Jawaharlal Nehru Technological University Anantapur
College OF Engineering Anantapur (Autonomous)
Department of Computer Science & Engineering
Course Structure for Master of Technology
(Computer Science& Engineering)
(w.e.f 2016-17)

I Year I Semester

Code	Subject	L	T/P/D	C
15D51101	Advanced Data Structures	4	0	4
15D51102	Advanced Data Bases	4	0	4
15D51103	Advances in Software Engineering	4	0	4
15D51104	Advanced Network Technologies	4	0	4
	Elective –I	4	0	4
15D51105	1. Distributed and Cloud Computing			
15D51106	2. Distributed Operating Systems			
15D51107	3. Parallel Computing			
	Elective –II	4	0	4
15D51108	1. 3D Technologies			
15D51109	2. Computer Vision			
15D51110	3. Computational Intelligence			
15D51111	Data Structures & Data BasesLab	0	4	2
	Total	**24**	**4**	**26**

I Year II Semester

Code	Subject	L	T/P/D	C
15D51201	Service Oriented Architecture	4	0	4
15D51202	Natural Language Processing	4	0	4
15D51203	Software Quality Assurance and Testing	4	0	4
15D51204	Advanced Data Mining	4	0	4
	Elective –III	4	0	4
15D51205	1. Cyber Security			
15D51206	2. Soft Computing			
15D51207	3. Information Retrieval Systems			
	Elective –IV	4	0	4
15D51208	1.Big Data Analytics			
15D51209	2. Digital Image Processing			
15D51210	3. Pattern Recognition			
15D54201	Research Methodology(Audit Course)			
15D51211	Service Oriented Architecture & Software Testing La	0	4	2

		Total	24	4	26

III & IV Semester

Code	Subject		L	P	C
	III Semester	**Seminar - I**	0	4	2
	IV Semester	**Seminar - II**	0	4	2
	III & IV Semester	**Project Work**	--	--	44
	Total		**0**	**8**	**48**

Note: All End Examinations (Theory and Practical) are of three hours duration.

T- Tutorial   L- Theory   P- Practical/Drawing   C - Credits

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Department of Computer Science & Engineering

M.Tech. I– ISem (CSE)

T	P	C
4	0	4

Advanced Data Structures

Objectives:

- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To develop a base for advanced computer science study.
- Study the advanced data structures & know the application areas
- To get acquaintance with some of the advanced algorithms.

UNIT-I
Introduction: Algorithm, Algorithm Specification, Performance Analysis, Randomized Algorithms,
Divide- And- Conquer: General Method, Binary search, Finding the Maximum and Minimum, Merge sort, Quick Sort, Selection.

UNIT-II:
Stacks and Queues: Templates in C++, The Stack Abstract Data type, The Queue Abstract Data Type, Evaluation of Expressions.
Linken Lists: Singly Linked Lists, Representing Lists in C++, Circular Lists, Linked Stacks and Queues.

UNIT-III:
HEAP STRUCTURES: Min/Max Heap, Binary Heap, Applications of Priority Queue, d- Heap, Leftist Heap, Skew Heap, Binomial Queues,

UNIT IV:
Trees: Preliminaries, Binary Trees, Search Tree ADT- Binary Search Trees, AVL Trees, Splay Trees, Trees Traversals, B- Tree.

UNIT-V:

Graphs: The Graphs Abdtract Data Types, Elementary Graph Operations: Depth First Search, Breadth Components, Spanning Trees. Minimum Cost Spanning Trees.

NP- Hard and NP- Complete Problems: Basic Concepts, Cooks Theorem, NP-Hard Graph Problems, NP- Hard Scheduling Problem, NP-Hard CODE generation problem.

Text Books:

1. Computer Algorithms, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, GALGOTIA.
2. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson.
3. Fundamentals of Data structures in C++ Sahni, Horowitz,Mehta, Universities Press, 2nd Edition.

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Department of Computer Science & Engineering

M.Tech. I– I Sem (CSE)

	T	P	C
	4	0	4

Advanced Databases

Objectives:
- Understand and describe current and emerging database models and technologies.
- Study the concepts of parallel and distributed databases
- Able to describe object and object relational databases
- Explore the databases for XML, Mobile and multimedia

UNIT I: PARALLEL AND DISTRIBUTED DATABASES
Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture-Case Studies.

UNIT II: OBJECT AND OBJECT RELATIONAL DATABASES
Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III: XML DATABASES
XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT IV: MOBILE DATABASES
Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

UNIT V: MULTIMEDIA DATABASES
Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

Text Books
1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2.Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth

Edition, McGraw Hill, 2006
3. V.S.Subramanian, "Principles of Multimedia Database Systems", Harcourt India Pvt Ltd.,
2001.
4. Vijay Kumar, " Mobile Database Systems", John Wiley & Sons, 2006

References:

1. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
2. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

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Department of Computer Science &Engineeting

M.Tech. I – I Sem.(CSE)

	T	P	C
	4	0	4

Advances in Software Engineering

Objectives:

The course should enable the student
- a broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development
- an ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems

- a range of skills focused on the analysis of requirements, design and implementation of
  reliable and maintainable software, with strong emphasis on engineering principles applied over the whole development lifecycle

- an awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems.

Unit - I :

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

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

Unit – II:

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Unit – III :

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

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

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

Unit – IV :

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

Coding and Testing: Coding, Code Review, Software Documentation, Testing, Testing in the Large versus Testing in the Small, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tools, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing.

Unit – V :

Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods.

Software Maintenance: Characteristics of Software Maintenance, Software Reverse

Engineering, Software Maintenance Process Models, Estimation of Maintenance cost.

Text Books :

1. Software Engineering A Practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.

Reference Books :

1. Software Engineering, Ian Sommerville, Eighth Edition, Pearson education.
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
3. Software Engineering, A Precise Approach, PankajJalote, Wiley India,2010.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer
   International edition , 2006.

7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.
8. Software Engineering Principles and Practice, Hans Van Vliet,3rd edition, John Wiley &Sons Ltd.
9. Software Engineering 3:Domains,Requirements,and Software Design, D.Bjorner, Springer
   International Edition.

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

JNTUA College Of Engineering (Autonomous)::Anantapuram
Department of Computer Science & Engineering

M.Tech. I– ISem (CSE)

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Advanced Network Technologies

Objectives:
- To understand the concepts and techniques that have been used to design and implement the TCP/IP Internet
- To understand the issues that are driving the development of new protocols to broaden and enhance the operation of the Internet
- Understand the architecture of the Internet protocols as a layered model
- Describe the functions implemented by each protocol, the design of the protocol and the characteristics of typical implementations
- Analyze the relationships and dependencies between the protocols
- Measure and characterize the behavior of the protocols in the operating environment seen on the Internet

Outcomes:

- Acquire Knowledge on TCP/IP architecture and layers and their comparison with the OSI layers
- Ability to analyze requirements of IP routing and choose appropriate routing methods
- Ability demonstrate how internetworking devices obtain their network configuration
- Ability to identify the purpose, features and functions of current common network hardware and OSI layer with which each is associated.

Unit I:
The OSI Model and the TCP/IP Protocols suite: Protocol layer, The OSI model, TCP/IP protocol suite, Addressing
Underlying Technologies: Wired local area networks, Wireless LANs, Point to point WANs, Switched WANs.
Introduction to Network Layer: Switching, Packet switching at network layer, Network layer services and issues.

Unit II:
Delivery and Forwarding of IP Packets: Delivery, Forwarding, Structure of a router
Internet Protocol Version 4(IPv4): Datagrams, IP over ATM, Security, IP Package
Internet Protocol Version 6(IPv6): Packet format, Transition from IPv4 to IPv6
Address Resolution Protocol: Address mapping, ATM layer, ARP packages
ICMPv4 and Mobile IP: debugging tools and packages, Addressing, Agents, Three Phases, Inefficiency in mobile IP

UNIT-III: UNICAST AND MULTICAST ROUTING PROTOCOLS
Intra-and-Inter Domain Routing, Distance Vector Routing, RIP (Routing Information Protocol), Link State Routing, OSPF (Open Shortest Path First) protocol, BGP (Border Gateway Protocol), Difference between unicast, multicast and broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing (MOSPF), Multicast Distance Vector (DVMRP).

UNIT-IV: TRANSPORT LAYER PROTOCOLS
User datagram protocol (UDP)-Process-to-Process communication, User datagram, Checksum, UDP operation, Use of UDP, Package.
Transmission Control Protocol (TCP) -TCP services, Features, Segment, Connection, Flow and Error Control, Congestion Control, TCP timers, Options, TCP package, Stream Control Transmission Protocol (SCTP) Services, Features, Packet format

Unit V- IEEE 802.15 WPAN STANDARDS
Standards Organizations for Information Networking: Evolution of Local & Personal Area Networks - IEEE 802.15 Wireless Personal-Area Network Standardization Series - IEEE 802.15.1 Bluetooth Overall Architecture - Protocol Stack Physical & MAC Mechanism - Frame Formats - Connection Management & Security. Interference between Bluetooth and 802.11.

TEXT BOOKS:
1. TCP/IP Protocol Suite, Behrouz A. Forouzan, TMH
2. KavehPahlavan and Prashant Krishnamurthy, "Networking Fundamentals: Wide, Local and Personal Area Communications", JohnWiley & Sons, 2009.

REFERENCES:

1.TCP/IP, Tittel Chappell, Cengage Learning.
2. TCP/IP Illustrated, Volume,1the Protocols, W. Richard Stevens, G. Gabrani, Pearson.
3. TCP/IP Application Layer Protocols for Embedded Systems, M.Tim Jones, Networking Series
4. Ramjee Prasad and Luis Munoz, "WLANs and WPANs towards 4G Wireless", Artech House, 2003.

JNTUA College Of Engineering (Autonomous):: Anantapuram
Department of Computer Science & Engineering

M.Tech. I– ISem (CSE)	T	P	C
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Distributed and Cloud Computing
(Elective- I)

Objectives:
- Understand the cloud computing paradigm and recognize its various forms
- Gain an appreciation on the challenges and opportunities faced by cloud computing environments
- Able to implement some cloud computing features

Unit - I :

Distributed System Models and Enabling Technologies: Scalable Computing Service over the Internet; The Age of Internet Computing, Computing Trends and New Paradigms, Internet of Things and Cyber-Physical Systems. System Models for Distributed and Cloud Computing; Clusters of Cooperative Computers, Grid Computing Infrastructures, Peer-to-Peer Network Families, Cloud Computing over the Internet. Software Environments for Distributed Systems and Clouds; Service-Oriented Architecture (SOA), Distributed Operating Systems and Software Tools, Parallel/Distributed Programming Models. Performance, Security, and Energy-Efficiency: Performance Metrics and Scalability Analysis, Fault-Tolerance and System Availability, Network Threats and Data Integrity, Energy-Efficiency in Distributed Computing.

Unit – II:

Design of Cloud Computing Platforms: Cloud Computing and Service Models; Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS) Model, Platform- and Software-as-a-Service (Paas, SaaS). Architecture Design of Compute and Storage Clouds: A Generic Cloud Architecture Design, Layered Cloud Architectural development, Virtualization Support and Disaster Recovery, Architectural Design Challenges. Public Cloud Platforms: GAE, AWS and Windows Azure; Public Clouds and Service Offerings, Google Application Engine (GAE), Amazon Web Service (AWS), Microsoft Windows Azure. Inter- cloud Resource Management: Extended Cloud Computing Services, Resource Provisioning and Platform Deployment, Virtual Machine Creation and Management, Global Exchange of Cloud Resources. Cloud Security and Trust Management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Datacenters.

Unit – III :

Service Oriented Architectures: Services and Service Oriented Architectures: REST and Systems of Systems, Services and Web Services, Enterprise Multi-tier Architecture, Grid Services and OGSA, Other Service Oriented Architectures and Systems. Message-Oriented Middleware: Enterprise Bus, Publish-Subscribe Model and Notification, Queuing and Messaging Systems, Cloud and Grid Middleware applications. Discovery, Registries, Metadata, and Databases: UDDI and Service Registries, Databases and Publish-Subscribe, Metadata catalogues, Semantic Web and Grid, Job Execution Environments and Monitoring. Workflow in Service-Oriented Architectures: Basic Concepts of Workflow, Workflow Standards, Workflow Architecture and Specification, Workflow Execution Engine

Unit – IV :

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms; Cloud Capabilities and Platform Features, Traditional Features Common To Grids and Clouds, Data Features and Databases, Programming and Runtime Features. Parallel and Distributed Programming Paradigms; Parallel Computing and Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Mapping Applications to Parallel and Distributed Systems. Programming Support of Google App Engine: Programming the Google App Engine, Google File System (GFS), Bigtable, Google's NOSQL system, Chubby, Google's Distributed Lock service. Programming on Amazon AWS and Microsoft Azure: Programming on Amazon EC2, Amazon Simple Storage Service S3, Amazon Elastic Block Store EBS and SimpleDB, Microsoft Azure programming support. Emerging Cloud Software Environments: Open Source Eucalyptus and Nimbus, OpenNebula, Sector/Sphere, and OpenStack, Manjrasoft Aneka Cloud and Appliances.

Unit – V :

Grid Computing Systems and Resource Management: Grid Architecture and Service Modeling; Grid History and service families, CPU Scavenging and Virtual super computers, OGSA, Data intensive Grid service models. Grid Resource Management and Brokering: Resource Management and Job Scheduling, Grid Resource Monitoring with CGSP, Service Accounting and Economy Model, Grid Resource Brokering with Gridbus. Software and Grid Computing; Open-Source Grid Middleware Packages, The Globus Toolkit Architecture (GT4), Containers and Resource/Data Management. Grid Application Trends and security measures; Trust models for grid security enforcement, Authentication and Authorization methods, GSI. On-Line Social and Professional Networking; Online Social Network Characteristics, Graph-Theoretic Analysis of Social networks, Communities and Applications of Social Networks, Facebook: The World's Largest Content-Sharing Network, Twitter for Microblogging, News and Alert Services.

Text Books :

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra, Geoffrey Fox. MK Publishers
2. Mastering Cloud Computing, RajakumarBuyya, Christian Vecchiola, S.ThamaraiSelvi,

TMH

Reference Books :

1. Grid Computing – Joshy Joseph, Craig Fellenstein, IBM Press, 2007.
2. Grid and Cluster Compting– Prabhu, Prentice-Hall of India, 2007.
3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010
4. Cloud Computing Concepts , Technology & Architecture, Thomas Erl, ZaighamMahmood and Ricardo Puttini, Pearson Education
5. To the Cloud – Cloud Powering an Enterprise, Pankaj Arora, Raj Biyani, Salil Dave, TMH
6. Cloud Computing – A Practical Approch, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, TMH
7. Cloud Computing Principles and Paradigms, RajkumarBuyya, James Broberg, AndrzejGoscinski, Wiley
8. Enterprise Cloud Computing-Technology, Architecture, Applications, Gautam Shroff, Cambridge

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Department of Computer Science & Engineering

M.Tech. I– I Sem (CSE)

	T	P	C
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DISTRIBUTED OPERATING SYSTEMS
(Elective- I)

Objectives:
- To learn the fundamentals of Distributed Systems.
- To gain knowledge on Distributed operating system concepts that includes architecture and Communication, process, synchronization, consistency and replication, and fault tolerance.
- To design and implement sample distributed file systems.

Outcomes:
- Students will identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
- Students will examine how existing systems have applied the concepts of distributed systems in designing large systems, and will additionally apply these concepts to develop sample systems.

UNIT-I
Introduction of Distributed System & Communication: Goals, Hardware Concepts, Software Concepts, the Client-Server Model, Remote Procedure Call, Remote Object Invocation, Message Oriented Communication, Stream-Oriented Communication.

UNIT-II
Processes & Synchronization: Threads, Clients, Servers, Code Migration, Software Agents, Clock Synchronization, Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions.

UNIT-III
Consistency & Replication: Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Distribution Protocols, Consistency Protocols, Examples.

UNIT-IV
Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery.

UNIT-V
Distributed File Systems: SUN Network File System, The CODA File System, Other Distributed File Systems, Comparison of Distributed File Systems.

Text Books

Andrew S. Tanenbaum, Maarten Van Steen. Distributed Systems – Principles and Paradigms 2/e, PHI, 2004.

Reference Books

1. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design", PHI 2002.
2. Randy Chow Theodore Johnson, "Distributed Operating Systems and Algorithm Analysis", PEA, 2009.
3. George Couloris, Jean Dollimore, Tim Kind berg, "Distributed Systems Concepts and Design", 3/e, PEA, 2002.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu

Department of Computer Science & Engineering

M.Tech. I– ISem (CSE)

	T	P	C
	4	0	4

Parallel Computing
(Elective- I)

Course Outcomes:

Acquire knowledge on large scale parallel system

Ability to implement parallel programs for large-scale parallel systems

Ability to design efficient parallel algorithms and applications

Ability to be conversant with performance to analyze and model parallel programs

UNIT I - Introduction to Parallel Computing

Motivating Parallelism-Scope of parallel computing-Parallel programming platforms-Implicit Parallelism- Limitations of Memory System Performance-Dichotomy of Parallel computing platforms-Physical organization of parallel platforms-Communication costs in parallel machines-Routing mechanisms for inter connection networks.

UNIT II - Principles of Parallel Algorithm Design

Preliminaries-Decomposition techniques-characteristics of tasks and interactions-mapping techniques for load balancing-methods for containing interaction overheads-parallel algorithm models.

UNIT III - Basic Communication Operations

One to all broadcast and all to one reduction-all to all broadcast and reduction -scatter and gather –sources of overhead in parallel programs-performance metrics for parallel systems-the effect of granularity on performance.

UNIT IV - Programming Using Message Passing Paradigm

Principles of message passing programming-Building blocks-Message passing interface-Topologies and embedding-Overlapping computation with communication-Collective communication and computation operation.

UNIT V - Programming Shared Address Space Platforms

Thread basics-Why threads?-POSIX thread-Thread basics-Synchronization primitives in Pthreads-controlling thread and synchronization attributes-Composite synchronization constructs-Case study:Implementation of Chat Server.

TEXT BOOKS
1. AnanthGrama ,VipinKumar,"*Introduction to parallel computing*",Second edition,2007
2. Cameron Hughes,TraceyHughes,"*Parallel and Distributed Programming using C++*.Pearson education,2005

REFERENCES

1. Quinn, M. J., Parallel Computing: Theory and Practice (McGraw-Hill Inc.).
2. Bary Wilkinson and Michael Allen: Parallel Programming Techniques using Networked of workstations and Parallel Computers, Prentice Hall, 1999.
3. R. Buyya (ed.) High Performance Cluster Computing: Programming and Applications, Prentice Hall, 1999.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– I Sem (CSE)

T	P	C
4	0	4

3D Technologies
(Elective II)

Objectives:
- Students should be able to learn the concepts of Animations, 2D Splines & Shapes & compound object, Animation Techniques.
- This course introduces fundamental 3D theories and principles of computer modeling and animation.

UNIT –I:
Computer-based Animation &Getting Started with Max Definition of Computer-based Animation, Basic Types of Animation: Real Time , Non-real-time, Definition of Modeling, Creation of 3D objects. Exploring the Max Interface, Controlling & Configuring the Viewports, Customizing the Max Interface & Setting Preferences, Working with Files, Importing & Exporting, Selecting Objects & Setting Object Properties, Duplicating Objects, Creating & Editing Standard Primitive & extended Primitives objects, Transforming objects, Pivoting, aligning etc.

Unit-II:
2D Splines & Shapes & compound object :Understanding 2D Splines& shape, Extrude & Bevel 2D object to 3D, Understanding Loft & terrain, Modeling simple 4 objects with splines, Understanding morph, scatter, conform, connect compound objects, blob mesh, Boolean ,Pro Boolean &procutter compound object.

Unit-III:
3DModelling: Modeling with Polygons, using the graphite, working with X Refs, Building simple scenes, Building complex scenes with X Refs, using assets tracking, deforming surfaces & using the mesh modifiers, modeling with patches & NURBS 8.

Unit-IV:
Key frame Animation Creating Key frames, Auto Key frames, Move & Scale Key frame on the timeline, Animating with constraints & simple controllers, animation Modifiers & complex controllers, function curves in the track view, motion mixer etc .

Unit –V:
Animation Techniques –Non Linear and Character Animation –Posing, Timing and Refining – Working with Poses.

Text Books:
1. Beginning Blender: Open Source 3D Modeling, Animation, and Game Design By Lance Flavell

2. Mastering 3D Animation , by Peter Ratner(Author) Autodesk Maya, 2011.
3. 3Ds Max 7 Fundamentals by Ted Boardman (Mar 26, 2005) - New Riders Publication.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– I Sem (CSE)	T	P	C
	4	0	4

Computer Vision
(Elective II)

Objectives:
- The objective of this course is to understand the basic issues in computer vision and major approaches that address them.
- Students should be able to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

UNIT-I
LINEAR FILTERS: Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT II
EDGE DETECTION: Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.

UNIT-III
TEXTURE:
Representing Texture - Extracting Image Structure with Filter Banks, Representing Texture Using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids -The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes,

UNIT-IV
SEGMENTATION BY CLUSTERING: What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves

UNIT-V
RECOGNIZATION BY RELATIONS BETWEEN TEMPLATES: Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

TEXT BOOK:
1. David A.Forsyth, Jean Ponce, Computer Vision-A Modern Approach, PHI, 2003.

(w.e.f 2016-2017)

REFERENCE BOOKS:
1. Geometric Computing With Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer; 1 edition,2001 by Sommer.
2. Digital Image Processing and Computer Vision, 1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition (With CD) by Jack, Academy Press, 2000.

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Department of Computer Science & Engineering

M.Tech. I– I Sem (CSE)	T	P	C
	4	0	4

Computational Intelligence
(ELECTIVE-II)

Course Objectives:
- Computational Intelligence is the successor to Artificial Intelligence
- Offering special benefits in its applications in certain areas like Classification, Regression, Pattern Matching, Control, Robotics, Data Mining etc.
- To introduce the basic tools and techniques in Computational Intelligence such as Neural Networks and Genetic Algorithms from an application perspective to the students.

UNIT I
Introduction: Background and history of evolutionary computation, Behavioral Motivations for Fuzzy Logic, Myths and Applications areas of Computational Intelligence. Adaption, Self organization and Evolution, Historical Views of Computational Intelligence, Adaption and Self organization for Computational Intelligence, Ability to Generalize, Computational Intelligence and Soft Computing Vs Artificial Intelligence and Hard Computing.

UNIT II
Review of evolutionary computation theory and concepts: History of Evolutionary Computation, Evolution Computation Overview, Genetic algorithms, Evolutionary programming, Evolution strategies, genetic programming, and particle swarm optimization.

UNIT III
Review of basic neural network theory and concepts: Neural Network History, What Neural Networks are and Why they are useful, Neural Networks Components and Terminology, Neural Networks Topology, Neural Network Adaption, Comparing Neural Networks and Other information Processing Methods, Preprocessing and Post Processing.

UNIT IV:
Fuzzy Systems Concepts and Paradigms: Fuzzy sets and Fuzzy Logic, Theory of Fuzzy sets , Approximate Reasoning , Fuzzy Systems Implementations , Fuzzy Rule System Implementation.

UNIT V:
Computational Intelligence Implementations: Implementation Issues, Fuzzy Evolutionary Fuzzy Rule System Implementation, Best tools, Applying Computational Intelligence to Data Mining.
Performance Metrics: General Issues, Percent Correct, Average Sum-squared Error.

Textbooks:
1. Computational Intelligence - Concepts to Implementations by Eberhart& Shi

References:
1. Introduction to Genetic Algorithms by Melanie Mitchell
2. Handbook of Genetic Algorithms by Davis
3. Machine Learning by Tom Mitchell

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Department of Computer Science & Engineering

M.Tech. I– ISem (CSE)   **T   P   C**
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Data Structures And Data Bases 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

1. Write a C++ program for sorting of array integers by using following techniques.
   a) Quick Sort, b) Merge Sort, c) Selection sort.
2. Write a C++ program to implement following using arrays.
   a) Stack b)queue c) circler Queue
3. Write a C++ program to implement following using Linked list
   a) Stack b)queue
4. Write a C++ program to implement ordered list using doubly linked list
5. Write C++ program for implementing Min/Max Heap.
6. Write a C++ program to implement binary search tree operation.
7. Write a C++ program to implement AVL Tree operations
8. Write a C++ program to implement Graph traverses by using following techniques
   a) DFS b) BFS
9. Write a SQL procedure that works with multimedia objects like images, audio, video and etc,.
10. Write DTD for XML representation of bank information.
11. Write a XML Schema for XML representation of bank information.
12. Using XPath perform the basic operations (Select query with where clause) on XML representation of bank information.
13. Using XQuery perform the grouping operation on XML representation of bank information.
14. Write a JSP program to retrieve bank information from XML file.

References
4. Fundamentals of Data structures in C++ Sahni, Horowitz,Mehta, Universities Press, 2nd Edition.
5. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson.
6. DataBase system concepts $5th$ edition by Silbersechatz, korath, Sudarshan.
7. Java Server Pages O'REILLY publications Hans Bergsten.

JNTUA COLLEGE OF ENGINEERING (*Autonomous*)::Ananthapuramu

Department Of Computer Science & Engineering

M.Tech. I – II Sem.(CSE)

T	P	C
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Service Oriented Architecture

Objectives:

The course should enable the student

- Understand SOA and evolution of SOA.
- Understand web services and primitive, contemporary SOA.
- Understand various service layers.
- Understand service-oriented analysis and design based on guidelines.

UNIT I

Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA.

The Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.

UNIT II

Web Services and Primitive SOA: The Web Services Frame Work, Services, Service Descriptions, Messaging.

Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration, Choreography.

Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.

UNIT III

Principles of Service-Orientation: Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service-Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Orientation.

Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

UNIT IV

SOA Delivery Strategies: SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy.

Service Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services.

Service Oriented Analysis (Part-II-Service Modelling): Service Modeling, Service Modelling Guidelines, Classifying Service Model Logic, Contrasting Service Modeling Approaches.

Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WSDL Language Basics, Service Interface Design Tools.

Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.

UNIT V

Service Oriented Design (Part III- Service Design): Service Design Overview, Entity-Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines.

Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS- Coordination Overview, Service Oriented Business Process Design.

]TEXT BOOKS:

1. Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education.
2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education.

REFERENCE BOOKS:

1. The Definitive guide to SOA, Jeff Davies & others, Apress, Dreamtech.
2. Java SOA Cook book, E.Hewitt, SPD.
3. SOA in Practice, N.M.Josuttis, SPD.
4. Applied SOA, M.Rosen and others, Wiley India pvt. Ltd.
5. Java Web Services Architecture, J.Mc Govern, and others, Morgan Kaufmann Publishers, Elsevier.
6. SOA for Enterprise Applications, Shankar.K, Wiley India Edition.
7. SOA-Based Enterprise Integration, W.Roshen, TMH.
8. SOA Security, K.Rama Rao, C.Prasad, dreamtech press.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)	T	P	C
	4	0	4

Natural Language Processing

Objectives:
- able to explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Understand approaches to syntax and semantics in NLP.
- Understand current methods for statistical approaches to machine translation.
- Understand language modeling.
- Understand machine learning techniques used in NLP.

UNIT I:
Introduction to Natural language
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

Unit II: Grammars and Parsing
Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

UNIT III: Grammars for Natural Language
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT IV:
Semantic Interpretation
Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.
Language Modeling
Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling.

UNIT V:
Machine Translation
Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status.
Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem,

Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

TEXT BOOKS:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications : From Theory To Practice-Daniel M.Bikel and ImedZitouni , Pearson Publications.
3. Natural Language Processing, A paninian perspective, AksharBharathi,Vineetchaitanya,Prentice –Hall of India.

REFERENCES BOOKS:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) : : ANANTAPURAMU

Department Of Computer Science & Engineering

M.Tech. I – II Sem.(CSE)

	T	P	C
	4	0	4

Software Quality Assurance & Testing

Objectives:

The student should be able to:

- Understand software testing and quality assurance as a fundamental component of software life cycle
- Define the scope of software testing & quality assurance projects
- Efficiently perform testing & quality assurance activities using modern software tools
- Estimate cost of a testing & quality assurance project and manage budgets
- Prepare test plans and schedules for a testing & quality assurance project
- Develop testing & quality assurance project staffing requirements
- Effectively manage a testing & quality assurance project

UNIT I
Introduction to software quality, Challenges, Objectives, Quality Factors, Components of SQA, Contract review, Development and quality Plans, SQA Components in Project Life Cycle, SQA Defect Removal Policies, Reviews.

UNIT II
Software Testing Strategy and Environment: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy.
Building Software Testing Process: Software Testing Guidelines, Workbench Concept, Customizing the Software Testing Process, Process Preparation Checklist.

UNIT III
Software Testing Techniques: Dynamic Testing – Black Box Testing Techniques, White Box Testing Techniques, Static Testing, Validation Activities, Regression Testing.
Software Testing Tools: Selecting and Installing Software Testing tools
Automation and Testing Tools: Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.

UNIT IV
Seven Step Testing Process–I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing.

UNIT V
Seven Step Testing Process-II: Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis
Specialized Testing Responsibilities: Software Development Methodologies, Testing Client/Server Systems.

TEXT BOOKS:

1. Effective Methods for Software Testing, Third edition, William E. Perry, Wiley India, 2009
2. Software Testing – Principles and Practices, Naresh Chauhan, Oxford University Press, 2010.
3. Software Quality Assurance – From Theory to Implementation, Daniel Galin, Pearson Education, 2009.

Reference Books:
1. Testing Computer Software, CemKaner, Jack Falk, Hung Quoc Nguyen, Wiley India, rp2012.
2. Software Testing – Principles, Techniques and Tools, *M.G.Limaye*, Tata McGraw-Hill, 2009.
3. Software Testing - A Craftsman's approach, *Paul C. Jorgensen*, Third edition, Auerbach Publications, 2010.
4. Software Quality Assurance, *MilindLimaye*, Tata McGraw-Hill, 2011.

5. Software Quality – Theory and Management, *Alan C. Gillies*, Second edition, Cengage Learning,2009.

6. Software Quality – A Practitioner's approach, *Kamna Malik, Praveen Choudhary,* Tata McGraw-Hill, 2008.

7. Software Quality Models and Project Management in a Nutshell, *Shailesh Mehta*, Shroff Publishers and Distributors, 2010.

8. Software Quality Engineering – Testing, Quality Assurance and Quantifiable Improvement, *Jeff Tian*, Wiley India, 2006.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)	T	P	C
	4	0	4

Advanced Data Mining

Objectives:

- To develop the abilities of critical analysis to data mining systems and applications.
- To implement practical and theoretical understanding of the technologies for data mining
- To understand the strengths and limitations of various data mining models.

UNIT-I
Introduction about data mining, Need of data mining, Business data mining, data mining tools, Data Mining Process: CRISP Data Mining, Business Understanding, data understanding and data preparation, modeling, evaluation and deployment, SEMMAS Process, Data mining applications, comparison of CRISP & SEMMA.

UNIT-II
Memory-Based Reasoning Methods, Matching ,Weighted Matching, Distance Minimization Data Mining Methods As Tools X Contents, Association Rules in Knowledge Discovery, Market-Basket Analysis, Market Basket Analysis Benefits Demonstration on Small Set of Data, Real Market Basket Data The Counting Method Without Software.

UNIT-III
Fuzzy Sets in Data Mining, Fuzzy Sets and Decision Trees, Fuzzy Sets and Ordinal Classification, Fuzzy Association Rules, Demonstration Model, Computational Results, Testing Inferences.
Rough Sets :Theory of Rough Sets , Information System, Decision Table, Applications of Rough Sets, Rough Sets Software Tools, The Process of Conducting Rough Sets Analysis, Data Pre-Processing, Data Partitioning, Discretization, Reduct Generation, Rule Generation and Rule Filtering, Apply the Discretization Cuts to Test Dataset, Score the Test Dataset on Generated Rule set , Deploying the Rules in a Production System.

UNIT-IV
Support Vector Machines, Formal Explanation of SVM, Primal Form, Dual Form, Soft Margin, Non-linear Classification, Regression, implementation, Kernel Trick.
Use of SVM–A Process-Based Approach, Support Vector Machines versus Artificial Neural Networks, Disadvantages of Support Vector Machines, Genetic Algorithm Support to Data Mining, Demonstration of Genetic Algorithm, Application of Genetic Algorithms in Data Mining

UNIT-V
Performance Evaluation for Predictive Modeling, Performance Metrics for Predictive Modeling ,Estimation Methodology for Classification Models, Simple Split, The k-Fold Cross Validation

Bootstrapping and Jackknifing, Area Under the ROC Curve.

Applications: Applications of Methods Memory-Based Application, Association Rule Application Fuzzy Data Mining, Rough Set Models, Support Vector Machine Application, Genetic Algorithm Applications-Product Quality Testing Design, Customer Targeting .

Text Book:
[1]   Advanced Data Mining Techniques Authors: David L. Olson (Author), DursunDelen.

References :
[1]   Advances in data mining and modeling by Wai-Ki ChingMichael Kwok-Po Ng

[2]   Advanced Techniques in Knowledge Discovery and Data Mining edited by Nikhil R. Pal, Lakhmi C Jain.

[3]   Dynamic and Advanced Data Mining for Progressing Technological Development: Innovations and Systemic ApproachesA B M Shawkat Ali (Central Queensland University, Australia) and Yang Xiang (Central Queensland University, Australia)

JNTUA College of Engineering (*Autonomous*) :: Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)	**T**	**P**	**C**
	4	**0**	**4**

Cyber Security
Elective –III

Objectives:
- Learn fundamentals of cryptography and its application to network security.
- Understand network security threats, security services, and countermeasures.
- Acquire background Knowledge on well known network security protocols such as Kerberos, IPSec and SSL.
- Understand software vulnerability and Access control in the OS
- Acquire background on hash functions, authentication, firewalls, intrusion detection techniques.
- Obtain background for original research in network security, especially wireless network and cell phone security.

UNIT-I
Introduction: Cyber attacks, Defense Strategies and Techniques
Mathematical background for Cryptography: Modulo arithmetic, The greatest common divisor, Useful Algebraic Structures, Chinese Remainder Theorem
Basics of Cryptography: Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties
Secrete Key Cryptography: Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

UNIT-II
Public Key Cryptography: RSA Operations, Performance, Applications, Practical Issues
Cryptographic Hash: Properties, Construction, Applications and Performance
Discrete Logarithm and its applications: Diffie-Hellman Parameters, Other applications
Elliptic Curve Cryptography and Advanced Encryption Standard: Elliptic Curve Cryptography, Applications, Practical Considerations, Advanced Encryption Standard (AES).

UNIT-III
Key Management: Digital Certificates, Public key Infrastructure, Identity based Encryption,
Authentication-I: One-way Authentication, Mutual Authentication, Dictionary attacks,
Authentication-II: Centralized Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics
Security at the Network Layer: Security at Different Layers: Pros and Cons, IP Sec, Internet Key Exchange(IKE) protocol, Security policy and IPSec, Virtual Private Networks
Security at the Transport Layer: Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, Open SSL.

UNIT-IV
Software Vulnerabilities: Phishing, Buffer Overflow, Format string attacks, Cross-site Scripting(XSS), SQL Injection, Virus and Worm Features, Internet scanning Worms, Topological Worms, Botnets,
Access Control in the Operating System: Preliminaries, Mandatory Access Control, Role-based Access control
Firewalls: Basics, Practical issues
Intrusion Prevention and Detection: Prevention Versus Detection, Types of Intrusion detection systems, DDoS attack prevention/detection, Malware Defense.

UNIT-V
WLAN Security: IEEE 802.11 Wireless LAN Security: Background, Authentication, Confidentiality and Integrity
Cell phone Security: Preliminaries, GSM (2G) Security, Security in UMTS (3G)
RFIDs and E-Passports: RFID basics, Applications, Security issues, Addressing RFID Privacy Concerns, Electronic Passports
Electronic Payment: Introduction, Enabling Technologies, Cardholder Present E-Transactions, Payment over the Internet, Mobile Payments, Electronic cash

TEXT BOOKS:
1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.

REFERENCES:

1. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
2. Jonathan Katz, Yehuda Lindell, "Introduction to Modern Cryptography", Chapman & Hall/CRC, New York, 2007.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York, 2004.
4. Charlie Kafuman, Radia Perlman, Mike Spenciner, Network Security Private Communication in Private world, Second Edition, Prentice Hall India 2002,ISBN:81-203-2213-4

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)

	T	P	C
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Soft Computing
(Elective -III)

Course Objective
To give students knowledge of soft computing theories fundamentals, i.e. Fundamentals of artificial and neural networks, fuzzy sets and fuzzy logic and genetic algorithms

Course Outcomes
Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques

Unit - I :
Artificial Intelligence: AI Problems, Techniques, Problem Spaces, Pattern and Data
Search Techniques: Generate and Test, Hill Climbing, Best First Search Problem reduction. Knowledge Representation using Predicate Logic and Rules
Introduction: Hard Computing and Soft Computing.
Characteristics of Neural Networks: Biological Neural Networks and Features, Performance of Computer and Biological Neural Networks

Unit – II:
Artificial Neural Networks: Introduction, Basic models of ANN, important technologies Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network, Associative Memory Networks, Training Algorithms for pattern association, BAM and Hopfield Networks

Unit – III :
Unsupervised Learning Network: Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohenen-Self-Organizing Featue Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks, Special Networks- Introduction o various networks

Unit – IV :
Introduction to Classical Sets (crisp sets) and Fuzzy Sets: operations and Fuzzy sets. Classical Relations and Fuzzy Relations-Cardinality, Operations, Properties and composition, Tolerance and equivalence relations.
Membership functions: Features, Fuzzifications, membership value assignments, Defuzzification

Unit – V :
Fuzzy arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making and Fuzzy Logic Control System.
Genetic Algorithm: Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Techniques

Text Books :
  1.Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley, India, 2007.
  2.Soft Computing and Intelligent System Design- Fakhreddine O Karry, Clarence D Silva, Pearson Edition, 2004.

Reference Books :
  1. Artificial Intelligence and SoftComputing- Behavioural and Cognitive Modelling of the Human Brain- Amit Konar, CRC press, Taylor and Francis Group.
  2. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, rp2008.
  3. "Soft Computing" Sameer Roy, Pearson Education,2013.
  4. A first course in Fuzzy Logic-Hung T Nguyen and Elbert A Walker, CRC. Press Taylor and Francis Group.
  5. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford Univ. Press
  6. "Artificial Intelligence and Neural Networks" Umarao, Pearson-Sangune

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)

T	P	C
4	0	4

Information Retrieval Systems
(Elective III)

Course Objective
- To learn the different models for information storage and retrieval
- To learn about the various retrieval utilities
- To understand indexing and querying in information retrieval systems
- To expose the students to the notions of structured and semi structured data
- To learn about web search

Course Outcomes
- Ability to store and retrieve textual documents using appropriate models
- Ability to use the various retrieval utilities for improving search
- Ability to do indexing and compressing documents to improve space and time efficiency
- Ability to formulate SQL like queries for unstructured data

Unit - I :
Introduction to information retrieval
Retrieval Strategies: Vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language Models

Unit – II:
Retrieval Utilities: Relevance feedback, Clustering, N-grams, Regression analysis, Thesauri.

Unit – III :
Retrieval Utilities: Semantic networks, Parsing.
Cross-Language Information Retrieval: Introduction, Crossing the language barrier.

Unit – IV :
Efficiency: Inverted index, Query processing, Signature files, Duplicate document detection

Unit – V :
Integrating Structured Data and Text: A Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.
Distributed Information Retrieval: A Theoretical model of distributed retrieval, Web search

Text Books :
1. Information Retrieval – Algorithms and Heuristics, David A. Grossman, OphirFrieder, 2nd Edition, 2012, Springer, (Distributed by Universities Press)

Reference Books :
1. "Modern Information Retrieval Systems", Yates, Pearson Education
2. "Information Storage and Retrieval Systems " Gerald J Kowalski, Mark T Maybury., Springer, 2000
3. "Mining the Web : Discovering Knowledge from Hypertext Data" SoumenChakrabarti, , Morgan-Kaufmann Publishers, 2002
4. "An Introduction to Information Retrieval" Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, , Cambridge University Press, Cambridge, England, 2009

JNTUA College of Engineering (Autonomous): Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)	T	P	C
	4	0	4

Big Data Analytics
(Elective IV)

Course Objectives:

- To understand Big Data Analytics for different systems like Hadoop.
- To learn the design of Hadoop File System.
- To learn how to analyze Big Data using different tools.
- To understand the importance of Big Data in comparison with traditional databases.

Course Outcomes:

- To gain knowledge about working of Hadoop File System.
- Ability to analyze Big Data using different tools.

UNIT- I

Introduction to Big Data. What is Big Data? Why Big Data is Important. Meet Hadoop Data, Data Storage and Analysis, Comparison with other systems, Grid Computing. A brief history of Hadoop. Apache hadoop and the Hadoop Ecosystem. Linux refresher, VMWare Installation of Hadoop.

UNIT-II

The design of HDFS. HDFS concepts. Command line interface to HDFS.Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model. Parallel copying with distcp, keeping an HDFS cluster balanced.

UNIT-III

Introduction. Analyzing data with unix tools. Analyzing data with hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MRUnit. Running a job in local job runner. Running on a cluster, Launching a job. The MapReduceWebUl.

UNIT-IV

Classic Mapreduce. Job submission. Job Initialization. Task Assignment. Task execution .Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side.

Configuration tuning. Map Reduce Types. Input formats. Output cormats. Sorting. Map side and Reduce side joins.

UNIT-V

The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. Hive QI. Hbasics. Concepts. Implementation. Java and Map reduce clients. Loading data, web queries.

Text Books:

1. Tom White, Hadoop,"The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012.

2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,"Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH,2012.

References:

1. Big Data and Health Analytics Hardcover Katherine Marconi (Editor), Harold Lehmann (Editor)
2. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications by bartbaesens, Wiley publications.

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– IISem (CSE)	T	P	C
	4	0	4

DIGITAL IMAGE PROCESSING

-(Elective IV)

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

Unit - I :

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

Unit – II:

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

Unit – III :

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

Unit – IV :

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

Unit – V :

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

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

Text Books :

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

Reference Books :

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

JNTUA College Of Engineering (Autonomous)::Ananthapuramu
Department of Computer Science & Engineering

M.Tech. I– II Sem (CSE)	T	P	C
	4	0	4

PATTERN RECOGNITION
(Elective IV)

Objectives:
- Understand the fundamental pattern recognition and machine learning theories
- Able to design and implement certain important pattern recognition techniques
- Capable of applying the pattern recognition theories to applications of interest.

Unit - I :
Introduction to Pattern Recognition: Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition,
Pattern Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature, Feature Selection, Evaluation of Classifiers, Evaluation of Clustering

Unit – II:
Nearest Neighbour Based Classifiers: Nearest Neighbour Algorithm, Variants of the NN Algorithm , Use of the Nearest Neighbour Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection,
Bayes Classifier: Bayes Theorem, Minimum error rate classifier, Estimation of Probabilities, Comparison with the NNC, Naive Bayes Classifier, Bayesian Belief Network.

Unit – III :
Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification Using HMMs, Classification of Test Patterns.
Decision Trees: Introduction, Decision Trees for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Over fitting and Pruning, Example of Decision Tree Induction.

Unit – IV :
Support Vector Machines: Introduction, Linear Discriminant Functions, Learning the Linear Discriminant Function, Neural Networks, SVM for Classification, Linearly Separable Case, Non-linearly Separable Case.
Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers, Evaluation of Classifiers, Evaluation of Clustering

Unit – V :
Clustering: Clustering and its Importance, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets, An Application to Handwritten Digit Recognition: Description of the Digit Data, Pre-processing of Data, Classification Algorithms, Selection of Representative Patterns.

Text Books :

1. Pattern Recognition an Introduction, V. Susheela Devi M. NarasimhaMurty, University Press.
2. Pattern Recognition, SegriosTheodoridis,KonstantinosKoutroumbas, Fourth Edition, Elsevier

Reference Books :

1. Pattern Recognition and Image Analysis, Earl Gose, Richard John Baugh, Steve Jost, PHI 2004.
2. C. M. Bishop, 'Neural Networks for Pattern Recognition', Oxford University Press, Indian Edition, 2003.
3. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, Johy Wiley, 2002

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Department Of Computer Science & Engineering

M.Tech. I – II Sem.(CSE)

Research Methodology (Audit Course)

(Audit Course ForM.Tech. –II Semester Program from 2015 admitted batches onwards)

UNIT I

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

UNIT II

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.
Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.
Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

UNIT III

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

UNIT IV

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

UNIT V

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Text books:

1. **Research Methodology:Methods and Techniques – C.R.Kothari, 2ndEdition,New Age International Publishers.**

2. **Research Methodology: A Step by Step Guide for Beginners- Ranjit Kumar, Sage Publications (Available as pdf on internet)**
3. **Research Methodology and Statistical Tools – P.Narayana Reddy and G.V.R.K.Acharyulu, 1ˢᵗEdition,ExcelBooks,New Delhi.**

REFERENCES:

  1. **Scientists must Write - Robert Barrass(Available as pdf on internet)**
  2. **Crafting Your Research Future –Charles X. Ling and Quiang Yang (Available as pdf on internet)**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) : : ANANTAPURAMU

Department Of Computer Science & Engineering

M.Tech. I – II Sem.(CSE)
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SERVICE ORIENTED ARCHITECTURE & SOFTWARE TESTING LAB

Student is expected to complete the following experiments as a part of laboratory work.

Part - A

1. Develop at least 5 components such as Order Processing, Payment Processing, etc., using .NET component technology.

2. Develop at least 5 components such as Order Processing, Payment Processing, etc., using EJB Component Technology.

3. Invoke .NET components as web services.

4. Invoke EJB components as web services.

5. Develop a Service Orchestration Engine (workflow) using WS-BPEL and Implement Service Composition. For Example, a business process for planning business travels will invoke several services. This process will invoke several airline companies (such as American Airlines, Delta Airlines etc.) to check the airfare price and buy at the lowest price.

6. Develop a J2EE client to access a .NET web service.

7. Develop a .NET client to access a J2EE web service.

Part - B

1. Write programs in C Language to demonstrate the working of the following constructs:
i) do...while ii) while….do iii) if…else iv) switch v) for
2. A program written in C language for Matrix Multiplication fails.Introspect the causes for its failure andwrite down the possible reasons for its failure.
3. Consider ATM System and Study its system specifications and report the various bugs.
4. Write the test cases for Bankingapplication.
5. Create test plandocument for Library Management System.
6. Create test cases for Railway Reservation.
7. Create test plan document for Online Shopping.

Working with Tool's:

Understand the Automation Testing Approach, Benefits, Workflow, Commands and Perform Testing on one application using the following Tool's.

1. Win runner Tool for Testing.
2. Load runner Tool for Performance Testing.
3. Selenium Tool for Web Testing.
4. Bugzilla Tool for Bug Tracking.
5. Test Director Tool for Test Management.
6. Test Link Tool for Open Source Testing.

Part-C

1. Transforming Data into ARFF

2. Transforming CSV into ARFF.

3. Visualizing Arff Data Files using WEKA

4. Simulating Apriori Algorithm in WEKA

5. Create OLAP Cube from Student Data Base

6. Demonstrating Decision trees using J48 Classifier

7. Create OLAP Cube from Library Data Base

8. Create OLAP Cube from Hotel Data Base

9. Create OLAP Cube from shopping Data Base.

10.Create OLAP Cube from sales Data Base