KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
(Autonomous)

M.TECH DEGREE IN INFORMATION TECHNOLOGY (FULL TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – I

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AMT22	Applied Mathematics for Information Technology	3	1	0	4	40	60	100
14MIT12	Advanced Data Structures and Algorithms	3	1	0	4	40	60	100
14MIT13	Advanced Database Technologies	3	0	0	3	40	60	100
14MIT14	Distributed Operating Systems	3	1	0	4	40	60	100
14CNT15	Web Technologies	3	0	0	3	40	60	100
14CNT16	Cloud Computing Technologies	3	0	0	3	40	60	100
	PRACTICAL							
14CNL13	Data Structures and DBMS Laboratory	0	0	3	1	100	0	100
14CNL14	Web Technologies Laboratory	0	0	3	1	100	0	100
				Total	**23**			

CA - Continuous Assessment, ESE – End Semester Examination

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M.TECH DEGREE IN INFORMATION TECHNOLOGY (FULL TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – II

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14CNT23	Building Internet of Things	3	0	0	3	40	60	100
14CNT24	Network and Information Security	3	1	0	4	40	60	100
14CNT25	Data Sciences	3	1	0	4	40	60	100
14CNT26	Network Engineering	3	0	0	3	40	60	100
	Elective – I (Professional)	3	0	0	3	40	60	100
	Elective – II (Professional)	3	0	0	3	40	60	100
	PRACTICAL							
14CNL22	Internet of Things Laboratory	0	0	3	1	100	0	100
14CNL23	Networks and Security Laboratory	0	0	3	1	100	0	100
				Total	**22**			

CA – Continuous Assessment, ESE – End Semester Examination

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M.TECH DEGREE IN INFORMATION TECHNOLOGY (FULL TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – III

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
	Elective – III (Professional)	3	0	0	3	40	60	100
	Elective – IV (Professional)	3	0	0	3	40	60	100
	Elective – V (Open)	3	0	0	3	40	60	100
	PRACTICAL							
14CNP32	Project Work - Phase I	0	0	12	6	50	50	100
				Total	**15**			

CA – Continuous Assessment, ESE – End Semester Examination

SEMESTER - IV

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	PRACTICAL							
14CNP42	Project Work - Phase II	0	0	24	12	100	100	200
				Total	**12**			

CA- Continuous Assessment, ESE – End Semester Examination

Total Credits: 72

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
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M.TECH DEGREE IN INFORMATION TECHNOLOGY (PART TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – I

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AMT22	Applied Mathematics for Information Technology	3	1	0	4	40	60	100
14MIT12	Advanced Data Structures and Algorithms	3	1	0	4	40	60	100
14MIT13	Advanced Database Technologies	3	0	0	3	40	60	100
	PRACTICAL							
14CNL13	Data Structures and DBMS Laboratory	0	0	3	1	100	0	100
				Total	**12**			

CA - Continuous Assessment, ESE – End Semester

SEMESTER – II

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14CNT23	Building Internet of Things	3	0	0	3	40	60	100
14CNT25	Data Sciences	3	1	0	4	40	60	100
	Elective – I (Professional)	3	0	0	3	40	60	100
	PRACTICAL							
14CNL22	Internet of Things Laboratory	0	0	3	1	100	0	100
				Total	**11**			

CA – Continuous Assessment, ESE – End Semester Examination

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M.TECH DEGREE IN INFORMATION TECHNOLOGY (PART TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – III

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14MIT14	Distributed Operating Systems	3	1	0	4	40	60	100
14CNT15	Web Technologies	3	0	0	3	40	60	100
14CNT16	Cloud Computing Technologies	3	0	0	3	40	60	100
	PRACTICAL							
14CNL14	Web Technologies Laboratory	0	0	3	1	100	0	100
				Total	**11**			

CA – Continuous Assessment, ESE – End Semester Examination

SEMESTER – IV

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14CNT24	Network and Information Security	3	1	0	4	40	60	100
14CNT26	Network Engineering	3	0	0	3	40	60	100
	Elective – II (Professional)	3	0	0	3	40	60	100
	PRACTICAL							
14CNL23	Networks and Security Laboratory	0	0	3	1	100	0	100
				Total	**11**			

CA – Continuous Assessment, ESE – End Semester Examination

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
(Autonomous)

M.TECH DEGREE IN INFORMATION TECHNOLOGY (PART TIME)
CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – V

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
	Elective – III (Professional)	3	0	0	3	40	60	100
	Elective - IV (Professional)	3	0	0	3	40	60	100
	Elective - V (Open)	3	0	0	3	40	60	100
	PRACTICAL							
14CNP32	Project Work - Phase I	0	0	12	6	50	50	100
				Total	**15**			

CA – Continuous Assessment, ESE – End Semester Examination

SEMESTER - VI

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	PRACTICAL							
14CNP42	Project Work - Phase II	0	0	24	12	100	100	200
				Total	**12**			

CA- Continuous Assessment, ESE – End Semester Examination

Total Credits: 72

LIST OF ELECTIVES					
Course Code	**Course Title**	**Hours/Week**			**Credit**
		L	**P**	**T**	
14MSE01	Adhoc and Wireless Sensor Networks	3	0	0	3
14MST11	Multicore Architectures	3	1	0	4
14MSE12	Machine Learning Techniques	3	0	0	3
14MSE17	Soft Computing	3	0	0	3
14MIE02	Information Retrieval Techniques	3	0	0	3
14MIE03	Social Network Analysis	3	0	0	3
14MIE10	Biometric Security	3	0	0	3
14MIT22	Information Theory and Coding	3	0	0	3
14CNT14	Multimedia Compression Techniques *	3	0	0	3
14CNT22	High Speed Networks	3	0	0	3
14CNE08	Image Processing *	3	0	0	3
14CNE09	Embedded Computing System Design	3	0	0	3
14CNE10	Web Mining	3	0	0	3
14CNE11	Knowledge Engineering	3	0	0	3
14CNE12	Parallel Programming Paradigms	3	0	0	3
14CNE13	Software Quality and Testing	3	0	0	3
14CNE14	Operation Research Methodologies	3	0	0	3
14CNE15	Evolutionary Computation	3	0	0	3
14CNE16	3G and 4G Wireless Networks	3	0	0	3

* - Open Elective

14AMT22 APPLIED MATHEMATICS FOR INFORMATION TECHNOLOGY

3 1 0 4

UNIT – I **9**

Number Theory: Divisibility – GCD – Euclid's algorithm – Prime numbers – Fundamental theorem of arithmetic – Fermat's Little theorem – Congruence – Basic properties – Residue classes and complete residue systems – Linear congruences – Solution of congruences – Simultaneous linear congruences – Chinese remainder theorem. **Algebraic Structures**: Groups, Rings, Fields, Finite fields of the form GF(2^n). (Theorems without proof).

UNIT – II **9**

Primality Testing and Factorization: Introduction – Fermat's test – Solovay-Strassen test – Miller-Rabin test – Fibonacci test – Factorization: Trial division method – Fermat's method – Pollard-Rho Method – *p*-1 method – Continued fraction method – Quadratic-Sieve method.

UNIT – III **9**

Linear Programming: Formulation – Graphical solution – Simplex method – Big M method – Two phase method – Transportation Problem – Formulation – Initial Basic Feasible Solution – North west corner rule – Least Cost Method – Vogel's approximation method – Optimum solution by MODI method – Assignment problems – Hungarian method.

UNIT – IV **9**

Project Management: Network representation – Critical path computation – PERT Network Analysis. **Decision Analysis and Game Theory:** Decision making environment – Decision making under uncertainty – Decision making under risk – Game theory: Two-person Zero sum games – Pure and Mixed Strategies – Principle of Dominance – Solution of Mixed Strategy games – Algebraic method – Arithmetic method –Graphical method.

UNIT - V **9**

Queuing Networks: Non-Markovian Queues – M/G/1 queue – Pollaczek-Khintchine formula – Series queues – Open and Closed queuing networks.

Lecture: 45, Tutorial: 15, TOTAL: 60

REFERENCE BOOKS:

1. Neal Koblitz, "A Course in Number Theory and Cryptography", 2nd Edition, Springer, 2002.
2. Johannes A. Buchmann, "Introduction to Cryptography", 2nd Edition, Springer, 2004.
3. William Stallings, "Cryptography and Network Security: Principles and Practice", 6th Edition, Pearson Education, 2013.
4. Taha H.A., "Operations Research, An introduction", 9th Edition, Pearson Education, New Delhi, 2014.
5. Sharma J.K., "Operations Research: Theory and Applications", 5th Edition, Macmillan Company, New Delhi, 2013.
6. Frederick S. Hillier and Gerald J. Lieberman, "Introduction to Operations Research", 10th Edition, Tata McGraw Hill, New York, 2015.
7. Donald Gross and Carl M. Harris, "Fundamentals of Queuing Theory", 4th Edition, John Wiley and Sons, New York, 2008.

Course Outcomes:

On completion of the course students will be able to

- implement number theory concepts into various security applications
- understand various ways of testing and factorization of prime numbers
- analyze various linear programming and network problems
- apply the techniques of decision making in practical problems
- use queuing theory in communication

14MIT12 ADVANCED DATA STRUCTURES AND ALGORITHMS

(Common to Information Technology and Information Technology (ICW))

3 1 0 4

UNIT – I **9**

Iterative and Recursive Algorithms: Mathematical Induction - Asymptotic Notations – Algorithm Analysis - NP-Hard and NP Completeness – Divide-and-Conquer-Recurrence Equations –Towers of Hanoi-Checklist for Recursive Algorithms- Solving Recurrence Equations –The maximum-sub array problem- Strassen's algorithm for matrix multiplication- The substitution method for solving recurrences-The recursion-tree method for solving recurrences - master method for solving recurrences-Time-Space Tradeoff.

UNIT – II **9**

Sorting and Trees: Heap sort – Quick sort – Topological sort - Sorting in Linear Time -Lower bounds for sorting-Counting sort-Radix sort-Bucket sort- Elementary Data Structures – Hash Tables – Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees – B-Trees- Fibonacci Heaps

UNIT – III **9**

Algorithm Design Techniques: Divide-and-Conquer - Dynamic Programming-Greedy Algorithms– An activity-selection problem-Elements of the greedy strategy-Huffman codes–Amortized Analysis - Aggregate analysis-The accounting method-The potential method-Dynamic tables- Backtracking Algorithm – Branch-and-Bound techniques.

UNIT – IV **9**

Graph Algorithms: Elementary graph Algorithms – Depth-First Search- Breadth-First Search Minimum Spanning Trees – Single-Source Shortest Paths-The Bellman-Ford algorithm-Single-source shortest paths in directed acyclic graphs-Dijkstra's algorithms - All-Pairs Shortest Paths – Maximum flow -Flow networks-The Ford-Fulkerson method-Maximum bipartite matching - Multithreaded Algorithms

UNIT – V **9**

Linear Programming: Standard and slack forms-Formulating problems as linear programs-The simplex algorithm- Graphical method - Polynomials and FFT – Number-Theoretic Algorithms – Computational Geometry –NP-Completeness – Approximation Algorithms.

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, 3rd Edition, 2010.
2. G. Brassard and P. Bratley, "Algorithmics: Theory and Practice", Printice –Hall, 1997.
3. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press,2007.
4. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms/C++", 2nd Edition, University Press, 2007.
5. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", AddisonWesley.

Course Outcomes:

On completion of the course the students will be able to

- assess the importance of iterative and recursive algorithms
- explore various algorithmic design techniques
- illustrate various graph algorithms and their applications
- analyze various linear programming methods

14MIT13 ADVANCED DATABASE TECHNOLOGIES

(Common to Information Technology and Information Technology (ICW))

3 0 0 3

UNIT – I **9**

Physical database design and tuning: Introduction to database systems: File system versus a DBMS-Advantages of a DBMS-Describing and storing data in a DBMS-Structure of a DBMS- Tree based indexing-B+tree-Hash based indexing- Functional dependencies-Normal forms(1NF-5NF)-Introduction to physical database design-Guidelines for index selection-Examples-Clustering and indexing-indexes on multiple-attribute search keys-Enable index only plans-Data base tuning - overview-conceptual schema-queries and views-Impact of concurrency- DBMS bench marking

UNIT – II **9**

Parallel and distributed databases: Parallel database: Architecture- Parallel query evaluation-Parallelizing Individual operation- Parallel Query optimization-Distributed Database: Types – Architectures-Data Storage – Distributed query processing-Updating distributed data- Distributed Transactions – Distributed Concurrency Control – Distributed recovery

UNIT – III **9**

Object database systems and spatial data management: Object database systems: Structured Data types- Operations on Structured Data - Encapsulation and ADTs- Inheritance – Objects, OIDs, and Reference types- Database design for an ORDBMS- Spatial data management: Spatial Data Types-Spatial indexes-Grid files-R trees-Issues

UNIT – IV **9**

Enhanced data models for advanced applications : Active database concepts and triggers-Temporal database concepts-Deductive database: Overview- Datalog notation- Clausal form and Horn clauses-Interpretation of rules-Datalog programs- Evaluation of non recursive datalog queries

UNIT – V **9**

Emerging Technologies: Mobile Databases: Mobile computing architecture- Issues- Multimedia databases: Type of multimedia data - Issues –Research problems-XML Databases: XML Hierarchical data model- XML DTD,schema- XML documents and databases- Querying

TOTAL : 45

REFERENCE BOOKS:

1. Raghu Ramakrishnan, Johannes, “Database Management Systems”, McGraw Hill, Third Edition 2004.
2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
3. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
4. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
5. C.J.Date, A.Kannan and S.Swamynathan, ”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

Course Outcomes:

On completion of the course the students will be able to

- select the appropriate high performance database like parallel and distributed database
- model and represent the real world data using object oriented database
- represent the data using XML database for better interoperability

14MIT14 DISTRIBUTED OPERATING SYSTEMS

(Common to Information Technology and Information Technology (ICW))

3 1 0 4

UNIT – I **9**

Process Synchronization: Functions of an Operating System – Design Approaches –Types of Advanced Operating Systems- synchronization mechanisms- process deadlocks**:** Preliminaries – Models of Deadlocks – Models of Resources – A Graph-Theoretic Model of a System State – Necessary and Sufficient Conditions for a Deadlock – Systems with Single Unit-Requests – Systems with only Consumable Resources – Systems with only Reusable Resources

Distributed Operating System: Architecture of distributed systems-Theoretical foundations: Inherent Limitations of a Distributed System – Lamport's Logical clocks – Vector Clocks – Casual Ordering of Messages – Global State – Cuts of a Distributed Computation – Termination Detection-Distributed mutual exclusion -Distributed deadlock detection-agreement protocols: The System Model – A Classification of Agreement Problems – Solutions to the Byzantine Agreement Problem – Applications of Agreement Algorithms

UNIT – II **9**

Distributed Resource Management: Distributed file systems – Architecture – Mechanisms for Building Distributed File Systems – Design Issues – Case Studies – Log-Structured File Systems-Distributed shared memory**:** Architecture and Motivation – Algorithm for Implementing DSM – Memory Coherence Protocols – Design Issues – Case Studies-Distributed scheduling**:** Motivation – Issues in Load Distributing – Components of a Load Distributing Algorithm – Stability – Load Distributing Algorithm – Performance Comparison – Selecting a Suitable Load Sharing Algorithm – Requirements for Load Distributing – Load Sharing Policies – Task Migration – Issues in Task Migration

UNIT – III **9**

Failure Recovery and Fault Tolerance: Basic Concepts – Classification of Failures – Backward and Forward Error Recovery – Backward Error Recovery :Basic Approaches – Recovery in Concurrent Systems – Consistent Set of Check points – Synchronous Check pointing and Recovery – Asynchronous Check pointing and Recovery – Check pointing for Distributed Database Systems - Recovery in Replicated Distributed Database Systems-Fault tolerance: Issues – Atomic Actions and Committing – Commit Protocols – Nonblocking Commit Protocols – Voting Protocols – Dynamic Voting Protocols – The Majority based Dynamic Voting Protocols – Failure Resilient Processes – Reliable Communication.

UNIT – IV **9**

Multiprocessor Operating Systems: Multiprocessor system architectures- Basic Multiprocessor System Architectures – Interconnection Networks for Multiprocessor Systems – Caching – Hypercube Architectures-multiprocessor operating systems **:** Structures of Multiprocessor Operating Systems – Operating System Design Issues – Process Synchronization – Process Scheduling – Memory Management: The Mach Operating System – Reliability / Fault Tolerance: The Sequoia System

UNIT – V **9**

Database Operating Systems: Requirements of a Database Operating System -concurrency control**:** A Concurrency Control Model of Database Systems – Serializability Theory – Distributed Database Systems- concurrency control algorithms: Introduction – Basic Synchronization Primitives – Lock Based Algorithms – Time Stamp Based Algorithms – Optimistic Algorithms – Concurrency Control Algorithms: Data Replication.

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. Mukesh Singhal, "Advanced concepts in operating systems", Tata McGraw Hill, 2008.
2. Tanenbaum, Andrew S.," Modern Operating Systems", 3rd Edition, Prentice Hall, 2008.
3. Tanenbaum Andrew S, Albert S Woodhull, "Operating Systems Design and Implementation", 3rd Edition, Prentice Hall, 2006.
4. Sinha, Pradeep K. "Distributed Operating System: Concepts and Design", IEEE Computer Society Press, PHI, 2004.
5. Tanenbaum, Andrew S., "Modern Operating Systems", 2nd Edition, Pearson Education, New Delhi, 2004.

Course Outcomes:

On completion of the course the students will be able to

- identify the various process synchronization mechanisms and demonstrate the distributed mutual exclusion algorithms deadlock detection and agreement protocols of distributed operating system
- explore various resource management techniques for distributed systems
- illustrate various failure recovery and fault-tolerant techniques and issues
- correlate the working principles of multiprocessor OS and database OS with distributed event

14CNT15 WEB TECHNOLOGIES

3 0 0 3

UNIT – I **9**

Web Technology and Design: Introduction to Web technology – Dynamic Web Pages - Active Web Pages. Problems with Statelessness – Sessions and Sessions Management – Techniques for maintaining State Information. Introduction to HTML 5 Tags - Cascading Style Sheet.

UNIT – II **9**

Client Side Scripting: Introduction to Java Scripting- Control Statements- Function - Objects – Document Object Model and Collections- Event Handling - XML introduction – DTD-Schema

UNIT – III **9**

Server Side Scripting: Web Application Development with ASP .NET in C#: Multitier Application Architecture, Standard Web Controls, Validation Controls, Session Tracking- Database connectivity - Case Study

UNIT – IV **9**

Java Server Pages: JSP Overview - Directive Elements- Action Elements- Java Bean components in JSP- Custom Tag libraries- JSP Standard Tag Library – Developing custom Tag Libraries – Error handling and Debugging

UNIT – V **9**

Enterprise Application Development: Working With Model-View-Controller – Introduction to J2EE –Server Side Component Architecture – EJB overview –Types – Session Beans – Message driven Bean - Entity Beans – Persistent Entity Beans –Building business logic with Session bean – Messaging with Message Driven Bean - Transactions and Security – Bean managed transaction – Exposing EJB as a Web Services

TOTAL: 45

REFERENCE BOOKS:

1. Achyut S. Godbole, Atul Kahate, "Web Technologies – TCP/IP to Internet Application Architecture", Reprint, Tata Mcgraw Hill, 2006.(Unit – I)
2. Deitel & Deitel, "Internet & World Wide Web - How to Program", 5th Edition, Pearson Education, India, 2012. (Unit – I ,II and III)
3. Hans Bergsten , "Java Server Pages" , 3rd Edition, O′Reilly, 2003. (Unit IV)
4. Debu Panda, Reza Rahman and Derek Lane, "EJB 3 in Action", 2nd Edition, Dreamtech Press, 2007. (Unit-V)
5. Asbury Stephen and Weiner Scott R., "Developing Java Enterprise Applications", 2nd Edition, Wiley Publications, 2001.

Course Outcomes:

On completion of the course the students will be able to

- understand about web architecture and design web pages
- create interactive web pages using Markup languages, CSS, Java Script
- implement Server-Side Scripting using ASP.NET and JSP
- develop Enterprise Applications using EJB
- develop Enterprise Applications for online communities in the business world

14CNT16 CLOUD COMPUTING TECHNOLOGIES

3 0 0 3

UNIT – I **9**

Introduction: Characteristics and Benefits, The Evolution of Cloud Computing: Hardware Evolution, Software Evolution, Server Virtualization – WEB Services Delivered from the cloud: Communication –as-a-Service (CaaS), infrastructure–as-a-Service (IaaS), Monitoring –as-a-Service (MaaS), Platform–as-a-Service (PaaS), Software –as-a-Service (SaaS).

UNIT – II **9**

Virtualization: Levels of Virtualization - Virtualization Structures /Tools and Mechanisms - Virtualization of CPU, Memory and I/O Devices – Virtual Clusters and Resource Management – Virtualization for Data-Center Automation

UNIT – III **9**

Cloud Platform Architecture: Cloud Computing and Service Models – Data- Center Design and Interconnection Networks- Architectural Design of Compute and Storage Clouds- Public Cloud Platforms: GAE, AWS and Azure-Inter-Cloud Resource Management.

UNIT – IV **9**

Cloud Programming: Parallel and Distributed Programming Paradigms- Programming Support of Google App Engine- Programming on Amazon AWS and Microsoft Azure- Emerging Cloud Software Environments.

UNIT – V **9**

Security: Cloud Security Challenges – Security Management, Governance- Risk Management, Assessment – Security Portfolio Management, Awareness- Policies, Standards and Guidelines – SecSDLC – Third-Party Risk Management- Security Architecture Design- Data Privacy, Governance, Security-Application Security – Virtual Machine Security- Identify Access Management (IAM)-Physical Security.

TOTAL: 45

REFERENCE BOOKS:

1. Kai Hwang, Geoffrey C. Fox and Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. Toby Velte, Anthony Velte and Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
4. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly, 2009.
5. James E. Smith and Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

Course Outcomes:

On completion of the course the students will be able to

- articulate the main concepts, key technologies, strengths and limitations of cloud computing
- identify the architecture, infrastructure and delivery models of cloud computing
- explain the core issues of cloud computing such as security, privacy and interoperability
- choose the appropriate technologies, algorithms and approaches for the related issues

14CNL13 DATA STRUCTURES AND DBMS LABORATORY

0 0 3 1

LIST OF EXPERIMENTS /EXERCISES:

Write a C program to implement the following:

1. Recursive Algorithm - Tower of Hanoi for N Number of Disks.
2. Red-Black Tree Operations.
3. Collision Resolution Technique-Any One Hashing Method.
4. Greedy Technique - An Activity Selection Problem
5. Branch-and-Bound techniques – Travelling Salesman Problem
6. Single-Source Shortest Paths-The Bellman-Ford algorithm
7. Data Definition, Manipulation of Tables and Views
8. Database Querying – Simple queries, Nested queries, Sub queries and Joins
9. Embedded SQL
10. Database Connectivity with Front End Tools / Programming Languages
11. High level language extensions - PL/SQL Basics, Procedures and Functions
12. Database Design and Implementation (Case Study)

TOTAL : 45

REFERENCES / MANUALS / SOFTWARE:

- Linux/Windows-Operating System
- Oracle/DB2/MySQL

Course Outcomes:

On completion of the course the students will be able to

- identify and implement appropriate data structure for a given problem
- design algorithms using graph and tree structure to solve real life problems
- understand and implement algorithms using various design techniques
- model and design the databases for real world data using any database languages

14CNL14 WEB TECHNOLOGIES LABORATORY

0 0 3 1

LIST OF EXPERIMENTS /EXERCISES:

1. Create a Website using HTML and CSS
2. Design a dynamic Website using JavaScript
3. Design a dynamic web page with Event Handling
4. Develop Web application using ASP.NET Controls
5. Develop Web Application using ASP.NET using session tracking
6. Developing Web Application using JSP
7. Developing Web Application using JSP with custom tag libraries
8. Developing Web Application using Session bean
9. Design a Web Application using Entity bean
10. Design Web Applications using Transaction and Security

TOTAL : 45

REFERENCES / MANUALS / SOFTWARE:

- JDK.18/Web server/Application server/ visual studio 2013

Course Outcomes:

On completion of the course the students will be able to

- design and develop static web site
- create a dynamic web site through ASP.NET and JSP
- develop enterprise applications for real world applications
- develop secure and deploy real world web applications

14CNT23 BUILDING INTERNET OF THINGS

3 0 0 3

Pre-requisites: Computer Networking Concepts, Wireless Networking Concepts

UNIT – I **9**

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

UNIT – II **9**

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

UNIT – III **9**

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

UNIT – IV **9**

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

UNIT – V **9**

Case Studies and Advanced Topics: Various Real time applications of IoT-Connecting IoT to cloud – Cloud Storage for Iot–Data Analytics for IoT –Software and Management Tools for IoT

TOTAL : 45

REFERENCE BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press, 2015.
2. Matt Richardson and Shawn Wallace, “Getting Started with Raspberry Pi”, O'Reilly, 2014.

Course Outcomes:

On completion of the course the students will be able to

- design a portable IoT using Raspberry pi and relevant protocols
- develop web services to access/control IoT devices
- deploy an IoT application and connect to the cloud
- analyze applications of IoT in real time scenario

14CNT24 NETWORK AND INFORMATION SECURITY

3 1 0 4

UNIT – I **9**

Introduction and Symmetric Key Cryptography: Introduction- Services, Mechanisms and attacks-OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques)- Finite fields-Data Encryption Standard-Advanced Encryption Standard (AES).

UNIT – II **9**

Public Key Cryptography, Hash Functions and Digital Signatures: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography, Authentication requirement – Authentication function – MAC – Hash function - MD5 - SHA – HMAC, Digital signature – DSS – EI Gamal – Schnorr.

UNIT – III **9**

Security Practice and System Security: Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - Intruder – Intrusion detection system – Firewalls design principles – Trusted systems.

UNIT – IV **9**

E-Mail, IP and Web Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME- IPSecurity**:** Overview of IPSec - Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange - Web Security**:** SSL/TLS Protocol- Secure Electronic Transaction (SET).

UNIT – V **9**

Legal and Ethical issues in Security: Protecting Programs and Data – Information and the Law – Rights of Employees and Employers – Software Failures – Computer Crime – Privacy – Ethical Issues in Computer Security. Need for security : The security SDLC - Business needs, threats, attacks - NSTISSC security model, ISO, NIST and VISA models

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. William Stallings, "Cryptography and Network Security", 6th Edition, Pearson Education, March 2013. (UNIT I, II, III, IV)
2. Whitman Michael E. and Mattord Herbert J., "Principles of Information Security", 4th Edition, Cengage Learning, 2012. (UNIT V)
3. Behrouz A. Ferouzan, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
4. Man Young Rhee, "Internet Security: Cryptographic Principles, Algorithms and Protocols", 1st Edition, Wiley Publications, 2003.
5. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.

Course Outcomes:

On completion of the course the students will be able to

- compare various cryptographic techniques
- design Secure applications
- identify the flaws in system and web security

14CNT25 DATA SCIENCES

3 1 0 4

UNIT – I **9**

Introduction: Big Data Overview- Practice in Analytics – Key Roles of Big data Eco system – Examples – Data Analytics life cycle: Discovery – Data Preparation – Model Planning – Model Building – Communicate results – Operationalize – Case study: Global Innovation Network and Analysis.

UNIT – II **9**

Data Analytical Methods: Linear Regression: Use Cases – Model description – Diagnostics – Logistic Regression: Use Cases – Model description – Diagnostics – Reasons to choose and cautions – Additional regressional models – Case studies

UNIT – III **9**

Big Data Technologies: Big data - Types of Data – Characteristics – Evolution – Definition – Challenges – Other Characteristics Business Intelligence Vs Big Data – Big Data Analytics: Classification of Analytics – Top Challenges and importance – Data Science – Data Scientist - Terminologies used in Big data environments – Big data Technology landscape: NoSQL – Hadoop.

UNIT – IV **9**

Hadoop: Introduction – RDBMS Vs Hadoop – Distributed Computing Challenges – Hadoop History and Overview – Hadoop Distributed File System – Processing Data with Hadoop – Managing Resources and Applications with Hadoop - Interacting with Hadoop Ecosystem.

UNIT – V **9**

MongoDb and Cassandra: MongoDB : Introduction to MongoDB – RDBMS and MongoDB - Data Types in MongoDB – MongoDB Query Language. Cassandra: Introduction – Features of Cassandra – CQL Data Types – Operations – Collections – Alter Commands – Import and Export – Querying System Tables.

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley and Sons, 2015.
2. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 1st Edition, Wiley, 2015.
3. Frank J. Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
4. Holden Kararu, Andy Konwinski, Padtrick Wendell and Matei Zaharia, "Learning Spark", O'Reilly Books, 2015.

Course Outcomes:

On completion of the course the students will be able to

- understand big data and the challenges of capturing, storing and retrieving massive data
- acquire hands-on experience with relevant software tools, languages, data models and environments for data processing and visualization
- use data management techniques to store data locally and in cloud infrastructures
- use statistical methods and visualization to quickly explore data
- apply statistics and computational analysis to make predictions based on data

14CNT26 NETWORK ENGINEERING

3 0 0 3

UNIT – I **9**

Foundations of Networking: Communication Networks – Network Elements – Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching - Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration.

UNIT – II **9**

Quality of Service: Integrated Services Architecture – Queuing Discipline – Random Early Detection – Differentiated Services- RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – RTP – Protocol Architecture, Data Transfer Protocol

UNIT – III **9**

Congestion Control: Effects of Congestion – Congestion and Control – Traffic Management – congestion control in Packet Switching Networks-Frame Relay Congestion Control- Link level Flow and Error Control – Link control Mechanisms -TCP Traffic Control -TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management

UNIT – IV **9**

Network Device Architecture: Network Devices – Switch – Router – Hardware Components- Software – Configuration – Routing Concepts- Static Routing – Dynamics Routing – Routing Information Protocol – Open Shortest Path First Protocol – Multiplexers, Modems and Internet Access Devices – Switching and Routing Devices- Router Structure - Configuring EGP –RIP – OSPF – Hub - Bridges – Routers – Multicast Architecture.

UNIT – V **9**

Software Defined Networking: SDN approach-SDN Data plane and openflow-SDN control plane: SDN Control Plane Architecture-SDN Application Plane: SDN Application plane Architecture.

TOTAL: 45

REFERENCE BOOKS:

1. Kurose James F. and Ross Keith W., "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education, New Delhi, 2012.
2. William Stallings, "High Speed Networks and Internet- Performance and Quality of Service "**,** 2nd Edition, Pearson Education, 2002.
3. James Macfarlane, "Network Routing Basics: Understanding IP Routing in Cisco Systems", 1st Edition,Wiley, 2006.
4. Wendell Odom and Rick McDonald, "Routers and Routing Basics CCNA 2 Companion Guide (Cisco Networking Academy)", Cisco Press, 2006.
5. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", 1st Edition, Pearson Education, 2016.

Course Outcomes:

On completion of the course the students will be able to

- gain an understanding of the principles of network engineering
- acquire knowledge of advanced network engineering concepts and techniques
- gain the capability for understanding of network engineering principles for network, system and service management
- understand the modern approaches to computing and networking

14CNL22 INTERNET OF THINGS LABORATORY

0 0 3 1

LIST OF EXPERIMENTS /EXERCISES:

1. Simple light controller(Traffic) using Arduino
2. Reading sensor data using Arduino
3. Create simple alarm system
4. Interface RFID with Arduino
5. Control and monitor the temperature of the elements using temperature sensor
6. Create your own smart light using Raspberry pi
7. Monitor pollution levels using Raspberry pi and Python
8. Interface GSM module with Raspberry pi/Arduino
9. Demonstrate wireless sensor network using XBee module
10. IoT Python app with a Raspberry Pi and IBM Bluemix
11. Mini Project

TOTAL: 45

REFERENCES / MANUALS / SOFTWARE:

- Raspberry pi , Arduino, XBee, GSM Module and Sensors
- Linux ,Python and C

Course Outcomes:

On completion of the course the students will be able to

- make smart appliances
- handle and build smart devices
- work on IoT and IoE
- find solutions for the societal problems

14CNL23 NETWORKS AND SECURITY LABORATORY

0 0 3 1

LIST OF EXPERIMENTS /EXERCISES:

1. Client-Server programming
2. Socket programming (TCP/UDP)
3. Network analyzer
4. Traffic Analysis
5. Protocol Analysis
6. Study of Software Defined Networking tools
7. Implementation of any two stream cipher algorithms to provide confidentiality service using Symmetric key.
8. Implementation of any two block cipher algorithms to provide confidentiality service using Symmetric key.
9. Implementation of any two public key algorithms to provide confidentiality service.
10. Implementation of any two key management algorithms.
11. Implementation of any two signature algorithms to provide authentication service.
12. Study of any two security tools.

TOTAL: 45

REFERENCES / MANUALS / SOFTWARE:

- Linux and C
- Java, C,C++
- Network Analyzer Tools: WireShark/Xirrus Wi-Fi Inspector/Wireless Netview

Course Outcomes:

On completion of the course the students will be able to

- gain knowledge about network connectivity and network components
- analyse the network traffic
- implement network security services and techniques
- implement security algorithms using sender and receiver approach

14MSE01 ADHOC AND WIRELESS SENSOR NETWORKS

(Common to Computer Science and Engineering, IT and IT(ICW))

3 0 0 3

Pre-requisites: Computer Networks

UNIT – I **9**

Wireless Network: Characteristics of wireless channel - Fundamentals of WLANs - IEEE 802.11 Standard - HIPERLAN Standard–Bluetooth-Cellular Concept and Architecture – WLL - Wireless ATM - IEEE 802.16 Standard - HIPERACCESS – Ad hoc Wireless Network - Recent Advances in Wireless Network.

UNIT – II **9**

MAC Protocols: MAC Protocols design issues - Goals and Classification - Contention based Protocols –MACAW –Contention based reservation scheme-D-PRMA-Contention based with scheduling mechanisms-DPS

UNIT – III **9**

Routing Protocols: Design issues and Classification - Table-driven(DSDV), On-demand(DSR)-Hybrid routing protocols(ZRP) - Routing protocols with efficient flooding mechanisms(PLBRP) – Hierarchical(HSRP) and power-aware routing protocols(PARM). Multicast routing protocols design issues and operation - Architecture reference model – Classification.

UNIT – IV **9**

Introduction to WSN: Overview of Wireless Sensor Networks-Architecture-Constraints and Challenges-Advantages and Applications - Data Dissemination and Gathering-MAC – Localization and Tracking

UNIT – V **9**

WSN Routing and QoS: Geographic Routing- Attribute Routing – Infrastructure Establishment-Sensor Tasking and Control - Quality of Sensor Network-Evolving Standards-Other Issues

TOTAL: 45

REFERENCE BOOKS:

1. Siva Ram Murthy C. and Manoj B.S., “AdHoc Wireless Networks: Architectures and Protocols”, Prentice Hall PTR, 2007.
2. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks - an information processing approach”, Morgan Kaufman Publishers, 2004.
3. Toh C.K., “AdHoc Mobile Wireless Networks: Protocols and Systems”, Prentice Hall PTR, 2001.
4. Mohammad Ilyas, “The Handbook of AdHoc Wireless Networks”, CRC press, 2002.
5. Ramin Hekmat, “Ad-hoc Networks: Fundamental Properties and Network Topologies”, Springer, First Edition, 2006.

Course Outcomes:

On completion of the course the students will be able to

- express the basic wireless network concepts
- relate the MAC and routing protocols of ad hoc networks
- outline the application of WSN and usage of higher layers of adhoc networks

14MST11 MULTICORE ARCHITECTURES

(Common to Computer Science and Engineering and Information Technology (ICW))

3 1 0 4

UNIT – I **9**

Fundamentals of Quantitative Design and Analysis: Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design- Classes of Parallelism – ILP, DLP, TLP and RLP – Multi Threading – SMT and CMP Architectures – Limitations of Single Core Processors – The Multi Core era- Case Studies of Multi Core Architectures.

UNIT – II **9**

DLP in Vector, SIMD and GPU Architectures: Vector Architectures – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units- Detecting and Enhancing Loop Level Parallelism – Case Studies.

UNIT – III **9**

TLP and Multiprocessors: Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues – Performance Issues – Synchronization Issues – Models of Memory Consistency – Inter Connection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

UNIT – IV **9**

RLP and DLP in Warehouse Scale Architectures: Programming Models and Workloads for Warehouse scale Computers – Architecture for Warehouse scale computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

UNIT – V **9**

Architectures for Embedded Systems: Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – Digital Signal Processor – Embedded Multi Processors – Case Studies.

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann, Elsevier, Fifth Edition, 2012.
2. Kai Hwang, “Advanced Computer Architecture”, Tata McGraw-Hill Education, 2003.
3. Richard Y, Kain, “Advanced Computer Architecture: A Systems Design Approach”, Prentice Hall, 2011.
4. David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture: A Hardware/ Software Approach”, Morgan Kaufmann, Elsevier, 1997.

Course Outcomes:

On completion of the course the students will be able to

- identify the limitations of ILP and the need for multi core architectures
- identify the issues related to multiprocessing
- summarize the salient features of different multi core architectures and how they exploit parallelism
- critically analyze the different types of inter connection networks
- recognize the architecture of GPUs, Warehouse scale computers and embedded processors

14MSE12 MACHINE LEARNING TECHNIQUES

(Common to Computer Science and Engineering & IT (ICW))

3 0 0 3

UNIT – I **9**

Machine Learning: Introduction–Supervised Learning–Learning a Class from Examples–VC Dimension–PAC Learning–Noise–Learning Multiple Classes–Regression–Model Selection and Generalization–Bayesian Decision Theory: Classification–Losses and Risks–Discriminant Functions–Utility Theory–Value of Information–Bayesian Networks–Influence Diagrams- Parametric Methods: Maximum Likelihood Estimation–Evaluating an Estimator–Bayes' Estimator–Parametric Classification–Regression–Tuning Model Complexity–Model Selection Procedures

UNIT – II **9**

Multivariate Methods: Data–Parameter Estimation–Estimation of Missing Values–Multivariate Normal Distribution–Multivariate Classification and Regression- Dimensionality Reduction: Subset Selection– Principal Components Analysis–Factor Analysis–Multidimensional Scaling–Linear Discriminant Analysis- Clustering: k–Means Clustering–Expectation–Maximization Algorithm–Latent Variable Models–Hierarchical Clustering.

UNIT – III **9**

Nonparametric Methods: Nonparametric Density Estimation and Classification-Generalization to Multivariate Data–Condensed Nearest Neighbor–Smoothing Models - Decision Trees: Univariate Trees–Pruning–Rule Extraction–Learning Rules–Multivariate Trees- Linear Discrimination: Generalizing the Linear Model–Geometry of the Linear Discriminant–Pairwise Separation–Parametric Discrimination–Gradient Descent–Logistic Discrimination–Discrimination by Regression–Support Vector Machines

UNIT- IV **9**

Multilayer Perceptrons: Training a Perceptron–Learning Boolean Functions - Back Propagation Algorithm – Training Procedures – Tuning the Network Size – Bayesian View of Learning – Learning Time - Local Models: Competitive Learning – Radial Basis Functions – Rule Based Knowledge – Normalized and Competitive Basis Functions– Learning Vector Quantization – Mixture of Experts

UNIT- V **9**

Classification Algorithms Comparison: Cross–Validation and Resampling–Measuring Error–Interval Estimation–Hypothesis Testing–Assessing a Classification's Performance–Comparing Classification Algorithms– Combining Multiple Learners: Voting–Error–Correcting Output Codes–Bagging–Boosting–Stacked Generalization–Cascading–Reinforcement Learning: Single State Case–Elements of Reinforcement Learning–Model–Based Learning–Temporal Difference Learning–Generalization

TOTAL : 45

REFERENCE BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
2. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006
3. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
4. Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2008

Course Outcomes:

On completion of the course the students will be able to

- describe the applications of Machine Learning and different parametric methods
- identify suitable Supervised or Unsupervised learning methods for an application
- apply Neural Networks to solve real world problems

14MSE17 SOFT COMPUTING

(Common to Computer Science and Engineering and Information Technology (ICW))

3 0 0 3

Pre-requisites: Basic knowledge of elementary calculus and linear algebra

UNIT – I **9**

Artificial Neural Network: Introduction to Soft Computing, Artificial Neural Network: Supervised Learning Networks, Associative Memory Networks

UNIT - II **9**

Unsupervised Learning: Introduction, Fixed weight competitive networks, Kohonen SOM, Learning Vector Quantization, Counter Propagation Network, Adaptive Resonance Theory Network : ART1 and ART2, Special Networks

UNIT – III **9**

Fuzzy Logic: Introduction: Fuzzy Logic, Classical Sets, Fuzzy Sets, Classical Relation and Fuzzy relation, Membership Functions, Defuzzification, Fuzzy Rule-Base and Approximate Reasoning

UNIT– IV **9**

Genetic Algorithm: Introduction, Traditional optimization and search Techniques, Search Space, Operators, Stopping Condition, Constraints, Problem Solving, Schema Theorem, Classification, Holland Classifier System, Genetic Programming

UNIT – V **9**

Hybrid Soft Computing Techniques: Introduction, Neuro-Fuzzy Hybrid System, Genetic-Neuro Hybrid System, Genetic-Fuzzy Hybrid System, Fuzzy-Genetic Hybrid System, Simplified Fuzzy ARTMAP, Application of Soft Computing, CASE Study.

TOTAL : 45

REFERENCE BOOKS:

1. S.N. Sivanandan and S.N. Deepa, “Principles of Soft Computing”, Wiley India, 2007. ISBN: 10: 81-265-1075-7.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
3. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
4. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education.

Course Outcomes:

On completion of the course the students will be able to

- identify and describe soft computing techniques and their roles in building intelligent machines
- recognize the feasibility of applying a soft computing methodology for a particular problem
- identify and select a suitable Soft Computing technology to solve the problem; and construct a solution and implement a Soft Computing solution
- design Soft Computing Systems by hybridizing various other techniques

14MIE02 INFORMATION RETRIEVAL TECHNIQUES

(Common to IT, IT(ICW) & Computer Science and Engineering)

3 0 0 3

Pre-requisites: DBMS, DWDM, Web Technology

UNIT – I **9**

Introduction and Classic IR Models : Information Retrieval – The IR Problem – The IR System – Search Interfaces Today-Visualization in Search Interfaces- Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Retrieval Evaluation

UNIT – II **9**

Relevance Feedback, Languages and Query Properties: A Framework for feedback methods-Explicit feedback-Implicit feedback through local analysis-Global analysis-Documents: Metadata-Documents formats-Markup languages-Queries.

UNIT – III **9**

Text Operations, Indexing and Searching: Text Properties-Document Preprocessing – Organizing Documents- Text Compression – Text Classification-Indexing and Searching – Inverted files – Boolean Queries – Sequential searching – Multidimensional Indexing.

UNIT – IV **9**

Web and Multimedia Information Retrieval: Introduction-The Web-Search Engine Architectures-Ranking-User Interaction-Browsing-Web Crawling-Structured Text Retrieval-Multimedia Information Retrieval.

UNIT – V **9**

Applications: Enterprise Search-Tasks-Architecture-Evaluation- Library Systems-OPAC-IR System and Databases-Digital Libraries.

TOTAL : 45

REFERENCE BOOKS:

1. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", 2nd Edition, Pearson Education Asia, 2011.
2. G.G. Chowdhury, "Introduction to Modern Information Retrieval", Neal-Schuman Publishers, 2nd Edition, 2003.
3. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", Pearson Education, 2000.
4. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms, and Heuristics", Academic Press, 2000.
5. Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press, 2000.

Course Outcomes:

On completion of the course the students will be able to

- understand and apply the basic concepts of information retrieval
- appreciate the limitations of different information retrieval techniques
- write programs to implement search engines
- evaluate search engines

14MIE03 SOCIAL NETWORK ANALYSIS

(Common to IT, IT (ICW) & Computer Science and Engineering)

3 0 0 3

UNIT – I **9**

Introduction to the semantic web and social networks: Limitations of the current Web – The Semantic Solution – Development of the Semantic Web - The emergence of the social web – Discussion-Development of Social Network Analysis – Key concepts and measures in network analysis.

UNIT – II **9**

Web data and semantics in social network applications: Electronic discussion networks – Blogs and online communities – Web- based Networks- Ontologies and their role in the Semantic Web - Ontology languages for the Semantic Web-State-of-the-art in network data representation – Ontological representation of social relationships – Aggregating and reasoning with social network area- Building semantic web application with social network features – Flink: the social networks of the Semantic web community – open academia: distributed, semantic- based publication management

UNIT – III **9**

Evaluation of web-based social network extraction : Differences between survey methods and electronic data extraction – Context of the empirical study – Data collection- Preparing the data – Optimizing goodness of fit – Comparison across method and networks – Predicting the goodness of fit – Evaluation through analysis- Semantic-based social network analysis in the sciences - Ontologies - emergent semantics in folksonomy systems.

UNIT – IV **9**

Social media mining and search: Discovering Mobile Social Networks by Semantic Technologies – Online Identities and Social Networking – Detecting Communities in Social Networks – Concept of Discovery in Youtube.com using Factorization method – Mining Regional Representative Photos from Consumer – Generated Geotagged Photos – Collaborating Filtering Based on Choosing a Different Number of Neighbors for Each User – Discovering Communities from Social Networks : Methodologies and Applications.

UNIT – V **9**

Social network infrastructures and communities: Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Networks Communities, Privacy in online social networks: Managing Trust in Online Social Networks – Security and Privacy in Online Social Networks – Investigation of Key-Player Problem in Terrorist Network Using Bayes Conditional Probability – Optimizing Targeting of Intrusion Detection System in Social Networks – Security Requirements for Social Networks in Web 2.0- visualization and applications of social networks

TOTAL : 45

REFERENCE BOOKS:

1. Peter mika, "Social networks and the semantic web", Springer publishers, 2007
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer publishers, 2010
3. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st edition, 2011.
4. Dion Goh and Schubert Foo, “Social information retrieval systems: emerging technologies and applications for searching the Web effectively”, IGI Global snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling”, IGI Global snippet, 2009.
6. John G. Breslin, Alexandre Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

Course Outcomes:

On completion of the course the students will be able to

- apply knowledge for current web development in the era of Social Web
- model, aggregate and represent knowledge for Semantic Web
- design extraction and mining tools for Social networks
- develop personalized web sites and visualization for social networks

14MIE10 BIOMETRIC SECURITY

(Common to Information Technology and Information Technology (ICW))

3 0 0 3

UNIT – I **9**

Biometrics: Introduction- Benefits of biometrics over traditional authentication systems –Benefits of biometrics in identification systems-Selecting a biometric for a system –Applications – Key biometric terms and processes - Biometric matching methods -Accuracy in biometric systems

UNIT – II **9**

Facial and Fingerprint Biometric Technologies: Fingerprints - Technical description – Characteristics -Competing technologies - Strengths – Weaknesses – Deployment - Facial scan – Technical description - Characteristics - Weaknesses-Deployment.

UNIT – III **9**

Physiological Biometric Technologies: Iris scan - Technical description – Characteristics - Strengths – Weaknesses – Deployment - Retina vascular pattern – Technical description – Characteristics - Strengths – Weaknesses – Deployment - Hand scan – Technical description- Characteristics - Strengths – Weaknesses deployment – DNA biometrics

UNIT – IV **9**

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - Signature and Handwriting technology - Technical description – Classification - Keyboard / Keystroke dynamics - Voice – Data acquisition - Feature extraction - Characteristics - Strengths – Weaknesses- Deployment.

UNIT – V **9**

Multi Biometrics: Multi biometrics and multi factor biometrics - Two-factor authentication with passwords - Tickets and Tokens – Executive decision - Implementation plan-Case studies on Physiological, Behavioral and Multifactor biometrics in identification systems.

TOTAL : 45

REFERENCE BOOKS:

1. Samir Nanavathi, Michel Thieme and Raj Nanavathi, “Biometrics -Identity verification in a network”, Wiley Eastern, 2002.
2. John Chirillo and Scott Blaul, “Implementing Biometric Security”, Wiley Eastern Publications, 2005.
3. John Berger, “Biometrics for Network Security”, Prentice Hall, 2004.

Course Outcomes:

On completion of the course the students will be able to

- acquire knowledge in various bio metric security technologies
- develop a authentication system based on multi biometric

14MIT22 INFORMATION THEORY AND CODING

(Common to Information Technology & Information Technology (ICW))

3 0 0 3

UNIT – I **9**

Source Coding: Introduction to Information theory - Uncertainty and Information - Average Mutual Information and Entropy - Source Coding Theorem - Shannon-fano coding - Huffman Coding - Arithmetic Coding - Lempel-Ziv algorithm - Run-length Encoding and Rate Distortion Function.

UNIT – II **9**

Channel Capacity and Coding: Channel Models - Channel Capacity - Channel Coding - Information Capacity Theorem - Random Selection of Codes - Error control coding: Linear Block Codes and their properties - Decoding of Linear Block Code - Perfect codes - Hamming codes - Optimal Linear Codes and MDS codes.

UNIT – III **9**

Cyclic Codes: Polynomials - Division algorithm for Polynomials - A method for generating cyclic codes, Matrix description of cyclic codes, Burst error correction - Fire codes - Golay codes - CRC codes - Circuit implementation of cyclic codes - BCH codes: Minimal polynomials - Generator polynomial for BCH codes - Decoding of BCH codes - Reed-Solomon codes and Nested codes.

UNIT – IV **9**

Convolutional Codes: Tree codes and Trellis codes - Polynomial description of convolutional codes - Distance notions for convolutional codes - Generation function - Matrix description of convolutional codes - Viterbi decoding of convolutional codes - Distance bounds for convolutional codes - Turbo codes and Turbo Decoding.

UNIT – V **9**

Trellis Coded Modulation: Concept of Coded Modulation - Mapping by set partitioning - Unger beck's TCM design rules - TCM decoder - Performance evaluation for Additive White Gaussian Noise (AWGN) Channel - TCM for fading channels.

TOTAL : 45

REFERENCE BOOKS:

1. Ranjan Bose, "Information Theory, Coding and Cryptography", Tata McGraw Hill, 2002.
2. Viterbi, "Information theory and coding", McGraw Hill, 1982.
3. John G. Proakis, "Digital Communications", 2nd Edition, McGraw Hill, 1989.

Course Outcomes:

On completion of the course the students will be able to

- apply encoding and decoding of digital data streams
- acquire a complete understanding of error–control coding
- acquire a detailed knowledge of compression and decompression techniques

14CNT14 MULTIMEDIA COMPRESSION TECHNIQUES

(Common to Information Technology(ICW) & Communication Systems)

3 0 0 3

UNIT – I **9**

Introduction : Special features of Multimedia – Graphics and Image Data Representations – Popular File formats - Fundamental Concepts in Video - Digital Audio – Storage requirements for multimedia applications -Need for Compression - Lossy & Lossless compression techniques– Overview of Source Models - Source coding - Scalar and Vector quantization

UNIT – II **9**

Text Compression: Compression techniques: Shannon- Fano coding -Huffman coding – Adaptive Huffman Coding – Arithmetic coding – Dictionary techniques : LZW algorithm.

UNIT– III **9**

Audio Compression: Audio compression techniques - μ- Law and A-Law companding-Frequency domain and filtering – Differential Encoding –DPCM- ADPCM – DM – Optimal Predictors and Optimal Quantization -Application to speech coding: G.722 – Application to audio coding : MPEG audio, Silence compression- Speech compression techniques : Formants and CELP Vocoders

UNIT– IV **9**

Image Compression : Transform Coding: JPEG Standard – Sub band coding algorithms - Design of Filter banks – Implementation using filters- Wavelet based compression: EZW- SPIHT coders – JPEG 2000 standards- JBIG- JBIG2 standards

UNIT – V **9**

Video Compression : Video compression Based on Motion Compensation – Search for Motion Vectors - H.261 - MPEG Video Coding I: MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4: Object Based Visual Coding –Synthetic Object Coding –Object types-Profiles and Levels – MPEG 7.

TOTAL : 45

REFERENCE BOOKS:

1. Morgan Kauffman, Khalid Sayood, "Introduction to Data Compression", 2nd Edition, Harcourt India, 2000.
2. David Salomon , " Data Compression – The Complete Reference", 2nd Edition, Springer Verlag New York Inc., 2001.
3. Yun Q.Shi, Huifang Sun, "Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards", CRC Press, 2003.
4. Peter Symes , " Digital Video Compression", McGraw Hill , 2004.
5. Mark Nelson , " Data compression", BPB Publishers, New Delhi, 2000.
6. Mark S.Drew, Ze-Nian Li, "Fundamentals of Multimedia", 1st Edition, PHI, 2003.
7. Watkinson J., "Compression in Video and Audio", Focal Press, London,1995.

Course Outcomes:

On completion of the course the students will be able to

- perform text and audio compression
- acquire the knowledge of various compression techniques in image and video
- apply the above knowledge and skills to compress various types of media

14CNT22 HIGH SPEED NETWORKS

(Common to Information Technology(ICW) & Computer Science and Engineering)

3 0 0 3

UNIT – I **9**

High Speed Networks : Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL- High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fibre Channel – Wireless LANs: applications, requirements – Architecture of 802.11

UNIT – II **9**

Congestion and Traffic Management: Queuing Analysis- Queuing Models – Single Server Queues – Multi server queues-Effects of congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT – III **9**

TCP and ATM Congestion Control : TCP Flow control – TCP Congestion Control – Retransmission Timer Management – Exponential RTO backoff – KARNs Algorithm – Window management – Performance of TCP over ATM - Traffic and Congestion control in ATM – Requirements – Attributes - Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management

UNIT – IV **9**

Integrated and Differentiated Services : Services- Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT – V **9**

Protocols for QoS Support : RSVP – Goals and Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP

TOTAL : 45

REFERENCE BOOKS:

1. Stallings William, "High Speed Networks and Internet", 2nd Edition, Pearson Education, New Delhi, 2002.
2. Walrand and Pravin Varaiya, "High Performance Communication Networks", 2nd Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
3. Pepelnjak Irvan, Guichard Jim and Apcar Jeff, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.
4. http://pages.cpsc.ucalgary.ca/~carey/CPSC641/archive/Sept2005/

Course Outcomes:

On completion of the course the students will be able to

- develop an in-depth understanding, in terms of architecture, protocols and applications, of major high-speed networking technologies
- solve numerical or analytical problems pertaining to the high-speed networking technologies
- design and configure a network to support a specified set of applications
- develop necessary background to manage projects involving any of the high-speed networking technologies

14CNE08 IMAGE PROCESSING

3 0 0 3

UNIT – I **9**

Fundamentals of Image Processing: Introduction – Elements of Visual Perception, Steps in Image Processing Systems – Digital Imaging System - Image Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – Color Images and Models - Image Operations – Arithmetic, Logical, Statistical and Spatial Operations.

UNIT – II **9**

Image Enhancement and Restoration: Spatial Domain - Gray Level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT, Smoothing and Sharpening filters – Homomorphic Filtering, Noise models, Constrained and Unconstrained Restoration Models.

UNIT – III **9**

Image Segmentation and Image Feature Analysis: Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Features – Textures - Boundary representations and Descriptions- Component Labeling – Regional descriptors and Feature Selection Techniques.

UNIT – IV **9**

Multi Resolution Analysis and Morphological Processing: Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms - Fast Wavelet Transforms - Wavelet Packets - Image Morphology - Binary and Gray Level Morphology Operations – Erosion – Dilation - Opening and Closing Operations – Distance Transforms – Basic Morphological Operations.

UNIT – V **9**

Image Pattern Recognition and Case Studies: Statistical Classifiers – Clustering Algorithms – Hierarchical and Partitional clustering – Image classification and Recognition - Image Understanding – Case Studies in Biometrics - Image Fusion – Steganography

TOTAL: 45

REFERENCE BOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2008, New Delhi.
2. S.Sridhar, "Digital Image Processing", 1st Edition, Oxford University Press, New Delhi, 2011.
3. Alasdair McAndrew, "Introduction to Digital Image Processing with Matlab", 1st Edition, Cengage Learning, India, 2011.
4. Anil J. Jain, "Fundamentals of Digital Image Processing", 3rd Edition, PHI, 2011.
5. Wilhelm Burger and Mark J Berge, "Digital Image Processing: An algorithmic Introduction using Java", 2nd Edition, Springer-Verlag, London, 2016.

Course Outcomes:

On completion of the course the students will be able to

- implement basic image processing algorithms using MATLAB tools
- design an application that incorporates different concepts of Image Processing
- apply and explore new techniques in the areas of image enhancement- restoration-segmentation-compression-wavelet processing and image morphology
- analyze different approaches to implement mini projects
- explore the possibility of applying Image processing concepts in various domains

14CNE09 EMBEDDED COMPUTING SYSTEM DESIGN

3 0 0 3

UNIT – I **9**

Embedded Processors: Embedded Computers - Characteristics of Embedded Computing Applications - Challenges in Embedded Computing System Design - Embedded System Design Process- Formalism for System Design - Structural Description - Behavioural Description - ARM Processor - Intel ATOM Processor.

UNIT – II **9**

Embedded Computing Platform: CPU Bus Configuration - Memory Devices and Interfacing - Input/Output Devices and Interfacing - System Design - Development and Debugging – Emulator – Simulator - JTAG Design Example – Alarm Clock - Analysis and Optimization of Performance - Power and Program Size.

UNIT – III **9**

Embedded Network Environment : Distributed Embedded Architecture - Hardware And Software Architectures - Networks for Embedded Systems - I2C - CAN Bus - SHARC Link Supports – Ethernet – Myrinet – Internet - Network-based Design - Communication Analysis - System Performance Analysis - Hardware Platform Design - Allocation and Scheduling - Design Example - Elevator Controller.

UNIT – IV **9**

Real-Time Characteristics: Clock Driven Approach - Weighted Round Robin Approach - Priority Driven Approach - Dynamic versus Static Systems - Effective Release Times and Deadlines - Optimality of the Earliest Deadline First (EDF) Algorithm - Challenges in Validating Timing Constraints in Priority Driven Systems - Off-Line versus On-Line Scheduling.

UNIT – V **9**

System Design Techniques: Design Methodologies - Requirement Analysis – Specification - System Analysis and Architecture Design - Quality Assurance - Design Examples - Telephone PBX - Ink jet printer - Personal Digital Assistants - Set-Top Boxes.

TOTAL: 45

REFERENCE BOOKS:

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", 3rd Edition, Morgan Kaufman Publishers, 2012.
2. Jane W.S. Liu, "Real-Time systems", 1st Edition, Pearson Education Asia, 2000.
3. Krishna C. M. and Shin K. G., "Real-Time Systems", Tata McGraw-Hill Education, 2010.
4. Frank Vahid and Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", 1st Edition, John Wiley & Sons, 2002.
5. Andrew N Sloss, Symes D. and Wright C., "Arm System Developers Guide", 1st Edition, Morgan Kauffman/ Elsevier, 2006.

Course Outcomes:

On completion of the course the students will be able to

- understand different architectures of embedded processor, microcontroller and peripheral devices
- interface memory and peripherals with embedded systems
- familiar with embedded network environment
- understand challenges in Real time operating systems
- design and analyze applications on embedded systems

14CNE10 WEB MINING

3 0 0 3

UNIT – I **9**

Introduction: Overview of Data mining – Data mining from a Business Perspective – Data types, Input and output of data mining algorithms- Decision Tree- Classification and Regression Trees – Preprocessing and Post processing in Data mining

UNIT – II **9**

Information Retrieval: Information Retrieval and Text Mining - Keyword Search - Nearest-Neighbor Methods – Measuring Similarity - Web-Based Document Search - Document–Matching - Inverted Lists - Evaluation of Performance - Structure in a Document Collection - Clustering Documents by Similarity- Evaluation of Performance - Information Extraction - Patterns and Entities from Text- Co reference and Relationship Extraction - Template Filling and Database Construction

UNIT – III **9**

Web Search: Crawling the web – HTML and HTTP Basics – Crawling Basics – Engineering Large Scale Crawlers- Putting together a Crawler- Boolean Queries and the Inverted Index – Relevance Ranking – Similarity Search

UNIT – IV **9**

Learning: Similarity and Clustering – Formulations and approaches- Bottom up and Top down Partitioning Paradigms – Clustering and Visualization via Embeddings – Probabilistic Approaches to clustering – Collaborative Filtering – Supervised Learning – The Supervised Learning Scenario- Overview of Classification Strategies - Evaluating Text Classifiers – Semi Supervised Learning- Expectation Maximization

UNIT – V **9**

Applicaions: Social Network Analysis- Social Sciences and Bibliometry – Page Rank and HITS – Short comings of coarse Grained Graph model- Enhanced Models and Techniques- Evaluation of Topic Distillation- Measuring and Modeling the Web – Resource Discovery – Collecting Important Pages Preferentially – Similarity Search Using Link Topology – Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining.

TOTAL: 45

REFERENCE BOOKS:

1. Soman K.P., Shyam Diwakar and Ajay V., "Insight into Data Mining Theory and Practice", 1st Edition, Prentice Hall of India Private Ltd., 2006.
2. Sholom Weiss, "Text Mining: Predictive Methods for Analyzing Unstructured Information", 1st Edition, Springer, 2005.
3. Soumen Chakrabarti, "Mining the Web: Discovery Knowledge from Hypertext Data", 1st Edition, Elsevier Science, 2002.
4. Margret H.Dunham, "DATA MINING - Introductory and Advanced Concepts", 2nd Edition, Pearson Education, 2006.
5. Kosala R. and Blockeel H., "Web Mining Research: A Survey", SIGKDD Exploration, Vol. 2, Issue 1, 2000.

Course Outcomes:

On completion of the course the students will be able to

- understand the basic concepts of data mining
- acquire knowledge on information retrieval methods
- develop schemes to crawl, organize and index the web data
- formulate different learning methods
- apply web mining techniques for different real world problems

14CNE11 KNOWLEDGE ENGINEERING

3 0 0 3

UNIT – I **9**

Introduction: Intelligent Agents - Problem Solving - Solving Problems by Searching - Beyond Classical Search - Adversarial Search - Constraint Satisfaction Problems.

UNIT – II **9**

Knowledge and Reasoning: Logical Agents - First Order Logic - Inference in First Order Logic - Knowledge Representation.

UNIT – III **9**

Uncertain Knowledge and Reasoning: Quantifying Uncertainty-Probabilistic Reasoning - Probabilistic Reasoning overTime - Making Simple Decisions -Making Complex Decisions.

UNIT – IV **9**

Object Oriented Representation: Object-Oriented Representation - Frame Formalism - Structured Descriptions - Meaning and Entailment - Taxonomies and Classification - Inheritance

UNIT – V **9**

Actions and Planning: Actions - The Situation Calculus - Frame Problem - Complex Actions - Planning - The STRIPS Representation - Planning as a Reasoning Task - Hierarchical and Conditional Planning

TOTAL : 45

REFERENCE BOOKS:

1. Russell Stuart and Norvig, Peter, "Artificial Intelligence: A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, New Delhi, 2009.
2. Ronald Brachman and Hector Levesque, "Knowledge Representation and Reasoning", 1st Edition, The Morgan Kaufmann Series in Artificial Intelligence, 2004.
3. Arthur B.Markman, "Knowledge Representation", 1st Edition, Lawrence Erlbaum Associates, Reprint 2008.
4. http://nptel.ac.in

Course Outcomes:

On completion of the course the students will be able to

- know the basic concepts of Artificial Intelligence
- understand the functionalities of intelligent agents
- discover different search strategies for a problem
- evaluate different knowledge representation schemes for typical AI problems
- design and implement a typical AI problem to be solved using machine learning techniques

14CNE12 PARALLEL PROGRAMMING PARADIGMS

3 0 0 3

UNIT – I **9**

Foundations of Parallel Programming: Motivation for parallel programming - Concurrency in computing – basics of processes, multitasking, and threads – cache – cache mappings – caches and programs – virtual memory – instruction level parallelism – hardware multi-threading – SIMD – MIMD – interconnection networks – cache coherence – shared-memory vs distributed-memory – parallel software– I/O –performance of parallel programs – parallel program design.

UNIT – II **9**

Message Passing Paradigm: Basic MPI programming – MPI_Init and MPI_Finalize – MPI communicators – SPMD programs –communication– MPI_Send and MPI_Recv – message matching – MPI I/O – parallel I/O –collective communication – MPI_Reduce – MPI_Allreduce – broadcast – scatter – gather –allgather – derived types – performance evaluation of MPI programs

UNIT – III **9**

Shared Memory Paradigm: Pthreads: Process, Threads and Pthreads – Matrix vector multiplication – critical sections – busy-waiting – mutexes – producer and consumer synchronization and semaphores – barriers and condition variables – read-write locks – Caches, cache coherence and false sharing – thread safety.

UNIT – IV **9**

Shared Memory Paradigm: OpenMP: Basic OpenMP constructs – scope of variables – reduction clause – parallel for directive – loops in OpenMP – scheduling loops – producer and consumer in OpenMP– Caches, cache coherence and false sharing in OpenMP-threads safety in OpenMP

UNIT – V **9**

Graphical Processing Paradigms: CUDA : Introduction to CUDA – CUDA programming examples – CUDA execution model – CUDA memory hierarchy - Introduction to OpenCL – OpenCL programming examples – Programs and Kernels – OpenCL case study.

TOTAL: 45

REFERENCE BOOKS:

1. Peter S. Pacheco, "An Introduction to Parallel Programming", 1st Edition, Morgan Kaufmann, 2011.
2. Rob Farber, "CUDA application design and development", 1st Edition, Morgan Haufmann, 2011.
3. Munshi A., Gaster B., Mattson T. G., Fung J., and Ginsburg D., "OpenCL Programming Guide", 1st Edition, Addison Wesley, 2011.

Course Outcomes:

On completion of the course the students will be able to

- recognize models and issues in parallel programming
- identify hardware level support for concurrency
- create message-passing parallel programs using MPI framework
- develop shared-memory parallel programs using Pthreads and OpenMP
- construct CUDA programs and OpenCL programs

14CNE13 SOFTWARE QUALITY AND TESTING

3 0 0 3

UNIT – I **9**

Introduction: Basic concepts and Preliminaries – Theory of Program Testing– Unit Testing – Control Flow Testing –Data Flow Testing– System Integration Testing.

UNIT – II **9**

Software Testing Methodology: Software Test Plan–Components of Plan - Types of Technical Reviews - Static and Dynamic Testing- – Software Testing in Spiral Manner - Information Gathering - Test Planning - Test Coverage - Test Evaluation -Prepare for Next Spiral - Conduct System Test - Acceptance Test - Summarize Testing Results.

UNIT – III **9**

Emerging Specialized Areas in Testing: Test Process Assessment – Test Automation Assessment - Test Automation Framework – Nonfunctional Testing – SOA Testing – Agile Testing – Testing Center of Excellence – Onsite/Offshore Model - Modern Software Testing Tools – Software Testing Trends – Methodology to Develop Software Testing Tools.

UNIT – IV **9**

Software Quality Models: Software quality –Verification versus Validation– Components of Quality Assurance – SQA Plan – Quality Standards – CMM – PCMM – CMMI – Malcolm Baldrige National Quality Award.

UNIT – V **9**

Quality through Continuous Improvement Process: Role of Statistical Methods in Software Quality – Transforming Requirements intoTest Cases – Deming‟s Quality Principles – Continuous Improvement through Plan Do Check Act (PDCA).

TOTAL: 45

REFERENCE BOOKS:

1. William E.Lewis, “Software Testing and Continuous Quality Improvement”, 3rd Edition, Auerbach Publications, 2011.
2. Kshirasagar Naik and Priyadarshi Tripathy, “Software Testing and Quality Assurance Theory and Practice”, 2nd Edition, John Wiley & Sons Publication, 2011.
3. Ron Patton, “Software Testing”, 2nd Edition, Pearson Education, 2007.

Course Outcomes:

On completion of the course the students will be able to

- choose the software testing techniques to cater to the need of the project
- identify the components of software quality assurance systems
- work with various software testing strategies
- design and develop software quality models and implement software quality assurance

14CNE14 OPERATION RESEARCH METHODOLOGIES

3 0 0 3

UNIT – I **9**

Queueing Models: Markovian Queues - Steady state analysis of Single and Multi-server Models - Little‟s Formula - Finite and Infinite Capacity Models - Machine Interference Model - Self-Service Queue.

UNIT – II **9**

Linear Programming: Formulation - Graphical Solution - Simplex Method - Two-Phase Method - Transportation and Assignment Models.

UNIT – III **9**

Non-Linear Programming: Constrained Problems - Equality Constraints - Lagrangean Method - Inequality Constraints - Karush – Kuhn -Tucker (KKT) Conditions - Quadratic Programming.

UNIT – IV **9**

Dynamic Programming: Dynamic Programming - Principle of Optimality - Forward and Backward Recursion – Applications of Dynamic Programming - Problem of Dimensionality.

UNIT – V **9**

Simulation Modeling: Monte Carlo Simulation - Types of Simulation - Elements of Discrete Event Simulation - Generation of Random Numbers - Applications to Queuing systems.

TOTAL: 45

REFERENCE BOOKS:

1. Taha H.A, “Operations Research: An Introduction”, 9th Edition, Pearson Education, New Delhi, 2010.
2. Gupta P.K. and Hira D.S., “Operations Research”, Revised Edition, S.Chand & Company Ltd., 2012.
3. Ravindran A., Don T. Phillips and James J. Solberg, “Operations Research”, 2nd Edition, Wiley-India Edition, 2006.
4. Sharma J. K., “Operations Research”, 3rd Edition, Macmillan Publishers India Ltd., 2009.

Course Outcomes:

On completion of the course the students will be able to

- acquire skills to analyze queuing models
- solve linear programming models
- have a clear perception of the power of mathematical programming
- apply operation research techniques to solve engineering problems
- create and analysis a computerized mathematical model

14CNE15 EVOLUTIONARY COMPUTATION

3 0 0 3

UNIT – I **9**

Introduction: Introduction to Evolutionary Computation, Principles of Evolutionary Processes and Genetics, History of Evolutionary Computation. Evolutionary Algorithms: Genetic algorithms, Evolution strategies, Evolution programming, Genetic programming, Classifier systems.

UNIT – II **9**

Basic Data Structures and Operators: Representations, Selection schemes - Proportional selection, Tournament selection, Rank based selection, Boltzmann selection, Generation gap methods, Comparison of selection methods, Search operators

UNIT – III **9**

Advanced Features: Fitness Evaluation - Encoding and decoding functions, competitive fitness evaluation, Complexity based fitness evaluation, **C**onstraint handling – Penalty functions, repair algorithms, Constraint preserving operators. Speciation methods, Parameter Control, Self-adaptation, Coevolutionary algorithms.

UNIT – IV **9**

Evolutionary Computation Approaches: Constrained Optimization, Multimodal optimization, multi-objective optimization, Combinatorial optimization, Applications.

UNIT – V **9**

Swarm Intelligence: Ant Colony Optimization, Particle swarm optimization. **Artificial Immune Systems:** Clonal selection, Immune network, Negative selection**.** Benchmark Problems

TOTAL: 45

REFERENCE BOOKS:

1. Back T., Fogel D. B. and Michalewicz Z., "Evolutionary Computation 1: Basic Algorithms and Operators ", 1st Edition, Taylor and Francis Group, New York, 2000.
2. Back T., Fogel D. B. and Michalewicz Z., "Evolutionary Computation 2: Advanced Algorithms and Operators" 1st Edition, Taylor and Francis Group, New York, 2000.
3. Carlos A. CoelloCoello, Gary B. Lamont and David A. Van Veldhuizen, "Evolutionary Algorithms for Solving Multi-Objective Problems", 2nd Edition, Springer, New York, 2007.

Course Outcomes:

On completion of the course the students will be able to

- understand the basic evolutionary process and algorithms
- understand advanced features of evolutionary algorithms
- study different evolutionary computation and swarm intelligence approaches
- apply evolutionary algorithms for solving real world problems

14CNE16 3G AND 4G WIRELESS NETWORKS

3 0 0 3

UNIT – I **9**

Introduction: Introduction: History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards

UNIT – II **9**

3G Networks: Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X - EVDO Rev -0, Rev-A, Rev-B, Rev-C Architecture- Protocol stack.

UNIT – III **9**

4G LTE Networks: LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - System Architecture Evolution (SAE) - Communication protocols – Interfaces.

UNIT – IV **9**

Wimax Networks: Introduction – IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20- Applications.

UNIT – V **9**

DLNA & NFC Revolution: Introduction and Evolution - Applications of DLNA and NFC - DLNA Architecture and Protocol stack - Smart phone and NFC – Mobile Commerce and NFC – NFC tags – Security Issues.

TOTAL: 45

REFERENCE BOOKS:

1. Juha Korhonen, "Introduction to 3G Mobile Communication", 2nd Revised Edition, Artech House, 2003.
2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", 2nd Edition, Academic Press, 2008.
3. Flavio Muratore, "UMTS Mobile Communication for the Future", John Wiley & Sons, 2001.
4. Harri Holma and Antti Toskala, "HSDPA/HSUPA for UMTS", 1st Edition, John Wiley & Sons, 2006.

Course Outcomes:

On completion of the course the students will be able to

- conversant with the latest 3G/4G and WiMAX networks and its architecture
- design and implement wireless network environment for any application using latest wireless protocols and standards
- implement different type of applications for smart phones and mobile devices with latest network strategies