

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH. (COMPUTER SCIENCE)
COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Data Structures and Algorithms	25	75	4	--	4
Core Course II	Database Internals	25	75	4	--	4
Core Course III	Distributed Systems	25	75	4	--	4
Core Elective I	1. Network Security 2. Android Application Development 3. Cloud Computing 4. Internet of Things	25	75	4	--	4
Core Elective II	1. Machine Learning 2. Parallel and Distributed Algorithms 3. Software Architecture and Design Patterns 4. Embedded Systems	25	75	4	--	4
Open Elective I	Open Elective – 1	25	75	4	--	4
Laboratory I	Data Structures and Algorithms Lab	25	75	--	4	2
Seminar I		50	--	--	4	2
Total Credits				24	8	28

I Year – II Semester

	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Network Programming	25	75	4	--	4
Core Course V	Information Retrieval Systems	25	75	4	--	4
Core Course VI	Internet Technologies and Services	25	75	4	--	4
Core Elective III	1. Data Mining 2. Storage Area Networks 3. Semantic Web and Social Networks 4. Cyber Security	25	75	4	--	4
Core Elective IV	1. Big Data Analytics 2. Soft Computing 3. Software Process and Project Management 4. Distributed Computing	25	75	4	--	4
Open Elective II	Open Elective – 2	25	75	4	--	4
Laboratory II	Internet Technologies and Services Lab	25	75	--	4	2
Seminar II		50	--	--	4	2
Total Credits			24	8	28	

II Year - I Semester

	Course Title	Int. marks	Ext. marks	L	P	C
	Comprehensive Viva-Voce	--	100	--	--	4
	Project work Review I	50	--	--	24	12
Total Credits				--	24	16

II Year - II Semester

	Course Title	Int. marks	Ext. marks	L	P	C
	Project work Review II	50	--	--	8	4
	Project Evaluation (Viva-Voce)	--	150	--	16	12
Total Credits				--	24	16

Open Electives

1. Basic Computer Programming skills are required for all open electives. Additionally, knowledge on the specified area mentioned in prerequisites is required for opting the open elective
2. Note: A student can register for any open elective subject provided that he has not already registered for the same subject

S.NO	Open Elective subjects	Prerequisites
1.	"R" Programming	Maths, Statistics
2.	Android Application Development	Java
3.	Algorithmics	----
4.	Big Data Analytics	Data Bases , Maths
5.	Bioinformatics	Data Structures
6.	Biometrics	----
7.	Computer Forensics	Maths, Data Structures
8.	Cyber Security	Internet Technologies
9.	Distributed Systems Security	Information Security
10.	E-Commerce	Internet Technologies
11.	Embedded Systems	Digital logic
12.	Information Security and Audit	---
13.	Intellectual Property Rights	---
14.	Internet of Things	Java
15.	Java Programming	---
16.	Linux Programming	---
17.	Mobile Computing	Java
18.	Mobile Application Security	Mobile Application Development
19.	OpenStack cloud computing	Linux programming
20.	Operations Research	Maths, Data Structures
21.	Principles of Information Security	----
22.	Scripting Languages	---
23.	Social Media Intelligence	---
24.	Software Engineering	---
25.	Storage Area Networks	Computer Networks
26.	Web Usability	-----

DATA STRUCTURES AND ALGORITHMS

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

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples.

Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

UNIT III

Searching-Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable.

Sorting -Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees.

Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-dfs and bfs, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

UNIT V

Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees -Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- TreeSet, Tree Map Classes, Tries(examples only),Comparison of Search trees. Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

TEXT BOOKS:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition, Cengage Learning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

REFERENCE BOOKS:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition, Wiley India Edition.
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain, J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

DATABASE INTERNALS

Objectives:

By the end of the course, you will know:

- History and Structure of databases
- How to design a database
- How to convert the design into the appropriate tables
- Handling Keys appropriately
- Enforcing Integrity Constraints to keep the database consistent
- Normalizing the tables to eliminate redundancies
- Querying relational data
- and processing the queries
- Storage Optimizing Strategies for easy retrieval of data through index
- Triggers, Procedures and Cursors , Transaction Management
- Distributed databases management system concepts and Implementation

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL,DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers

UNIT II

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.

UNIT III

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques – Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT IV

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

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

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, Extendable Vs Linear Hashing.

UNIT V

Distributed databases: Introduction to distributed databases, Distributed DBMS architectures, Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.

2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition, Ramez Elmasri, Shamkant B.Navathe, Pearson Education, 2008.

REFERENCE BOOKS:

1. Introduction to Database Systems, C.J.Date, Pearson Education.
2. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
3. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
4. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
5. Database-Principles, Programming, and Performance, P.O'Neil & E.O'Neil, 2nd ed, ELSEVIER
6. Fundamentals of Relational Database Management Systems, S.Sumathi, S.Esakkirajan, Springer.
7. Introduction to Database Management, M.L.Gillenson and others, Wiley Student Edition.
8. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
9. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH.
10. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition.
11. Distributed Database Systems, Chhanda Ray, Pearson.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

DISTRIBUTED SYSTEMS

Objectives:

- Understand the need for distributed systems and their applications.
- Understand the concepts of remote procedure calls, remote file systems, distributed agreement, clock synchronization, and security.

UNIT I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models-Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication.

Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems.

Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT III

Peer to Peer Systems-Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore, Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT IV

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

UNIT V

Security-Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 Wi-Fi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, TMH.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

NETWORK SECURITY
(CORE ELECTIVE-I)

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

UNIT – I

Attacks on Computers and Computer Security: 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 & Algorithms(DES, AES, Blowfish), Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution **Asymmetric key Ciphers:** Principles of public key cryptosystems, Algorithms(RSA, Diffie-Hellman, ECC), Key Distribution

UNIT – III

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm **Authentication Applications:** Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication

UNIT – IV

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

UNIT – V

Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction **Intruders, Virus and Firewalls:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls **Case Studies on Cryptography and security:** Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual Elections.

TEXT BOOKS:

1. Cryptography and Network Security : William Stallings, Pearson Education, 5th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 2nd Edition.
3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2nd 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. Principles of Information security by Michael E Whitman and Herbert J.Mattord.

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M. Tech-CS – I Year – I Sem

ANDROID APPLICATION DEVELOPMENT (CORE ELECTIVE-I)

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-CS – I Year – I Sem

CLOUD COMPUTING (CORE ELECTIVE-I)

Objectives:

- To learn the new computing model which enables shared resources on demand over the network.
- To learn about the pay-per-use scenarios.
- To learn about the new kind of service models and deployment models.
- To learn about the virtualization technology.
- To learn the python programming or various services and models.
- To develop cloud applications in Python

UNIT-I

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Mapreduce.

UNIT –II

Cloud Platforms for Industry, Healthcare and education, Cloud Platforms in the Industry, cloud applications. Virtualization, cloud virtualization technology, deep dive: cloud virtualization, Migrating in to cloud computing, Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems,

UNIT-III

Cloud computing Applications: Industry, Health, Education, Scientific Applications, Business and Consumer Applications, Understanding Scientific Applications for Cloud Environments, Impact of Cloud computing on the role of corporate IT.

Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

UNIT-IV

Python Basics, Python for cloud, cloud application development in python, Cloud Application Development in Python.

Programming Google App Engine with Python: A first real cloud Application, Managing Data in the cloud, Google app engine Services for Login Authentication, Optimizing UI and Logic, Making the UI Pretty: Templates and CSS, Getting Interactive. Map Reduce Programming Model and Implementations.

UNIT-V

Cloud management, Organizational Readiness and change management in the cloud age ,Cloud Security ,Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services

TEXT BOOKS:

1. Cloud Computing : Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.
3. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
4. Cloud computing: Dr Kumar Saurab Wiley India 2011.

REFERENCES;

1. Code in the Cloud: Mark C.Chu-Carroll 2011, SPD.(Second part of IV UNIT)
2. Essentials of cloud computing : K Chandrasekharan CRC Press.
3. Cloud Computing: John W. Rittinghouse, James Ransome, CRC Press.
4. Virtualization Security: Dave shackleford 2013. SYBEX a wiley Brand.
5. Cloud computing and Software Services: Ahson , Ilyas.2011.
6. Cloud Computing Bible: Sosinsky 2012. Wiley India .
7. Cloud Computing: Dan C. Marinescu-2013, Morgan Kaufmann.
8. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
- 9 . Fundamentals of Python Kenneth A.Lambert | B.L.Juneja

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M. Tech-CS – I Year – I Sem

INTERNET OF THINGS (CORE ELECTIVE-I)

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 BOOK:

Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

MACHINE LEARNING (CORE ELECTIVE-II)

Objectives:

- 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 understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

UNIT I

INTRODUCTION - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

UNIT II

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning

Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition

Advanced topics in artificial neural networks

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

UNIT IV

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

UNIT V

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995
4. Machine Learning by Peter Flach , Cambridge.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

**PARALLEL AND DISTRIBUTED ALGORITHMS
(CORE ELECTIVE –II)**

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, 2nd Edition.

REFERENCE BOOK:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech-CS – I Year – I Sem

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (CORE ELECTIVE –II)

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-CS – I Year – I Sem

EMBEDDED SYSTEMS (CORE ELECTIVE-II)

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, dreamTech 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.

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M. Tech-CS – I Year – I Sem.

DATA STRUCTURES AND ALGORITHMS LAB

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, 3rd edition, A.Drozdek, Cengage Learning.
 2. Data Structures with Java, J.R.Hubbard, 2nd edition, Schaum's Outlines, TMH.
 3. Data Structures and algorithms in Java, 2nd 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, 7th editon, 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 , 8th 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)