PROPOSED SYLLABUS FOR B.E. IV YEAR

OF

FOUR YEAR DEGREE COURSE

IN

INFORMATION TECHNOLOGY

JUNE 2016

DEPARTMENT OF INFORMATION TECHNOLOGY

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

HYDERABAD – 500 075

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SCHEME OF INSTRUCTION AND EXAMINATION
B.E. IV YEAR
INFORMATION TECHNOLOGY

Semester–I

S. No	Syllabus Ref. No	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per Week		Duration in Hrs.	Maximum Marks		
			L/T	D/P		End Sem. Exam	Sessional	
		THEORY						
1	IT 411	Big Data Analytics	4/1	-	3	75	25	3
2	IT 412	Mobile Computing	4	-	3	75	25	3
3	IT 413	Distributed Systems	4	-	3	75	25	3
4	IT 414	VLSI Technology	4	-	3	75	25	3
5		ELECTIVE -II	4	-	3	75	25	3
		PRACTICALS						
1	IT 415	Big Data Analytics Lab	-	3	3	50	25	2
2	IT 416	VLSI Technology Lab	-	3	3	50	25	2
3	IT 417	Project Seminar	-	3	-		25	1
		TOTAL	**20/1**	**9**		**475**	**200**	**20**

ELECTIVE - II

IT 461 Information Retrieval Systems
IT 462 Semantic Web
IT 463 Grid Computing
IT 464 Research Methodologies
IT 465 Parallel Computing
CE 422 Disaster Management
MB 215 Organizational Behaviour

IT 411

BIG DATA ANALYTICS

Instruction	4 L / 1T periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites:

Data Structures, Design and Analysis of Algorithms, Database Systems, Data Warehousing and Data Mining.

Course Objectives:

1. To introduce the concepts and challenges of big data, role of HDFS in handling big data and MapReduce Architecture.
2. To explore mapper and reducer to solve real world problems.
3. To introduce the features of NoSQL and study the working mechanisms of MongoDB
4. To impart knowledge to work with semi structured and unstructured data using Pig
5. To familiarise with features of Hive to process and query big data

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Develop framework for handling Big Data using Hadoop
2. Acquire, Store and analyse big data in business environments using HDFS
3. Develop programs in MapReduce to solve real world problems
4. Model data using MongoDB
5. Handle semi structured and unstructured big data using Pig
6. Process and query big data in HDFS environment using Hive

Unit - I

What is Big Data?, Why is Big Data Important: When to consider a Big data solution, Big Data use cases: IT for IT Log Analytics, The Fraud Detection Pattern, Social Media Pattern.

The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

Unit - II

MapReduce: A Weather Dataset, Data Format, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner Functions, Running a Distributed MapReduce Job

Developing a MapReduce Application: Writing a Unit Test with MRUnit, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, The MapReduce Web

Unit – III

How MapReduce Works: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side, **MapReduce Types and Formats:** MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output

Unit – IV

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working mechanisms of Mongo DB:** Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation

Unit - V

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.

Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Paul C. Zikopoulos, Chris Eaton, Dirk DeRoos, Thomas Deutsch, George Lapis, "Understanding Big Data - Analytics for Enterprise class Hadoop and Streaming Data", McGrawHill, 2012.
3. Kristina Chodorow, "MongoDB: The Definitive Guide-Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Media, 2013

Suggested Reading:

1. Chuck Lam, Mark Davis, AjitGaddam, "Hadoop in Action", Manning Publications Company, 2016.
2. Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.
3. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.
4. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
5. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. http://www.planetcassandra.org/what-is-nosql/
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com/

IT 412

MOBILE COMPUTING

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Data Communication, Computer Networks

Course Objectives:

1. To introduce cellular concepts, medium access mechanisms and features of a range of mobile devices and systems
2. To familiarize with the functions of network and transport layers for mobile networks
3. To provide an understanding of different techniques to handle databases, data dissemination and data Synchronization in Mobile Computing environments.

Course Outcomes:

Upon successful completion of the course, student will be able to

1. Explain the cellular concepts, techniques for improving cellular system capacity and medium access control.
2. Describe the features of a wide variety of mobile devices and systems.
3. Appreciate the evolution in mobile system standards
4. Understand Mobile IP, packet delivery and Dynamic Host Configuration Protocol
5. Analyze different variations of TCP for mobile communication systems.
6. Describe database hoarding techniques, data dissemination and data Synchronization on mobile computing systems

UNIT-I

Introduction: Challenges in mobile computing, Coping with uncertainties, resource poorness, bandwidth, etc. Cellular architecture, Co-channel interference, Frequency reuse, Capacity increase by cell splitting.

Medium Access Control: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.

UNIT-II

Mobile Devices And Systems-Features of Mobile Smart Phones,Digital Music Players, Hand-held Pocket Computers, Operating Systems of Hand-held Devices and their features, Smart Systems- Smart cards, Smart labels, RFID, Smart Tokens, Sensors and Actuators, Set-top Boxes,Limitations of Mobile Devices,Automotive Systems.

GSM: Mobile services, System architecture, Localization, Call Handling, Handover, Security, New data services.

Features of HSPA 3G Network, HSPA+, Long Term Evolution (LTE), WiMax and 4G LTE Advanced and WiMax 802.16m Networks.

UNIT-III

Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol.

UNIT-IV

Mobile Transport Layer : Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/timeout freezing, Selective retransmission, Transaction oriented TCP .

UNIT-V

Databases and Mobile Computing: Data Hoarding Techniques, Data Caching-Cache Invalidation Mechanisms, Data Cache Maintenance and Web Cache Maintenance in Mobile Environments, Power-aware Mobile Computing, Context-aware Computing.

Data Dissemination: Communication Asymmetry, Classification of Data Delivery mechanisms: Push-based mechanisms, Pull-based mechanisms, Hybrid mechanisms.

Data Synchronization: Synchronization in Mobile Computing Systems, Usage Models for Synchronization, Domain-dependent Specific rules for Data Synchronization, Personal Information Manager (PIM), Synchronization and Conflict resolution strategies, Synchronizer.

Text Books:

1. Jochen, M Schiller, "Mobile Communications", 2nd Edition Pearson Education, India, 2012.
2. Raj Kamal, "Mobile Computing", Second Edition, Oxford University Press, 2013.

Suggested Reading:

1. Reza B, "Mobile Computing Principles", Cambridge University press 2005.
2. Frank Adelstein, S.K.S. Gupta, Golden G. Richard III and Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional Publication.
2. KurnkumGarg, "Mobile Computing", Pearson Education, 2010.
3. K. Pahlavan and P. Krishnamurthy, "Principles of Wireless Networks", Prentice Hall.
4. D.P. Agrawal and Q.A. Zeng, "Introduction to Wireless and Mobile Systems", Thomson Brooks/Cole.

IT 413

DISTRIBUTED SYSTEMS

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites
Operating Systems, Computer Networks

Course Objectives:

1. To present the basic concepts and principles of distributed systems.
2. To introduce the architectures and models of distributed systems
3. To familiarize with communication, Synchronization, Consistency and Replication, Fault Tolerance in distributed systems.
4. To provide understanding of various security issues in distributed environments

Course Outcomes:
Upon successful completion of the course, student will be able to

1. Describe the various models and architectures of distributed systems.
2. Illustrate use of threads in distributed systems
3. Demonstrate the distributed communication mechanisms like RPC and RMI.
4. Describe various naming and synchronization mechanism in distributed systems
5. Apply Consistency, Replication and Fault Tolerance in distributed systems.
6. Compare and contrast various distributed object-based systems

UNIT – I

Introduction: Definition of A Distributed System; Goals- Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls; Types of Distributed Systems- Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.

Architectures: Architectural Styles, System Architectures- Centralized Architectures, Decentralized Architectures, Hybrid Architectures; Architectures versus Middleware- Interceptors, General Approaches to Adaptive Software, Discussion.

UNIT – II

Processes: Threads- Introduction to Threads, Threads in Distributed Systems; Virtualization, The Role Of Virtualization In Distributed Systems, Architectures of Virtual Machines; Clients- Networked User Interfaces, Client-Side Software for Distribution Transparency; Servers- General Design Issues, Server Clusters, Managing Server Clusters; Code Migration- Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

Communication: Fundamentals- Layered Protocols, Types of Communication; Remote Procedure Call- Basic RPC Operation, Parameter Passing; Asynchronous RPC, Example: DCE RPC; Message-Oriented Communication- Message Oriented Transient Communication, Message Oriented Persistent Communication, Example: IBM'S Web-Sphere Message-Queuing System; Stream-Oriented Communication- Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication, Application-Level Multicasting, Gossip-Based Data Dissemination.

UNIT-III

Naming: Names, Identifiers, and Addresses, Flat Naming, Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches; Structured Naming, Name Spaces, Name Resolution, the Implementation of a Name Space, Example: The Domain Name System; Attribute-based Naming, Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations;

Synchronization: Clock Synchronization- Physical Clocks, Global Positioning System, Clock Synchronization Algorithms; Logical Clocks- Lamport's Logical Clocks, Vector Clocks; Mutual Exclusion-Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms; Global Positioning of Nodes, Election Algorithms- Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large Scale Systems.

UNIT-IV

Consistency And Replication: Introduction- Reasons for Replication, Replication as Scaling Technique; Data-Centric Consistency Models- Continuous Consistency, Consistent Ordering of Operations; Client-Centric Consistency Models- Eventual Consistency, Monotonic Reads, Monotonic Writes, Read your Writes, Writes Follow Reads; Replica Management- Replica-Server Placement, Content Replication and Placement, Content Distribution; Consistency Protocols- Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, A Cache-Coherence Protocols, Implementing Client-Centric Consistency.

Fault Tolerance: Introduction To Fault Tolerance-Basic Concepts, Failure Models, Failure Masking by Redundancy; Process Resilience- Design Issues, Failure Masking and Replication, Agreement in Faulty Systems, Failure Detection; Reliable Client-Server Communication- Point-To-Point Communication, RPC Semantics in The Presence Of Failures; Reliable Group Communication- Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast; Distributed Commit-Two-Phase Commit, Three-Phase Commit; Recovery- Introduction, Checkpointing, Message Logging, Recovery-Oriented Computing.

UNIT-V

Distributed Object-Based Systems: Architecture- Distributed Objects, Example: Enterprise Java Beans, Example- Globe Distributed Shared Objects; Processes- Object Servers, Example: The Ice Runtime System; Communication- Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, Example: Java RMI, Object-Based Messaging; Naming- CORBA Object References, Globe Object References;

Synchronization, Consistency and Replication- Entry Consistency, Replicated Invocations; Fault Tolerance- Example: Fault-Tolerant CORBA, Example: Fault-Tolerant Java; Security-Example: GLOBE , Security for Remote Objects.

Text Books:

1. Andrew S. Tanenbaum and Van Steen "Distributed Systems", PHI, Second Edition, 2014
2. Colouris G., Dollimore Jean and Kindberg Tim, "Distributed Systems Concepts and Design", Pearson education, 3rd Edition, 2002.

Suggested Reading:

1. Sunitha Mahajan, Seema Shah, "Distributed Computing", Oxford University Press, Second Edition, 2013
2. Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing", Morgan Kaufmann publishers, 2012.
3. S.Ghosh, Chapman & Hall/CRC, "Distributed Systems", Taylor & Francis Group, 2010.
4. Ajay D. Kshemakalyani & MukeshSinghal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge, 2010.

IT 414

VLSI TECHNOLOGY

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Basic Electronics, Digital Electronics, Computer Organization.

Course Objectives:

1. To introduce the students to the fundamentals of CMOS circuits, to understand basic electrical properties of MOS circuits and the design process at gate level and subsystem level
2. To develop an understanding of VLSI Design Flow and Transistor-Level CMOS Logic Design
3. To familiarize with VLSI Fabrication and Experience CMOS Physical Design

Course Outcomes:

After completing the course, student will be able to

1. Use circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnections.
2. Create models of moderately sized CMOS circuits that realize specified digital functions.
3. Know the Fabrication process of a chip .
4. Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
5. Understand the characteristics of CMOS circuit construction and compare state-of-the-art CMOS process and emerging electronic circuit technologies and processes.
6. Complete a significant VLSI design project having a set of objective criteria and design constraints.

UNIT-I

An overview of VLSI, Moore's law, Electrical Conduction in Silicon, Electrical Characteristics of MOSFETs Threshold voltage, n-FET Current-Voltage equations, square law and linear model of a FET, MOS capacitances, gate-source and gate drain capacitances, junction capacitances in a MOSFET, RC model of a FET, Modeling small MOSFET, scaling. MOSFET as switches, pass characteristics, logic gates using CMOS, Bubble pushing, XOR and XNOR gates, AOI and OAI logic gates, transmission gates. TG based 2-to-1 MUX, XOR, XNOR, OR circuits.

UNIT-II

Physical structure of CMOS ICs, IC layers, layers used to create a MOSFET, Top and side view of MOSFETs, Silicon patterning or layouts for series and parallel connected FETs. Layouts of NOT gate, transmission gate, non-inverting buffer, NAND2, NOR2, Complex logic gate, 4 input AOI gate. Stick diagram representations. Layouts of Basic Structure: n-wells, active area definition, design of n^+, p^+ regions, masks for the n-FET, active contact cross section and mask set, metal1 line with active contact, poly contact: cross section and layout, vias and higher level metals. Latchup prevention.

UNIT-III

Fabrication of CMOS ICs, CMOS process flow, Design rules: minimum space width, minimum spacing, surround, extension, cell concepts and cell based design, logic gates as basic cells, creation of new cell using basic gates. DC characteristics of the CMOS inverter symmetrical inverter, layouts, Inverter switching characteristics, RC switch model equivalent for the CMOS inverter, fan-out, input capacitance and load effects, rise time and fall time calculation, propagation delay, driving large capacitive loads, delay minimization in an inverter cascade.

UNIT-IV

Pseudo n-MOS, tri-state inverter circuits, clocked CMOS, charge leakage, Dynamic CMOS logic circuits, pre-charge and evaluation charge sharing, Domino logic, Dual rail logic networks, differential Cascade Voltage Switch Logic (CVSL) AND/NAND, OR/NOR gates, Complementary Pass Transistor Logic (CPL). The SRAM, 6T SRAM cell design parameters, writing to an SRAM, resistor model, multi-port SRAM, SRAM arrays, Dynamic RAMs: 1T RAM cell, charge leakage and refresh in a DRAM cell, NOR based ROM, ROM array using pseudo n-MOS circuitry, floating gate MOSFET, effect of charge storage on the floating gate, A E^2PROM word using floating gate n-FETs, logic gate diagram of the PLA, NOR based design, CMOS PLA, Gate arrays.

UNIT-V

VLSI Design flow, structural gate level modeling, gate primitives, gate delays, switch level modeling, behavioural and RTL operators, timing controls, blocking and non blocking assignments, conditional statements, Data flow modeling and RTL, Comparator and priority encoder barrel shifter, D latch Master slave D type flip-flop, Arithmetic circuits; half adder, full adder, AOI based, TG based, ripple carry adders, carry look ahead adders, High speed adders, multipliers. Interconnect modeling; Interconnect resistance and capacitance sheet resistance Rs, time delay, single and multiple rung ladder circuits, simple RC interconnect model, modeling interconnect lines with a series pass FET, cross talk, floor planning and routing, clocking, Testing of VLSI circuits.

Text Book:

1. John P. Uyemura, "Introduction to VLSI circuits and Systems", John Wiley & Sons, 2002.
2. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design" 3rd Edition, PHI, 2000.

Suggested Reading:

1. John P. Uyemura, "Chip design for submicron VLSI: CMOS layout and simulation" IE, Cengage learning, 2006.
2. Jan M. Rabey and others "Digital Integrated Circuits A design perspective", Pearson Education
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, "Essentials of VLSI circuits and systems", PHI, 2011.

IT415

BIG DATA ANALYTICS LAB

Instruction	3 periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Prerequisites: Java and Web Programming, Data Warehousing and Data Mining, Computational Intelligence.

Course Objectives:

1. To provide the knowledge to setup a Hadoop Cluster
2. To impart knowledge to develop programs using MapReduce Technique
3. To learn file handling in HDFS
4. To introduce Pig, PigLatin and HiveQL to process big data
5. To learn machine learning operations using Mahout Hadoop
6. To introduce NoSQL databases

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Understand Hadoop working environment
2. Work with big data applications in multi node clusters
3. Write scripts using Pig to solve real world problems
4. Write queries using Hive to analyse the datasets
5. Model and build a recommendation system using Mahout Hadoop
6. Apply big data and echo system techniques for real world problems

Experiments:

1. Understanding and using basic HDFS commands
2. Word count application using MapperReducer on single node cluster
3. Analysis of Weather Dataset on Multi node Cluster
4. Working with files in Hadoop file system: Reading, Writing and Copying
5. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig
6. Retrieving user login credentials from /etc/passwd using Pig Latin
7. Working with HiveQL.
8. Writing User Defined Functions in Hive
9. Perform classification & clustering in Mahout Hadoop
10. Building a Mahout Recommendation System on a Hadoop Cluster

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, April 2015.
2. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
2. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
2. https://class.coursera.org/datasci-001/lecture
3. http://bigdatauniversity.com/

IT416

VLSI TECHNOLOGY LAB

Instruction	3 periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Prerequisites: Digital Electronics and Logic Design, Programming and Problem Solving

Course Objectives:

1. To introduce the students to understand basics in Hardware design using CAD tools
2. Understand and Experience Verilog Design Flow
3. Learn Transistor-Level CMOS Logic Design using both Verilog and VHDL
4. Understand VLSI Fabrication and experience CMOS Physical Design using backend tools

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Use CAD tools to program digital electronics circuits
2. Create models of CMOS circuits that realize specified digital functions.
3. Do simulation and synthesis process for design of CMOS technology
4. Understand process and emerging tools in electronic circuit technologies
5. Complete a small significant VLSI design project having a set of objective criteria and design constraints.
6. Experience the difference in both Hardware design tools

Experiments:

1. Switch level modeling using Verilog
   a) Logic gates b) AOI and OAI gates c) Transmission gate
   d) Complex logic gates using CMOS

2. Structural Gate-level modeling[With and without delays] – Digital circuits using gate primitives – using Verilog.
   a) AOI and OAI gate b) Half adder and full adders c) MUX using buffers
   d) S-R latch etc.
3. Mixed gate –level and Switch-level modeling using Verilog-usage of primitives, modules and instancing and understanding the hierarchical design.
   a) Constructing a 4-input AND gate using CMOS 2-input NAND and NOR gates.
   b) Constructing a decoder using CMOS 2-input AND gates and NOT gates etc.

4. RTL modeling of general VLSI system components.(Verilog)
   a) MUX es b) Decoders
   c) Priority encoders d) Flip-flops &Latch e) Registers.

5. Synthesis of Digital Circuits
   a) Ripple carry adder and carry look-ahead adder
   b) Array multiplier

6. Verilog code for finite state machine

7. Structural Gate-level modeling [With and without delays] – Digital circuits using gate primitives – using VHDL.
   a) AOI and OAI gate b) Half adder and full adders c) MUXes

8. RTL modeling of general VLSI system components using VHDL.
   a) Decoders c) Priority encoders d) Flip-flops &Latches e) Registers

9. Design of 4-bit ALU with 8 instructions using VHDL.

10. Design of 4-bit Comparator using VHDL.

Suggested Reading:

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, IEEE 1364-2001 Compliant, Pearson Education, 2005.

2. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logicwith VHDL design", 2nd Edition, McGraw Hill, 2009.

IT417

PROJECT SEMINAR

Instruction	3 periods per week
Sessional	25 Marks
Credits	1

The objective of the project seminar is to actively involve the student in the initial work required to undertake the final year project. Dealing with a real time problem should be the focus of the under graduate project.

It may comprise of

- Problem definition and specifications.
- A broad understanding of the available techniques to solve a problem of interest.
- Presentation (Oral & written) of the project.

The department should appoint a project coordinator who will coordinate the following.

- Grouping of students as project batch(a maximum of 3 in group)
- Allotment of projects and project guides
- Project monitoring at regular intervals.

Each project group/batch is required to

1. Submit a one page synopsis of the seminar to be delivered for display on notice board.
2. Give a 30-40 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write up on the talk delivered.

Three (3) teachers will be associated with the evaluation of the project seminar for the award of the Sessional marks which should be on the basis of performance on all the three items stated above.

IT 461

INFORMATION RETRIEVAL SYSTEMS
(Elective-II)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Database Systems, Data Warehousing and Data Mining

Course Objectives:

1. Learn how to build index of the unstructured data for information retrieval problem
2. To understand basic IR Models
3. To understand various techniques to compress indexing, matching, organizing, and evaluating methods to IR problems
4. To know various classification and clustering algorithms

Course Outcomes:

Students should have gained a good understanding of the foundation concepts of information retrieval techniques and should be able to:

1. Build and manage the unstructured data into a well-organized structure
2. Compress the structured data and apply IR principles to locate relevant information from large collections of data
3. Analyze performance of retrieval systems
4. Apply classification techniques on unstructured data
5. Apply clustering techniques on unstructured data
6. To Analyse current research problems in information retrieval

UNIT- I

Boolean retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, determining the vocabulary of terms, faster postings list intersection via skip pointers, Positional postings and phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, spelling correction, Phonetic correction.

Index construction: Hardware basic, Blocked sort-based indexing, Single-pass in-memory indexing, distributed indexing, dynamic indexing.

UNIT- II

Index compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model:Parametric and zone indexes, Term frequency and weighting, Vector space model for scoring, Variant tf-idf functions.

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

UNIT- III

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance, A broader perspective: System quality and user utility.

Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

Probabilistic information retrieval: Review of basic probability theory, The Probability Ranking Principle, The Binary Independence Model.

UNIT- IV

Text classification: The text classification problem, Naive Bayes text classification, The Bernoulli model, Properties of Naive Bayes, Feature selection, Evaluation of text classification.

Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k nearest neighbour, Linear versus nonlinear classifiers, Classification with more than two classes, the bias-variance trade-off.

Support vector machines and machine learning on documents: Support vector machines: The linearly separable case, Extensions to the SVM model, Issues in the classification of text documents, Machine learning methods in ad hoc information retrieval.

UNIT- V

Flat clustering: Clustering in information retrieval, Problem statement, Evaluation of clustering, K-means, Model-based clustering.

Hierarchical clustering: Hierarchical agglomerative clustering, Single-link and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Optimality of HAC, Divisive clustering, Cluster labelling.

Matrix decompositions and latent semantic indexing: Linear algebra review, Term-document matrices and singular value decompositions, Low-rank approximations, Latent semantic indexing.

Text Book:

1. Christopher D. Manning and Prabhakar Raghavan and Hinrich Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2009.
2. David A. Grossman, OphirFrieder, "Information Retrieval – Algorithms and Heuristics", Springer, 2nd Edition, Universities Press, 2004.

Suggested Reading:

1. Kowalski, Gerald and Mark T Maybury, "Information Storage and Retrieval Systems: Theory and Implementation", Springer.
2. Baeza-Yates Ricardo and Berthier Ribeiro-Neto "Modern Information Retrieval", 2nd edition, Addison-Wesley, 2011.

Web links:

1. https://class.coursera.org/nlp/lecture
2. http://www.dcs.gla.ac.uk/Keith/Preface.html

IT 462

SEMANTIC WEB
(Elective-II)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Discrete Structures, Web Programming

Course Objectives:
This course is intended to introduce
1. Features, rationale, and advantages of Semantic Web technology.
2. XML (Extensible Markup Language) language structure, RDF model and RDF Schema.
3. Requirements and features of web ontology language (OWL) and Rule Markup languages
4. Different Semantic web services and various ontology development methods
5. Software agent architecture and role of semantic web in various applications

Course Outcomes:
At the end of the course student will be able to:
1. Distinguish between semantic web and syntactic web
2. Describe knowledge using DL, XML, RDF and RDF Schema
3. Represent domain knowledge using OWL and Rule Markup Languages
4. Develop an ontology for a given knowledge domain
5. Understand the role of software agents
6. Realise the role of Semantic Web technologies in various application areas

UNIT- I
The Future of the Internet: Introduction, Syntactic Web, Semantic Web, Working of Semantic Web, What is not a Semantic Web, Side Effects.
Ontology: Definitions, Taxonomies, Thesauri and Ontologies, Classifying Ontologies, Web Ontology Description language, Ontologies-Categories-Intelligence.

UNIT- II
Knowledge Description in Description Logic: Introduction, Example, Family of Attributive Languages, Inference problems.
RDF and RDF Schema: Introduction, XML Essentials, RDF, RDF Schema.

UNIT- III
OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning and Annotation Properties, Properties, Classes, Individuals, Data types.
Rule Languages: Introduction, Usage Scenarios, Datalog, RuleML, SWRL, TRIPLE.

UNIT- IV

Semantic Web Services: Introduction, Web Service Essentials, OWL-S Service Ontology, OWL-S Example.

Methods for Ontology Development: Introduction, Uschold and King Ontology Development Method, Toronto Virtual Enterprise Method, Methontology, KACTUS Project Ontology Development Method, Lexicon-Based Ontology Development Method, Simplified Methods.

UNIT- V

Ontology Sources: Introduction, Metadata, Upper Ontologies.

Software Agents: Introduction, Agent Forms, Agent Architecture, Agents in the Semantic Web Context.

Applications: Introduction, Horizontal Information Products, Open academia, Bibster, Data Integration, Skill Finding, Think Tank Portal, e-learning, Web Services.

Text Books:

1. Karin K Brietman, Marco Antonio Casanova, Walter Truszkowski, "Semantic Web – Concepts Technologies and Applications", Springer 2007.
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer", PHI 2008.

Suggested Reading:

1. Liyang Yu, "Semantic Web and Semantic Web Services", CRC 2007.
2. Dean Allemang, James Hendler, "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL", Elsevier, 2011.
3. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", CRC Press 2009.

Web Resources:

1. http://www.cambridgesemantics.com/resources/case-study
2. The World Wide Web Consortium www.w3.org
3. http://protege.stanford.edu/
4. http://protege.stanford.edu/publications/ontology_development/ontology101-noy-mcguinness.html

IT 463

GRID COMPUTING
(Elective-II)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

CoursePrerequisites:

Knowledge in Operating Systems, Basics of client server programming

Course Objectives:

1. To understand the genesis of grid computing
2. To know the application of grid computing
3. To understanding the technology and tools to facilitated the grid computing

Course Outcomes:

1. To understand the need for and evolution of Grids in the context of processor
2. To be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.
3. To be able to form a grid infrastructure.
4. To be able to design and implement Grid computing applications using Globus or similar toolkits.
5. To be able to analyze solve the complex problems using Grid Computing.
6. To be able to justify the applicability, or non-applicability, of Grid technologies for a specific application.

UNIT - I

Introduction to Grid Computing: Grid Computing Concept, History of Distributed Computing, Computational Grid Applications, Grid Computing Infrastructure Development, GridComputing Software Interface Job Submission: Introduction, Globus Job Submission, Transferring Files.

UNIT - II

Schedulers: Scheduler Features, Scheduler Examples, Grid Computing Meta-Schedulers, Distributed Resource Management Application (DRMAA).

Security Concepts: Introduction, Symmetric Key Cryptography, Asymmetric Key Cryptography, (Public Key Cryptography), Public Key Infrastructure, Systems/Protocols Using Security Mechanisms.

Grid Security: Introduction, Grid Security Infrastructure (GSI), Delegation, Higher-Level Authorization Tools.

UNIT - III

System Infrastructure I: Web Services: Service-Oriented Architecture, Web Services and Web Service Implementation.

System Infrastructure II: Grid Computing Services: Grid Computing and Standardization Bodies, Interacting Grid Computing Components, Open Grid Services Architecture (OGSA), WSRF.

User-Friendly Interfaces: Introduction Grid Computing Workflow Editors, Grid Portals.

UNIT - IV

Grid-Enabling Applications: Introduction, Parameter Sweep, Using an Existing Program on Multiple Grid Computers, Writing an Application Specifically for a Grid, Using Multiple Grid Computers to Solve a Single Problem.

UNIT - V

Case Studies:

Globus: Overview of Globus Toolkit 4, Installation of Globus, GT4 Configuration, Main Components and programming Model, Using Globus.

gLite: Introduction, Internal Workings of gLite, Logging and Bookkeeping (LB), Security Mechanism Using gLite, Resource management using Gridway and Grid bus, Scheduling using Condor, SGE, PBS, LSF Grid scheduling with QoS.

Text Books:

1. Barry Wilkinson, "Grid Computing Techniques and Applications", CRC Press, 2010.
2. Luis Ferreira, Viktors Berstis, Jonathan Armstrong, Mike Kendzierski, Andreas Neukoetter, Masanobu Takagi, Richard Bing-Wo, Adeeb Amir, Ryo Murakawa, Olegario Hernandez, James Magowan, Norbert Bieberstein "Introduction to Grid Computing with Globus", IBM Redbooks.

Suggested Reading:

1. Frederic Magoules, Jie Pan, Kiat-An Tan, Abhinit Kumar, "Introduction to Grid Computing" CRC Press, 2009.
2. Vladimir Silva, "Grid Computing for Developers ", Dreamtech Press, 2006.
3. Ian Foster, Carl Kesselman. "The Grid 2-Blueprint for a new computing Infrastructure".
4. Elsevier Series, 2004.
5. Fran Berman, Geoffrey Fox. Anthony J.G Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003.
6. Joshey Joseph, Craig Fellenstein, "Grid computing", IBM Press, 2004.

Web Links:

1. Globus project: http://www.globus.org/alliance/
2. Global Grid Forum: http://www.ggf.org

IT 464

RESEARCH METHODOLOGY
(Elective-II)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Mini Projects

Course Objectives:

1. To assist in the planning and carrying out research projects.
2. To understand the principles, procedures and techniques of implementing a research project.
3. To understand the tools used for data analysis

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Define and describe the research process and research methods
2. Apply basic research methods including research design, data analysis, and interpretation.
3. Identify and analyse the problems
4. Apply analytical tools to solve the problem
5. Use Quantitative Techniques methods to provide soltuions
6. Develop technical reports using LaTex

UNIT -I

Research Methodology :Description: Introduction - meaning of research - objectives of research -motivation in research - types of research - research approaches - significance of research -research methods versus methodology - research and scientific method -importance of knowing how research is done - research processes - criteria of good research - defining research problem - selecting the problem - necessity of defining the problem - techniques involved in defining a problem –research design - meaning of research design - need for research design - features of good design - different research designs - basic principles of experimental design.

Originality in Research: Resources for research - research skills –time management - role of supervisor and scholar - interaction with subject experts.

Thesis Writing: The preliminary pages and the introduction - the literature review - methodology - the data analysis - the conclusions - the references (IEEE format).

UNIT- II

Review of Literature: Significance of review of literature –source for literature: books - journals – proceedings - thesis and dissertations -unpublished items.

On-line Searching: Database – SciFinder – Scopus - Science Direct –Searching research articles - Citation Index - Impact Factor - H-index etc,

UNIT- III

Introduction of analytical tools – Introduction to data analysis –least squares fitting of linear data and non-linear data - exponential type data -logarithmic type data - power function data and polynomials of different orders -plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and Sigmoidal type data - fitting of exponential growth, exponential decay type data –plotting polar graphs - plotting histograms - Y error bars - XY error bars - data masking.

UNIT- IV

Quantitative Techniques: General steps required for quantitative analysis -reliability of the data - classification of errors – accuracy – precision –statistical treatment of random errors - the standard deviation of complete results –error proportion in arithmetic calculations - uncertainty and its use in representing significant digits of results - confidence limits - estimation of detection limit.

UNIT- V

LaTeX and Beamer: Description: Writing scientific report - structure and components of research report - revision and refining' - writing project proposal - paper writing for international journals, submitting to editors - conference presentation –preparation of effective slides, pictures, graphs - citation styles.

Text Books:

1. C. R. Kothari, "Research Methodology Methods and Techniques", New Age International Publishers, New Delhi, 2nd edition, 2009.
2. F. Mittelbach and M. Goossens, "The LATEX Companion", Addison Wesley, 2nd edition, 2004.

Suggested Reading:

1. R. Panneerselvam, "Research Methodology", PHI, 2005.
2. P. Oliver, "Writing Your Thesis", Vistaar Publications, 2004.
3. J. W. Creswell, "Research Design: Qualitative, Quantitative, and Mixed Methods & Approaches", Sage Publications, 3rd edition, 2008.
4. Kumar, "Research Methodology: A Step by Step Guide for Beginners", SAGE Publications, 2005.

IT 465

PARALLEL COMPUTING
(Elective-II)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Data Structures and Design and Analysis of Algorithms.

Course Objectives:

1. To develop an understanding of parallel computing environment and its needs.
2. To understand the difference between the principles of sequential and parallel programming.
3. To solve problems using parallel computing.

Course Outcomes:

Student who completes this course will be able to:

1. Define terminology commonly used in parallel computing systems.
2. Describe different parallel architectures, inter-connect networks, programming models.
3. Explain algorithms for common operations such as broadcast, sorting etc.
4. Show the steps performed by a parallel algorithm on a given input as per the topology of processors.
5. Analyze the performance of a parallel algorithm, determine its computational bottlenecks and optimize the performance.
6. Design a parallel algorithm for a given problem**.**

UNIT - I

Introduction to Parallel Computing: Motivating Parallelism: The Computational Power Argument, The Memory/Disk Speed Argument, The Data Communication Argument, Scope of Parallel Computing; Applications in Engineering and Design, Scientific Applications, Applications in Computer Systems.

Parallel Programming Platforms Implicit Parallelism: Trends in Microprocessor, Pipelining and Superscalar Execution, Very Long Instruction Word Processors, Limitations of Memory System Performance, Improving Effective Memory Latency Using Caches, Impact of Memory Bandwidth, Alternate Approaches for Hiding Memory Latency, Communication Costs in Parallel Machines, Message Passing Costs in Parallel Computers, Communication Costs in Shared-Address-Space Machines.

UNIT -II

Principles of Parallel Algorithm: Decomposition, Tasks, and Dependency, Granularity, Concurrency, and Task-Interaction, Processes and Mapping, Processes versus Processor, Decomposition Techniques, Characteristics of Tasks and Interactions, Characteristics of Tasks, Characteristics of Inter-Task Interactions, Mapping Techniques for Load Balancing, Schemes for Static Mapping, Schemes for Dynamic Mapping, Methods for Containing Interaction Overheads, Maximizing Data Locality, Minimizing Contention and Hot Spots, Overlapping Computations with Interactions, Replicating Data or Computations, Using Optimized Collective Interaction Operations, Overlapping Interactions with Other Interactions.

UNIT -III

Basic Communication Operations: One-to-All Broadcast and All-to-One, Ring or Linear Array, Mesh, Hypercube, Balanced Binary Tree, All-to-All Broadcast and Reduction, Linear Array and Ring , Mesh, Hypercube, Cost, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Ring, Mesh, Hypercube, Circular Shift, Mesh, Hypercube.

Analytical Modelling of Parallel Programs: Sources of Overhead in Parallel, Performance Metrics for Parallel Systems, Execution Time, Total Parallel Overhead, Speedup, Efficiency, Cost, The Effect of Granularity on Performance, Scalability of Parallel Systems, Scaling Characteristics of Parallel Programs.

UNIT -IV

Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, Blocking Message Passing Operations, Non-Blocking Message Passing Operations.

Sorting: Issues in Sorting on Parallel Computers, Where the Input and Output Sequences are Stored, How Comparisons are Performed, Sorting Networks, Bubble Sort and its Variants, Shellsort, Quicksort, Parallelizing Quicksort, Pivot Selection.

UNIT -V

Graph Algorithms: Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Dijkstra's Algorithm, Floyd's Algorithm.

Search Algorithms for Discrete Optimization Problems: Definitions and Examples, Sequential Search Algorithms, Depth-First Search Algorithms, Best-First Search Algorithms.

Dynamic Programming: Overview of Dynamic Programming, Serial Monadic DP Formulations, the Shortest-Path Problem, the 0/1 Knapsack Problem.

Text Books:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Second Edition, Publisher: Addison Wesley, January, 2003 ISBN: 0-201-64865-2, Pages: 856.
2. Behrooz Parhami, "Introduction to Parallel Processing Algorithms and Architectures", Kluwer Academic Publishers, New York, Boston, Dordrecht, London, Moscow, 2002.

Suggested Reading:

1. Michael J. Quinn, "Parallel Computing", January 1st 1994 by McGraw-Hill Companies.
2. Selim G. Akl, "The Design and Analysis of Parallel Algorithms", January 1st 1989 by Prentice Hall
3. Justin R. Smith, "The Design and Analysis of Parallel Algorithms".

Web Resources:

1. Web link: http://nptel.ac.in/syllabus/106102114/
2. http://www.cse.hcmut.edu.vn/~tuananh/courses/parallel_computing/Parhami%20B.%20Introduction%20to%20Parallel%20Processing%20%20Algorithms%20and%20Architectures%20(Kluwer,%202002).pdf

CE 422 DISASTER MITIGATION AND MANAGEMENT

Instruction	4 Periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Objectives:

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.
2. To impart knowledge in students about the nature, mechanism causes, consequences and mitigation measures of the various natural disasters including hydro metrological and geological based disasters.
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters including chemical, biological and nuclear warfare agents.
4. To equip the students with the knowledge of various chronological phases in the disaster management cycle.
5. To create awareness about the disaster management framework and legislations in the context of national and global conventions.
6. To enable students to understand the applications of geospatial technologies like remote sensing and geographical information systems in disaster management.

Course Outcomes:

1. Ability to analyse and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at local level
2. Ability to choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Ability to understand various mechanisms and consequences of natural and human induced disasters for the participatory role of engineers in disaster management.
4. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans
5. Ability to understand various participatory approaches/strategies and their application in disaster management
6. Ability to understand the concepts of remote sensing and geographical information systems for their effective application in disaster management.

UNIT-I:

Introduction to Natural, human induced and human made disasters – Meaning, nature, types and effects; International decade of natural disaster reduction (IDNDR); International strategy of natural disaster reduction (ISDR)

UNIT-II:

Natural Disasters– Hydro meteorological disasters: Causes, impacts, Early warning systems, structural and non-structural measures for floods, drought and cyclones; Tropical cyclones: Overview, cyclogenesis, drought monitoring and management.; Geographical based disasters: Earthquakes and Tsunami- Overview, causes, impacts, zoning, structural and non-structural mitigation measures; Tsunami generation; Landslides and avalanches: Overview, causes, impacts, zoning and mitigation measures. Case studies related to various hydro meteorological and geographical based disasters.

UNIT III:

Human induced hazards: Risks and control measures in a chemical industry**,** Causes, impacts and mitigation measures for chemical accidents, chemical disaster management, current status and perspectives; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents and traffic accidents .

UNIT IV:

Use of remote sensing and GIS in disaster mitigation and management; Scope of application of ICST (Information, communication and space technologies in disaster management, Critical applications & Infrastructure; Potential application of Remote sensing and GIS in disaster management and in various disastrous conditions like earthquakes, drought, Floods, landslides etc.

UNIT V:

Concept of Disaster Management: Introduction to disaster management, Relationship between Risk, vulnerability and a disaster, Disaster management cycle, Principles of disaster mitigation: Hazard identification and vulnerability analysis, Early warning systems and forecasting; Infrastructure and development in disaster management; Disaster management in India: National disaster management framework at central, state, district and local levels. Community based disaster management.

Text Books:

1. Rajib, S and Krishna Murthy, R.R, "Disaster Management Global Challenges and Local Solutions" Universities Press Hyderabad 2012.
2. Notes / Reading material published by National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.

Suggested Reading:

1. Navele, P & Raja, C.K., Earth and Atmospheric Disasters Management, Natural and Manmade. B.S. Publications, Hyderabad 2009.
2. Fearn-Banks, K, Crises computations approach: A case book approach. Route ledge Publishers, Special Indian Education, New York & London 2011.
3. Battacharya, T., Disaster Science and Management. Tata McGraw Hill Company, New Delhi 2012.

MB 215 ORGANIZATIONAL BEHAVIOUR

Instruction	4L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Internal Examination	20 Marks
Case Study/Assignment	5 Marks
Credits	3

Course Objectives: The objectives of the course are to:

1. Familiarize the students with the basic understanding of individual behavior and explore issues of motivation, communication, leadership, power, politics and organizational change.
2. Provide a comprehensive, up-to-date, practical knowledge base that provides an engaging introduction and concepts of organizational behavior.
3. Oriented the students with real life examples that correlate the theory to actual practice from the industry.
4. Enable the students to practically implement the Organizational Behavior principles and practice in real time situations in their careers and life.

Course Outcomes: After completion of this course students will be able to:

1. analyze the behavior, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
2. assess the potential effects of organizational-level factors on organizational behavior.
3. critically evaluate the potential effects of motivating and leading the individuals in the Organization.
4. analyze organizational behavioral issues in the context of groups, power, politics and conflict issues.

Unit – I

Organizational behavior – Nature and levels of organizational behavior – Individuals in organization – Individual differences – Personality and Ability – The Big 5 Model of personality – Organizationally relevant personality traits. The nature of perception – characteristics of the perceiver, target and situation – perceptual problems.

Unit – II

Organizational Designs and Structures – Traditional and Contemporary organizational designs.Organizational culture and ethical behavior – factors shaping organizational culture– creating an ethical culture.

Unit – III

Motivation–early and contemporary theories of motivation. Leadership – early and contemporary approaches to leadership.

Unit – IV

Groups and group development – turning groups into effective teams.Managing change – process, types and challenges.Communicating effectively in organizations – communication

process–barriers to communication–overcoming barriers to communication–persuasive communication–communication in crisis situations.

Unit – V

Power, Politics, Conflict and Negotiations–Sources of individual, functional and divisional Power.Organizational politics.Conflict – causes and consequences – Pondy's model of organizational conflict–conflict resolution strategies.

Essential Readings:

1. Jennifer George and Gareth Jones "Understanding and Managing Organizational Behavior", Published by Pearson Education Inc.
2. Jon L Pierce and Donald G. Gardner, "Management and Organizational behavior", Cengage Learning India (P) Limited.
3. Richard Pettinger, "Organizational Behavior", 2010 Routledge.

Suggested Books:

1. Stephen P. Robbins, Jennifer George and Gareth Jones, "Management and Organizational Behavior", Pearson Education Inc.
2. K. Aswathappa, "Organizational behavior", Himalaya Publishing House.
3. John Schermerhorn, Jr., James G. Hunt and Richard N. Osborn, "Organizational Behavior", 10th edition, Wiley India Edition.

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IV YEAR
INFORMATION TECHNOLOGY

Semester – II

S.No	Syllabus Ref.No	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per Week		Duration in Hrs.	Maximum Marks		
			L/T	D/P		End Sem. Exam	Sessional	
		THEORY						
1	IT 421	Embedded Systems & Internet of Things	4	-	3	75	25	3
2		Elective-III	4	-	3	75	25	3
3		Elective-IV	4	-	3	75	25	3
		PRACTICALS						
1	IT 422	Embedded Systems &IoTLab	-	3	3	50	25	2
2	IT 423	Seminar	-	3	-	-	25	1
3	IT 901	Main Project	-	6	Viva voice	Gr*	50	9
		TOTAL	**12**	**12**	**-**	**275**	**175**	**21**

ELECTIVE - III

IT 471 Data Hiding
IT 472 Social Media Analytics
IT 473 Information Storage and Management
IT 474 Adhoc and Sensor Networks
IT 475 Enterprise Technologies
IT 476 E-Commerce
IT 477 Data Analysis using R programming
ME 414 Operations Research

ELECTIVE - IV

IT 481 Cloud Computing
IT 482 Software Quality Assurance
IT 483 Simulation and Modelling
IT 484 Security Policies & Procedures
IT 485 Distributed Databases
ME 464 Entrepreneurship
ME 472Intellectual Property Rights

IT 421

EMBEDDED SYSTEMS& INTERNET OF THINGS

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Digital Logic and Design, C programming, Microelectronics, Computer Organization

Course Objectives:

1. To teach students theoretical aspects of the design and development of an embedded system, including hardware and embedded software development.
2. To familiarize students with the basic concepts and structure and development of embedded systems.
3. To provide an overview of Internet of Things, building blocks of IoT and the real-world applications
4. To introduce Rasberry Pi device, its interfaces and Django Framework.

Course Outcomes:

1. Possess the passion for acquiring knowledge and skill in development of embedded systems.
2. Design and develop embedded systems (hardware, software and firmware)
3. Demonstrate real-time and advanced processor concepts.
4. Describe the role of things and Internet in IoT and determine the IoT levels for designing an IoT system.
5. Learn about generic design methodology for IoT system design.
6. Describe about the Rasberry Pi board and interfacing sensors and actuators with Rasberry Pi and work with python based web application framework called Django.

UNIT-I

Embedded Computing: Introduction, Complex Systems and Microprocessor, Embedded System Design Process, Formalisms for System Design, Design Examples. The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT-II

Programming using 8051. Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. Introduction to Real- Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipe.

UNIT-III

Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded

Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, Introduction to advanced architectures: ARM and SHARC Processor and memory organization, Bus protocols, 12C bus and CAN bus.

UNIT-IV

Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IOT-Things in IoT, IoT Protocols, Logical Design of IOT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IOT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels& Deployment Templates.

Domain Specific IOTs: Various types of IoT Applications in Home Automation, Cities, Environment, Energy, Retail, Logistics Agriculture, Industry, Health & Life Style-Wearable Electronics.

UNIT-V

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

IoT Physical Devices and End Points: Basic building blocks of an IoT device, Rasberry Pi-About the board, Rasberry Pi interfaces-Serial, SPI,I2C.

Python Web Application Framework: Django Framework-Roles of Model, Template and View.

Text Books:

1. Wayne Wolf, "Computers and Components", Elsevier.
2. Kenneth J.Ayala, "The 8051 Microcontroller", Third Edition, Thomson.
3. David E. Simon, "An Embedded Software Primer", Pearson Education.
4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press.

Suggested Reading:

1. Raj Kamal, "Embedded Systems", Tata McGraw Hill.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

IT 422

EMBEDDED SYSTEMS & IoT LAB

Instruction	3 periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Prerequisites: Micro Processors Lab

Course Objectives:

1. To teach students all aspects of the design and development of an embedded system, including hardware and embedded software development.
2. To provide necessary knowledge to develop working code for real-world IoT applications

Course Outcomes:

After completion of the course, student will be able to

1. Possess the passion for acquiring programming skills in using different tools.
2. Able to design and develop embedded systems (hardware, peripherals and firmware).
3. Experience Programming in Real Time Operating System using VxWorks.
4. Develop python programs that run on Rasberry Pi
5. Interface Sensors and Actuators with Rasberry Pi
6. Develop simple IoT systems using Rasberry Pi device and appropriate sensors and Django Framework.

Experiments:

A. Use of 8-bit and 32-bit Microcontrollers, (such as 8051 Microcontroller, ARM2148 / ARM2378, LPC 2141/42/44/46/48) and C compiler (Keil, Ride etc.) to:

1. Interface Input-Output and other units such as: Relays, LEDs, LCDs, Switches, Keypads, Stepper Motors, Sensors, ADCs, Timers
2. Demonstrate Communications: RS232, IIC and CAN protocols
3. Develop Control Applications such as: Temperature Controller, Elevator Controller, Traffic Controller

B. Understanding Real Time Concepts using any RTOS through Demonstration of:

1. Timing
2. Multi-Tasking
3. Semaphores
4. Message Queues
5. Round-Robin Task Scheduling
6. Pre-emptive Priority based Task Scheduling
7. Priority Inversion
8. Signals
9. Interrupt Service Routines

C. **Internet of Things (IoT) Experiments**

Following are some of the programs that a student should be able to write and test on an Raspberry Pi, but not limited to this only.

1. Python- Installation, Working with Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Control flow examples, Pass statement, Functions, Modules, Packages, File Handling, Date/Time operations, Classes
2. Create a Python program to compute document statistics
3. Switching LED on/off from Rasberry Pi Console
4. Python program for blinking LED
5. Interfacing an LED and Switch with Rasberry Pi
6. Python program for sending an email on switch press
7. Interfacing a Light Sensor with Rasberry Pi
8. Implement any IoT application using Rasberry Pi, Python and Django Framework

Student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Text Book:

1. Kenneth J.Ayala, "The 8051 Microcontroller", Third Edition, Thomson.
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press.

IT 423

SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks
Credits	1

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of state of the art topics in a broad area of his /her specialization.

Seminar topics may be chosen by the students with advice from the faculty members. The seminar topic must be chosen from a standard publication (IEEE/ACM/Springer/ Elsevier/John Wiley & Sons Publishing Company etc.) with a prior approval from the designated faculty.

Students are to be exposed to following aspects of seminar presentations.

- Literature survey
- Consolidation of available information
- Power point Preparation
- Technical writing

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.

2. Give twenty(20) minutes presentation through OHP/ PPT/ Slide Projector followed by Ten(10) minutes discussion

3. Submit a report on the seminar topic with list of references and hard copy of the slides.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule should be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar should be from any peer reviewed recent journal publications.

IT 471 **DATA HIDING**
(Elective-III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Cryptography and Network security and Digital Image processing

Course Objectives:

1. To teach students theoretical aspects of the watermarking and steganography
2. Students have knowledge about the History of watermarking and steganography
3. Students have knowledge about the basic models of watermarking
4. Students have knowledge about the basic concepts of watermarking and steganography
5. Students have knowledge about the embedding process in steganography
6. The course utilizes and applies the scenarios of Steganalysis

Course Outcomes:

After completion of the course, student will be able to

1. Possess the passion for acquiring knowledge and skill in preserving and authenticate information
2. Able to design and develop Watermarked security and cryptography
3. Able to demonstrate algorithms of watermarking and steganography

UNIT- I

Introduction: Information Hiding, Steganography, and Watermarking, History of Watermarking, History of Steganography, Importance of Digital Watermarking, Importance of Steganography. Applications and Properties: Applications of Watermarking, Applications of Steganography , Properties of Watermarking Systems, Evaluating Watermarking Systems, Properties of Steganography and Steganalysis Systems. Evaluating and Testing Steganographic Systems.

UNIT- II

Models of Watermarking: Notation, Communications, Communication-Based Models of Watermarking, Basic model, Watermarking as Communications with Side Information at the Transmitter, Watermarking as Multiplexed Communications, Geometric Models of Watermarking, Modeling Watermark Detection by Correlation, Linear Correlation, Normalized Correlation, Correlation Coefficient, Robust Watermarking: Approaches, Robustness to Volumetric Distortions.

UNIT-III

Watermark Security: Security Requirements, Restricting Watermark Operations, Public and Private Watermarking, Categories of Attack, Assumptions about the Adversary, Watermark

Security and Cryptography, The Analogy between Watermarking and Cryptography, Preventing Unauthorized Detection, Embedding and Removal, Some Significant Known Attacks, Scrambling Attacks, Pathological Distortions, Copy Attacks, Ambiguity Attacks, Sensitivity Analysis Attacks, Gradient Descent Attacks, Content Authentication : Exact Authentication ,Selective Authentication, Localization, Restoration.

UNIT-IV

Steganography: Information-Theoretic Foundations of Steganography, Cachin's Definition of Steganographic Security, Practical Steganographic Methods: Statistics Preserving Steganography, Model-Based Steganography, Masking Embedding as Natural Processing, Minimizing the Embedding Impact, Matrix Embedding, Nonshared Selection Rule.

UNIT-V

Steganalysis: Steganalysis Scenarios, Detection, Forensic Steganalysis, the Influence of the Cover Work on Steganalysis, Significant Steganalysis Algorithms, LSB Embedding and the Histogram Attack, Sample Pairs Analysis. Blind Steganalysis of JPEG Images Using Calibration, Blind Steganalysis in the Spatial Domain.

Text Book:

1. Ingemar Cox, Matthew Miller, Jeffrey Bloom, and Jessica Fridrich, "Digital Watermarking and Steganography", 2nd Edition, (The Morgan Kaufmann Series in Multimedia Information and Systems).

Suggested reading:

1. Frank Y. Shih. "Digital Watermarking and Steganography: Fundamentals and Techniques", CRC Press.
2. Stefan Katzenbeisser, Fabien, and A.P. Petitcolas, "Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
3. Neil F. Johnson; ZoranDuric; SushilJajodia, "Information Hiding: Steganography and Watermarking - Attacks and Countermeasures", Springer.
4. Gregory Kipper, "Investigator's Guide to Steganography", Auerbach Publications.

IT 472

SOCIAL MEDIA ANALYTICS
(Elective- III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Data Structures, Design and Analysis of Algorithms, Data Warehousing and Data Mining, Computational Intelligence, Big Data Analytics

Course Objectives:

1. To introduce the basics of Social media mining and challenges in mining social media data
2. To discuss graph essentials, network essentials and network models for social media mining
3. To teach the process of detecting, analyzing communities and Information diffusion in the context of Social media analytics
4. To impart knowledge about mining essentials and importance of influence and homophily
5. To discuss recommendation systems in the context of social media
6. To introduce the working of prediction systems

Course Outcomes:

After Completion of the course, student will be able to

1. Understand and analyse the challenges posed by social media data
2. Represent social media using a suitable network model
3. Perform community analysis and analyse herd behaviour
4. Model, measure and distinguish between influence and homophily
5. Understand and build recommendation systems
6. Understand how a prediction system works

Unit - I

Introduction: What is Social Media Mining, New Challenges for Mining, **Graph Essentials:** Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms, **Network Measures**: Centrality, Transitivity and Reciprocity, Balance and Status, Similarity, **Network Models:** Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model.

Unit - II

Community Analysis: Community Detection, Community Evolution, Community Evaluation, **Information Diffusion in Social Media:** Herd Behaviour, Information Cascades, Diffusion of Innovations, Epidemics

Unit - III

Data Mining Essentials: Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning, **Influence and Homophily**: Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily.

Unit - IV

Recommendation in Social Media: Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations, **Behavior Analytics:** Individual Behavior, Collective Behavior.

Unit - V

Prediction: Predicting the future, Prediction of learning, Predicting elections, Predicting Box offices, Predicting Stock market, Closing predictions.

Text Books:

1. Zafarani R., Abbasi M.A., Liu H, "Social Media Mining: An Introduction", Cambridge University Press, 2014.
2. Lutz Finger, Soumitra Dutta, "Ask, Measure, Learn: Using Social Media Analytics to Understand and Influence Customer Behavior", O'Reilly Media, 2014.

Suggested Reading:

1. Bing Liu, "Sentiment Analysis: mining opinions, sentiments, and emotions", Cambridge University Press, 2015.
2. Matthew A. Russell, "Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites", O'Reilly Media 2011.

Web Resources:

1. http://www.kdd.org/kdd2015/tutorial.html
2. http://thinktostart.com/category/social-media/
3. http://simplymeasured.com/free-social-media-tools/#sm.0001p0rf42mqwdxnu1s1j6llvxvix
4. http://blogs.iit.edu/iit_web/social-media-2/social-media-whats-your-strategy/

IT 473

INFORMATION STORAGE AND MANAGEMENT
(Elective- III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: IT Workshop, Database Systems, Computer Networks, Data communications

Course Objectives:

1. To introduce storage architectures, including storage subsystems, DAS, SAN, NAS, CAS
2. To provide understanding of logical and physical components of a storage infrastructure and different storage virtualization technologies
3. To facilitate the knowledge about components for managing and monitoring the data center and for establishing clusters

Course Outcomes:

After successful completion of the course, students will be able to

1. Identify key challenges in managing information and analyze different storage technologies
2. Monitor the storage infrastructure and management activities
3. Identify CAS architecture and types of archives and forms current storage virtualization technologies
4. Manage virtual servers and storage between remote locations
5. Design, analyze and manage clusters of resources
6. Gain Knowledge to establish Data Centres

UNIT-I

Introduction to Storage Technology: Data creation and The value of data to a business, Information Lifecycle, Challenges in data storage and data management, Solutions available for data storage, Core elements of a Data Centre infrastructure, role of each element in supporting business activities.

UNIT-II

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Integrated and Modular storage systems, high-level architecture and working of an intelligent storage system.

UNIT-III

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfil the need, Understand the appropriateness of the different networked storage options for different application environments.

UNIT-IV

Information Availability, Monitoring & Managing Data Center: Reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Key areas to monitor in a data centre, Industry standards for data center monitoring and management, Key metrics to monitor storage infrastructure.

UNIT-V

Securing Storage and Storage Virtualization: Information Security, Critical security attributes for information systems, Storage security domains, Analyze the common threats in each domain. Storage Virtualization: Forms, Configurations and Challenges, Types of Storage Virtualization: Block-level and File-Level.

Text Book:

1. G.Somasundaram, Alok Shrivastava, EMC Education Series, "Information Storage and Management", Wiley, Publishing Inc., 2011.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.

Suggested Reading:

1. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne. 2001.
2. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002

Web Links:

1. http://www.mikeownage.com/mike/ebooks/Information%20Storage%20and%20Management.pdf

IT 474

ADHOC AND SENSOR NETWORKS
(Elective- III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Data Communication, Computer Networks, Mobile Computing

Course Objectives:

1. To provide students with an understanding of wireless ad-hoc and sensor networks
2. To enable them to recognise the wide range of applicability of these networks
3. To provide an understanding of the major design issues, including topics such as protocol mechanisms and resource constraints.

Course Outcomes:

After learning the course student should be able to:

1. Understand the needs of Wireless Adhoc and Sensor Network in current scenario of technology.
2. Describe current technology trends for the implementation and deployment of wireless adhoc/sensor networks.
3. Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
4. Explain the principles and characteristics of wireless sensor networks

UNIT-I

Introduction: Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio Propagation Mechanisms, Characteristics of the Wireless Channel, IEEE 802.11Standard, Origin of Ad hoc Packet Radio Networks – Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Comparison of Cellular and Ad-hoc Wireless Networks, Applications of Ad-hoc Wireless Networks, Challenges and Issues of Ad hoc Wireless Networks.

UNIT-II

Adhoc Network Protocols : Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols. Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Issues in Designing a Transport Layer Protocol for Ad hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks, Classification of Transport Layer Solutions, TCP over Ad hoc Wireless Networks, Security in Ad Hoc Wireless Networks.

UNIT-III

QoS and Energy Management in Adhoc Wireless Networks: Issues and Challenges in Providing QoS in Ad hoc Wireless Networks, Classifications of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad hoc Wireless Networks. Need for Energy Management in Ad hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Power Management Schemes, and System Power Management Scheme.

UNIT-IV

Introduction and Overview of Wireless Sensor Networks: Background of Sensor Network Technology, Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends.

UNIT-V

Wireless Sensor Network Protocols: MAC Protocols for WSNs: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case study, Routing Protocols for WSNs: Background, Data Dissemination and Gathering, Routing Challenges and design Issue, Flooding, SPIN and LEACH protocols for WSNs. Transport Protocol Design Issues in WSNs.

Text Books:

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, PTR, 2004.
2. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks', A John Wiley & Sons Inc. Publication, 2007.

Suggested Reading:

1. Carlos de MoraisCordeiro and Dharma PrakashAgrawal, "Ad Hoc and Sensor Networks : Theory and Applications", Second Edition, World Scientific Publishers, 2011.
2. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001.
3. Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong, "Wireless Sensor Networks Signal Processing and Communications", John Wiley & Sons.

IT 475

ENTERPRISE TECHNOLOGIES
(Elective- III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Java Programming, Web Programming

Course Objectives:

1. To understand the enterprise application environment and how middleware services like security,clustering,transaction etc., can be applied in distributed environment
2. To understand the flow of execution of struts framework.
3. To understand the advantageof Hibernate ORMin comparison with existing alternatives.
4. To understand the core concepts of spring framework.
5. To understand the spring MVC web application development process.

Course Outcomes:

Upon successful completion of this course, student will be able to

1. Identify the suitability of EJB in application development and configuring the appropriate middleware services
2. Develop web applications using struts framework
3. Apply ORM in place of entity beans and JPA
4. Apply the spring concepts like Inversion of Control (IOC), Dependency Injection etc.
5. Develop robust web applications using spring MVC.

UNIT-I

EJB 3: Introduction to EJB 3.0, Architecture of EJB 3.0, Session Beans in EJB 3.0Stateless Session Bean, Stateful Session Bean, JPA-Java persistence API,Building applications with session beans and entity beans.

UNIT-II

Struts: The scope of Struts, The development process with struts, The Struts Controller, Action Class, Views in Struts, Sample Applications.

UNIT-III

Hibernate: Introduction to ORM, Introduction to hibernate, Hibernate Architecture, Hibernate Configuration file & Mapping files, Session Operations, Building applications with Hibernate

UNIT-IV

Spring: What is spring; How Spring fits into enterprise world, Introduction to IOC, Types of DI, Setters Vs Constructor, Collection DI, Bean Inheritance, Collection Merging, and Building Applications.

UNIT-V

Spring MVC: Spring 3.0 features, Spring MVC Architecture, Advantages of Spring MVC Framework, Handler Mapping, Validation Framework and Building applications.

Text Books:

1. Jim Farley, William Crawford, O'Reilly and Associates, "Java Enterprise in a Nutshell",2005.
2. Govind Seshadri, "Enterprise java Computing: Application and Architectures", Cambridge University Publications, 1999.

Suggested Reading:

1. Jonathan Wetherbee and Raghu Kodali, "Beginning EJB 3, Java EE, 7th Edition" Apress, 2013.
2. Christian Bauer and Gavin King "Hibernate in Action" Manning Publications, 2004.
3. Richard Scarry "The Rooster Struts Board book", Golden books, 2015.
4. Willie Wheeler, Joshua White "Spring in Practice" Manning Publications, 2013.

Online Resources:

1. http://docs.oracle.com/javaee/6/tutorial/doc/gijsz.html
2. https://www.udemy.com/javaspring/
3. http://viralpatel.net/blogs/tutorial-spring-3-mvc-introduction-spring-mvc-framework/
4. http://www.journaldev.com/3793/hibernate-tutorial
5. http://www.ibm.com/developerworks/websphere/techjournal/0302_fung/fung.html

IT 476

ELECTRONIC COMMERCE
(Elective-III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Computer Networks, Information Security

Course Educational Objectives:

1. To introduce the concepts and importance of E-commerce.
2. To facilitate understanding of the importance of ethics, legal issues and privacy in E-Commerce.
3. To familiarize with various electronic payment systems, advertising and marketing on the web.

Course Outcomes:

Students who complete this course will be able to

1. Understand the impact of information superhighway and multimedia on global business and life style.
2. Explain the significance of Electronic data interchange and legal, security and privacy issues.
3. Describe the digital documentations, market research and corporate data warehouses, and their usage in the business strategy formulation.
4. Understand the significance of the various modes of electronic payments and the risks involved.
5. Explain the significance of organizing the data in a consumer oriented view.

UNIT-I

Electronic Commerce: Electronic Commerce Frame Work, Electronic Commerce and Media Convergence, Anatomy of E-Commerce appellations, Electronic Commerce Consumer applications, Electronic Commerce Organization Applications.

Consumer Oriented Electronic Commerce: Consumer- Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer's Perspective, Mercantile Models from the Merchants' Perspective.

UNIT-II

Electronic Payment systems: Types of Electronic Payment Systems, Digital Token - Based Electronic Payment Systems, Smart Cards Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment systems, Designing Electronic Payment Systems.

UNIT -III

Inter Organizational Commerce and EDI: Electronic Data Interchange, EDI applications in business, EDI: Legal, Security, and Privacy issues, EDI and Electronic Commerce. EDI Implementation, MIME and Value added networks.-Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value-Added Networks, Internet-Based EDI.

Intra organizational Electronic Commerce: Internal Information Systems, Work Flow Automation and Coordination, Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library: Dimensions of Internal electronic Commerce Systems, Types of Digital Documents, Issues behind Document Infrastructure, Corporate Data Warehouse Advertising and Marketing on the Internet - Information based marketing, advertising on Internet, on-line marketing process, market research.

UNIT -V

Consumer Search and Resource Discovery: Search and Resource Discovery paradigms, Information search and Retrieval, Electronic Commerce catalogues or Directories, information filtering, Consumer-Data Interface, Emerging Tools.

Multimedia and Digital video: key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Book:

1. Ravi Kalakota & A. B. Whinstong: "Frontiers of Electronic Commerce", Pearson Education, lndia, 2006.

Suggested Reading:

1. Daniel Minoli, Emma Minoli, “Web Commerce Technology Handbook” Tata McGraw Hill 2007.
2. J Christopher W, Theodore HKC, "Global Electronic Commerce: Theory and Case Studies", Universities Press, 2001.

IT 477

DATA ANALYSIS USING R PROGRAMMING
(Elective-III)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Probability and Random Processes, Java Programming, Big Data Analytics

Course objectives:
To introduce R, an easy to use tool for high level data analytics.

Course outcomes:
After successful completion of the course students will be able to

1. Learn and use various built-in data types in R and read and write data from other datasets using R packages.
2. Use Textual and binary formats for storing data and perform numerical and statistical calculations using Vectorized operations, Date and Time.
3. Perform operations for managing Data frames using dplyr package and write programs using control structures and Functions.
4. Appreciate lexical scoping of R that simplifies statistical computations and use loop functions to implement loops in a compact form.
5. Debug programs using interactive debugging tools of R and optimize R programs using Rprofiler
6. Simulate a system by modeling random inputs using random number generators.

UNIT-I

History and Overview of R: Basic Features of R, Design of the R System, Limitations of R, R Resources, **Introduction to R:**Installation, Interface, Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors, Mixing Objects, Explicit Coercion, Matrices, Lists, Factors, Missing Values, Data Frames, Names, **Getting Data In and Out of R :**Reading and Writing Data, Reading Data Files with read.table(), Reading in Larger Datasets with read.table, Calculating Memory Requirements for R Objects, **Using the readr Package**

UNIT-II

Using Textual and Binary Formats for Storing Data: Usingdput() and dump(), Binary Formats, **Interfaces to the Outside World**: File Connections, Reading Lines of a Text File, Reading From a URL Connection, **Subsetting R Objects**: Subsetting a Vector, Subsetting a Matrix, Subsetting Lists, Subsetting Nested Elements of a List Extracting Multiple Elements of a List, Partial Matching, Removing NA Values, **Vectorized Operations**:Vectorized Matrix Operations, **Dates and Times**: Dates in R, Times in R, Operations on Dates and Times.

UNIT-III

Managing Data Frames: Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package, select(), filter(), arrange(), rename(), mutate(), group_by(), Pipeline operator, **Control Structures**: if-else, for Loops, Nested for loops, while Loops, repeat Loops, next, break, **Functions**: Functions in R, Argument Matching, Lazy Evaluation, The ... Argument, Arguments Coming After the ... Argument.

UNIT-IV

Scoping Rules of R:A Diversion on Binding Values to Symbol, Scoping Rules, Lexical Scoping: Lexical vs. Dynamic Scoping, Application: Optimization, Plotting the Likelihood, **Coding Standards for R, Loop Functions**:, Looping on the Command Line, lapply(), sapply(), split(), Splitting a Data Frame, tapply, apply(), Col/Row Sums and Means, Other Ways to Apply, mapply(), Vectorizing a Function, **Debugging:** Figuring Out What's Wrong, Debugging Tools in R, Using traceback(), Using debug(), Using recover().

UNIT-V

Profiling R Code: Usingsystem.time(), Timing Longer Expressions, The R Profiler Using summaryRprof(), **Simulation:** Generating Random Numbers, Setting the random number seed, Simulating a Linear Model, Random Sampling, **Data Analysis Case Study:**Simulation, Loading and Processing the Raw Data , Results.

Text Book:

1. Ravi Kalakota & A. B. Whinstong, "Frontiers of Electronic Commerce", Pearson Education, lndia, 2006.

Suggested Reading:

1. Daniel Minoli, Emma Minoli, "Web Commerce Technology Handbook", Tata McGraw Hill 2007.
2. J Christopher W, Theodore HKC, "Global Electronic Commerce: Theory and Case Studies", Universities Press, 2001.

ME 414

Operations Research

Instruction	4 Periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the significance of Operations Research concept and techniques
2. To know the formulation of LPP models
3. To understand the Algorithms of Graphical and Simplex Methods
4. To understand the Transportation and Assignment techniques
5. To know the procedure of Project Management along with CPM and PERT techniques
6. To understand the concepts of sequencing and queuing theory

Course Outcomes: At the end of the course, the students were able to

1. Recognize the importance and value of Operations Research and mathematical formulation in solving practical problems in industry;
2. Formulate a managerial decision problem into a mathematical model;
3. Apply Operations Research models to real time industry problems;
4. Build and solve Transportation Models and Assignment Models.
5. Apply project management techniques like CPM and PERT to plan and execute project successfully
6. Apply sequencing and queuing theory concepts in industry applications

UNIT-I

Introduction: Definition and Scope of Operations Research.

Linear Programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method, Degeneracy in Simplex, Duality in Simplex.

UNIT-II

Transportation Models: Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in Transportation, Profit Maximization in Transportation.

UNIT-III

Assignment Techniques: Introduction, Hungarian technique of Assignment techniques, unbalanced problems, problems with restrictions, Maximization in Assignment problems, travelling salesman problems

UNIT-IV

Project Management: Definition, Procedure and Objectives of Project Management, Differences between PERT and CPM, Rules for drawing Network diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of ES and EF times in forward path, LS & LF times in backward path, Determination of critical path, duration of the project, Free float, Independent float and Total float, Crashing of network.

UNIT-V

Sequencing Models: Introduction, General assumptions, processing 'n' jobs through two machines, processing 'n' jobs through three machines.

Queuing Theory: Introduction, Kendal's Notation, single channel - poisson arrivals - exponential service times

Text Books:

1. Hamdy, A. Taha, "Operations Research-An Introduction", Sixth Edition, Prentice Hall of India Pvt. Ltd., 1997.
2. S.D. Sharma, "Operations Research", Kedarnath, Ramnath& Co., Meerut,2009
3. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004

Suggested Reading:

1. Harvey M. Wagner, "Principles of Operations Research", Second Edition, Prentice Hall of India Ltd., 1980.
2. R. Paneer Selvam, "Operations Research", Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
3. Nita H. Shah, Ravi M. Gor, HardikSoni, "Operations Research", PHI Learning Private Limited, 2013

IT 481

CLOUD COMPUTING
(Elective-IV)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course prerequisites: Operating Systems, Distributed Systems

Course Objectives:

1. To introduce mechanisms that enable cloud computing
2. To familiarize with the architecture and standards of cloud computing
3. To facilitate understanding of different virtualization technologies
4. To provide an introduction to various cloud platforms

Course Outcomes:

After successful completion of the course, student will be able to

1. Describe the features of clouds and basic principles of cloud computing
2. Discuss system virtualization and outline its role in enabling the cloud computing system model.
3. Analyze and apply various clouds architectures
4. Identify the security requirements of cloud computing
5. Develop applications on different cloud platforms

UNIT-I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT-II

Virtual Machines and Virtualization of Clusters and Data Centers, Levels of Virtualization, Virtualization Structures / tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Centre Automation.

UNIT-III

Cloud computing architectures: over Virtualized Data Centers: Data–Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT-IV

Cloud Security and Trust Management, data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layers – DET, RND, OPE, JOIN, SEARCH, HOM and Holomorphic Encryption, FPE. Trust, Reputation and Security Management.

Unit-V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWs and Microsoft Azure, Emerging Cloud Software Environments.

Text Books:

1. John W. Rittenhouse, James F. Ransome, "Cloud Computing: Implementation, Management, and Security ", CRC Press, 2009.
2. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", WileyPublishing, 2011.

Suggested Reading:

1. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Elsevier, 2012.
2. Raluca Ada Popa, Catherine M.S.Redfield, NickolaiZeldovich and HariBalakrishnana, "CryptDB: Protecting Confidentiality with encrypted Query Processing" 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", AuerbachPublications(CRC Press), 2006.

IT 482

SOFTWARE QUALITY ASSURANCE
(Elective-IV)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Software Engineering, Software Testing

Course Objectives:

1. To introduce the concepts and methods required for effective and efficient SQA.
2. To develop a broad understanding of SQA processes from planning until execution
3. Introduce various approaches, techniques, technologies, and methodologies used in software quality assurance.
4. Prepare students to conduct independent research on software testing and quality assurance and to apply that knowledge in their future research and practice.

Course Outcomes:

At the end of this course students will be able to:

1. Understand quality management processes
2. Distinguish between the various activities of quality assurance, quality planning and quality control.
3. Understand the importance of standards in the quality management process and their impact on the final product.
4. Understand and apply key quality assurance techniques tailored for specific software development environments.
5. Propose and defend innovative solutions to software quality assurance and measurement problems in the context of various software development environments.
6. Research, consolidate and present large amounts of information related to appropriate quality assurance techniques and be able to make recommendations for management strategies.

UNIT I:

Fundamentals Of Software Quality Assurance : The Role of SQA , SQA Plan, Establishing quality goals, the purpose of quality goals, the quality goal methodology , SQA responsibilities, Factors affecting the SQA effort, SQA functions, SQA considerations, SQA people , Quality Management, Software Configuration Management, Configuration control, Change management, Revisions, Deltas, Conditional code.

UNIT II

Managing Software Quality: Managing Software Organizations , Managing Software Quality, Defect Prevention, Defect evaluation, Defect reporting, Cause analysis, Action plan development, Performance tracking, Software Quality Assurance Management, Quality tasks, A minimal QA effort, Factors affecting the SQA effort, the critical Personnel question, Fundamental requirements.

UNIT III

Software Quality Assurance Metrics: Software Quality – Total Quality Management (TQM) – Quality Metrics –QA techniques, Technical Reviews, technical review objectives, Auditing, Software Inspection, software inspection objectives, Walkthroughs , Walkthrough objectives, planning for process improvement, Software Quality Metrics Analysis-Software quality metric, CMM Compatibility, ISO 9000 compatibility.

UNIT IV

Software Quality Program: Software Quality Program Concepts –Scope of the software quality program, Establishment of a Software Quality Program – Professional ethics, a Minimal QA effort, Software Quality Assurance Planning – An Overview –Contents and structure of the standard, establishing quality goals, the purpose of quality goals, the quality goal methodology, Purpose& Scope.

UNIT V

Software Quality Assurance Standardization : Software Standards–ISO 9000 Quality System Standards - Capability Maturity Model and the Role of SQA in Software Development Maturity – SEI CMM Level 5 – Comparison of ISO 9000 Model with SEI's CMM –The models orientations, ISO 9000 weaknesses, CMM weaknesses, the capability model enjoys some important strengths, SPICE-software Process improvement and capability determination

Text Books:

1. Mordechai Ben-Menachem / Garry S Marliss, "Software Quality", Vikas Publishing House, Pvt. Ltd., New Delhi.
2. Watts S Humphrey, "Managing the Software Process", Pearson Education Inc.

Suggested Reading:

1. G. Gordon Schulmeyer, "Handbook of Software Quality Assurance", Fourth Edition, Artech House Inc, London.
2. KshirasagarNaik , "Software Testing and Quality Assurance: Theory and Practice", 1st Edition, Wiley Publishers.

IT 483

SIMULATION AND MODELING
(Elective-IV)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Probability and Statistics

Course Objectives:

1. To present an introduction to discrete event simulation systems.
2. To familiarize with simulation languages/software to solve real world problems in the manufacturing as well as services sectors.
3. To discuss the modeling techniques of entities, queues, resources and entity transfers in discrete event environment.
4. To teach the necessary skills to formulate and build valid models, implement the model, perform simulation analysis of the system and analyze results.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply simulation concepts to achieve in business, science, engineering, industry and services goals
2. Demonstrate formulation and modeling skills
3. Perform a simulation using spreadsheets as well as simulation language/package
4. Generate pseudorandom numbers using the Linear Congruential Method
5. Evaluate the quality of a pseudorandom number generator using statistical tests
6. Analyze and fit the collected data to different distributions

UNIT-I

Introduction to Simulation: Advantages and Disadvantages of simulation, Areas of application, System and System Environment, Components of a System, Discrete And Continuous Systems, Model of a System, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study, Simulation Examples.

UNIT-II

Overview of Statistical models and queuing systems: Programming languages for simulation, Continuous and discrete simulation languages-FOTTRAN, GPSS, SIMAN, SIMSCRIPT, SLAM and MODSIM III

UNIT-III

Random Numbers: generation, properties of random numbers, generation of pseudo-random numbers, tests for random numbers

Random variants: generation, inverse transformation technique, uniform distribution, exponential distribution. Weibul's distribution, triangular 38 distributions, direct transformation for the normal distribution, convolution method of Erlang distribution, **Acceptance rejection techniques:** Poisson distribution, Gamma distribution.

UNIT-IV

Input data analysis: Data Collection, Identify the distribution, parameter and estimation. Goodness of fit tests: Chi square test- KS test, Multivariate and time series input models, Verification and validations of simulation models, Model building.

V**erification and Validation:** Verification of simulation models, calibration and validation of models face validity, Validation of model assumptions, validation input/output Transformations, Input/output validation using historical input data, Input/output validation using Turning test.

UNIT-V

Output data analysis: stochastic nature of output data, Types of simulation with respect to output analysis. Measures of performance and their estimation, Output analysis for terminating simulations, Output analysis for steady-state simulations.

Comparison and evaluation of alternative system designs: Comparison of several system designs. Statistical models for estimating the effect of design alternatives.

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, and David M. Nicol, "Discrete-Event System Simulation", Pearson Education Asia, 2001.
2. Narsingh Deo, "System Simulation with Digital Computers", Prentice Hall of India, 1979.

Suggesting Reading:

1. Anerill M Law and W. David Kelton, "Simulation Modeling and Analysis", McGraw Hill, 2009.

IT 484

SECURITY POLICIES AND PROCEDURES
(Elective-IV)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Information Security

Course Objectives:

1. To understand various security policies, procedures, standards and its central role in an Information security program.
2. To have an overview of information security strategy and architecture.
3. To obtain a thorough knowledge to identify and prioritize information assets.
4. To know how to sell policies, Standards and procedures.
5. To study the concepts of Corporate Communications, Electronic Communications, Internet security, Information protection techniques.
6. To learn the concepts like Corporate Information Security policy, Information Security program Administration, Responsibilities.

Course Outcomes:

Students who complete this course should be able to

1. Aware of corporate and organizational policies and also key factors in establishing development cost.
2. Aware of overview of the field of Information Security from a management perspective.
3. Exposed to the spectrum of security activities, methods, methodologies, and procedures.
4. Apply project management principles to an information security program.
5. Select appropriate techniques to tackle and solve problems in the discipline of information security.
6. Understand why security and its management are important for any modern organisation.

UNIT- I

Introduction: corporate Policies, Organization wide(Tier 1) policies, Organization wide policy Document, Legal Requirements, Duty of loyalty, Duty of Care, Other Laws and Regulations, Business Requirements.

Planning and Preparation: Objectives of Policies, Standards And Procedures, Employee Benefits, Preparation Activities, core and Support Teams, Focus Groups, Development Responsibilities.

key factors in Establishing the Development Cost: Research, collect, and organize the information, conduct interviews, write the initial draft and prepare illustrations ,proofread and Edit, choosing the medium, maintenance. Responsibilities, Development Checklist.

UNIT-II

Developing Policies: Why Implement Information Security Policy, Definitions, Policy key Elements, Policy Format

Asset Classification Policy: why classify Information, what is Information Classification, Employee Responsibilities, Record Management policy, Information Classification Methodology, Authorization for Access

Developing Standards: overview, where Do standards Belong, what Does a standard look like, where Do I Get standards.

Developing Procedures: important procedure requirements, key elements in procedure writing, procedure checklist, procedure styles, and procedure development review.

Understanding How to sell policies, Standards and procedures: Effective Communication, keeping management Interested in security, Need for controls.

UNIT-III

Typical Tier 1 policies: Employee Standards of Conduct, Conflict Of interest, Employment Practices.

Records Management: role of retention center, role of records manager, role of management personnel, types of documents maintained in retention center, services, transferring records, record retrieval, and record destruction.

Corporate Communications, Electronic Communications, Internet security, Employee Discipline General Security, Business Continuity Planning, Information Protection, Information Classification.

UNIT-IV

Typical Tier2 Policies: Computer and Network management, Anti-virus policy, personnel security, systems Development and maintenance policy, Application Access Control policy, **Data and software Exchange:** policy, responsibilities, scope, compliance, supporting standards policy, Network Access Control, Network management policy, Information systems operational policy, physical and Environmental security, User Access policy.

UNIT-V

Sample Standards manual: Corporate Information Security policy.

Responsibilities: Manager, Information systems manager/team leader, information and system owner, information and system user, ISM, Information security Administration.

Standards: risk management, personnel security issues, physical and environmental security controls, security management, Information Classification process.

Sample Information security manual: What Are we protecting, User Responsibilities, Access Control policy, penalty for security violation, security Incident Handling Procedures.

Tools of Information security, Information processing, Information Security program Administration.

Text Book:

1. Thomas R. Peltier, "Information security Policies and Procedures A practitioner's Reference", Second Edition.
2. Thomas R Peltier, JustingPeltier, John Blackley, "Information Security. Fundamentals", Auerbacj Publications 2010.

Suggested Reading:

1. Michael E. Whitman and Hebert J Mattord, Principles of Information Security, 4th edition Ed. Cengage Learning 2011
2. Detmar W Straub, Seymor Goodman, Richard L Baskerville, Information Security. Policy proceses and practices PHI 2008

Online Resources:

1. http://www.lse.ac.uk/intranet/LSEServices/IMT/about/policies/home.aspx
2. https://www.crcpress.com/Information-Security-Policies-and-Procedures-A-Practitioners-Reference/Peltier/p/book/9780849319587#googlePreviewContainer
3. https://www.sans.org/security-resources/policies

IT 485

DISTRIBUTED DATABASES
(Elective-IV)

Instruction	4 L periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessional	25 Marks
Credits	3

Course Prerequisites: Database Systems, Distributed Systems

Course Objectives:

1. To introduce the features of distributed databases and different levels of Distribution transparency.
2. Impart knowledge about the design of distributed database and working of fragment queries
3. To provide understanding about optimization of queries and management of distributed transactions
4. To discuss the basics of distributed concurrency control and reliability
5. To teach about distributed database administration and heterogeneous distributed database systems

Course Outcomes:

After successful completion of the course, students will be able to

1. Explain the features of distributed databases and different levels of distribution transparency.
2. Understand the intricacies of distributed database design.
3. Gain knowledge to handle all types of queries, query optimization techniques.
4. Understand and analyse distributed Concurrency Control.
5. Understand the administration of distribute databases
6. Analyse the working of Heterogeneous distributed databases

UNIT -I

Distributed Databases: An overview: Features of distributed versus centralised databases, why distributed databases?, distributed database management systems. **Principles of Distributed Databases:** Levels of Distribution Transparency: Reference architecture for distributed databases, types of data fragmentation, distribution transparency for read-only applications, distribution transparency for update applications, distributed database access primitives, integrity constraints in distributed databases.

UNIT - II

Distributed Database design: A framework for Distributed Database Design, The design of database fragmentation, the allocation of fragments. **Translation of global queries to fragment queries:** Equivalence transformations for queries, transforming global queries into fragment queries, distributed grouping and aggregate function evaluation, parametric queries.

UNIT - III

Optimization of Access Strategies: A framework for query optimization, join queries, general queries. **The management of distributed transactions:** A framework for transaction management, supporting atomicity of distributed transactions, concurrency control for distributed transactions, architectural aspects of distributed transactions.

UNIT - IV

Concurrency control: Foundations of distributed concurrency control, distributed deadlocks, concurrency control based on timestamps, optimistic methods for distributed concurrency control. **Reliability:** Basic Concepts, Non blocking Commitment protocols, reliability and concurrency control, determining a consistent view of the network, detection and resolution of inconsistency, checkpoints and cold restart

UNIT - V

Distributed Database Administration: Catalog management in distributed databases, Authorization and protection. **Heterogeneous Distributed Database System:** Problems of Heterogeneous Distributed Databases, MULTIBASE, DDTS: A Distributed Testbed System, Heterogeneous SIRIUS-DELTA

Text Books:

1. Stefano Ceri, Giuseppe Pelagaui, "Distributed Databases Principles & Systems", TMH, 1988.
2. M. Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Pearson Education, 3rd Edition, 2011.

Suggested Reading:

1. Chhanda Ray, "Distributed Database Systems", Pearson Education, 2009.
2. Donald K. Burleson, "Managing distributed databases: building bridges between database islands", Wiley, 1994.

Web Resources:

1. http://docs.oracle.com/cd/B10501_01/server.920/a96521/ds_concepts.htm
2. http://www.csee.umbc.edu/portal/help/oracle8/server.815/a67781/c30dstdb.htm
3. http://cadp.inria.fr/

ME 464

Entrepreneurship (Elective – IV)

Instruction	4 Periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To understand the essence of Entrepreneurship
2. To know the environment of industry and related opportunities and challenges
3. To know the concept a procedure of idea generation
4. To understand the elements of business plan and its procedure
5. To understand project management and its techniques
6. To know behavioral issues and Time management

Course Outcomes: After completing this course, students will be able to:

1. Apply the entrepreneurial process
2. Analyze the feasibility of a new business plan and preparation of Business plan
3. Evaluate entrepreneurial tendency and attitude
4. Brainstorm ideas for new and innovative products or services
5. Use project management techniques like PERT and CPM
6. Analyze behavioural aspects and use time management matrix

UNIT-I

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT-II

Identification and characteristics of entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT-III

Business plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT-IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT-V

Behavioral aspects of entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Graw Hill Publishing Company Ltd., 5lh Ed., 2005
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

ME 472

Intellectual Property Rights (Elective – III)

Instruction	4 Periods per week
Duration of End Semester Examination	3 Hours
End Semester Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To introduce fundamental aspects of IP
2. Introducing all aspects of IPR acts.
3. Creating awareness of multi disciplinary audience
4. Creating awareness for innovation and its importance
5. Exposing to the changes in IPR culture
6. Awareness about techno-business aspects of IPR

Course Outcomes: At the end of the course, a student

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IP. .
6. Capable of converting creativity into IP and effectively protect it.

UNIT-I

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II

Industrial Designs: What is an industrial design? How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III

Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered? How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV

Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights. Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT-V

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection.

Unfair Competition: What is unfair competition? Relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
2. B. L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi 2010

Suggested Reading:

1. Cronish W.R1 Intellectual Property; Patents, copyright, Trad and Allied rights, Sweet & Maxwell, 1993.
2. P. Narayanan, Intellectual Property Law, Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs, Sweet, Maxwell 4th Edition.

IT 901 **PROJECT**

Instruction	6 Periods per week
Duration of End Semester Examination	Viva-voce
End Semester Examination	100 Marks
Sessional	50 Marks
Credits	9

Dealing with a real time problem should be the focus of under graduate project.

All projects will be monitored at least four times in the II-semester through individual presentations (Project batch wise).

Every student should maintain a project dairy, wherein he/she needs to record the progress of his/her work and get it signed at least once in a week by the guide(s). If working outside and college campus, both the external and internal guides should sign the same.

Sessional marks should be based on the marks, awarded by a project monitoring committee of faculty members as well as the marks given by the guide.

Common norms are established for final documentation of the project report, the students are directed to download from the website regarding the guidelines for preparing the project report and the project report format.

The project report shall be evaluated for 100 Marks by the External Examiner.

If the project work found inadequate in the end examination, the candidate should repeat the project work with a new problem or improve the quality of work and report it again.

Break up for 100 Marks in the end examination:

1. Power point presentation 20 Marks
2. Thesis/Report preparation 40 Marks
3. Viva-voce 40 Marks