

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech in COMPUTER SCIENCE AND ENGINEERING  
Common to (CS, CSE)**

**EFFECTIVE FROM ACADEMIC YEAR 2017- 18 ADMITTED BATCH**

**COURSE STRUCTURE AND SYLLABUS**

**I Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-1	Advanced Algorithms	25	75	4	0	0	4
PC-2	Computer Networking	25	75	4	0	0	4
PC-3	Software Engineering	25	75	4	0	0	4
PE-1	1. Network Security and Cryptography 2. Mobile Application Development 3. Graph Theory 4. Internet of Things	25	75	3	0	0	3
PE-2	1. Game Theory 2. Parallel and Distributed Algorithms 3. Software Architecture and Design Patterns 4. Embedded Systems	25	75	3	0	0	3
OE-1	<b>*Open Elective – 1</b>	25	75	3	0	0	3
Laboratory I	Advanced Algorithms Lab	25	75	0	0	3	2
Seminar I	Seminar-I	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

**II Semester**

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-4	Network Programming	25	75	4	0	1	4
PC-5	Distributed Systems and Cloud Computing	25	75	4	0	1	4
PC-6	Theory of Computation	25	75	4	0	1	4
PE-3	1. Data Warehousing and Data Mining 2. Storage Area Networks 3. Semantic Web and Social Networks 4. Cyber Security	25	75	3	0	0	3
PE4	1. Big Data Analytics 2. Soft Computing 3. Software Process and Project Management 4. Machine Learning	25	75	3	0	0	3
OE-2	<b>*Open Elective – 2</b>	25	75	3	0	0	3
Laboratory II	Internet Technologies and Services Lab	25	75	0	0	3	2
Seminar II	Seminar -II	100	0	0	0	3	2
<b>Total</b>		<b>275</b>	<b>525</b>	<b>21</b>	<b>0</b>	<b>6</b>	<b>25</b>

### III Semester

<b>Course Title</b>	<b>Int. marks</b>	<b>Ext. marks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
Technical Paper Writing	100	0	0	3	0	2
Comprehensive Viva-Voce	0	100	0	0	0	4
Project work Review I	100	0	0	0	22	8
<b>Total</b>	<b>200</b>	<b>100</b>	<b>0</b>	<b>3</b>	<b>22</b>	<b>14</b>

### IV Semester

<b>Course Title</b>	<b>Int. marks</b>	<b>Ext. marks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
Project work Review II	100	0	0	0	24	8
Project Evaluation (Viva-Voce)	0	200	0	0	0	16
<b>Total</b>	<b>100</b>	<b>200</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>24</b>

**\*Open Elective subjects must be chosen from the list of open electives offered by various departments.**

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year – I Sem CSE

### ADVANCED ALGORITHMS (PC -1)

#### Course Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.
- Significance of algorithms in the computer field
- Various aspects of algorithm development
- Qualities of a good solution

**Unit - I : Introduction** - Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Strassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis.

**Unit - II: Review of Data Structures-** Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

**Unit - III: Dynamic Programming** - Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms - Elements of the greedy strategy, Huffman codes, Amortized Analysis - Aggregate analysis, The accounting method, The potential method, Dynamic tables.

**Unit - IV: Graph Algorithms** - Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

**Unit - V: NP-Complete & Approximate Algorithms**-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems - Clique problem, Vertex-cover problem, formula satisfiability, 3 CNF Satisfiability, The vertex-cover problem, The traveling-salesman problem, The subset-sum problem.

#### TEXT BOOKS:

1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third *Edition*, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

#### REFERENCES:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication
2. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
3. Data structures and Algorithm Analysis in C++, 3<sup>rd</sup> edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2<sup>nd</sup> edition, PHI.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year - I Sem. (CSE)

### COMPUTER NETWORKING (PC -2)

#### UNIT-1

The internet architecture, Access Networks, The network Core, Peer-to-Peer Networks, Content Distribution Networks, Delay Tolerant Networks, Circuit Switching vs. Packet switching, Packet switching Delays and congestion, Client/Server and Peer-to-Peer Architectures, MAC and LLC, Virtual LAN, Asynchronous Transfer Mode (ATM)

#### UNIT-2

Network Address Translator, Internet Control Message Protocol, SNMP, CIDR, IPv6, Routing Protocol Basics in advanced networks, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Switching Services, Spanning Tree Protocol (STP), Standard Network Management Protocol.

#### UNIT-3

TCP and Mobile TCP, TCP Tahoe and TCP Reno, High speed TCP, Coexistence of UDP and TCP flows, HTTP and HTTPS, FTP and SFTP, Domain Name Service, TCP and UDP sockets

#### UNIT-4

Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Delay Analysis, Connectivity and Availability, Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet.

Introduction, Wireless Links and Network Characteristics, CDMA, WiFi: 802.11, Wireless LANs, The 802.11 Architecture, The 802.11 MAC Protocol, The IEEE 802.11 Frame, Mobility in the Same IP Subnet, Advanced Features in 802.11, Personal Area Networks: Bluetooth and Zigbee, Cellular Internet Access, An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular Subscribers, On to 4G: LTE, Mobility Management: Principles, Addressing, Routing to a Mobile Node, Mobile IP, Managing Mobility in Cellular Networks, Routing Calls to a Mobile User, Handoffs in GSM, Wireless and Mobility: Impact on Higher-Layer Protocols

#### UNIT-5

Explaining IP Multicasting, VOIP, Unified Communication, Virtual Networking, Data center Networking, Introduction to Optical Networking, SONET /SDH Standard, Next generation cellular networks, Secure Socket Layer, IP Sec, TLS, Kerberos, Domain name system Protection.

#### TEXT BOOKS:

1. Computer Networking: A Top-Down Approach, 6/e, James F. Kurose and Keith W. Ross, Pearson Education, 2012.
2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A systems approach, Morgan Kaufman, 5th Edition, 2012
3. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill
4. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings*, Second Edition, Pearson Education.
5. Top-Down Network Design, *Priscilla Oppenheimer*, Second Edition, Pearson Education (CISCO Press)

## REFERENCE BOOKS:

1. Advance Computer Network, By Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, Wiley India
2. CCNA Intro – Study Guide – Todd Lammle, Sybex
3. Computer Networks by Mayank Dave, Cengage.
4. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson*, Fifth Edition, Thomson.
5. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
6. An Engineering Approach to Computer Networking, *S. Keshav*, Pearson Education.
7. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet*, Pearson Education (CISCO Press)
8. Computer Communications Networks, Mir, Pearson Education.
9. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to computer networks and Cyber Security, CRC press, Taylor & Francis Group, 2014
10. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5<sup>th</sup> Edition, 2014
11. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech- I Year – I Sem CSE

### SOFTWARE ENGINEERING (PC - 3)

#### Prerequisites:

- A course on “Computer Programming and Data Structures”
- A course on “Object Oriented Programming Through Java”

#### Course Objectives:

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

#### Course Outcomes:

- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

#### UNIT-I:

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths.

**A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.

#### UNIT-II:

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**System models:** Context models, behavioral models, data models, object models, structured methods.

#### UNIT-III:

**Design Engineering:** Design process and design quality, design concepts, the design model.

**Creating an architectural design:** software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

#### UNIT-IV:

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

**Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

**UNIT-V:**

**Metrics for Process and Products:** Software measurement, metrics for software quality.

**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

**Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**TEXT BOOKS:**

1. Software Engineering, A practitioner's Approach - Roger S. Pressman, 6<sup>th</sup> edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7<sup>th</sup> edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

**REFERENCES:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Education.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**NETWORK SECURITY AND CRYPTOGRAPHY  
(Professional Elective- 1)**

**Course Objectives:**

- Understand the basic categories of threats to computers and networks
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

**Course Outcomes:**

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security

**UNIT – I**

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT – II**

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT – III**

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512),

**Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

**UNIT – IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security



## **UNIT – V**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### **TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill, 3<sup>rd</sup> Edition

### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, Cengage Learning
6. Network Security and Cryptography: Bernard Menezes, Cengage Learning

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**MOBILE APPLICATION DEVELOPMENT  
(Professional Elective- 1)**

**Course Objectives:**

- To demonstrate their understanding of the fundamentals of Android operating systems
- To demonstrate their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

**Unit - I:**

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**Unit - II:**

**Android User Interface:** Measurements – Device and pixel density independent measuring units  
Layouts – Linear, Relative, Grid and Table Layouts  
User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers  
Event Handling – Handling clicks or changes of various UI components  
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing, and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**Unit - III**

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS  
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity  
Notifications – Creating and Displaying notifications, Displaying Toasts

**Unit - IV**

**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference  
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Unit - V**

**Advanced Topics:** Alarms – Creating and using alarms  
Using Internet Resources – Connecting to internet resource, using download manager

Location Based Services – Finding Current Location and showing location on the Map, updating location

**TEXT BOOKS:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCES:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**GRAPH THEORY  
(Professional Elective- 1)**

**Unit - I:**

**Introduction**-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

**Unit - II:**

**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

**Unit III:**

**Trees**- Definitions and characterizations, Number of trees, Cayley's formula, Kircho-matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

**Unit IV:**

**Independent sets coverings and matchings** – Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, Kőnig's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**Unit - V:**

**Vertex Colorings**- Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**TEXTBOOKS:**

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1<sup>st</sup> edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications  
<https://www.imo.unimontreal.ca/~hahn/IFT3545/GTWA.pdf>

**REFERENCES:**

**Lecture Videos:** <http://nptel.ac.in/courses/111106050/13>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**INTERNET OF THINGS  
(Professional Elective- 1)**

**Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

**Unit - I**

Introduction to Internet of Things –Definition and Characteristics of IoT,  
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs  
IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,  
Communication protocols, Embedded Systems, IoT Levels and Templates  
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry,  
health and Lifestyle

**Unit - II**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN  
and NFV for IoT  
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

**Unit - III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow,  
functions, modules, packaging, file handling, data/time operations, classes, Exception handling  
Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**Unit - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)  
Programming – Python program with Raspberry PI with focus of interfacing external gadgets,  
controlling output, reading input from pins.

**Unit - V**

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication  
APIs  
Webserver – Web server for IoT, Cloud for IoT, Python web application framework  
Designing a RESTful web API

**TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**GAME THEORY  
(Professional Elective- 2)**

**UNIT - I:**

**Introduction:** Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation

Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

**UNIT - II:**

Mixed, Correlated, and Evolutionary Equilibrium -Mixed Strategy Nash Equilibrium Interpretations of Mixed Strategy Nash Equilibrium Correlated Equilibrium Evolutionary Equilibrium

Rationalizability and Iterated Elimination of Dominated Actions-Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions

**UNIT - III:**

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? , Knowledge and Solution Concepts, The Electronic Mail Game

**UNIT - IV:**

Extensive Games with Perfect Information -Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy , Two Notable Finite Horizon Games , Iterated Elimination of Weakly Dominated Strategies

Bargaining Games -Bargaining and Game Theory , A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions

**UNIT - V:**

Repeated Games - The Basic Idea Infinitely Repeated Games vs.\ Finitely Repeated Games Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game

**TEXT BOOKS:**

1. M. J. Osborne and A. Rubinstein, A course in Game Theory, MIT Press
2. Roger Myerson, Game Theory, Harvard University Press
3. D. Fudenberg and J. Tirole, Game Theory, MIT Press

**REFERENCES:**

1. J. von Neumann and O. Morgenstern, Theory of Games and Economic Behavior, New York: John Wiley and Sons.
2. R.D. Luce and H. Raiffa, Games and Decisions, New York: John Wiley and Sons.,
3. G. Owen, Game Theory, (Second Edition), New York: Academic Press,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**PARALLEL AND DISTRIBUTED ALGORITHMS  
(Professional Elective- 2)**

**Course Objectives:**

- To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
- To study the main classes of parallel algorithms.
- To study the complexity and correctness models for parallel algorithms.

**UNIT-I**

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

**UNIT-II**

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

**UNIT-III**

Pipelining- Techniques computing platform, pipeline programs examples

**UNIT-IV**

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallel sharing data parallel programming languages and constructs, open MP

**UNIT-V**

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**TEXT BOOK:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2<sup>nd</sup> Edition.

**REFERENCE BOOK:**

1. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech. I Year – I Sem CSE**

**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS  
(Professional Elective- 2)**

**Course Objectives:** After completing this course, the student should be able to:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation, and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.
- To highlight the evolution of patterns.
- To how to add functionality to designs while minimizing complexity
- To understand what design patterns really are, and are not
- To learn about specific design patterns.
- To learn how to use design patterns to keep code quality high without overdesign.

**UNIT - I**

**Envisioning Architecture**

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

**Creating an Architecture**

Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

**UNIT - II**

**Analyzing Architectures**

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

**Moving from one system to many**

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

**UNIT - III**

**Patterns**

Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

**Creational and Structural patterns**

Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

**UNIT - IV**

**Behavioral patterns**

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

**UNIT - V**

**Case Studies**

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development,



**TEXT BOOKS:**

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

**REFERENCE BOOKS:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
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
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
  8. Pattern Oriented Software Architecture, F. Buschmann & others, John Wiley & Sons.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year – I Sem CSE

### EMBEDDED SYSTEMS (Professional Elective- 2)

#### Course Objectives:

- To explain various embedded system applications and design requirements.
- To construct embedded system hardware.
- To develop software programs to control embedded system.
- To generate product specification for embedded system.

#### UNIT - I

**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems

#### UNIT - II

**8051 and Advanced Processor Architecture:** 8051 Architecture, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts, Introduction to Advanced Architectures, Real World Interfacing, Processor and Memory organization - **Devices and Communication Buses for Devices Network:** Serial and parallel Devices & ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems, Wireless and Mobile System protocols

#### UNIT - III

**Embedded Programming Concepts:** Software programming in Assembly language and High Level Language, Data types, Structures, Modifiers, Loops and Pointers, Macros and Functions, object oriented Programming, Embedded Programming in C++ & JAVA

#### UNIT IV

**Real – Time Operating Systems:** OS Services, Process and Memory Management, Real – Time Operating Systems, Basic Design Using an RTOS, Task Scheduling Models, Interrupt Latency, Response of Task as Performance Metrics - **RTOS Programming:** Basic functions and Types of RTOSes, RTOS VxWorks, Windows CE

#### UNIT - V

**Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-Design - **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine, Simulators, Laboratory Tools

#### TEXT BOOK:

1. Embedded Systems, Raj Kamal, Second Edition TMH.

#### REFERENCE BOOKS:

1. Embedded/Real-Time Systems, Dr. K.V.K.K. Prasad, dream Tech press
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
3. The 8051 Microcontroller, Third Edition, Kenneth J Ayala, Thomson.

4. An Embedded Software Primer, David E. Simon, Pearson Education.
5. Micro Controllers, Ajay V Deshmukhi, TMH.
6. Microcontrollers, Raj kamal, Pearson Education.
7. Introduction to Embedded Systems, Shibu K.V, TMH.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M. Tech. I Year – I Sem CSE

### ADVANCED ALGORITHMS LAB

#### Course Objectives:

- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction.

#### Sample Problems on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
  - a) Linear search
  - b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
  - a) List ADT
3. Write Java programs to implement the following using an array.
  - a) Stack ADT
  - b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program to implement circular queue ADT using an array.
6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
7. Write Java programs to implement the following using a singly linked list.
  - a) Stack ADT
  - b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
  - a) Array
  - b) Singly linked list
  - c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. Write a Java program to perform the following operations:
  - a) Construct a binary search tree of elements.
  - b) Search for a key element in the above binary search tree.
  - c) Delete an element from the above binary search tree.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
  - a) Preorder
  - b) Inorder
  - c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. Write Java programs for implementing the following sorting methods:
  - a) Bubble sort
  - b) Insertion sort
  - c) Quick sort
  - d) Merge sort
  - e) Heap sort
  - f) Radix sort
  - g) Binary tree sort
16. Write a Java program to perform the following operations:
  - a) Insertion into a B-tree
  - b) Searching in a B-tree
17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

#### REFERENCE BOOKS:

1. Data Structures and Algorithms in java, 3<sup>rd</sup> edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard, 2<sup>nd</sup> edition, Schaum's Outlines, TMH.

3. Data Structures and algorithms in Java, 2<sup>nd</sup> Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P. H. Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work, W. J. Collins, Mc Graw Hill.
8. Java: the complete reference, 7<sup>th</sup> edition, Herbert Schildt, TMH.
9. Java for Programmers, P. J. Deitel and H. M. Deitel, Pearson education / Java: How to Program P. J. Deitel and H. M. Deitel , 8<sup>th</sup> edition, PHI.
10. Java Programming, D.S. Malik, Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S. Goldman & K. Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

**(Note: Use packages like java.io, java.util, etc)**