pyramid for WebApps, WebApp Interface Design, Aestheic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design, Object-Oriented Hypermedia Design Method(OOHMD).

Unit V:

Software Testing Strategies: A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, basic Path testing, Control Structure Testing, Black-Box Testing, Model-based Testing, Testing for Specialized Environments, Architectures and Applications, Patterns for Software Testing.Testing Object-Oriented Applications: Broadening the View of Testing, Testing with OOA and OOD Models, Object-Oriented Testing Strategies, Object-Oriented Testing Methods, Testing Methods Applicable at the Class level, Interclass Test-Case Design.

Textbook:

1. "Software engineering A practitioner's Approach", Roger S. Pressman, McGraw Hill International Education, Seventh Edition, 2016.

Reference Textbooks:

1. Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI,

2. Software Engineering, Ninth Edition, IAN Sommerville, Pearson, Ninth edition.

3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.

4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.

7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.

8. Software Engineering Principles and Practice, Hans Van Vliet,3rd edition, John Wiley &Sons Ltd.

9. Software Engineering 3: Domains, Requirements, and Software Design, D.Bjorner, Springer International Edition.

10. Introduction to Software Engineering R.J.Leach, CRC Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58107) ARTIFICIAL INTELLIGENCE

Course Objective:

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Learning Outcome:

- Possess the ability to formulate an efficient problem space for a problem expressed in English
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and Machine Learning.

Unit – I

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art.

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit – II

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

Unit – III

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

Unit – IV

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

Unit – V

Learning Probabilistic Models: Statistical Learning, Learning with Complete data, Lear1qning with Hidden variables: The EM Algorithm.

Text Books :

1. "Artificial Intelligence A Modern Approach", Stuart J. Russell & Peter Norvig – Pearson.
2. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.

Reference Books:

1. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(15A05301) DATABASE MANAGEMENT SYSTEMS

Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To become familiar with the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques.

Outcomes:

- Demonstrate the basic elements of a relational database management system,
- Ability to identify the data models for relevant problems.
- Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
- Apply normalization for the development of application software.

UNIT-I

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.

Introduction to Data base design , ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views Destroying/ altering Tables and Views.

UNIT-II

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.

Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.

REFERENCES:

1. Database Systems, 6th edition, Ramez Elmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58101) ADVANCED DATA STRUCTURES AND ALGORITHMS

Course Objectives:

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability.

Course Outcomes:

- Upon completion of this course students will be able to:
- Choose appropriate data structure to specified problem definition.
- Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
- Apply concepts learned in various domains to implement new data structures.
- Use linear and non-linear data structures like stacks, queues, linked list etc.

UNIT I : Overview of Data Structures - Arrays, Stacks, Queues, linked lists , Linked stacks and Linked queues, Applications

Algorithm Analysis - Efficiency of algorithms, Asymptotic Notations, Time complexity of an algorithm using O notation, Polynomial Vs Exponential Algorithms, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs.

UNIT II: Trees and Graphs – Basics of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs, representation and traversals.

Binary Search Trees, AVL Trees and B Trees - Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

UNIT III: Red – Black Trees, Splay Trees and Hash Tables - Red–Black Trees, Splay Trees and their applications, Hash Tables, Hash Functions and various applications, File Organizations.

UNIT IV: Divide – and – Conquer & Greedy Method - General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Strassen's Matrix Multiplication, Greedy Method- General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

Back Tracking and Branch – and – Bound - General Method, 8 – Queen's Problem, Graph Coloring. Branch – and – Bound: The Method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

UNIT V: Dynamic Programming - General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 /1 Knapsack problem, Reliability Design, Traveling Sales Person's Problem.

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.

References:

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education, 2010.
2. Classic Data Structures by D. Samanta, 2005, PHI
3. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG
6. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
7. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(15A05402) COMPUTER ORGANIZATION

Course Objectives:

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To make the students understand the structure and behavior of various functional modules of a computer.
- To understand the techniques that computers use to communicate with I/O devices
- To study the concepts of pipelining and the way it can speed up processing.
- To understand the basic characteristics of multiprocessors

Course Outcomes:

- Ability to use memory and I/O devices effectively
- Able to explore the hardware requirements for cache memory and virtual memory
- Ability to design algorithms to exploit pipelining and multiprocessors

Unit I:

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.

Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

Unit II:

Arithmetic: Addition and Subtraction of Signed Numbers, Design and Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Multiprogrammed Control.

Unit III:

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Unit IV:

Input/output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

Unit V:

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.

Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose, Interconnection Networks.

Textbook:

1) "Computer Organization", Carl Hamacher, Zvonko Vranesic, Safwat Zaky, McGraw Hill Education, 5th Edition, 2013**.**

Reference Textbooks:

1. Computer System Architecture, M.Morris Mano, Pearson Education, 3rd Edition.
2. Computer Organization and Architecture, Themes and Variations, Alan Clements, CENGAGE Learning.
3. Computer Organization and Architecture, Smruti Ranjan Sarangi, McGraw Hill Education.
4. Computer Architecture and Organization, John P.Hayes, McGraw Hill Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D25201) ADVANCES IN SOFTWARE TESTING

Course objectives:

- Study the significance of testing
- Study the testing to be done at various levels
- Understand the procedure for designing test cases

Course Outcomes:

- Ability to systematically test the applications
- Ability to write test cases
- Ability to use testing tools effectively

UNIT I

Control flow graph – basic blocks, flow graphs, paths, basic paths, path conditions and domains, Dominators and post-dominators; Program dependence graph – data dependence, control dependence, call graph,

Tests generation - Test selection Problem, equivalence partitioning, Equivalence class partitioning, boundary value analysis and category partitioning method.

UNIT II

Finite state machines (FSM) - properties of FSM, Conformance testing, test generation, test optimization, Fault detection. **Combinatorial designs** – combinatorial test design process. **Pairwise design**: Binary factors and multi-valued factors. **Orthogonal arrays** and multi level orthogonal arrays.

UNIT III

Test Adequacy: Basics, measurement of test adequacy, infeasibility and test adequacy. Adequacy criteria based control – statement, block, conditions and decisions coverage techniques. Basics of Junit tool for Java.

Metrics

Importance of Metrics in Testing - Effectiveness of Testing – Defect Density – Defect Leakage Ratio – Residual Defect Density – Test Team Efficiency – Test Case Efficiency.

UNIT IV

Regression Testing

What is Regression Testing? Regression test process. Regression test selection techniques: Test all, Random selection, modification traversing tests, using execution trace. Test minimization and prioritization.

UNIT V

Non-functional testing

Load testing, performance testing, GUI testing, Security testing techniques and tools.

Automation: Case studies functional test automation using Selenium.

Text Books:

1. Aditya P Mathur, Foundations of software testing, 2nd edition, Pearson , 2013.
2. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dream tech press, 2003.

Reference Books:

1. M G Limaye, "Software Testing – Principles, Techniques and Tools", Tata McGraw Hill, 2009.
2. Edward Kit, "Software Testing in the Real World - Improving the Process", Pearson Education, 2004.
3. William E. Perry, "Effective methods for software testing", 2nd Edition, John Wiley, 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58103) SOFTWARE PATTERNS

COURSE OBJECTIVES:

- Introduction to the fundamentals of software architecture.
- To understand various architectural patterns of software systems.
- To understand design patterns and their underlying object oriented concepts.
- Software architecture and quality requirements of a software system
- Identifying the appropriate patterns for design problems.
- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

COURSE OUTCOMES:

The student will be able to:

- Design and motivate software architecture for large scale software systems
- Recognize major software architectural patterns, design patterns, and frameworks
- Know the underlying object oriented principles of design patterns.
- Understand the context in which the pattern can be applied.
- Understand how the application of a pattern affects the system quality and its tradeoffs.

UNIT I

Envisioning Architecture - What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views and the Architecture Business Cycle.

Creating an Architecture - Quality Attributes, Achieving qualities, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT II

Introduction to Patterns - What is a Pattern? What makes a Pattern? Pattern Categories, Relationships between Patterns, Pattern Description, Patterns and Software Architecture.

Architectural Patterns

Layers, Pipes and Filters, Blackboard, Broker, Microkernel, MVC, PAC, Reflection.

UNIT III

What is Design Pattern, Organizing catalogs, Role in solving design problems, Selection and Usage, **Creational Patterns -** Abstract factory, builder, factory method, prototype, singleton,

UNIT IV

Structural Patterns - Adapter, bridge, composite, decorator, façade, flyweight, Proxy, Decorator, façade, flyweight, Proxy.

UNIT V

Behavioral Patterns - Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor.

Case Studies – Designing a Document Editor **-** Design issues of Lexi Editor in Deign Patterns, The World Wide Web - a case study in interoperability

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education,2003.
2. Pattern-Oriented Software Architecture", A System of Patterns, Frank Buschmann Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal, WlLEY.
3. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Education.

REFERENCE BOOKS:

1. AntiPatterns: Refactoring Software, Architectures, and Projects in Crisis, by William J. Brown, Raphael C. Malveau, Hays W. "Skip" McCormick , Thomas J. Mowbray (Author) 1st Edition,
2. Java testing patterns, John Thomas etc, wiley.
3. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR,2001
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D25202) MODEL DRIVEN SOFTWARE ENGINEERING

Objectives:

- Develop enabling technologies for supporting model driven engineering approaches to software development
- Develop improved techniques and tool support for using executable specifications and model-based testing to better capture, manage and test software against its requirements
- Better integrate social networking tools and techniques into the software development process to improve the efficiency of collaborative and community development of software
- Better support "early phase" decision making by providing tools and techniques to assess nonfunctional requirement adherence at early stages in the software development process.

Outcomes:

- Explain the role and importance of modelling in software development
- Make and defend decisions regarding the appropriate use of modelling throughout the software development life-cycle
- Demonstrate the practical application of several general purpose modeling languages
- Design and demonstrate the practical application of domain specific modeling languages
- Integrate a set of models to form effective software specifications
- Describe concepts involved in the verification and translation of specifications
- Demonstrate the translation of specifications to form executable software

UNIT I

MDSD Basic Terminology

Goals of MDSD, MDSD Approach, Overview of MDA concepts, Architecture-Centric MDSD, Common MDSD concepts and terminology, Model-Driven Architecture, Generative Programming, Software factories, Model-Integrated computing, Language-Oriented Programming, Domain specific modeling.

UNIT II

Metamodeling

What is Metamodeling?, Metalevels vs. Level of Abstraction, MOF and UML, Extending UML, UML profiles, Metamodeling and OCL, Examples, Tool-supported Model validation, Metamodeling and Behavior, Pitfalls in Metamodeling, MDSD classification.

UNIT III

Model Transformation with QVT

History, M2M language requirements, Overall Architecture, An Example Transformation, The OMG standardization Process and Tool Availability, Assesment.

MDSD Tools:Roles, Architecture, Selection Criteria, and Pointers

Role of Tools in the Development Process, Tool Architecture and selection criteria, pointers.

The MDA Standard: Goals, Core concepts

UNIT IV

MDSD Process Building Blocks and Best Practices

Introduction, Separation between Application and domain Architecture Development, Two track Iterative Development, Target Architecture Development Process, Product-line Engineering.

Testing

Test Types, Tests in Model-driven Application Development, Testing the Domain Architecture

Versioning

What is Versioned? Projects and Dependencies, The structure of Application Projects, Version management and Build Process for mixed files, Modeling in a team and versioning of partial models

UNIT V

Quality : Quality in Model Driven Engineering

Case study: Embedded Component Infrastructures

Overview, Product-Line Engineering, Modeling, Implementation of Components, Generator Adaptation, Code Generation.

TEXT BOOKS:

1. Model-Drievn Software Development-Technology, Engineering, Management by Thomos Stahl, Markus Volter, jul 2006, John Wiley & Sons.

2. Model-Driven Software Development: Integrating Quality Assurance by Jorg Rech, Christian Bunse,2008,Information Science Publishing.

REFERENCE BOOKS :

1. Model-Driven Software Development by Sami Beydeda Matthias Book , Volker Gruhn, Springer.
2. Model Driven Systems Development with Rational Products By Brian Nolan, Barclay Brown, Dr. Laurent Balmelli, Et Al Tim Bohn, 2008,IBM.
3. Model Driven Development with Executable UML by Dragan Milicev, 2009,Wilei India pvt Ltd.
4. Model Driven Software Development by Kevin Lano, Apr 2009, Ci Business Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D25204) SOFTWARE RELIABILITY

Objectives:

- To discuss the problems of reliability specification and measurement
- To introduce reliability metrics and to discuss their use in reliability specification
- To show how reliability predications may be made from statistical test results.

Course Outcome:

- Master attributes and assessment of quality, reliability and security of software
- To describe the statistical testing process

UNIT I:

Introduction: The Need for Reliable Software, Software Reliability Engineering Concepts, Basic definitions, Software practitioners biggest problem, software reliability engineering approach, software reliability engineering process, defining the product.

The Operational Profile: Reliability concepts, software reliability and hardware reliability, developing operational profiles, applying operational profiles, learning operations and run concepts.

UNIT II:

Software Reliability Concepts: Defining failure for the product, common measure for all associated systems, setting system failure intensity objectives, determining develop software failure intensity objectives, software reliability strategies, failures, faults and errors, availability, system and component reliabilities and failure intensities, predicting basic failure intensity.

UNIT III:

Software Reliability Modeling Survey: Introduction, Historical Perspective and Implementation, Exponential Failure Time Class of Models, Weibull and Gamma Failure Time Class of Models, Infinite Failure Category Models, Bayesian Models, Model Relationship, Software Reliability Prediction in Early Phases of the Life Cycle.

UNIT IV:

Software Metrics for Reliability Assessment: Introduction, Static Program Complexity, Dynamic Program Complexity, Software Complexity and Software Quality, Software Reliability Modeling.

Software Testing and Reliability: Introduction, Overview of Software Testing, Operational profiles, Time/Structure Based Software Reliability Estimation.

UNIT V:

Best Practice of SRE: Benefits and approaches of SRE, SRE during requirements phase, SRE during implementation phase, SRE during Maintenance phase.

Neural Networks for Software Reliability: Introduction, Neural Networks, Neural Networks for software reliability, software reliability growth modeling.

Text Books

1. Handbook of Software Reliability Engineering Edited by Michael R. Lyu, published by IEEE Computer Society Press and McGraw-Hill Book Company.

2. Software Reliability Engineering John D. Musa, second edition Tata McGraw-Hill.

Reference Books

1. Practical Reliability Engineering, Patric D. T. O connor 4th Edition, John Wesley & Sons, 2003.

2. Fault tolerance principles and Practice, Anderson and PA Lee, PHI, 1981.

3. Fault tolerant computing-Theory and Techniques, Pradhan D K (Ed.): Vol 1 and Vol 2, Prentice hall, 1986.

4. Reliability Engineering E. Balagurusamy, Tata McGrawHill, 1994.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58206) MACHINE LEARNING

Objectives:

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more

UNIT I INTRODUCTION

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANCE BASED LEARNING

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT V ADVANCED LEARNING

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOKS

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH05201) SPEECH PROCESSING

Objectives:

- To analyze a speech signal in terms of its frequency content.
- To understand the basics of human speech production mechanism.
- To understand which speech coding methods are used for what reasons.
- To implement LPC Analysis.

UNIT I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & physiology of speech organs, The process of speech production, The acoustic theory of speech production, Digital models for speech signals.

UNIT II

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Introduction- Window considerations, Short time energy and average magnitude short time average zero crossing rate, Speech Vs Silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT III

LINEAR PREDICTIVE CODING (LPC) ANALYSIS: Basic principles of linear predictive analysis: The Autocorrelation method, The covariance method, solution of LPC equations: Cholesky Decomposition, solution for covariance method, Durbin's recursive solution for the Autocorrelation equations, Comparison between the methods of solution of the LPC parameters, Formant analysis using LPC parameters.

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic systems for convolution: Properties of the complex cepstrum, computational considerations, The complex cepstrum of speech, pitch detection, Formant estimation, The homomorphic vocoder.

SPEECH SYNTHESIS

Formant Speech Synthesis –Concatenative Speech Synthesis – Prosodic Modification of Speech– Source Filter Models For Prosody Modification

UNIT IV

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, parametric representation of speech, Evaluating the similarity of speech patterns, isolated digit recognition system, continuous digit recognition system.

HIDDEN MARKOV MODEL (HMM) FOR SPEECH: Hidden markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

UNIT V

SPEAKER RECOGNITION: Recognition techniques, Features that distinguish speakers, speaker recognition systems: speaker verification system, Speaker identification system.

SPEECH ENHANCEMENT: Nature of interfering sounds, speech enhancement techniques, spectral subtraction, Enhancement by re-synthesis.

TEXT BOOKS:

1. L.R.Rabiner and S.W.Schafer. Digital processing of speech signals,Pearson.
2. Douglas. O. Shaughnessy, speech communication, second edition Oxford university press,2000.
3. Fundamentals of speech recognition- L.R. Rabinar and B.H.Juang

REFERENCES:

1. Discrete Time Speech Signal Processing-Thomas F. Quateri1/e,Pearson.
2. Speech & Audio signal processing- Ben Gold & Nelson Morgan,1/e,Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17PH05202) DIGITAL IMAGE PROCESSING

Objectives:

- Develop an overview of the field of image processing.
- Understand the Image segmentation, enhancement, compression etc., approaches and how to implement them.
- Prepare to read the current image processing research literature.
- Gain experience in applying image processing algorithms to real problems
- Analyze general terminology of digital image processing.

Unit - I :

Digital Image Fundamentals: What is Digital Image Processing, examples of fields that use digital image processing, fundamental Steps in Digital Image Processing, Components of an Image processing system, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

Unit – II:

Image Enhancement: Image Enhancement in the spatial domain: some basic gray level transformations, histogram processing, enhancement using arithmetic and logic operations, basics of spatial filters, smoothening and sharpening spatial filters, combining spatial enhancement methods.

Unit – III :

Segmentation: Thresholding, Edge Based Segmentation: Edge Image Thresholding, Region Based Segmentation, Matching, **Representation and Description**: Representation , Boundary Descriptors, Regional Descriptors.

Unit – IV :

Image Compression: Fundamentals, image compression models, elements of information theory, error-free compression, lossy compression,Image Compression Stanadrds.

Unit – V :

Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit transformation, basic morphologic algorithms.

Color Image Processing: Color fundamentals, Color Models and basics of full-color image processing

Text Books :

1. “Digital Image Processing”, Rafael C.Gonzalez and Richard E. Woods, Third Edition, Pearson Education, 2007
2. Digital Image Processing”, S.Sridhar, Oxford University Press

Reference Books :

1. “Fundamentals of Digital Image Processing” , S. Annadurai, Pearson Edun, 2001.
2. “Digital Image Processing and Analysis”, B. Chanda and D. Dutta Majumdar, PHI, 2003.
3. “Image Processing” , Analysis and Machine Vision , Milan Sonka, Vaclav Hlavac and Roger Boyle, 2nd Edition, Thomson Learning, 2001.
4. “Digital Image Processing” Vipula Singh, Elsevier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(15A05602) DATA WAREHOUSING AND MINING

Course Objectives:

- To know the basic concepts and principles of data warehousing and data mining
- Learn pre-processing techniques and data mining functionalities
- Learn and create multidimensional models for data warehousing
- Study and evaluate performance of Frequent Item sets and Association Rules
- Understand and Compare different types of classification and clustering algorithms

Course Outcomes:

- Understand the basic concepts of data warehouse and data Mining
- Apply pre-processing techniques for data cleansing
- Analyze and evaluate performance of algorithms for Association Rules
- Analyze Classification and Clustering algorithms

UNIT I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT III

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

UNIT IV

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT V

Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multi relational Data Mining, Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

REFERENCES:

1. Data Mining Techniques, Arun KPujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory& Dennis Murray Pearson EdnAsia.
3. Insight into Data Mining, K.P.Soman, S.Diwakar,V.Ajay, PHI,2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58201) BIG DATA ANALYTICS

Objectives:

- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.

Outcomes:

On completion of this course the student will able to

- Analyze the big data analytics techniques for useful business application.
- Design efficient algorithms for mining the data from large volumes.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
- Explore on big data applications using Pig and Hive.

UNIT-I

Introduction to Big Data

Introduction to Big Data Platform – Challenges of Conventional System – Intelligent data analysis – Nature of Data – Analytic Processes and Tool – Analysis vs Reporting – Modern Data Analytic Tool – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Prediction Error.

UNIT- II

Mining Data Streams

Introduction To Stream Concepts – Stream Data Model and Architecture - Stream Computing – Sampling Data in a Stream – Filtering Stream – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT – III

Hadoop

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop – Analyzing the Data with Hadoop – Scaling Out – Hadoop Streaming – Design of HDFS- Java interfaces to HDFSBasics- Developing a Map Reduce Application – How Map Reduce Works – Anatomy of a Map Reduce Job run – Failures – Job Scheduling – Shuffle and Sort – Task Execution – Map Reduce Types and Formats – Map Reduce Features.

UNIT – IV

Hadoop Environment

Setting up a Hadoop Cluster – Cluster specification – Cluster Setup and Installation –Hadoop Configuration – Security in Hadoop – Administering Hadoop – HDFS – Monitoring – Maintence – Hadoop Benchmarks – Hadoop in the Cloud.

UNIT –V

Frameworks

Applications on Big Data Using Pig and Hive – Data Processing operators in Pig – Hive Services – HiveQL – Querying Data in Hive – fundamentals of HBase and Zookeeper – IBM Info Sphere Big Insights and Streams. Visualization - Visual data analysis techniques, interaction techniques; Systems and applications.

Text Books:

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Spingers, 2007.
2. Tom White, Hadoop: The Definitive Guide Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Uderstanding Big Data : Analytics for Enterprise Class Hadoop and Streaming Data, McGrawHill Publishing, 2012.
4. AnandRajaraman and Jeffrey David UIIman, Mining of Massive Datasets Cambridge University Press, 2012.

Reference Books:

1. Bill Franks, Taming the big Data tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data , John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
3. Jiawei Han, MichelineKamber, Data Mining Concepts and Techniques, Second Edition.
4. Elsevier, Reprinted 2008. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58203) INTERNET OF THINGS

Objectives

- Makes clear view over physical computing, ubiquitous computing, or the Internet of Things, it's a hot topic in technology.
- It discusses design concepts that will make IOT products eye-catching and appealing.

Outcomes

- Ability to combine sensors, servos, robotics, Arduino chips, and more with various or the Internet, to create interactive, cutting-edge devices.
- Better idea of the overview of necessary steps to take the idea of IOT concept through production.

UNIT 1

Introduction - Internet of Things – **Design Principles for Connected Devices** – Web Thinking for Connected Devices – **Internet Principles** – IP – TCP – IP Protocol Suite – UDP – IP Address – MAC Address – TCP and UDP Ports – Application Layer Protocols.

UNIT 2

Prototyping – Prototypes and Production – Cloud – Open Source vs Closed Source – Tapping into the Community **– Prototyping Embedded Devices** – Electronics – Embedded Computing Basics – Ardunio – Raspberry Pi – Beagle Bone Black – Electronic Imp.

UNIT 3

Prototyping the Physical Design – Laser Cutting – 3D Printing – CNC Milling – Repurposing and Recycling – **Prototyping Online Components** – New API – Real Time Reactions – Other Protocols.

UNIT 4

Techniques for writing Embedded Code – Memory Management – Performance and Battery life – Libraries – Debugging – **Business Models** – Models – Funding an Internet of Things Startup.

UNIT 5

Moving to Manufacture – Designing Kits – Designing Printed Circuit Boards – Manufacturing Printed Circuit Boards – Mass Producing the case and other Fixtures – Scaling up Software – **Ethics** – Characterizing the Internet of Things – Control – Environment – Solutions.

Text Books:

1. Adrian Mcewen and HakinCassimally, “Designing The Internet of Things” Wiley Publications , 2015

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

CunoPfister, “Getting Started with the Internet of Things”,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58207) CLOUD COMPUTING

Objectives

- To introduce the basis of Cloud Computing
- To educate the cloud working function
- To allow computer system resources to be used in an efficient manner
- Makes the environment to the cloud.

Outcomes

On successful completion of the course, students will be able to:

- Understand the concepts of cloud computing and its related techniques.
- Provide a pleasant and effective user interface.

UNIT-I

Introduction to cloud computing – The Evolution of cloud computing – Hardware Evolution- Internet Software Evolution – Server Virtualization – Web Services Deliver from the cloud– Communication-as-a-service–Infrastructure-as-a-service–Monitoring-as-a-service–Platform- as-a-Service - Software-as-a-service – Building Cloud Network.

UNIT-II

Federation in the cloud – presence in the cloud – Privacy and its Relation to cloud-Based Information Systems– Security in the cloud – Common Standards in the cloud-End-User Access to the cloud Computing.

UNIT-III

Introduction – Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups- Standards Bodies and Working Groups- Service Oriented Architecture- Business Process Execution Language- Interoperability Standards for Data Center Management – Utility Computing Technology- Virtualization – Hyper Threading – Blade Servers- Automated Provisioning- Policy Based Automation- Application Management – Evaluating Utility Management Technology – Virtual Test and development Environment – Data Center Challenges and Solutions – Automating the Data Center.

UNIT-IV

Software Utility Application Architecture – Characteristics of a SaaS – Software Utility Applications – Cost Versus Value – Software Application Services Framework – Common Enablers – Conceptual view to Reality – Business profits – Implementing Database System for Multitenant Architecture.

UNIT-V

Other Design Consideration – Design of a Web Services Metering Interface – Application Monitoring Implementation – A Design for an update and Notification Policy – Transforming to Software as a Service – Application Transformation Program – Business Model Scenarios – Virtual Services for Organizations – The Future.

Text Books:

1. Guy Bunker and Darren Thomson, Delivering utiliy Computing, John Wiley & Sons Ltd, 2012.

References Books:

1. John W. Rittinghouse and Ames F. Ransome, Cloud Computing Implementation , Management and security, CRC press & Francis Group, Boca Raton London New York. 2010.

2. Alfredo Mendroza, Utility Computing Technologies, Standards, and Strategies Artech House INC, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(15A05502) COMPUTER NETWORKS

Course Objectives:

- Study the evolution of computer networks and future directions.
- Study the concepts of computer networks from layered perspective.
- Study the issues open for research in computer networks.

Course Outcomes:

- Ability to choose the transmission media depending on the requirements.
- Ability to design new protocols for computer network.
- Ability to configure a computer network logically.

Unit I

Introduction: Networks, Network Types, Internet History, Standards and Administration, Network Models: Protocol Layering, TCP/IP Protocol Suite, The ISO Model.

The Physical layer: Data and Signals, Transmission impairment, Data rate limits, Performance, Transmission media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet switching.

Unit II

The Data Link Layer: Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol, Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

Unit III

The Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking, The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

Unit IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.

Unit V

The Application Layer: Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.

Text Books:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.

References:

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D08204) MOBILE ADHOC NETWORKS

Course Objective:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

Course Outcomes:

- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications

UNIT I

Introduction to Ad Hoc Networks:

Characteristics of MANETs, Applications of MANETs and challenges of

MANETs -Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT II

Data Transmission:

Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TCPover Ad Hoc:

TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT III

Basics of Wireless, Sensors and Applications:

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV

Data Retrieval in Sensor Networks:

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT V

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System:TinyOS -Imperative Language:nesC, Dataflow style language: TinyGALS,Node-Level Simulators, ns-2 and its sensor network extension.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos CorderioDharma P.Aggarwal,World Scientific Publications, March 2006,ISBN –981-256-681-3

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 (Morgan Kauffman)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58104) INFORMATION SECURITY

Course Objectives:

- Extensive, thorough and significant understanding of the concepts, issues, principles and theories of computer network security
- Identifying the suitable points for applying security features for network traffic
- Understanding the various cryptographic algorithms and implementation of the same at software level
- Understanding the various attacks, security mechanisms and services

Course Outcomes:

- Protect the network from both internal and external attacks
- Design of new security approaches
- Ability to choose the appropriate security algorithm based on the requirements.

Unit-I

Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security

Classical encryption techniques- symmetric cipher model, substitution ciphers, transposition ciphers, Steganography.

Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, linear and differential cryptanalysis, block cipher modes of operations, AES, RC4.

Unit-II

Introduction to Number theory – Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence, Algebraic Structures, GF(2^n) Fields, Primes, Primality Testing, Factorization, Chinese remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

Public-key cryptography - Principles of public-key cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, ELGamal cryptographic system, Elliptic Curve Arithmetic, Elliptic curve cryptography

Unit-III

Cryptographic Hash functions: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)

Message Authentication Codes: Message authentication Requirements, Message authentication functions, Requirements for Message authentication codes, security of MACs, HMAC, MACs based on Block Ciphers, Authenticated Encryption

Digital Signatures-RSA with SHA & DSS

Unit-IV

Key Management and distribution: Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using Asymmetric, Distribution of Public keys, X.509 Certificates, Public key Infrastructure.

User Authentication: Remote user Authentication Principles, Remote user Authentication using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric Encryption, Federated Identity Management, Electronic mail security: Pretty Good Privacy (PGP), S/MIME.

Unit-V

Security at the Transport Layer(SSL and TLS) : SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security, HTTPS, SSH

Security at the Network layer (IPSec): Two modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

System Security: Description of the system, users, Trust and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, worms, viruses, Intrusion Detection System(IDS), Firewalls

Text books:

1. “Cryptography and Network Security”, Behrouz A. Frouzan and Debdeep Mukhopadhyay, Mc Graw Hill Education, 2nd edition, 2013.

2.“Cryptography and Network Security: Principals and Practice”, William Stallings, Pearson Education , Fifth Edition, 2013.

References:

1. “Network Security and Cryptography”, Bernard Menezes , Cengage Learning.

2. “Cryptography and Security”, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India.

3. “Applied Cryptography, Bruce Schiener, 2nd edition, John Wiley & Sons.

4. “Cryptography and Network Security”, Atul Kahate, TMH.

5. ‘Introduction to Cryptography”, Buchmann, Springer.

6. ‘Number Theory in the Spirit of Ramanujan”, Bruce C.Berndt, University Press

7. “Introduction to Analytic Number Theory”, Tom M.Apostol, University Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(17D58204) DISTRIBUTED COMPUTING

Objectives

- Broad and detailed coverage of the theory is balanced with practical systems-related issues such as mutual exclusion, deadlock detection, authentication, and failure recovery.
- Gives clear understanding of the fundamental principles and models underlying the theory, algorithms and systems aspects of distributed computing.

Outcomes

- Provides solid understanding of the design problems and the theoretical and practical aspects of their solutions.
- Simple explanations and illustrations are used to elucidate the algorithms.

Unit 1

Introduction - Message-passing systems versus shared memory systems - Primitives for distributed communication - Synchronous versus asynchronous executions - **A model of distributed computations** - A model of distributed executions - Models of communication networks - Models of communication networks - Models of process communications.

Unit 2

Global state and snapshot recording algorithms - System model and definitions - Snapshot algorithms for FIFO channels - Variations of the Chandy–Lamport algorithm - Snapshot algorithms for non-FIFO channels - Snapshots in a causal delivery system - Monitoring global state - **Terminology and basic algorithms** - Topology abstraction and overlays - Classifications and basic concepts - Complexity measures and metrics.

Unit 3

Message ordering and group communication - Asynchronous execution with synchronous communication - Synchronous program order on an asynchronous system - Group communication - A nomenclature for multicast - Propagation trees for multicast - Classification of application-level multicast algorithms - **Termination detection** - Termination detection using distributed snapshots - Termination detection by weight throwing - A spanning-tree-based termination detection algorithm.

Unit 4

Distributed mutual exclusion algorithms - Lamport's algorithm - Ricart–Agrawala algorithm - Singhal's dynamic information-structure algorithm - Lodha and Kshemkalyani's fair mutual exclusion algorithm - Quorum-based mutual exclusion algorithms - Maekawa's algorithm - Agarwal–El Abbadi quorum-based algorithm

Unit 5

Deadlock detection in distributed systems - Models of deadlocks - Knapp's classification of distributed deadlock detection algorithms - Mitchell and Merritt's algorithm for the singleresource model - Chandy–Misra–Haas algorithm for the AND model - Chandy–Misra–Haas algorithm for the OR model.

Text Book

1. Kshemkalyani, Ajay D., and Mukesh Singhal, "Distributed computing: principles, algorithms, and systems Cambridge University Press, 2011.

Reference Books

1. Sunita Mahajan and Seema Shah, "Distributed Computing", Oxford University Press, Second Edition, 2011.
2. Albert Y.Zomaya, "Parallel and Distributed Computing Hand book", Second edition, McGrawl Publications, 2005.
3. Francesco Pierfederici, "Distributed Computing with Python", First Edition, Packt Publishing, 2016.
4. Mahajan, Sunita, and Seema Shah, "Distributed Computing", Oxford University Press, Inc., 2013.