TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

M.TECH (COMPUTER SCIENCE AND ENGINEERING)

COURSE STRUCTURE

I Semester

	Course Title	Int. marks	Ext. marks	L	P	C
A251PC1	Data Structures and Algorithms	30	70	**4**	--	**4**
A251PC2	Data Science	30	70	4	--	4
A251PC3	Distributed Systems	30	70	4	--	4
A251PE4	1. Information Security 2. Mobile Applications Development 3. Wireless Networks 4. Multimedia and Gaming	30	70	3	2	4
A251PE5	1. Machine Learning 2. Natural Language Processing 3. Design Patterns 4. Advanced Computer Architecture	30	70	3	2	4
A251OE6	Open Elective – 1	30	70	4	--	4
A251PC7	Software Lab-1	30	70	--	4	2
A251SE8	Seminar	50	--	--	4	2
	Total Credits			**24**	**8**	**28**

II Semester

	Course Title	Int. marks	Ext. marks	L	P	C
A252PC1	Network Programming	30	70	4	--	4
A252PC2	Mining with Big Data	30	70	4	--	4
A252PC3	Internet Technologies and Services	30	70	4	--	4
A252PE4	**Core Elective– 3** 1. Cyber Security 2. Advanced Databases 3. Social Network Analysis 4. Cloud Computing	30	70	3	2	4
A252PE5	**Core Elective– 4** 1. Deep Learning 2. Internet of Things 3. Service Oriented Computing 4. Distributed Computing	30	70	3	2	4
A252OE6	**Open Elective – 2**	30	70	4	--	4
A252PC7	Software Lab-2	30	70	--	4	2
A252SE8	Seminar	50	--	--	4	2
	Total Credits			24	**8**	**28**

Note: In core elective courses two practical hours to be conducted for every week and implement the concepts discussed in theory hours.

II Year - I Semester

Course Title	**Int. marks**	**Ext. marks**	**L**	**P**	**C**
A253CV1	--	100	--	--	4
A253PW2	50	--	--	24	12
Total Credits	---	---	---	24	**16**

II Year - II Semester

Course Title	**Int. marks**	**Ext. marks**	**L**	**P**	**C**
A254PW1	50	--	--	8	4
A254PW2	--	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 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 Electives	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.	Cyber Security	Internet Technologies
8.	Computer Forensics	Maths, Data Structures
9.	Distributed Systems Security	Information Security
10.	E-Commerce	Internet Technologies
11.	Embedded Systems	Digital logic
12.	Information Security	Maths
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	------

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I-Sem (Computer Science & Engineering)

Data Structures and Algorithms

L T P C
4 0 0 4

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++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I Year I-Sem (Computer Science & Engineering)

Data Science

L	T	P	C
4	0	0	4

Course Outcomes

At the conclusion of the course, students should be able to:

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Identify probability distributions commonly used as foundations for statistical modeling that are required to fit a model to data.
- Identify the significance of exploratory data analysis (EDA) in data science. Apply basic tools to carry out EDA.
- Use APIs and other tools to scrap the Web and collect data, and Use of techniques to extract meaning from data and create features to incorporate into models.
- Apply basic machine learning algorithms for predictive modeling.

UNIT – I

Introduction: What is Data Science, Big Data and Data Science hype - and getting past the hype, why now – Data classification, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model, Introduction to R.

Exploratory Data Analysis and the Data Science Process- Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process;

UNIT - II

Three Basic Machine Learning Algorithms- Linear Regression, k-Nearest Neighbors (k-NN), k-means, Filtering Spam and Naïve Bayes. Data Wrangling: APIs and other tools for scrapping the Web.

UNIT - III

Feature Generation and Feature Selection (Extracting Meaning From Data)- Motivating application: user (customer) retention, Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms- Filters, Wrappers, Decision Trees, Random Forests.

UNIT – IV

Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, - Principal Component Analysis.

UNIT - V

Mining Social-Network Graphs- Social networks as graphs, Clustering of graphs, Direct

discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs.
Data Visualization- Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset.

Practical exposure:
Case Study: Real direct (online real estate firm). R to
Filtering spam using linear regression, k-NN, Naïve Bayes.
Tools for data wrangling
User retention and brainstorming case studies w.r.t filters, wrapers, decision trees, random forests.
Building recommendation system.
Creating visualization of a complex dataset.

Books

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline.O'Reilly. 2014.

References

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)
6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
7. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I-Sem (Computer Science & Engineering)

Distributed Systems

L T P C
4 0 0 4

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, Inter process 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, Ocean Store, 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.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I-Sem (Computer Science & Engineering)

Information Security

L	T	P	C
3	0	2	4

Prerequisites - A Course on "Computer Networks and a course on Mathematics

Objectives

- To understand the fundamentals of Cryptography.
- To understand various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks.
- To apply algorithms used for secure transactions in real world applications.

Outcomes

- Demonstrate the knowledge of cryptography, network security concepts and applications.
- Ability to apply security principles in system design.

UNIT-I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.
Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT-II

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Cryptography.
Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT-III

Digital Signatures, Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service. Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT-IV

IP Security - Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.
Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT-V
Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOKS:

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

REFERENCE BOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I-Sem (Computer Science & Engineering)

Mobile Application Development

L	T	P	C
3	0	2	4

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 Text Views, 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

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech I-Sem (Computer Science & Engineering)

Wireless Networks

L	T	P	C
3	0	2	4

Objectives

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for adhoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

UNIT- I

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

UNIT-II

Data Transmission In MANETs: The Broadcast Storm, Multicasting, Geocasting

TCP over Ad Hoc Networks: TCP Protocol overview, TOP and MANETs, Solutions for TOP over Ad Hoc.

UNIT- III

Basics of Wireless Sensors and Applications:

The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, Applications.

Data Retrieval In Sensor Networks:

Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT- IV

Security: Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems. Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms

UNIT- V

Operating System — TinyOS Imperative Language:

nesC, Dataflow style language: T1nyGALS, Node- Level Simulators, ns-2 and its sensor network extension, TOSSIM.

TEXT BOOKS

1. Ad Hoc and Sensor Networks — Theory and Applications, Car/os Corderlo Dharma R Aggarwal, World Scientific Publications /Cambridge University Press, March 2006
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp 2009.

REFERENCE BOOKS

1. Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
2. Wireless Sensor Networks — Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010
3. Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
4. Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
5. Wireless Ad hoc Networking, Shih-Liri Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007
6. Wireless Ad hoc and Sensor Networks — Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007, rp 2010.
7. Security in Ad hoc and Sensor Networks, Raheem Beyah, et al., World Scientific Publications / Cambridge University Press, 2010
8. Ad hoc Wireless Networks — A communication-theoretic perspective, Ozan K.Tonguz, Giatuigi Ferrari, Wiley India, 2006, rp2009.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech. I-Sem (Computer Science & Engineering)

Multimedia and Gaming

L	T	P	C
3	0	2	4

Course outcomes:

1. Explain approaches to represent multimedia data in digital format and identify their properties;
2. Derive the rational of the multimedia representation format and compression algorithms based on the human visual and auditory perception;
3. Analyze image, video and audio in the frequency domain to identify important components to be encoded;
4. Explain the major steps in some of the image, video and audio compression standards;
5. Apply lossless and lossy compression techniques on multimedia data.

Syllabus:

Unit-I

Introduction to multimedia- components of multimedia (Text, Graphic, Animation, Video and Audio), History, Software tools for multimedia, taks and concerns, Multimedia presentations, data compression, multimedia production, sharing and distribution. Tools for multimedia- Adobe Premier, Directory, Flash.

Unit-II

Basic concepts for game design: Designer, creates an experience, experience takes a place at venue, the experience raises out of game, game elements and its theme, game idea, idea improvements, game player motivation, mechanics, interface and story.

Unit-III

Importance of text in multimedia, fonts and typefaces, text elements, editing and design tools, applications.

Introduction to Graphics/Images, types, File formats, Color science, color models in image, creation of multimedia images, still images, colors and palettes in multimedia, tools for editing images.

Unit-IV

Introduction to sound, Multimedia system sound, Digital audio, MIDI audio, audio formats. Tools for creating and editing audio.

Introduction to animation, principles, techniques, file formats, tools for creating animation, Ex: Bouncing Ball.

Introduction to video, working principle, standards, analog and digital video concepts, formats of video, compression techniques and tools for making and editing video.

Unit-V

Multimedia data compression- lossless and lossy compression algorithms, image, audio, video standards, compression techniques and supported tools.

Practical exposure:
Hardware for multimedia systems, Basic software tools- Authoring system, Text editing, word processing, painting and drawing tools, 2D, 3D Modeling and Animation tools, Image Editing Tools, sound editing tools, Animation, Video, and Digital move tools.

Books

1. Ze-Nian Li, Mark S.Drew, Jiangchuan Liu, **Fundamentals of Multimedia**, second edition, springer publications, 2014.
2. Jesse Schell, **The Art of Game Design** *A Book of Lenses*, Second edition CRS Press 2015.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

M.Tech I-Sem (Computer Science & Engineering)

Machine Learning

L T P C
3 0 2 4

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, Gibs 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, and 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. Ethern Alpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.
3. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

REFERENCE BOOKS:

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

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech I-Sem (Computer Science & Engineering)

Natural Language Processing

L	T	P	C
3	0	2	4

Objectives - Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms.
- Able to design different language modeling Techniques.

UNIT-I

Finding the Structure of Words - Words and Their Components, Issues and Challenges, Morphological Models.

Finding the Structure of Documents - Introduction, Methods, Complexity of the Approaches, Performance of the Approaches.

UNIT-II

Syntax - Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT-III

Semantic Parsing - Introduction, Semantic Interpretation, System Paradigms, Word Sense Recourse, Systems, Software.

UNIT-IV

Predicate - Argument Structure, Meaning Representation Recourse, Systems, Software.

UNIT-V

Language Modeling - Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling.

Text Books:

1. Multilingual natural Language Processing Applications : From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication

Reference:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

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M.Tech I-Sem (Computer Science & Engineering)

Design Patterns

L	T	P	C
3	0	2	4

OUTCOMES

- Ability to understand and apply common design patterns to incremental / iterative development.
- Ability to identify appropriate patterns for design of given problem

UNIT I

Introduction: What is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design patterns, Organizing the Catalog, How Design patterns solve Design problems, How to select a Design Pattern, How to use a Design Pattern.

UNIT – II

A Case Study: Designing a Document Editor, Design Problems, Document Structure, Formatting Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window systems, User Operations Spelling Checking and Hyphenation, Summary.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT – III

Structural Pattern Part – I: Adaptor, Bridge, Composite.
Structural Pattern Part – II : Decorator, acade, flyweight, proxy.

UNIT – IV

Behaviour Patterns Part – I : Chain of Responsiblity, Command, Interpreter, Iterator.
Behaviour Patterns Part – II : Mediator, Memento, Observer.

UNIT – V

Behaviour Patterns Part – Ii (cont'd) State, strategy, Template Method, Visitor, Discussion of Behavioural Patterns.
What to Expect from Design Patterns, A brief History, The Pattern Community An Invitation, A Parting Thought.

TEXT BOOKS

1. Design Patterns Bya Erich Gamma, Pearson Education.

REFERENCE BOOK

1. Pattern's in JAVA Vol-I By Mark Grand, Wiley Dream Tech.
2. Pattern's in JAVA Vol – II BY Mark Grand, Wiley Dream Tech.

3. JAVA Enterprise Design Patterns Vol – III By Mark Grand, Wiley Dream TECH.
4. Head First Design Patterns By Eric Freeman – Oreilly – spd.
5. Peeling Design Patterns, Prof Meda Srinivasa Rao, Narsimha Karumanchi, Career Monk Publication.
6. Design Patterns Explained By Alan Shallowy, Pearson Education.
7. Pattern Oriented Software Architecture, af.Buschman & others, John Wiley & Sons.

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

M.Tech I-Sem (Computer Science & Engineering)

Advanced Computer Architecture

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3	0	2	4

Unit–I

Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.

Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

Unit–II

Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP

ILP software approach- compiler techniques- static branch protection – VLIW approach – H.W support for more ILP at compile time- H.W verses S.W Solutions

Unit–III

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

Unit–IV

Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

Storage systems- Types – Buses – RAID- errors and failures- bench marking a storage device- designing a I/O system.

Unit-V

Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

TEXT BOOK:

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

REFERENCES:

1. “Computer Architecture and parallel Processing” Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware / Software Approach, David E. Culler, Jaswinder Pal singh with Anoop Gupta, Elsevier

TKR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

M.Tech. I Year I-Sem (Computer Science & Engineering)

Software Lab-1

L T P C
0 0 4 2

Programs on Data structures:

1. Write Java programs that use both recursive and non-recursive functions for implementing a) Linear search b) Binary search c) Merge sort d) Quick sort e) Radix sort f) Heapsort
2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT b) Stack ADT c) Queue ADT d) Priority queue ADT
   e) Circular Queue ADT f) Dequeue
3. Write a Java programs 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.
   d) Preorder, Inorder and Postorder travels.
4. Write a Java program to implement all the functions of a dictionary (ADT) using hashing.
5. Write Java programs for the implementation of bfs and dfs for a given graph and implement Dijkstra's algorithm for Single source shortest path problem and implement Kruskal's algorithm to generate minimum cost spanning tree.

Programs on Data science:

1. Using any Basic tools implement plots, graphs and summary statistics.
2. Case Study: RealDirect (online real estate firm).
3. Implement i) Linear Regression
   ii) k-Nearest Neighbors (k-NN)
   iii) k-means
   iv) Filtering Spam Emails using Naïve Bayesian algorithm

-Programs on Distributed Systems:

1. Write a program to simulate the functioning of Lamport's logical clock in 'C'.
2. Write a program to simulate the Distributed Mutual Exclusion in 'C'.
3. Write a program to implement a Distributed chat server using TCP sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'.
5. Write a JAVA code to implement 'Java RMI' mechanism for accessing methods of remote systems.

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. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
4. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.