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Faculty of Engineering
Scheme of Instruction and Syllabi

of

BE I - IV YEAR

OF
FOUR YEAR DEGREE COURSE

IN

COMPUTER SCIENCE & ENGINEERING

(With effect from the Academic Year 2013-2014)

July 2013
Osmania University
Hyderabad - 500 007.

CS 383

COMPILER CONSTRUCTION LAB

Instruction	3 Periods per we
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. Scanner programs using C
2. Scanner programs using LEX
3. Finding first set and follow set of productions
4. Top down parsers (Recursive decent parser, LL(1) parser, etc.)
5. Bottom up parsers (LR, SLR etc.)
6. Parser programs using YACC
7. Intermediate code generation
8. Code optimization

CS 384

MINI PROJECT

Instruction	3 Periods per wee
Sessional	25 Marks

The students are required to carry out mini projects in any of the areas such Data Communications, Web Programming & Services, Computer Networks, Compil Construction, and Object Oriented System Development.

Students are required to submit a report on the mini project at th end of the semester.

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SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(COMPUTER SCIENCE & ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction: Periods per week L	Scheme of Instruction: Periods per week D/P	Scheme of Examination: Duration In Hours	Scheme of Examination: Maximum Marks: Univ. Exam	Scheme of Examination: Maximum Marks: Sessionals
		THEORY					
1	CS 401	Distributed Systems	4	-	3	75	25
2	CS 402	Artificial Intelligence	4	-	3	75	25
3	CS 403	Information Security	4	-	3	75	25
4	CS 404	Principles & Applications of Embedded Systems	4	-	3	75	25
5		ELECTIVE-I	4	-	3	75	25
		PRACTICALS					
1	CS 431	Distributed Systems Lab.	-	3	3	50	25
2	CS 432	Embedded Systems Lab.	-	3	3	50	25
3	CS 433	Project Seminar	-	3	3	-	25
		Total	**20**	**9**	—	**475**	**200**

ELECTIVE-I

CS 411 Software Project Management
CS 412 Computer Graphics
CS 413 Image Processing
CS 414 Adhoc and Sensor Networks
CS 415 Soft Computing
CS 416 Mobile Computing
CS 417 Real Time Systems

CS 401

DISTRIBUTED SYSTEMS

Instruction	4 Periods per wee
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Characterization of Distributed Systems

Introduction, Examples of distributed systems, Resource sharing and t web, Challenges.

System Models

Introduction, Architectural models, Fundamental models.

Operating System Support

The operating system layer, Protection, Processes and thread Communication and invocation, Operating system architecture.

UNIT-II

Interprocess communication: Introduction, The API for the inter protocols, External data representation and marshalling.

Client Server communication: Group Communication, Case stud Interprocess communication in UNIX.

Distributed objects and Remote Invocation: Introductio Communication between distributed objects, Remote procedure ca Events and notifications, Case study: Java RMI.

Name Services : Introduction, Name services and the Domain Nam System, Directory services, Case study of the X.500 Directory Servic

UNIT-III

Time and Global States

Introduction, Clocks , Events and process states, Synchronizing physic clocks, Logical clocks, Global states, Distributed debugging.

Coordination and Agreement

Introduction, distributed mutual exclusion, Election, Multica communication, Consensus and related problems.

UNIT-IV

Transactions and Concurrency Control

Introduction, Transactions, Nested transactions, Locks, Optimistic concurrency control..

Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions

Introduction, Flat and nested distributed transactions, Atomic commit process, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Replication

Introduction, System model and group communication, Fault-tolerant services.

Case study: The gossip architecture, CODA.

UNIT V

Distributed Shared Memory

Introduction, Design and implementation issues, Sequential consistency and IVY case

study. Release consistency and Munin case study, Other consistency model.

Distributed File Systems

Introduction, File service architecture, Case study: Sun Network File System.

Enhancements and further developments.

Suggesting Reading:

1. Colouris, Dollimore, Kindberg, " *Distributed Systems concepts and Design"* 5th Ed. Pearson Education, 2011.
2. Andrew S. Tanenbaum, Van Steen, " *Distributed Systems* ", Pearson Education, 2010.
3. Singhal M, Shivratari N.G, *"Advanced Concepts Introduction, Operating Systems"* McGraw Hill, 2001.
4. Pradeep K Sinha, *"Distributed Opearating Systems: Concepts and Design"*, Pearson Education, Asia India, 2007.

CS 402

ARTIFICIAL INTELLIGENCE

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Definition, history and applications of AI. Search in State Spaces: Agents that plan, Uninformed search, Algorithm A*, Heuristic Functions and Search Efficiency, Alternative Search Formulations and Applications, Adversarial Search.

UNIT-II

Knowledge Representation and Reasoning: The Propositional Calculus, Resolution in Propositional Calculus, The Predicate Calculus, Resolution in Predicate Calculus, Rule-Based Expert Systems, Representing Common Sense Knowledge.

UNIT-III

Reasoning with Uncertain Information: Review of probability theory, Probabilistic Inference, Bayes Networks.

Planning Methods Based on Logic: The Situation Calculus, Planning.

UNIT-IV

Learning from Observations: Learning decision-trees using Information theory, Learning General Logical Descriptions.

Neural Networks: Perceptron, Multilayer feed-forward neural networks, Rule Learning.

UNIT-V

Natural Language Processing: Communication among agents

Fuzzy Logic Systems: Crisp Sets, Fuzzy Sets, Some fuzzy terminology, Fuzzy Logic Control, Sugeno Style of Fuzzy inference processing, Fuzzy hedges, α Cut Threshold, Neuro Fuzzy systems.

Suggested Reading:

1. Nils J. Nilsson (1998) *Artificial Intelligence: A New Synthesis.* Elsevier
2. Stuart Russell, Peter Norvig (1995), *Artificial Intelligence – A Modern Approach,* Pearson Edition/PHI.
3. Elaine Rich, Kevin Knight, Shivashankar B Nair (2009), *Artificial Intelligence,* Third edition, Tata McGraw Hill.
4. George F Luger (2009), *Artificial Intelligence, Structures and strategies for Complex Problem solving,* Pearson Edition.

CS 403

INFORMATION SECURITY

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC.

Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security.

Risk Management: Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices.

UNIT-III

Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

UNIT-IV

Security Technology: Intrusion detection, Access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

Cryptography: Foundations of cryptology, cipher methods, Crypryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems.

UNIT-V

Implementing Information Security: information security project management, technical topics of implementation , Non- technical aspects of implementation, Security certification and accreditation

Security and Personnel: Positioning and staffing security function, Employment policies and practices, internal control strategies.

Information security Maintenance: Security management models. The maintenance model, Digital forensics

Suggesting Reading:

1. Michael E. Whitman and Hebert J Mattord, *Principles of Information Security,* 4th edition, Ed. Cengage Learning 2011
2. Thomas R Peltier, Justing Peltier, John Blackley, *Information Security. Fundamentals,* Auerbacj Publications 2010
3. Detmar W Straub, Seymor Goodman, Richard L Baskerville, *Information Security. Policy proceses and practices,* PHI 2008
4. Marks Merkow and Jim Breithaupt, *Information Security. Principle and Practices,* Pearson Education, 2007.

CS 404

PRINCIPLES AND APPLICATIONS OF EMBEDDED SYSTEMS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Embedded Computing: Introduction, Complex Systems and Microprocessor, Embedded System Design Process, Formalisms for System Design, Design Examples.

Instruction Sets: Preliminaries, ARM Processor.

UNIT-II

CPUs: Programming Input and Output, Supervisor Mode, Exceptions and Traps, Co-Processors, Memory System Mechanisms, CPU Performance, CPU Power Consumption.

Computing Platforms: Basic Computing Platforms, The CPU Bus, Memory Devices & Systems, Consumer Electronics Architecture, Platform-level Performance Analysis, Design Example.

UNIT-III

Introduction to Real- Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like µC-OS (Open Source).

UNIT-IV

Multirate Systems, Priority Based Scheduling, Evaluating Operating System Performance.

Networks and Multiprocessors: Networks and Multiprocessors, Categories of Multiprocessors, Distributed Embedded Systems, MPSoCs and Shared memory Multiprocessors, Design Example.

UNIT-V

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, An Example System.

Suggested Reading:

1. Marilyn Wolf, *Computers as Components: Principles of Embedded Computing System Design* 3rd Edition, Elsevier, 2012.
2. David E. Simon, *An Embedded Software Primer,* 1999.
3. Raj Kamal, *Embedded Systems,* Tata McGraw Hill, 2008.

CS 411

SOFTWARE PROJECT MANAGEMENT

(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Conventional Software Management, Evolution of software Economics, Improving Software Economics, Old way and New.

UNIT – II

Life cycle Phases, Artifacts of Process, Model based software Architectures, Workflows of the process, Check points of the process.

UNIT-III

Iterative process Planning, Project organization and responsibilities, Process automation, Project control of process instrumentation, Tailoring the process

UNIT-IV

Modern Project profiles, Next generation software Economics, Modern process transitions, Managing Contracts, Managing People and Organizing Teams.

UNIT-V

Process Improvement and Managing to the CMM, ISO 12207 – an Overview, Program Management.

Suggested Reading:

1. Walker Royce, *Software Project Management: A Unified Framework,* Pearson Education – 1998.
2. Bob Hughes and Mike Cotterell, *Software Project Management,* 4th Edition – Tata McGraw Hill – 2006.
3. Watt S. Humphery, *Managing Software Process,* Addision Weslley 1998.

CS 412

COMPUTER GRAPHICS

(Elective - I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Graphics Systems and Models: Graphics system; Images; Physical and synthetic; Imaging system; synthetic camera model; programming interface ; graphics architectures programmable pipelines; performance characteristics. Graphics Programming: Programming two-dimensional applications; OpenGL API; Primitives and attributes; color; viewing, control functions

UNIT-II

Input and Interaction: Input device; clients and servers; displays lists; display lists and modeling; programming event driven input; picking ; building interactive models; animating Interactive programs; logic operations. Geometrics Objects: Three - dimensional primitives; coordinates systems and frames; frames in OpenGL; Modeling colored cube.

UNIT-III

Transformations: Affine Transformations; Transformations in homogenous coordinates; concatenation of Transformations; OpenGL transformation matrices; Viewing: Classical and Computer views; Viewing with a computer; Positioning of camera; Simple projections; Projections in OpenGL; Hidden surface removal; Parallel-projection matrices; Perspective projection matrices

UNIT-IV

Lighting and Shading: Light sources; The Phong lighting model; Computational vectors; Polygonal shading; Light sources in OpenGL; Specification of matrices in OpenGL; Global illumination; From Vertices To Frames: Basic implementation strategies; line-segment clipping; polygon clipping; clipping of other primitives; clipping in three dimensions;

Rasterization ; Bresenham's algorithm; Polygon Rasterization ; Hidden surface removal; anti-aliasing; display considerations,

UNIT-V

Modelling & Hierarchy: Hierarchal models; trees and traversal; use of tree data structure; animation; Graphical objects; Scene graphs; Simple scene graph API; Open Scene graph; other tree structures; Curves and Surfaces: Representation of curves and surfaces; design criteria; Bezier curves and surfaces; Cubic B-splines; General B-splines; rendering curves and surfaces; curves and surfaces in OpenGL

Suggested Readings:

1. Edward Angel, *Interactive Computer Graphics A Top-Down Approach Using Open GL,* Peasrson Education, 5th edition, 2009.
2. Fransis S Hill Jr., Stephen M Kelley , *Computer Graphics Using Open GL,* Prentice, Hall, Inc., 3rd edition, 2007.
3. Jim X. Chen, *Foundation of 3D Graphics Programming Using JOGL and Java3D*, SpringerVerlag, 2006.
4. Hearn Donald, Pauline Baker M, *Computer Graphics,* 2nd edition, 1995.
5. Hearn Donald, Pauline Baker M, *Computer Graphics wih OpenGL,* 4th edition , Prentice Hall PTR, 2010.

CS 413

IMAGE PROCESSING

(Elective - I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to Digital Image Processing: Origins and Applications of Digital Image Processing. Fundamental Steps in Digital Image Processing, Components of Digital Image Processing System. Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization

UNIT-II

Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT) of One Variable, Extension to Function of Two Variables, Image Smoothing and Sharpening using Frequency Domain Filters.

UNIT-III

Filtering Intensity Transformations and Spatial: Histogram Processing, Fundamental of Spatial Filtering, Smoothing and Sharpening Spatial Filters

Image Segmentation: Point, Line and Edge Detection, Thresholding-(Foundation , Basic global thresholding, Otsus method) , Region-Based Segmentation.

UNIT-IV

Image Compression: Fidelity Criteria, Image Compression Models, Image Formats, Containers and Compression Standards

Compression Methods: Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-Length Coding.

UNIT-V

Restoration: Noise Models, Inverse filtering. Least squares Filtering.

Color Image Processing : Color fundamentals, Color models, Pseudocolor Image Processing, Basics of full color image processing.

Suggested Reading:

1. Gonzalez R.C., Woods R.E: *Digital Image Processing,* Pearson Education, Third Edition 2012.
2. William K. Pratt, *"Digital Image Processing"*, John Wiley & Sons Inc. 3rd Edition, 2001.
3. McAndrew, *Introduction to Digital Image Processing* , Cengage Learning, 2004.
4. Sonka, Hlavac, Boyle, *Digital Image Processing and Computer Vision,* Cengage learning, 2008.
5. Rosenfeld A. Kak AC: *Digital Picture Processing Vol.I & II Acad,* Press, 2nd Edition, 1982.

CS 414

ADHOC AND SENSOR NETWORKS

(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction
Routing in Ad Hoc Networks
Broadcasting, Multicasting and Geocasting

UNIT-II

Wireless LANs
Wireless PANs
Wireless Mesh Networks

UNIT-III

Cognitive Radio and Networks
TCP over Ad Hoc Networks
Applications of Sensor Networks

UNIT-IV

Sensor Networks Design Considerations
Sensor Networks in Controlled Environment and Actuators

UNIT-V

Security in Ad Hoc and Sensor Networks
Integrating MANETs, WLANs and Cellular Networks

Suggested Reading :

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, *"Ad Hoc and Sensor Networks : Theory and Applications"*, Second Edition, World Scientific Publishers, 2011.
2. Prasant Mohapatra and Sriramamurtyhy, *"Ad Hoc Networks: Technologies and Protocols"*, Springer International Edition, 2009
3. Kazem Sohraby, Daniel Minoli, Taieb Znati, *"Wireless Sensor Networks'*, A John Wiley & Sons Inc. Publication, 2007.

CS 415

SOFT COMPUTING

(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Neural networks, application scope of neural networks, fuzzy logic, genetic algorithm, hybrid systems, Soft computing. Artificial neural networks: Fundamental concepts, Evolution of neural networks, basic model of Artificial neural networks, Important terminology of ANNs, McCulloch-pitts neuron model, Linear separability, Hebb Network Supervised Learning Network: Perceptron networks, adaptive linear neuron (Adaline), Multiple adaptive linear neuron, Back propagation network, Radial basis Function network (Architecture& Training algorithms)

UNIT-II

Associative Memory Networks: Training algorithm for pattern Association, Associative memory network, Hetroassociative memory network (Architecture& Training algorithm), Bidirectional associative memory network Architecture, Discrete Bidirectional associative memory network, Continuous BAM ,Analysis of hamming distance, Energy function and storage capacity, Hopfield networks discrete &continuous. Unsupervised Learning Networks: Fixed weight competitive Nets, Kohonen self organizing network, Learning vector quantization (Architecture& Training algorithm) Adaptive Resonance theory network. Special networks: Simulated Annealing Networks,Boltzmann machine, Gaussian machine

UNIT-III

Fuzzy Logic: Introduction to Classical sets and fuzzy sets, Classical sets,Fuzzy sets: Operations and Properties. Fuzzy Relations: Cardinality, Operations and Properties, Equivalence & tolerance. Membership function: Fuzzification, membership value assignment: Inference, rank ordering, angular fuzzy sets

UNIT-IV

Defuzzification: Lamda Cuts for fuzzy sets and relations, defuzzification methods Fuzzy arithmetic and fuzzy measures: Fuzzy arithmetic, extension principle, fuzzy measures, measures of fuzziness, fuzzy integral Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy propositions formation of rules
,decomposition of compound rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference system, fuzzy expert systems

UNIT-V

Fuzzy decision making: Individual, multiperson, multi objective, multi attribute, Fuzzy Bayesian decision making, Fuzzy logic control system: control system design, architecture &operation of FLCsystem,FLC system models,Aplication of FLC system.

Genetic Algorithim: Introduction,basic operators& terminology, Traditional algorithm vs genetic algorithm, simple GA, general genetic algorithm, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming , applications of genetic algorithm

Suggested Reading:

1. S. N. Sivanandam & S.N.Deepa, *"Principles of Soft Computing"*, Wiley India, 2008.
2. Limin Fu, *"Neural Networks in Computer Intelligence"*, McGraw Hill, 1995.
3. Timoty J. Ross, *"Fuzzy Logic with Engineering Applications"*, McGraw Hill, 1997.

CS 416

MOBILE COMPUTING

(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction and applications of mobile computing, Wireless transmission: Frequencies, Signals, Antennas, Signal Propagation, Multiplexing, Modulation , Spread Spectrum, Cellular systems.

Medium access control, SDMA, FDMA, TDMA, CDMA, Comparisons.

UNIT-II

Telecommunication system, GSM, DECT, TETRA, Satellite systems: Applications, Basics, routing, localization, Handover. Broadcast systems: cyclic representation of data, Digital Audio Broadcasting, Digital video broadcasting, convergence of Broadcasting and Mobile Communications.

UNIT-III

Wireless LAN: Infrared Vs Radio transmission, Infrastructure and Adhoc Networks, HYPERLAN, Bluetooth.

UNIT-IV

Mobile IP, Dynamic Host Configuration Protocol, Mobile Adhoc Networks, Mobile Transport Layer, Traditional TCP Classical TCP improvements, TCP over 2.5/3G Wireless Networks, Performance Enhancing Proxies.

UNIT-V

Operating Systems for Mobile Devices: Features of Windows CE, PalmOS, Symbian OS, and Java Card Support for Mobility: Pile systems, WWW, Wireless Application Protocol.

Suggested Reading:

1. Schiller, *Mobile Communications, 2nd* Edition Pearson Education, India, 2003.
2. Hansmann, Merk, Nicklous, Stober, *Principles of Mobile Computing*. 2nd Edition, Springer International Edition, 2003.
3. Frank Adelstein, Sandeep K.S. Gupta "*Fundamentals of Mobile and Pervasive Computing* ",Tata McGraw-Hill 2005.

CS 417

REAL TIME SYSTEMS

(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction : Definition, Applications and Types of Real Time Systems, Typical Case Studies of Real Time Systems, Timing Constraints.

A Reference Model for Real Time Systems: Processors and Resources. Periodic Task Model, Precedence and Data Dependency, Temporal, Functional and Resource parameters, Scheduling Hierarchy.

UNIT-II

Real Time Scheduling: Different Approaches- Clock Driven, Priority Driven, Scheduling of Periodic, Aperiodic and Sporadic Jobs in Priority Driven Systems.

UNIT-III

Resource Management: Resources and Resource Access Control, Critical Section, Priority: Ceiling Protocols, Concurrent Access to Data Objects.

UNIT-IV

Implementation Aspects: Timing Services and Scheduling Mechanisms, Other Basic Operating System Functions, Processor Reserves and Resource Kernel, Open System Architecture, Capabilities of Commercial Real Time Operating Systems, Predictability of General Purpose Operating Systems.

UNIT-V

Case Studies: Vx – Works, RT Linux.

Suggested Reading:

1. Jane W.S. Liu *"Real Time System"*, Pearson Education Asia,2001.
2. C.M. Krishna and Kang 0. Shin, *"Real Time Systems"*, McGraw Hill Companies Inc., 1997.
3. Raymond J.A. Buhr, Donald L. Bailey, *"An Introduction to Real Time Systems"*, Prentice Hall International, 1999.
4. K.V.K.K Prasad, *"Embedded Real Time Systems, Concepts, Design and Programming"*, Dream Tech, 2003.

CS 431

DISTRIBUTED SYSTEMS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. Develop an FTP Client. Provide a GUI interface for the access of all the services.
2. Implement a mini DNS protocol using RPC.
3. Implement a chat server and RMI using JAVA.
4. Implement a 2PC for distributed transaction management.
5. Study of NFS.
6. Case Study on Database Replication

CS 432

EMBEDDED SYSTEMS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

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

I. Interface Input – Output and other units such as:
Relays, LEDs, LCDs, Switches, keypads, Stepper Motors, Sensors, ADCs, Timers.

II. Demonstrate Communications: RS232, IIC and CAN protocols,

III. Develop Control Applications such as: Temperature controller, Elevator controller, Traffic Controller.

2. Development and Porting of Real time applications on to Target machines such as Intel or other Computers using any RTOS.

I. Understanding Real Time Concepts using any RTOS through demonstration of:

a) Timing
b) Multi-tasking
c) Semaphores
d) Message Queues
e) Round-Robin Task Scheduling
f) Preemptive Priority based Task Scheduling
g) Priority Inversion
h) Signals
i) Interrupt Service Routines

II. Applications development using any RTOS:

a) Any RTOS Booting.
b) Application Development under any RTOS.

CS 433

PROJECT SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks

The department can initiate the project allotment procedure at the end of III year 2nd semester and finalize it in the first two weeks of IV year Ist semester.

First 4 weeks of IV year Ist semester will be spent on special lectures by faculty members, research scholars, postgraduate students of the department and invited lecturers by engineers from industries and R&D institutions. The objective of these preliminary talks will be to expose the students to real life practical problems and methodology to solve the technical problems.

Seminar schedule will be prepared by the coordinator for all the students from 5th week to the last week of the seminar which should be strictly adhered to.

Each student will be required to :

1. Submit a one page synopsis before the seminar for display on notice board.
2. Give a 20 minute presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the tal.

Atleast two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.

The seminar presentation should include the following components of the project :

- Problem definition and specification.
- Literature survey, familiarity with research journals.
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts
- Presentation - oral and written.

Note : Three periods of contact load will be assigned to each project guide.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR

(COMPUTER SCIENCE & ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1	CS 451	Data Mining	4	-	3	75	25
2		ELECTIVE –II	4	-	3	75	25
3		ELECTIVE-III	4	-	3	75	25
		PRACTICALS					
1	CS 481	Data Mining lab	-	3	3	50	25
2	CS 482	Seminar	-	3	-	-	25
3	CS 483	Project	-	6	Viva Voce	Gr*	50
		Total	**12**	**12**	—	**275**	**175**

**Excellent/Very Good/ Good/Satisfactory/Unsatisfactory*

ELECTIVE-II

CS 461 Simulation & Modeling
ME 404 Operations Research
CS 463 Software Quality and Testing
CS 464 Information Storage and Management
CS 465 Human Computer Interaction
CS 466 Software Reuse Techniques
ME 411 Entrepreneurship

ELECTIVE-III

CS 471 Information Retrieval Systems
CS 472 Semantic Web
LA 454 Intellectual Property Rights
CS 474 Advanced Databases
CS 475 Multimedia Systems
CS 476 Cloud Computing
CE 452 Disaster Mitigation and Management

CS 451

DATA MINING

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Fundamentals of Data Mining, Kinds of Patterns can be mined, Technologies Used, Applications and Issues in Data Mining

Types of Data: Attribute types, Basic Statistical descriptions of Data, Measuring data Similarity and Dissimilarity

Data Preprocessing: Need of Preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation

UNIT-II

Data Warehouse and OLAP: Data Warehouse, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-oriented induction

UNIT-III

Mining Frequent Patterns, Associations and Correlations: Market Basket Analysis, Association rule mining, Frequent Item set mining methods, Pattern Evaluation methods, Constraint based frequent pattern mining, Mining Multilevel and Multidimensional patterns

UNIT-IV

Classification : General approach to classification, Classification by Decision Tree Induction , Bayes Classification methods, Bayesian Belief Networks, Classification by Backpropogation, Lazy Learners, Other Classification methods , Classification using Frequent patterns, Model Evaluation and selection

UNIT-V

Cluster Analysis: Basic Clustering methods, Partitioning methods, Density –Based Methods, Grid-based methods, and Evaluation of Clustering, Outlier Analysis and Detection methods

Data Mining Trends and Research Frontiers: Mining Complex Data Types, Data Mining Applications, Data Mining Trends

Suggested Reading:

1. *Data Mining - Concepts and Techniques* - Jiawei Han & Micheline Kamber and Jain Pei, Third Edition, India (2011).
2. *Data Mining Introductory and advanced topics* – Margaret H Dunham, Pearson education, 2006.
3. *Data Mining Techniques* – Arun K Pujari, University Press, 2001.
4. Data Warehousing in the Real World – Sam Anahory & Dennis Murray Pearson Edn, 2004.
5. *Data Warehousing Fundamentals* – Paulraj Ponnaiah Wiley Student Edn, 2001.
6. *The Data Warehouse Life cycle Tool kit* – Ralph Kimball Wiley student edition, 2007.

CS 461

SIMULATION AND MODELLING
(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

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 - FORTRAN, GPSS, SIMAN, S1MSCRIPT, SLAM and MODSIM III

UNIT- III

Random Numbers: generation, properties of random numbers, generation of pseudo-random numbers, tests for random numbers, Random variate: generation, inverse transformation technique, uniform distribution, exponential distribution. Weibul's distribution, triangular 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, **verification 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 Turing 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.

Suggesting Reading:

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.
3. Anerill M Law and W. David Kelton, *Simulation Modeling and Analysis,* McGrw ill, 2009.

ME 404

OPERATIONS RESEARCH

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

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, maximization and minimization, Degeneracy in LPP, Unbounded and, Infeaseable solutions.

Unit-II

Duality : Definition, Relationship between primal and dual solutions, Economic Interpretation, Post optimal of sensitivity analysis, Dual Simplex Method.

Unit-Ill

Transportation Models : Finding an initial feasible solution - North West corner method, Least cost method, Vogel's Approximation method, Finding the optimal solution, optimal solution by stepping stone and MODI methods, Special cases in Transportation problems - Unbalanced Transportation problem.

Assignment Problems : Hungarian method of Assignment problem, Maximization in Assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.

Unit-IV

Replacement Models : Introduction, replacement of items that deteriorate igoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly - Individual replacement policy, Group replacement policy.

Game Theory: Introduction, 2 person zero sum games, Maximi - Minimax principle, Principle of Dominance, Solution for mixed strategy problems, Graphical method for 2 x n and m x 2 games.

Unit-V

Sequencing Models : Introduction, General assumptions, processing n jobs through 2 machines, processing 'n' jobs through m machines, Processing 2 jobs through m machines.

Queuing Theory : Introduction, single channel - poission arrivals - exponential service times with infinite population & finite population, Multi channel - poisson arrivals - Exponential service times with infinite population.

Introduction to optimization Techniques: Single objective & Multi objective optimization Techniques like G.A, NSGA, P.Q.O. & MPSO Techniques.

Suggested Reading :

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. Hrvey M. Wagner, *"Principles of Operations Research "*, Second Edition, Prentice Hall of India Ltd., 1980.
4. V.K. Kapoor, *"Operations Research "*, S. Chand Publishers,New Delhi, 2004.
5. R. Paneer Selvam, *"Operations Research"*, Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
6. Prof. Shanker Narasimha, *"Data Reconciliation"*.

CS 463

SOFT WARE QUALITY AND TESTING

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Software Quality Assurance Framework and Standards.

SQA Framework: Definition of Quality, Software Quality Assurance, Components of Software Quality Assurance, Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan, Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI. PCMM, Malcom Balridge, 3 Sigma, 6 Sigma

UNIT-II

Software Quality Assurance Metrics and Measurement Software Quality Metrics, product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs, Software Quality metrics methodology: Establish quality requirements, Identify Software quality metrics, implement the software quality metrics, analyze software metrics results, validate the software quality metrics, Software quality indicators - Fundamentals in Measurement theory

UNIT-III

Software Testing Strategy and Environment Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing Software Testing Methodology .Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist

UNIT-IV

Software Testing Techniques: Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured

Walkthroughs, Thread Testing, Performance Testing, White-Box Testing ,Software Testing Tools, Taxonomy of Testing tools. Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Java Testing Tools, JMetra, JUN IT and Cactus.

UNIT-V

Testing Process, Eleven Step Testing Process: Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing. Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report test results, testing software installation, Test software changes, Evaluate Test Effectiveness, Testing Specialized Systems and Applications Testing Client/ Server, Web applications, Testing off the Shelf Components, Testing Security, Testing a Data Warehouse .

Suggested Reading:

1. William E. Perry, *Effective Methods for Software Testing,* 2nd Edition, Second Edition. Published by Wiley & Sons.
2. Mordechai Ben-Menachem/Garry S. Marliss, *Software Quality,* Cengage Learning publication 2008.
3. Graham, Veenendaal, Evans, Black, *Foundations of Software Testing,* Cengage Learning 2007.
4. Gao, Tsao and Wu, *Testing and Quality Assurance for Component-based Software,* Artech House Publishers.
5. *Bories Beizer, Software Testing Techniques,* Second Edition, Dreamtech Press .

CS 464

INFORMATION STORAGE AND MANAGEMENT

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Storage System

Introduction to information storage, virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk drive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT-II

Storage Networking

Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option – FcoE, Network Attached Storage (NAS) – components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform

UNIT-III

Backup, Replication, Archive

Business continuity terminologies, planning and solutions, Clustering and multi-pathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data de-duplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection

UNIT-IV

Cloud Infrastructure

Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits, Cloud Service Models, Deployment Models, Cloud Computing Infrastructure, Cloud Challenges, Cloud Adoption Considerations, Concepts in practice

UNIT-V

Storage Security & Management

Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering.

Case Study:

1. Technologies described in the course are reinforced with BROCADE & EMC examples of actual solutions.
2. Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

Suggested Reading :

1. EMC Corporation, *"Information Storage and Management"*, Second Edition, Wiley Publishers.
2. John W. Rittinghouse, *"Implementation Management and Security"*, James F. Ransome, CRC Press.
3. Robert Spalding, *"Storage Networks: The Complete Reference"*, Tata McGgraw Hill, Osborne, 2003.
4. Marc Farley, *"Building Storage Networks"*, Tata McGraw Hill, Osborne, 2001.
5. Meeta Gupta, *"Storage Area Network Fundamentals"*, Pearson Education Limited, 2002.

CS 465

HUMAN COMPUTER INTERACTION

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT- I

Interaction Paradigms: Computing Environments, Analyzing Interaction Paradigms, Interaction Paradigms

Interaction Frameworks and Styles: Frameworks for Understanding Interaction, Coping with Complexity, Interaction Styles

UNIT- II

Interaction Design Process: Iterative Design, User-Centered Design, Interaction Design Models, Overview of Interaction Design Models

Discovery : Discovery Phase Framework, Collection, Interpretation , Documentation

Design : Conceptual Design, Physical Design, Evaluation, Interface Design Standards, Designing the Facets of the Interface

UNIT- III

Design Principles: Principles of Interaction Design, Comprehensibility, Learnability, Effectiveness/Usefulness, Efficiency/Usability, Grouping, Stimulus Intensity , Proportion , Screen Complexity, Resolution/ Closure, Usability Goals

Interaction Design Models: Model Human Processor , Keyboard Level Model, GOMS, Modeling Structure, Modeling Dynamics, Physical Models

Usability Testing: Usability, Usability Test, Design the Test, Prepare for the Test, Perform the Test, Process the Data

UNIT-IV

Interface Components: The WIMP Interface, Other Components

Icons : Human Issues Concerning Icons, Using Icons in Interaction Design, Technical Issues Concerning Icons

Color: The Human Perceptual System, Using Color in Interaction Design, Color Concerns for Interaction Design, Technical Issues Concerning Color

UNIT- V

Text : Human Issues Concerning Text, Using Text in Interaction Design, Technical Issues Concerning Text

Speech and Hearing : The Human Perceptual System, Using Sound in Interaction Design, Technical Issues Concerning Sound

Touch and Movement: The Human Perceptual System, Using Haptics in Interaction Design, Technical Issues Concerning Haptics

Suggested Reading:

1. Steven Heim, *The Resonant Interface: HCI Foundations for Interaction Design,* Addison-Wesley, 2007.
2. J. Preece, Y. Rogers, and H. Sharp, *Interaction Design: Beyond Human-Computer Interaction,* Wiley & Sons, 2nd Ed., 2007.
3. Ben Shneiderman, *Catherine Plaisant, Designing the User Interface: Strategies for Effective Human-Computer Interaction,* 5th edition, , Addison-Wesley, 2009.

CS 466

SOFTWARE REUSE TECHNIQUES

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Software reuse success factors, Reuse driven software engineering as business, Object oriented software engineering, Applications and Component subsystems, Use case components, Object components.

UNIT-II

Design Patters – Introduction. Creational Patterns – Factory, factory method, abstract factory, singleton, builder, prototype.

UNIT-III

Structural Patterns – Adapter, bridge, composite, decorator, façade, flyweight, proxy. Behavioral Patterns – Chain of responsibility, command, interpreter.

UNIT-IV

Behavioral Patterns – Interartor, mediator, memento, observer, state, strategy, template, visitor. Other design patterns – Whole – part, master – slave, view handler, forwarder – receiver, client dispatcher – server, publisher – subscriber.

UNIT-V

Architectural Patterns – Layers, pipes and filters, black board, broker, model-view controller, presentation – abstraction – control, micro kernel, reflection.

Suggested Reading:

1. Ivar Jacabson, Martin Griss, Patrick Johnson, *"Software Reuse: Architecture, Process and Organization for Business Success"*, ACM Press 1997.

2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides – " *Design Patterns"*, Pearson Education, 1995.
3. Frank Buschmann etc., - *"Pattern Oriented Software Architecture – Volume I"*, Wiley 1996.
4. James W Cooper, *"Java Design Patterns, a tutorial"*, Pearson Education, 2000.

ME 411

ENTREPRENEURSHIP

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Indian Industrial Environment – competence; Opportunities and Challenges, entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, linkages among small, medium and heavy industries,types and forms enterprises.

UNIT-II

Identification and characteristics of Entrepreneurs, Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas, their sources and decision making, Choice of Technology – Collaborative interaction for Technology development.

UNIT-III

Project formulation, Analysis of market demand, Demand supply gap, Financial and Profitability analysis and Technical analysis. Project financing in India.

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: Various approaches of time management, their strengths and weaknesses. The urgency addiction and the time management matrix.

Suggested Reading:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, 1997.
2. Prasanna Chandra, Project-*Planning, Analysis, Selection, Implementation and Review,* Tata Mc Graw Hill Publishing Company Ltd., 1995.
3. B.Badhai, *Entrepreneurship for Engineers*, Dhanpath rai & Co., Delhi, 2001.
4. Stephen R. Covey and A.Roger Merril, *First Things First*, Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, *Entreneurship,* Tata Mc Graw Hill ed., 2002. 6. Sudha G.S., *Organizational Behavior*, National Publishing House, 1996.

CS 471

INFORMATION RETRIEVAL SYSTEMS

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Basic concepts, Past present and Future of IRS, Retrieval Process. Modeling: Introduction, A Taxonomy of IR Models, Retrieval: Adhoc and Filtering, A formal characterization of IR Models, Classic IR, Set Theoretic Models, Algebraic Models, Probabilistic Models

UNIT-II

Structured Text Retrieval Models, Models for Browsing
Retrieval Evaluation: Introduction, Reference Collections.
Query languages: Introduction, Keyword-based querying, pattern Matching, Structural
Queries, Query Protocols.

UNIT-III

Query operations: Introduction, User Relevance Feedback, Automatic Local Analysis,
Automatic Global Analysis.

Text and Multimedia Languages and Properties: Introduction, Meta Data, Text, Markup
Languages, Multimedia.

UNIT-IV

Text operations: Introduction, Document Preprocessing, Document Clustering, Text
Compression, Comparing Text Compression Techniques.

Indexing: Introduction, Inverted Files, Other Indices for Text Searching, Boolean Queries,

UNIT-V

Searching: Sequential Searching, Pattern Matching, Structural Queries, Compression.

Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR.

Suggested Reading:

1. Ricardo, Baeza-Yates, Berthier Ribeiro-Neto, *"Modern Information Retrieval"* Pearson Education, 2008
2. David A. Grossman, Ophir Frieder, *"Information Retrieval - Algorithms and Heuristics"*, Springer, 2nd Edition (Distributed by Universities Press), 2004.
3. Gerald Kowalski, *"Information Retrieval Systems: Theory and Implementation"*, Kluwer Academic Publishers, 1997.
4. William B. Frakes, Ricardo Baeza- Yates, *"Information Retrieval – Data Structures & Algorithms"*, Pearson Education, 2008.

CS 472

SEMANTIC WEB

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

The Future of the Internet: Introduction, The Syntactic Web, The Semantic Web, The working Semantic Web. **Ontology in Computer Science:** Defining the Term Ontology, Differences among Taxonomies, Thesauri, and Ontologies,

Classifying Ontologies, Web Ontologies, Web Ontology Description Languages, Ontology, Categories, and Intelligence.

UNIT-II

Knowledge Representation in Description Logic: Introduction, an Informal Example, the Family of Attributive Languages, Inference Problems. **RDF and RDF Schema:** Introduction, XML Essentials, RDF, RDF Schema, A Summary of the RDF/RDF Schema Vocabulary.

UNIT-III

OWL: Introduction, Requirements for Web Ontology Description Languages, Header Information, Versioning, and Annotation Properties, Properties, Classes, Individuals, Data types, A Summary of the OWL Vocabulary. **Rule Languages:** Introduction, Usage

Scenarios for Rule Languages, Datalog, RuleML, SWRL, TRIPLE.

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

UNIT-IV

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.

Ontology Sources: Introduction, Metadata, Upper Ontologies, Other Ontologies of Interest, Ontology Libraries.

Semantic Web Software Tools: Introduction, Metadata and Ontology Editors, Reasoners, Other tools.

UNIT-V

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

Semantic Desktop: Introduction, Semantic Desktop Metadata, Semantic Desktop Ontologies, Semantic Desktop Architecture, Semantic Desktop Related Applications. **Ontology Application in Art:** Introduction, Ontologies for the Description of Works of Art, Metadata Schemas for The Description of Works of Art, Semantic Annotation of Art Images.

Suggested Reading :

1. *Semantic Web Concepts: Technologies and Applications,* Karin K. Breitman, Marco Antonio Casanova and Walter Truszowski, Springer.
2. *Information Sharing on the Semanting Web,* Heiner Stuckenschmidt, Frank Van Harmelen, Springer.
3. *Semantic Web Primer,* Grigoris Antoniou, Frank Van, third Edition, MIT Press.
4. *Semantic Web Services: Concepts, Technologies and Applications,* Rudi Studer, Stephan Grimm, Andrees Abeker, Springer.
5. *Towards the Semantic Web: Ontology Driven Knowledge Management,* John Davis, Dieter Fensal, Frank Van Harmelen, J. Wiley.

LA 454

INTELLECTUAL PROPERTY RIGHTS

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT–I

Introduction: Meaning of Intellectual Property- Nature of I.P- Protection of I.P. Rights-kinds of Intellectual Property Rights –International Conventions of Intellectual Property Rights- patent Treaty 1970, GATT 1994, TRIPS & TRIMS – International Organization for Protection of IPR – WTO, WIPRO, UNESCO.

UNIT-II

Patents: Meaning of Patent- Commercial Significance – Obtaining of Patent – patentable Subject – matter – rights and obligations of Patentee – specification – Registration of patents – Compulsory licensing and licenses of rights – Revocation.

UNIT-III

Industrial Designs : Definitions of Designs – Registration of Designs – Rights and Duties of Proprietor of Design – Piracy of Registered Designs.

UNIT-IV

Trade Marks : Meaning of trademark – purpose of protecting trademarks Registered trade mark – procedure – passing off – Assignment and licensing of trademarks – Infringement of trademarks.

UNIT-V

Nature, scope of copyright – Subject matter of copy right – Right conferred by copyrightPublication – Broad – casting, telecasting – computer programme – Database right – Assignment – Transmission of copyright – Infringement of copy right.

Suggested Reading:

1) Cornish W.R, *"Intellectual Property Patents"*, Copyright, Trademarks and Allied Rights, Sweet & Maxwell 1993.
2) P . Narayanan, *"Intellectual Property Law"*, Eastern law House 2nd Edn. 1997.

CS 474

ADVANCED DATABASES

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Object Based Databases: Overview, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset Types in SQL, Object –identity and reference Types in SQL, Implementing O-R features, Persistent programming languages, Object-relational mapping, Object-oriented versus object-relational.

UNIT-II

XML: Motivation, Structure of XML data, XML document scheme, Querying and transformation, Application program interface to XML, Storage of XML data, XML applications.

UNIT-III

Query Processing: Overview, Measures of query cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Overview, Transformation of relational expressions, Estimating statistics of expression results, Choice of evaluation plans, Materialized Views.

UNIT-IV

Parallel Databases: Introduction, I/O parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems.

Distributed Databases : Homogeneous and heterogeneous database, Distributed data Storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases.

UNIT-V

Advanced Application Development: Performance tuning, Performance benchmarks, Other issues in application development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and Personal databases.

Suggested Reading:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, *Database System Concepts,* McGraw Hill International Edition, 6th Edition, 2009.
2. Elmasri Navathe, Somayajulu, Gupta, *Fundamentals of Databases Systems, Pearson Education,* 4th Edition, 2006.
3. CJ Date, A Kannan, S Swamynathan, *An Introduction to Database Systems,* Pearson Education, 8th Edition, 2006.
4. Ramakrishna, Gehrke, *Databases Management Systems,* McGraw-Hill International Edition, 3rd Edition, 2003.

CS 475

MULTIMEDIA SYSTEMS

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Unit-I

Multimedia: An overview: Introduction, Multimedia Presentation and Production, characteristics of a multimedia presentation, Multiple Media, Utilities of Multisensory Perception, Hardware and Software Requirements, Uses of Multimedia, Promotions of Multimedia Based content, Steps for creating a multimedia presentation.

Digital Representation: Introduction, Analog Representation, Waves, Digital Representation, Need for Digital Representation, Analog to Digital Conversion, Digital to Analog Conversion,, Relation between Sampling Rate and Bit Depth, Quantization Error, Fourier Representation, Pulse Modulation, Importance and Drawbacks of Digital Representation.

Visual Display Systems: Introduction, Cathode Ray Tube(CRT), Video Adapter card, Video Adapter Cable, Liquid Crystal Display (LCD), Plasma Display Panel (PDP).

Unit-II

Text: Introduction, Types of Text, Unicode Standard, Font, Insertion of Text, Text Compression, File Formats.

Image: Introduction, Image types, Seeing Color, color Models, Basic Steps for Image Processing, Scanner, Digital Camera, Interface Standards, specifications of Digital Images, Color Management Systems(CMS), Device Independent Color Models, gamma and Gamma Correction, Image Processing Software, File Formats, Image Output on Monitor , Image Output on Printer.

Graphics: Introduction, advantage of Graphics, Uses of Graphics, Components of a Graphics System, Coordinate Systems, Line Drawing Algorithms, Filling Algorithms, Clipping Algorithms, Plotter,

Transformations, 3D Graphics, 3D Modeling, Surface Characteristics and Texture, Lights.

Unit-III

Audio: Introduction, Acoustics, Nature of Sound Waves, Fundamental Characteristics of Sound, Musical Note and Pitch, Psycho-Acoustics, Elements of Audio Systems, Microphone, Amplifier, Loudspeaker, Audio Mixer, Digital Audio Synthesizers, Musical Instrument Digital Interface(MIDI),MIDI Messages, MIDI Connections, General MIDI (GM) Specifications, Basics of Staff Notation, Sound Card, Audio Transmission, Audio Recording Devices, Audio File Formats and CODECs, Software Audio Players, Audio Recording Systems, Digital Audio Broadcasting, Audio and Multimedia, Voice Recognition and Response, Audio Processing Software.

Video: Introduction, Analog Video Camera, Transmission of Video Signals, Video Signals formats, Television Broadcasting /standards, Digital Video, Digital Video Standards ,PC Video, Video Recording Formats and Systems, Video File Formats and CODECs, Video Editing, Video Editing Software. Animation: Introduction, Historical Background. Uses of Animation, Key frames and Tweening, Types of Animation, Computer Assisted Animation, Creating Movement, Principles of Animation, Some Techniques of Animation, Animation on the Web, 3D Animation, Camera, Special Effects, Creating Animation, Rendering Algorithms, Animation Software, File Formats.

Unit-IV

Compression: Introduction, CODEC, Types of Compression, Types of Redundancies, Lossless/Statistical Compression Techniques, GIF Image Coding Standard, Lossy/Perceptual Compression Techniques, JPEG Image Coding Standard, MPEG Standards Overview, MPEG-1 Audio,MPEG-1 Video, MPEG-2 Audio, MPEG-2 Video, MPEG-4, MPEG-7, Fractals.

CD-Technology: Introduction, Compact Disc (CD), CD Formats, Magneto- Optical Disc, CD Interface, Laserdisc(LD), Error Handling, DVD, DVD- Formats.

Multimedia Architecture: Introduction, User Interfaces, Windows Multimedia Support, Hard ware Support, Distributed Multimedia

Applications, Real- time Protocols, Playback Architectures, Streaming Technologies, Temporal Relationships, Synchronization, Multimedia Data base Systems (MMDBS), Feature Extraction of Image, Feature Extraction of Audio, Feature Extraction of Video, Similarity Metrics, Indexing Mechanisms, Characteristics of Multimedia Databases, Benchmarking of MMDBS, Object Oriented Approach.

Unit-V

Multimedia Documents: Introduction, Document and Document Architecture, Designing a Multimedia Interchanges Format, Markup, Standard Generalized Markup Language (SGML), Open Document Architecture (ODA), Multimedia and Hypermedia Information Coding Expert Group(MHEG), Hypermedia Time based Structuring Language (Hytime), Open Media Framework (OMF), Digital Copyrights.

Multimedia Application Development: Introduction, Software Life Cycle Overview, ADDIE Model, Conceptualization, Content Collection and Processing , Story , Flowline, Script, Storyboard, Implementation, Authoring Metaphors, Testing and Feedback, Final Delivery, Report Writing/Documentation, case Study, Computer Games.

Virtual Reality: Introduction, Forms of Virtual Reality, VR Applications, Software Requirements, Peripheral Devices, Virtual Reality modeling Language (VRML)

Suggested Reading:

1. Ranjan Parekh, *"Principles of Multimedia"*, Tata McGraw Hill, 2008
2. Tay Vaughan, *"Multimedia: Making It Work"*, Seventh Edition Tata McGraw Hill, 2008
3. Ralf Stein Metz Clara Nahrstedit, *"Multimedia: Computing, Communication and Applications"*, Pearson Education, 2001.
4. John F. Koegel Buford, *"Multimedia Systems"*, Addison Wesely, 1994.

CS 476

CLOUD COMPUTING

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

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-Center Automation.

Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

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 Homomorphic 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.

Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging, Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Suggested Reading:

1) John W. Rittinghouse, *"Cloud Computing: Implementation, Management, and Security"*. James F. Ransome, CRC Press 2009.
2) Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, *"Distributed and Cloud Computing From Parallel Processing to the Internet of Things"*, Elsevier, 2012.
3) Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, *"Cloud Computing: Principles and Paradigms* (Wiley Series on Parallel and Distributed Computing), Wiley *Publishing* ©2011
4) Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, *"CryptDB: Protecting Confidentiality with encrypted Query Processing"*23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
5) A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
6) David Marshall, Wade A. Reynolds, *"Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center"*, Aucrbach Publications, 2006.

CE 452

DISASTER MITIGATION AND MANAGEMENT

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction - Natural, human induced and human made disasters international decade of disaster reduction.

UNIT-II

Natural Disasters - Hydrometereological based disasters - Trophfcal cyclones, floods, drought and desertification - Zones Geographical based disasters - Earth quake, Tsunammis, Landslides and avalanches.

UNIT-III

Human induced hazards -chemical industrial hazards, major power breakdowns, traffic accidents, etc.

UNIT-IV

Use of remote sensing and GISI disaster mitigation and management

UNIT-V

Rich and vulnerability to disaster - mitigation and management options warning and forecasting

Suggested Reading:

1. Rajib, S and Krishna Murthy, R. R (2012) *"Disaster Management global Challenges and Local Solutions"* Universities Press, Hyderabad.
2. Navele, P & Raja, C. K (2009), *Earth and atmospheric Disasters Management, Natural and Manmade*.- B. S. Publications, Hyderabad.
3. Fearn-Banks, K (2011), *Crises computations approach: A case book approach.*
4. *Special Indian Education*, Route ledge Publishers, New York & London.
5. Battacharya, T. (2012), *Disaster Science and Management*, Tata McGraw Hill Company, New Delhi.

CS 481

DATA MINING LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. Implement the following Multidimensional Data Models
   i. Star Schema
   ii. Snowflake Schema
   iii. Fact Constellation
2. Implement Apriori algorithm to generate frequent Item Sets
3. Implement the following clustering algorithms
   i. K-means
   ii. K-mediods
4. Implement the following classification algorithms
   i. Decision Tree Induction
   ii. KNN
5. Perform data Preprocessing using WEKA
6. Perform Discritization of data using WEKA
7. Classification algorithms using WEKA
8. Apriori algorithm using WEKA
9. Perform data transformations using an ETL Tool
10. A small case study involving all stages of KDD. (Datasets are available online like UCI Repository etc.)

CS 482

SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks

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 the 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. Students are to be exposed to the following aspects of a seminar presentation.

- Literature survey
- Organization of the material
- Presentation of OHP slides/PC presentation
- Technical writing

Each student is required to :

1. Submit a one page synopsis before the seminar talk for display on the notice board.
2. Give a 20 minute presentation through OHP, PC, Slide projector followed by a 10 minute discussion.
3. Submit a report on the seminar topic with a list of references and slides used

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

For award of the Sessional marks, students are to be judged by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussions.

CS 483

PROJECT

Instruction	6 Periods per week
Duration of University Examination	Viva Voce
University Examination	Grade*
Sessional	25 Marks

Solving a real life problem should be the focus of U.G. projects. Faculty members should propose the projects (brief scope and references) well in advance which should be made available to the students at the department library. The project could be classified as hardware, software, modeling, simulation etc. The project should involve one or many elements of techniques such as analysis, design, synthesis.

The department will appoint a project coordinator who will coordinate the following:

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

All projects allotment is to be completed by the 4th week of 4th year 1st semester so that the students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through student presentations. Sessional marks are to be based on the Grades/ Marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts should be made that some of the projects are carried out in industries with the help of industry coordinators, Problems can also be invited from the industries to be worked out through U.G. projects.

Common norms will be established for the final documentation of the project report by the respective departments.

****Excellent / Very Good / Good / Satisfactory / Unsatisfactory***

Note: Three periods of contact load will be assigned to each project guide.