DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Curriculum under Choice Based Credit & Grading System

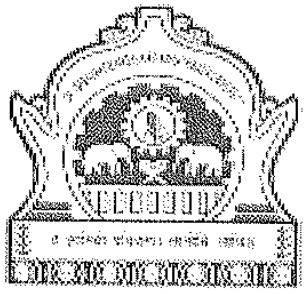
M.Sc. I & II Year

Computer Science & I.T.

Semester–I to IV

run at college level from the Academic Year 2015-16 & onwards

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY



SCHEME FOR CHOICE BASED CREDIT SYSTEM (CBCS)

W.E.F. JUNE, 2011 (ACADEMIC YEAR, 2011 to 2012 Onwards)

M. Sc. Computer Science Course Structure:

Sem-I	Sem-II	Sem-III	Sem-IV
Advanced Java	Data Structure and Analysis of Algorithm	Java Network Programming	Pattern Recognition
Neural Network	Advanced Neural Network and Fuzzy System	Advanced Software Engineering and Technology	Major Project
Digital Signal Processing	Image Processing	Computer Vision	Seminar
Advanced Operating System	Parallel Computing	Elective - I: (Select any one from list of elective I) 1. Advanced Embedded System 2. Data Ware Housing 3. GIT 4. Biometric Techniques 5. Mobile Computing	Elective -II: (Select any one from list of elective II) 1. Theoretical Computer Science 2. Decision Support System & Intelligent System 3. Data Mining 4. Cryptography and Network Security 5. Introduction to MEMS Pro+

Semester-I

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC401	Advanced Java	4	4	80	20
CSC402	Neural Network	4	4	80	20
CSC403	Digital Signal Processing	4	4	80	20
CSC404	Advanced Operating System	4	4	80	20
CSC451	Practical Based on CSC401	2	4 (Per Batch)	50	-
CSC452	Practical Based on CSC402	2	4 (Per Batch)	50	-
CSC453	Practical Based on CSC403	2	4 (Per Batch)	50	-
CSC454	Practical Based on CSC404	2	4 (Per Batch)	50	-
Total No of Credits in Sem-I		24	--	--	--

Semester-II

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC405	Data Structure and Analysis of Algorithm	4	4	80	20
CSC406	Advanced Neural Network and Fuzzy System	4	4	80	20
CSC407	Image Processing	4	4	80	20
CSC408	Parallel Computing	4	4	80	20
CSC455	Practical Based on CSC405	2	4 (Per Batch)	50	-
CSC456	Practical Based on CSC406	2	4 (Per Batch)	50	-
CSC457	Practical Based on CSC407	2	4 (Per Batch)	50	-
CSC458	Practical Based on CSC408	2	4 (Per Batch)	50	-
Total No of Credits in Sem-II		24	--	--	--

Semester-III

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC501	Java Network Programming	4	4	80	20
CSC502	Advanced Software Engineering and Technology	4	4	80	20
CSC503	Computer Vision	4	4	80	20
CSC504	Elective - I: (Select any one from list of elective I)	4	4	80	20
CSC551	Practical Based on CSC501	2	4 (Per Batch)	50	-
CSC552	Practical Based on CSC502	2	4 (Per Batch)	50	-
CSC553	Practical Based on CSC503	2	4 (Per Batch)	50	-
CSC554	Practical Based on CSC504	2	4 (Per Batch)	50	-
Total No of Credits in Sem-III		24	--	--	--

Semester-IV

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC505	Pattern Recognition	4	4	80	20
CSC506	Elective -II: (Select any one from list of elective II)	4	4	80	20
CSC555	Practical Based on CSC505	2	4 (Per Batch)	50	-
CSC556	Practical Based on CSC506	2	4 (Per Batch)	50	-
CSC557	Major Project	8	16 (Per Batch)	50	-
CSC558	Seminar	4	8 (Per Batch)	50	-
Total No of Credits in Sem-IV		24	--	--	--

Total credits of the course =104 (24+24+24+24+8)

Elective I

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC421	Advanced Embedded System	4	4	80	20
CSC422	Practical Based on CSC421	2	4 (Per Batch)	50	-
CSC423	Data Ware Housing	4	4	80	20
CSC424	Practical Based on CSC423	2	4 (Per Batch)	50	-
CSC425	GIT	4	4	80	20
CSC426	Practical Based on CSC425	2	4 (Per Batch)	50	-
CSC427	Biometric Techniques	4	4	80	20
CSC428	Practical Based on CSC427	2	4 (Per Batch)	50	-
CSC429	Mobile Computing	4	4	80	20
CSC430	Practical based on CSC429	2	4 (Per Batch)	50	-

Elective II

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks: 100	
				External	Internal
CSC431	Theoretical Computer Science	4	4	80	20
CSC432	Practical based on CSC431	2	4 (Per Batch)	50	-
CSC433	Decision Support System& Intelligent System	4	4	80	20
CSC434	Practical based on CSC433	2	4 (Per Batch)	50	-
CSC435	Data Mining	4	4	80	20
CSC436	Practical based on CSC435	2	4 (Per Batch)	50	-
CSC437	Cryptography and Network Security	4	4	80	20
CSC438	Practical based on CSC437	2	4 (Per Batch)	50	-
CSC439	Introduction to MEMS Pro+	4	4	80	20
CSC440	Practical based on CSC439	2	4 (Per Batch)	50	-

Service Courses:

The student should opt service course of 8 credits either from parent department or from other department.

Course Code	Course Title	No. of Credits	No. of Hours / Week	Total Marks:100	
				External	Internal
CSC441	Introduction to MATLAB	2	2	80	20
CSC442	Practical Based on CSC441	2	4 (Per Batch)	50	-
CSC443	Aptitude	2	2	80	20
CSC444	Practical Based on CSC443	2	4 (Per Batch)	50	-
CSC445	Personality Development	2	2	80	20
CSC446	Practical Based on CSC445	2	4 (Per Batch)	50	-
CSC447	Communication Skill	2	2	80	20
CSC448	Practical Based on CSC447	2	4 (Per Batch)	50	-
CSC449	Programming in VB.NET	2	2	80	20
CSC450	Practical Based on CSC449	2	4 (Per Batch)	50	-

Detail Syllabus of M. Sc. Computer Science Semester-I

Subject Reference No	CSC401	Subject Title	Advanced Java
No of Credits	4 Theory, 2Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Course Objective

This course assumes that students are aware of core java programming and hence it starts from threading and goes up to web programming. It covers some advance topics of reflection, applets, swings, JDBC, Networking, JSP and Servlet.

At Course Completion

After complication of this course students can write good application based on java. Students can appear for java certification examinations. Student can also work on networking and web projects.

Prerequisites

Student should know the programming in core java.

UNIT I:

Threading: Threading Basics: Java Thread Model, Creating and Running Threads, Manipulating Thread State, Thread Synchronization, Volatile Fields vs. Synchronized Methods, wait and notify, join and sleep, The Concurrency API, Atomic Operations **Reflection:** Uses for Meta-Data, The Reflection API, The Class<T> Class, The java.lang.reflect Package, Reading Type Information, Navigating Inheritance Trees, Dynamic Instantiation, Dynamic Invocation, Reflecting on Generics

UNIT II:

Java Database Connectivity: JDBC, JDBC Architecture (type 1, type 2, Type 3, type 4) the java.sql.* package, Connection, ResultSet, Statements

UNIT III:

Servlets: Web Application Basics: How the Web works, Thin Clients, TCP/IP, HTTP overview, Brief HTML review, Overview of Java EE, servlets & Web applications., Servlet Basics, Servlet API:-HTML Forms, HTTP: Request-response, headers, GET, POST, Overview: How Servlets Work, Servlet Lifecycle: init(), service(), destroy(), Requests and responses, Core Servlet API: GenericServlet, ServletRequest, and ServletResponse, HTTP Servlets: HttpServletRequest, HttpServletResponse and HttpServlet, Accessing Parameters, Additional Servlet Capabilities, HTTP headers and MIME types RequestDispatcher: Including and forwarding, Sharing data with the request object attributes, Sharing data with ServletContext attributes, Error Handling

UNIT IV:

Java Server Pages: Basics and Overview, JSP architecture, JSP tags and JSP expressions, Fixed Template Data, Lifecycle of a JSP, Model View Controller (MVC), Model 1/Model 2 Architecture, Data Sharing among servlets & JSP: Object scopes or "buckets", Request, application, session and page scope, Predefined JSP implicit objects (request, session, application, page), <jsp:useBean>, <jsp:getProperty>, <jsp:setProperty>, <jsp:include>, <jsp:forward>, More JSP Capabilities and Session Management, HTTP as a stateless protocol, Hidden form fields, Cookies: Overview, API, Using cookies, Session overview: Cookies and session tracking, HttpSession, Putting data into a session object, Retrieving data from a session object, Using session data in servlets and JSPs Additional JSP Capabilities, Exception handling and error pages, Directives (page, include, others), Import declarations, Multithreading considerations

and data safety, SingleThreadModel interface, Additional JSP Capabilities, JSP Directives, JSP Error Pages, JSP and Java Declarations, Scriptlet overview, Scriptlet syntax

UNIT V:

JSTL: Using Custom Tags, Custom tags overview, Reducing JSP complexity, Tag Libraries, Tag Library Descriptor (TLD), Loading a tag library in a web app, The JSTL, JSP Expression Language (EL), Using custom tags, The c:url, c:param, c:forEach, c:out tags, Overview of JSTL libraries, The JSTL Expression Language, Expressions, Type Coercion, Operators, String concatenation, Implicit Objects, The Core JSTL Library, General Purpose: c:out, c:set, c:catch, Conditional: c:if, c:choose,, Overview of other capabilities, Additional Topics : Servlet Filter overview, Filtering examples, lifecycle, & filter chains, Filter API, Modifying a request, Modifying a response, Struts Overview Advanced MVC – Struts overview, Command and State patterns, Struts View and Controller elements

Books

1. Java 2 Complete Reference by Herbert Schieldt (Sixth Edition)
2. Core Java Vol 1: Sun Press
3. Core Java Vol 2: Sun Press

Additional Web Reference

http://www.javapassion.com/javaintro/

Presentation Slides (Available in .ppt format)

E-book:

1. Java 2 Complete Reference by Herbert Schieldt (Fourth Edition)

Lab Exercise: CSC451 Practical based on CSC401

At least two experiments should be carried out on each unit.

Subject Reference no	CSC402	Subject Title	Neural Network
No of Credits	4 Theory, 2 Practical	Assignment / Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To study learning and modeling of the algorithms of Neural Networks.

Prerequisite: Basic knowledge of linear algebra, calculus and logic.

UNIT I:

INTRODUCTION: Feedforward Neural Networks: Artificial Neurons, **Neural Networks and Architectures:** Neuron Abstraction, Neuron Signal Functions, Mathematical Preliminaries, Neural Networks Defined, Architectures: Feed forward and Feedback, Salient Properties and Application Domains of Neural Network **Geometry of Binary Threshold Neurons and Their Network:**Patterns Recognition and Data Classification, Convex Sets, Convex Hulls and Linear Separability, Space of Boolean Functions, Binary Neurons are pattern Dichotomizes, Non-linearly separable Problems, Capacity of a simple Threshold Logic Neuron, Revisiting the XOR Problem, Multilayer Networks.

UNIT II:

SUPERVISED LEARNING: Supervised Learning I: Perceptrons and LMS: Learning and Memory, From Synapses to Behaviour: The Case of Aplysia, Learning Algorithms, Error Correction and Gradient Descent Rules, The Learning Objective for TLNs, Pattern space and Weight Space, Perceptron Learning Algorithm, Perceptron Convergence Theorem, Perceptron learning and Non-separable Sets, Handling Linearly Non-Separable sets, α-Least Mean Square Learning, MSE Error Surface and its Geometry, Steepest Descent Search with Exact Gradient Information, μ-LMS: Approximate Gradient Descent, Application of LMS to Noise Cancellation,

UNIT III:

Supervised Learning II: Backpropagation and Beyond: Multilayered Network Architectures, Backpropagation Learning Algorithm, Structure Growing Algorithms, Fast Relatives of Backpropagation, Universal Function Approximation and Neural Networks, Applications of Feedforward Neural Networks, Reinforcement Learning

UNIT IV:

Neural Networks: A Statistical Pattern Recognition Perspective: Introduction, Bayes Theorem, Classification Decisions With Bayes Theorem, Probabilistic Interpretation Of A Neuron Discriminant Function, Interpreting Neuron Signals As Probabilities, Multilayered Networks, Error Functions And Posterior Probabilities, Error Functions For Classification Problems

UNIT V:

Generalization: Support Vector Machines and Radial Basis Function Networks: Learning from Examples and Generalization, Statistical Learning Theory Briefer, Support Vector Machines, Radial Basis Function Networks, Regularization Theory Route to RRBFNs, Generalized Radial Basis Function Network, Learning In RRBFNs, Image Classification Application, Other Models for Valid Generalization

BOOKS:

1. Neural Network- A Classroom Approach, Satish Kumar, Tata McGraw Hill
2. Introduction to neural networks using MATLAB 6.0 by Sivanandam, S Sumathi, S N Deepa, TATA McGraw HILL

REFERENCES:

1. Neural networks A comprehensive foundations, Simon Hhaykin, Pearson Education 2nd edition 2004
2. Artificial neural networks - B.Yegnanarayana, Prentice Hall of India P Ltd 2005.
3. Neural networks in Computer intelligence, Li Min Fu, TMH 2003.
4. Neural networks James A Freeman David M S kapura, Pearson education 2004.
5. C++ Neural Network and Fuzzy Logic 2nd Edition, Valluru B. Rao,Hayagriva V. Rao, Henry Holt and Co.
6. Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence, Bart Kosko

Lab Exercise: CSC452 Practical based on CSC402

At least two experiments should be carried out on each unit.

Subject Reference no	CSC403	Subject Title	Digital Signal Processing
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective
To study the fundamental aspects, representation and analysis of digital signal and it's processing.
Prerequisite: Basics of signal theory, linear algebra, calculus and logic.

UNIT- I:
Multirate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rateconversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design &Implementation for sampling rate conversion, Applications of Multirate Signal Processing.
Review of DFT, FFT, IIR Filters, FIR Filters,

UNIT- II:
Non-Parametric methods of Power Spectral Estimation: Estimation of spectra from finite durationobservation of signals, Non-parametric Methods: Bartlett, Welch & Blackman & Tukey methods, Comparison of all Non-Parametric methods

UNIT -III:
Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between autocorrelation & model parameters, AR Models - Yule-Waker& Burg Methods, MA & ARMA models for powerspectrum estimation.

UNIT -IV:
Linear Prediction : Forward and Backward Linear Prediction – Forward Linear Prediction, Backward LinearPrediction, Optimum reflection coefficients for the Lattice Forward and Backward Predictors. Solution of theNormal Equations: Levinson Durbin Algorithm, Schur Algorithm. Properties of Linear Prediction Filters

UNIT V:
Finite Word Length Effects: Analysis of finite word length effects in Fixed-point DSP systems – Fixed,Floating Point Arithmetic – ADC quantization noise & signal quality – Finite word length effect in IIR digitalFilters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:
1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis&D.G.Manolokis, 4th ed.,PHI.
2. Discrete Time signal processing - Alan V Oppenheim & Ronald W Schaffer, PHI.
3. DSP – A Pratical Approach – Emmanuel C.Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

Lab Exercise: CSC453 Practical based on CSC403
At least two experiments should carried out on each unit.

Subject Reference no	CSC404	Subject Title	Advanced Operating System
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Course objective: This course explores the learners about operating system and their components. This covers the fundamental functionality of Operating system like memory management, process management, I/O management, storage management. Make them ready to analyze the real perspective of operating system in network, distributed, parallel and multi core environment.

Prerequisite: Computer system Architecture, basics of disk operating system.

UNIT I:
Overview: Introduction, history of operating system, **Memory Management;** Processes in memory, Logical addresses, Partitions: static *versus* dynamic, free space management, external fragmentation, Segmented memory, Paged memory: concepts, internal fragmentation, page tables, Demand paging/segmentation, Replacement strategies: FIFO, LRU (and approximations), NRU, LFU/MFU, MRU,

UNIT II:
Cache Management: Allocation and de-allocation techniques, coherence technique, **Processes and Scheduling:** Job/process concepts, Scheduling basics: CPU-I/O interleaving, (non-)preemption, context switching, Scheduling algorithms: FCFS, SJF, SRTF, priority scheduling, round robin, Combined schemes Process details like creation PCB, process view, Thread and interprocess Communication, **Lower Process Management:** Process Synchronization, Deadlocks, Live locks,

UNIT III:
I/O Subsystem: General structure, Polled mode *versus* interrupt-driven I/O, Application I/O interface: block and character devices, buffering, blocking *versus* non-blocking I/O, Other issues: caching, scheduling, spooling, performance, File-system Interface, File System Implementation, Mass Storage Structure, File concept, Directory and storage services, File names and meta-data, Directory name-space: hierarchies, DAGs, hard and soft links, File operations, Access control, Existence and concurrency control,

UNIT IV:
Protection and Security: Requirements, Subjects and objects, Design principles, Authentication schemes, Access matrix: ACLs and capabilities, Combined scheme, Covert channels, **Distributed System:** Distributed system Structures, Distributed File Systems, Distributed coordinated,

UNIT V:
Case Studies:
- The Linux System

Windows XP

Book:

1. Abraham Silberscatz, Peter Baer Galvin and Greg Gagne, " Operating System Concepts ", 7th Ed John Wiley and Sons, Inc 2005.
2. William Stallings, "Operating Systems: Internals and design Principles", 5th Ed Prentice –hall, 2005.
3. Andrew Tanenbaum, "Modern operating systems" 3rd Ed, Pearson Education.

Lab Exercise: CSC454 Practical based on CSC404
At least two experiments should carried out on each unit.

Subject Reference No	CSC405	Subject Title	Data Structure and Analysis of Algorithm
No of Credits	4 Theory, 2Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: This course provides an introduction to mathematical modeling of computational problems. It covers the common algorithms, algorithmic paradigms, and data structures used to solve these problems. The course emphasizes the relationship between algorithms and programming, and introduces basic performance measures and analysis techniques for these problems.

Prerequisite: Programming language concepts, discrete mathematical structure.

UNIT I:
Overview: Introduction to Algorithm, Analysis of algorithm, Designing of algorithm, the Correctness of Algorithms and the Complexity of Algorithms

UNIT II:
Linear Data Structures: Stack, Queue, Array, Linked list, Priority Queue, Deque, Doubly linked list, circular linked list **Searching and sorting Techniques**
Test1: Part 1, 2 and 3

UNIT III:
Graphs: Introduction to Graph Theory, Graph isomorphism, Graph data structures: Adjacency lists,Adjacency matrices Elementary graph Algorithms: BFS, DFS, Topological sort, strongly connected components **Trees:** Introduction to Trees, Tree traversals (preorder, inorder and postorder), Binary trees, **Balanced trees**: Avl etc., B and B+ tree Application of trees, Minimum Spanning Trees, Single source shortest path, All pair shortest path.
Test1: Part 4 and 5

UNIT IV:
Strings: The string abstract data type, Brute force string pattern matching, regular expression pattern matching, finite automata **Hashing** : Hash function, collision resolution, Heap

UNIT V:

Dynamic programming and greedy algorithms NP vs P: The spaces P and NP, polynomial reduction, NP complete problem **Final Exam: Total syllabus**

Book:
1) "Introduction to Algorithms", Thomas Cormen.
2) "Data structures and Algorithms", Alfred V.Aho,
3) "Fundamentals of Data Structures in c++", Ellis Horowitz.

Lab Exercise: CSC455 Practical based on CSC405
At least two experiments should carried out on each unit.

Subject Reference no	CSC406	Subject Title	Advanced Neural Network and Fuzzy System
No of Credits	4 Theory, 2 Practical	Assignment / Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: Modeling and deployment of the applications through Neural Networks, Fuzzy and Genetic algorithms.

Prerequisite:

UNIT I:

Dynamic Systems Review: States, State Vectors and Dynamics, State Equations, Attractors And Stability, Linear Dynamical Systems, Non-Linear Dynamical Systems, Lyapunov Stability, Neurodynamical Systems, The Cohen-Grossberg Theorem

UNIT II:

Attractor Neural Networks: Introduction, Associative Learning, Attractor Neural Network Associative Memory, Linear Associative Memory, Hopfield Network, Content Addressable Memory, Two Handworked Examples, Example of Recall of Memories in Continuous Time, Spurious Attractors, Error Correction with Bipolar Encoding, Error Performance of Hopfield Networks, Applications of Hopfield Networks, Brain-State-in-a-Box Neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory, Handworked Example, BAM Stability Analysis, Error Correction in BAMs, Memory Annihilation of Structured Maps in BAMs, Continuous BAMs, Adaptive BAMs, Application: Pattern Association,

UNIT III:

Adaptive Resonance Theory: Noise-Saturation Dilemma, Solving the Noise-Saturation Dilemma, Recurrent On-Center-Off-Surround Netowrks, Building Blocks of Adaptive Resonance, Substrate of Resonance, Structural Details of the Resonance Model, Adaptive Resonance Theory 1 (ART I), Handworked Example, MATLAB Code Description, A Breezy Review of ART Operating Principles, Neurophysiological Evidence for ART Mechanisms, Applications

UNIT IV:

Self-Organizing Feature Map: Self Organization, Maximal Eigenvector Filtering, Extracting Principal Components: Sanger's Rule, Generalized Learning Laws, Competitive Learning Revisited, Vector Quantization, Mexican Hat Networks, Self Organizing Feature Maps, Applications of the Self Organizing Map

UNIT V:

Pulsed Neuron Models; The New Generation: Introduction, Spiking Neuron Model, Integrate-and-Fire Neurons, Conductance Based Models, Computing with Spiking Neurons, Reflections, **Fuzzy Sets, Fuzzy Systems and Application:** Need for Numeric and Linguistic Processing, Fuzzy Uncertainty and the Linguistic Variable, Fuzzy Set, Membership Functions, Geometry of Fuzzy Sets, Simple Operations on Fuzzy Sets, Fuzzy Rules for Approximate Reasoning, Rule Composition and Deffuzification, Fuzzy Engineering

Neural Networks and the Soft Computing Paradigm: Soft Computing= Neural + Fuzzy + Evolutionary, Neural Networks: A Summary, Genetic Algorithms, Neural Networks and Fuzzy Logic, Neuro-Fuzzy-Genetic Integration

BOOKS:

1. Neural Network- A Classroom Approach, Satish Kumar, Tata McGraw Hill
2. Introduction to neural networks using MATLAB 6.0 by Sivanandam, S Sumathi, S N Deepa, TATA McGraw HILL

REFERENCES:

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3. Neural networks in Computer intelligence, Li Min Fu, TMH 2003.
4. Neural networks James A Freeman David M S kapura, Pearson education 2004.
5. C++ Neural Network and Fuzzy Logic 2nd Edition, Valluru B. Rao,Hayagriva V. Rao, Henry Holt and Co.
6. Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence, Bart Kosko,

Lab Exercise: CSC456 Practical based on CSC406

At least two experiments should carried out on each unit.

Subject Reference no	CSC407	Subject Title	Image Processing
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: The course begins with low level processing and works its way up to the beginnings of image interpretation. This approach is taken because image understanding originates from a common database of information. The learner will be required to apply their understating of the concepts involved through the process of building applications that manipulate bi-level and gray scale images through the use of suitable packages (e.g. MATLAB).

Prerequisite: To learn this course basic knowledge of Digital Signal Processing, Mathematics and Statistical Techniques is must.

Unit 1: Image Processing Fundamentals: Digital image, digital image processing, History of digital image processing, State of the art examples of digital image processing, Key stages in digital image processing, The human visual system, Light and the electromagnetic spectrum, Image representation, Image sensing and acquisition, Sampling, quantisation and resolution.

Unit 2: Image Enhancement (Histogram Processing, Point Processing and Spatial Filtering): image enhancement, Different kinds of image enhancement, Histogram processing, Point processing, Neighbourhood operations, Negative images, Thresholding, Logarithmic transformation, Power law transforms, Grey level slicing, Bit plane slicing, Neighbourhood operations, spatial filtering, Smoothing operations, What happens at the edges?, Correlation and convolution, Sharpening filters, 1st derivative filters, 2nd derivative filters, Combining filtering techniques.

Unit 3: Image Enhancement (Frequency Filtering): Jean Baptiste Joseph Fourier, The Fourier series & the Fourier transform, Image Processing in the frequency domain, Image smoothing, Image sharpening, Fast Fourier Transform

Unit 4: Image Restoration (Noise Removal): image restoration, Noise and images, Noise models, Noise removal using spatial domain filtering, Periodic noise, Noise removal using frequency domain filtering,

Unit 5: Segmentation, Morphology and color (Points, Lines, Edges & Thresholding): The segmentation problem, Finding points, lines and edges, thresholding, Simple thresholding, Adaptive thresholding, morphology, Simple morphological operations, Compound operations, Morphological algorithms, Colour fundamentals, Colour models.

Text Book

1. Digital Image Processing, 3/e, Rafael C. Gonzalez, Richard E. Woods. Pearson Education, ISBN: 9788131726952

Lab Exercise: CSC457 Practical based on CSC407
At least two experiments should be carried out on each unit.

Subject Reference no	CSC408	Subject Title	Parallel Computing
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Course Objective: the objective of this course is to make student aware of entirely new paradigm of parallel programming and computing.

Prerequisite: Programming Language Concepts, Threading and Concepts of Operating Systems.

UNIT I:
Introduction to Parallel Computing: Motivating Parallelism, The Computational Power Argument - from Transistors to FLOPS, The Memory/Disk Speed Argument, The Data Communication Argument,

Scope of Parallel Computing, Applications in Engineering and Design, Scientific Applications, Commercial Applications, Applications in Computer Systems, Organization and Contents of the Text, **Parallel Programming Platforms:** Implicit Parallelism: Trends in Microprocessor Architectures, Pipe lining 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, Tradeoffs of Multithreading and Prefetchin, Dichotomy of Parallel Computing Platforms, Control Structure of Parallel Platforms, Communication Model of Parallel Platforms, Physical Organization of Parallel Platforms, Architecture of an Ideal Parallel Computer, Interconnection Networks for Parallel Computers, Network Topologies, Evaluating Static Interconnection Networks, Evaluating Dynamic Interconnection Networks, Cache Coherence in Multiprocessor Systems, Communication Costs in Parallel Machines, Message Passing Costs in Parallel Computers, Communication Costs in Shared-Address-Space Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques,Mapping Techniques for Graphs, Cost-Performance Tradeoffs

UNIT II:

Principles of Parallel Algorithm Design: Preliminaries, Decomposition, Tasks, and Dependency Graphs, Granularity, Concurrency, and Task-Interaction, Processes and Mapping, Processes versus Processors, Decomposition Techniques, Recursive Decomposition, Data Decomposition, Exploratory Decomposition, Speculative Decomposition, Hybrid Decompositions, 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, Parallel Algorithm Models, The Data-Parallel Model, The Task Graph Model, The Work Pool Model, The Master-Slave Model, The Pipeline or Producer-Consumer Model, Hybrid Models, **Basic Communication Operations:**One-to-All Broadcast and All-to-One Reduction, Ring or Linear Array, Mesh, Hypercube, Balanced Binary Tree Detailed Algorithms, Cost Analysis, All-to-All Broadcast and Reduction, Linear Array and Ring, Mesh, Hypercube, Cost Analysis, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Ring, Mesh, Hypercube, Circular Shift, Mesh, Hypercube, Improving the Speed of Some Communication Operations, Splitting and Routing Messages in Parts, All-Port Communication,

UNIT III:

Analytical Modeling of Parallel Programs: 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, The Isoefficiency Metric of Scalability, Cost-Optimality and the Isoefficiency Function, A Lower Bound on the IsoefficiencyFunction,The Degree of Concurrency and the Isoefficiency Function, Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs, Other Scalability Metrics, **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, MPI: the Message Passing Interface, Starting and Terminating the MPI Library, Communicators, Getting Information, Sending and Receiving Messages, Example: Odd-Even Sort, Topologies and Embedding, Creating and Using Cartesian Topologies, Example: Cannon's Matrix-Matrix Multiplication, Overlapping Communication with Computation , Non-Blocking Communication Operations, Collective Communication and Computation Operations, Barrier , Broadcast, Reduction, Prefix, Gather, Scatter, All-to-All, Example: One-Dimensional Matrix- Vector Multiplication, Example: Single-Source Shortest-Path, Example: Sample Sort, Groups and

Communicators, Example: Two-Dimensional Matrix- Vector Multiplication,

UNIT IV:

Programming Shared Address Space Platforms: Thread Basics, Why Threads? The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Mutual Exclusionfor Shared Variables, Condition Variables for Synchronization, Controlling Thread and Synchronization Attributes, Attributes Objectsfor Threads, Attributes Objects for Mutexe, Thread Cancellation, Composite Synchronization Constructs, Read-Write Locks, Barriers, Tips for Designing Asynchronous Programs, OpenMP: a Standard for Directive Based Parallel Programming, The OpenMP Programming Model, Specifying Concurrent Tasks in OpenMP, Synchronization Constructs in OpenMP, Data Handling in OpenMP, OpenMP Library Functions, Environment Variables in OpenMP, Explicit Threads versus OpenMP Based Programming **Dense Matrix Algorithms:** Matrix- Vector Multiplication,Rowwise 1-D Partitioning, 2-D Partitioning, Matrix-Matrix Multiplication, A Simple Parallel Algorithm,Cannon's Algorithm, The DNS Algorithm, Solving a System of Linear Equations, A Simple Gaussian Elimination Algorithm, Gaussian Elimination with Partial Pivoting, Solving Q Triangular System: Back-Substitution, Numerical Considerations in Solving Systems of Linear Equations**Sorting:** Issues in Sorting on Parallel Computers, Where the Input and Output Sequences are Stored,How Comparisons are Performed, Sorting Networks, Bitonic Sort, Mapping Bitonic Sort to a Hypercube and a Mesh Bubble Sort and its Variants, Odd-Even Transposition, Shellsort,Quicksort, Parallelizing Quicksort, Parallel Formulationfor a CRCW PRAM, Parallel Formulationfor Practical Architectures, Pivot Selection,Bucket and Sample Sort,Other Sorting Algorithms, Enumeration Sort,Radix Sort.

UNIT V:

Graph Algorithms: Single-Source Shortest Paths: Dijkstra's Algorithm**Search Algorithms for Discrete OptimizationProblems:** Definitions and Examples,Sequential Search Algorithms, Depth-First Search Algorithms, Best-First Search Algorithms, Search Overhead Factor, Parallel Depth-First Search, Important Parameters of Parallel DFS, A General Frameworkfor Analysis of Parallel DFS, Analysis of Load-Balancing Schemes, Termination Detection, Experimental Results, Parallel Formulations of Depth-First Branch-and-Bound Search,Parallel Formulations of IDA *, Parallel Best-First Search, Speedup Anomalies in Parallel Search Algorithms, Analysis of Average Speedup in Parallel DFS **Dynamic Programming:** Overview of Dynamic Programming, Serial Monadic DP Formulations, The Shortest-Path Problem, The Oil Knapsack Problem, Nonserial Monadic DP Formulations, The Longest-Common-Subsequence Problem, Serial Polyadic DP Formulations, Floyd's All-Pairs Shortest-Paths Algorithm, NonserialPolyadic DP Formulations, The Optimal Matrix-Parenthesization Problem, **Fast Fourier Transform:** The Serial Algorithm, The Binary-Exchange Algorithm, A Full Bandwidth Network, Limited Bandwidth Network, Extra Computations in Parallel FFT, The Transpose Algorithm, Two-Dimensional Transpose Algorithm, The Generalized Transpose Algorithm

Books:

1. Introduction to Parallel Computing, AnanthGrama, Pearson Education

References:

1. Fundamental of Paralle Processing, Harry F. Jordan, Gita Alaghband, Pearson Education
2. Parallel Programming, Michael Allen, Barry Wilkinson, Pearson Education

Lab Exercise: CSC458 Practical based on CSC408

At least two experiments should carried out on each unit.

Semester-III

Subject Reference No	CSC501	Subject Title	Java Network Programming
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Course Objective

This course assumes that students are aware of core java programming, advanced java and hence it starts from Network Basics and goes up to Network programming. It covers some topics related to client/server concepts.

At Course Completion

After complication of this course students can write good network based application using java. Students can appear for java certification examinations. Student can also work on networking and web projects.

Prerequisites

Student should know the programming in core java and advanced java.

UNIT I:

Introduction to Networking: Basic Network Concepts: Networks, The Layers of a Network, IP, TCP, and UDP, The Internet, The Client/Server Model, Internet Standards, Basic Web Concepts: URIs, HTML, SGML, and XML, HTTP, MIME Media Types, Server-Side Programs

UNIT II:

Looking Up Internet Addresses: The InetAddress Class, Inet4Address and Inet6Address, The NetworkInterface Class, Some Useful Programs, URLs and URIs: The URL Class, TheURLEncoder and URLDecoder Classes, The URL Class, Proxies, Communicating with Server-Side Programs Through GET, Accessing Password-Protected Sites

UNIT III:

Sockets for Clients: Socket Basics, Investigating Protocols with Telnet, The Socket Class, Socket Exceptions, Socket Addresses, Examples, Sockets for Servers, The ServerSocket Class, Some Useful Servers, **Secure Sockets:** Secure Communications, Creating Secure Client Sockets, Methods of the SSLSocket Class, Creating Secure Server Sockets, Methods of the SSLServerSocket Class, Non-Blocking I/O, An Example Client, An Example Server, Buffers, Channels, Readiness Selection

UNIT IV:

UDP Datagrams and Sockets: The UDP Protocol, The DatagramPacket Class, The DatagramSocket Class, Some Useful Applications, DatagramChannel, Multicast Sockets:What Is a Multicast Socket, Working with Multicast Sockets, Two Simple Examples, URLConnections: Opening URLConnections, Reading Data from a Server, Reading the Header, Configuring the Connection, Configuring the Client Request HTTP Header, Writing Data to a Server, Content Handlers, The Object Methods, Security Considerations for URLConnections, Guessing MIME Content Types, HttpURLConnection, Caches, JarURLConnection

UNIT V:

Protocol Handlers: What Is a Protocol Handler, The URLStreamHandlerClass,Writing a Protocol Handler, More Protocol Handler Examples and Techniques, The URLStreamHandlerFactory Interface, **Content Handlers:** What Is a Content Handler, The ContentHandler Class, The ContentHandlerFactory Interface, A Content Handler for the FITS Image Format, Remote Method Invocation: What Is Remote Method Invocation, Implementation, Loading Classes at Runtime, The java.rmi Package, The java.rmi.registry Package, The java.rmi.server Package,
The JavaMail **API:** What Is the JavaMail API, Sending Email, Receiving Mail, Password Authentication, Addresses, The URLName Class, The Message Class, The Part Interface, Multipart Messages and File Attachments, MIME Messages, Folders

Books

1. Java Network Programming, Third Edition, O'Reilly Media, Oct 2004
2. Java Network Programming and Distributed computing, Addison Wesley, March 2002

Additional Reference

1. www.java.com
2. http://www.dct.udn.vn/daotao/Resource/82487.pdf (E-book of Java Network Programming and distributed Computing)

Lab Exercise: CSC551 Practical based on CSC501

At least two experiments should carried out on each unit.

Subject Reference no	CSC502	Subject Title	Advanced Software Engineering and Technology
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To learn object oriented Software engineering skills through UML.
Prerequisite: The student must aware of software development paradigms.

UNIT I:

Introduction: Software Engineering, Software Engineering Concepts, Software Engineering Development Activities, Managing Software Development, **Modeling with UML:** An Overview of UML, Use Case Diagrams Class Diagrams, Interaction Diagrams, State Machine Diagrams, Activity Diagrams, **Modeling Concepts:** Systems, Models, and Views,Data Types, Abstract Data Types, and Instances,Classes, Abstract Classes, and Objects, Event Classes, Events, and Messages,Object-Oriented Modeling, Falsification and Prototyping.

UNIT II:

Requirements Elicitation Concepts :Functional Requirements, Nonfunctional Requirements, Completeness, Consistency, Clarity, and Correctness, Realism, Verifiability, and Traceability, Greenfield Engineering, Reengineering, and Interface Engineering, **Requirements Elicitation Activities** : Identifying Actors, Identifying Scenarios, Identifying Use Cases, Refining Use Cases, Identifying Relationships among Actors and Use Cases, Identifying Initial Analysis Objects, Identifying Nonfunctional Requirements, **Managing Requirements Elicitation** : Negotiating Specifications with Clients: Joint Application Design, Maintaining Traceability, Documenting Requirements

Elicitation,Analysis Concepts: Analysis Object Models and Dynamic Models, Entity, Boundary, and Control Objects, Generalization and Specialization, **Analysis Activities:** Identifying Entity Objects, Identifying Boundary Objects, Identifying Control Objects, Mapping Use Cases toObjects with Sequence Diagrams, Modeling Interactions among Objects with CRC Cards, Identifying Associations, Identifying Aggregates, Identifying Attributes, Modeling State-Dependent Behavior of Individual Objects, Modeling Inheritance Relationships between Objects

UNIT III:

System Design: UML Deployment Diagrams, **System Design Activities:** Addressing Design Goals, Managing System Design, Object Design, **Reuse Concepts:** Solution Objects, Inheritance, and Design Patterns, **Reuse Activities:** Selecting Design Patterns and Components, **Interface Specification Concepts:** Class Implementer, Class Extender, and Class User, Types, Signatures, and Visibility, Contracts: Invariants, Preconditions, and Post conditions, Object Constraint Language, OCL Collections: Sets, Bags, and Sequences, **Interface Specification Activities:** Identifying Missing Attributes and Operations, Specifying Types, Signatures, and Visibility, Specifying Pre- and Post conditions, Specifying Invariants, Inheriting Contracts, **Managing Object Design:** Documenting Object Design, Assigning Responsibilities

UNIT IV:

Mapping Models to Code Mapping Concepts: Model Transformation, Refactoring, Forward Engineering, Reverse Engineering, Transformation Principles, **Mapping Activities:** Optimizing the Object Design Model, Mapping Associations to Collections, Mapping Contracts to Exceptions, Mapping Object Models to a Persistent Storage Schema, **Managing Implementation:** Documenting Transformations, Assigning Responsibilities **Testing:** Faults, Erroneous States, and Failures, Test Cases, Test Stubs and Drivers, Corrections, **Testing Activities:** Component Inspection, Usability Testing, Unit Testing, Integration Testing, System Testing, **Managing Testing:** Planning Testing, Documenting Testing, Assigning Responsibilities, Regression Testing, Automating Testing, Model-based Testing

UNIT V:

Configuration Management: Configuration Management Concepts, Configuration Management Activities, Managing Configuration Management, Management **Project Management:** Project Management Concepts, Classical Project Management Activities, Agile Project Management Activities

Books:

1) Object-Oriented Software Engineering: Using UML, Patterns and Java, B. Bruegge& A. H. Dutoit, Prentice Hall

2) Object Oriented Software Engineering: A Use Case Driven Approach By Ivar Jacobson, Pearson publication.

3) Software Engineering: A Practitioners approach 7TH Editionby R. S. Pressman.

Lab Exercise: CSC552 Practical based on CSC502

At least two experiments should be carried out on each unit.

Subject Reference no	CSC503	Subject Title	Computer Vision
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To provide the mechanics for representation and analysis of Multispectral data.

Prerequisite: Student must have knowledge of Signal Processing, Image Processing, Neural Networks and Artificial Intelligence.

UNIT I:

CAMERAS: Pinhole Cameras, Perspective Projection, Affine Projection, **GEOMETRIC CAMERA MODELS:** Elements of Analytical Euclidean Geometry, Coordinate Systems and Homogeneous Coordinates, Coordinate System Changes and Rigid Transformations, Camera Parameters and the Perspective Projection, Intrinsic Parameters, Extrinsic Parameters, A Characterization of Perspective Projection Matrices, Affine Cameras and Affine Projection Equations, Affine Cameras, Affine Projection Equations, A Characterization of Affine Projection Matrices, **GEOMETRIC CAMERA CALIBRATION:** Least-Squares Parameter Estimation, Linear Least-Squares Methods, Nonlinear Least-Squares Methods, A Linear Approach to Camera Calibration, Estimation of the Projection Matrix, Estimation of the Intrinsic and Extrinsic Parameters, Degenerate Point Configurations, Taking Radial Distortion into Account, Estimation of the Projection Matrix, Estimation of the Intrinsic and Extrinsic Parameters, Degenerate Point Configurations, Analytical Photogrammetry, An Application: Mobile Robot Localization **RADIOMETRY-MEASURING LIGHT**: Light in, Foreshortening, Solid Angle, Radiance, Light at Surfaces, Simplifying Assumptions, The Bidirectional Reflectance Distribution Function, Example: The Radiometry of Thin Lenses, Important Special Cases, Radiosity, Directional Hemispheric Reflectance, Lambertian Surfaces and Albedo, Specular Surfaces, The Lambertian + Specular Model. **SOURCES, SHADOWS, AND SHADING:** Qualitative Radiometry, Sources and Their Effects, Radiometric, Properties of Light Sources, Point Sources, Line Sources, Area Sources, Local Shading Models, Local Shading Models for Point Sources, Area Sources and Their Shadows, Ambient Illumination, Application: Photometric Stereo, Normal and Albedo from Many Views, Shape from Normals, Interreftections: Global Shading Models, An Interreflection Model, Solving for Radiosity, The Qualitative Effects of Interreftections, **COLOR:** The Physics of Color, Radiometry for Colored Lights: Spectral Quantities, The Color of Sources, The Color of Surfaces, Human Color Perception, Color Matching, Color Receptors, Representing Color, Linear Color Spaces, Non-linear Color Spaces, Spatial and Temporal Effects, A Model for Image Color, Cameras, A Model for Image Color, Application: Finding Specularities, Surface Color from Image Color, Surface Color Perception in People, Inferring Lightness, Surface Color from Finite-Dimensional Linear Models

UNIT II:

LINEAR FILTERS: Linear Filters and, Convolution, Shift Invariant Linear Systems, Discrete Convolution, Continuous Convolution., Edge Effects in Discrete Convolutions, Spatial Frequency and Fourier Transforms, Fourier Transforms, Sampling and Aliasing,Sampling, Aliasing, Smoothing and Resampling, Filters as Templates, Convolution as a Dot Product, Changing Basis, Technique: Normalized Correlation and Finding Patterns, Controlling the Television by Finding Hands by Normalized Correlation, Technique: Scale and Image Pyramids, The Gaussian Pyramid, Applications of Scaled Representations, **TEXTURE:** Representing Texture, Extracting Image Structure with Filter Banks, Representing Texture Using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids,The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity,, Synthesis by Sampling Local Models, **THE GEOMETRY OF MULTIPLE VIEWS:** Two Views, Epipolar Geometry, The Calibrated Case, Small Motions, The Uncalibrated Case, Weak Calibration, Three Views, Trifocal Geometry, The Calibrated Case, The

Uncalibrated Case, Estimation of the Trifocal Tensor, **STEREOPSIS:** Reconstruction, Image Rectification, Human Stereopsis, Binocular Fusion, Correlation, Multi-Scale Edge Matching, Using More Cameras Three Cameras, Multiple Cameras,

AFFINE STRUCTURE FROM MOTION: Elements of Affine Geometry, Affine Spaces and Barycentric Combinations, Affine Subspaces and Affine Coordinates, Affine Transformations and Affine Projection Models, Affine Shape, Affine Structure and Motion from Two Images, Geometric Scene Reconstruction, Algebraic Motion Estimation, Affine Structure and Motion from Multiple Images, The Affine Structure of Affine Image Sequences, A Factorization Approach to Affine Structure from Motion, From Affine to Euclidean Images, Euclidean Constraints and Calibrated Affine Cameras, Computing Euclidean Upgrades from Multiple Views, Affine Motion Segmentation, The Reduced Row-Echelon Form of the Data Matrix, The Shape Interaction Matrix, **PROJECTIVE STRUCTURE FROM MOTION:** Elements of Projective Geometry, Projective Spaces, Projective Subspaces and Projective Coordinates, Affine and Projective Spaces, Hyperplanes and Duality, Cross-Ratios and Projective Coordinates, Projective Transformations, Projective Shape, Projective Structure and Motion from Binocular Correspondences, Geometric Scene Reconstruction, Algebraic Motion Estimation, Projective Motion Estimation from Multilinear Constraints, Motion Estimation from Fundamental Matrices, Motion Estimation from Trifocal Tensors, Projective Structure and Motion from Multiple Images, A Factorization Approach to Projective Structure from Motion, Bundle Adjustment, From Projective to Euclidean Images

UNIT III:

APPLICATION: IMAGE-BASED RENDERING: Constructing 3D Models from Image Sequences, Scene Modeling from Registered Images, Scene Modeling from Unregistered Images, Transfer-Based Approaches to Image-Based Rendering, Affine View Synthesis, Euclidean View Synthesis, The Light Field, **SEGMENTATION BY CLUSTERING** What Is Segmentation? Model Problems, Segmentation as Clustering, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Background Subtraction, Shot Boundary Detection, Image Segmentation by Clustering Pixels, Segmentation Using Simple Clustering Methods, Clustering and Segmentation by K-means, Segmentation by Graph-Theoretic Clustering, Terminology for Graphs, The Overall Approach, Affinity Measures, Eigenvectors and Segmentation, Normalized Cuts, **SEGMENTATION BY FITTING A MODEL:** The Hough Transform, Fitting Lines with the Hough Transform, Practical Problems with the Hough Transform, Fitting Lines, Line Fitting with Least Squares, Which Point Is on Which Line?, Fitting Curves, Implicit Curves, Parametric Curves, Fitting as a Probabilistic Inference Problem, Robustness, M-estimators, RANSAC, Example: Using RANSAC to Fit Fundamental Matrices, An Expression for Fitting Error, Correspondence as Noise, Applying RANSAC, Finding the Distance, Fitting a Fundamental Matrix to Known Correspondences

UNIT IV:

SEGMENTATION AND FITTING USING PROBABILISTIC METHODS: Missing Data Problems, Fitting, and Segmentation, Missing Data Problems, The EM Algorithm, The EM Algorithm in the General Case, The EM Algorithm in Practice, Example: Image Segmentation, Revisited, Example: Line Fitting with EM, Example: Motion Segmentation and EM, Example: Using EM to Identify Outliers, Example: Background Subtraction Using EM, Example: EM and the Fundamental Matrix, Difficulties with the EM Algorithm, Model Selection: Which Model Is the Best Fit? Basic Ideas, AIC-An Information Criterion, Bayesian Methods and Schwartz' BIC, Description Length, Other Methods for Estimating Deviance, **APPLICATION: FINDING IN DIGITAL LIBRARIES:** Background: Organizing Collections of Information, How Well Does the System Work?, What Do Users Want?, Searching for Pictures, Structuring and Browsing, Summary Representations of the Whole Picture, Histograms and Correlograms, Textures and Textures of Textures, Representations of Parts of the Picture, Segmentation, Template Matching, Shape and Correspondence, Clustering and Organizing Collections, Video **TRACKING WITH LINEAR DYNAMIC MODELS:** Tracking as an Abstract Inference Problem, Independence Assumptions, Tracking as Inference, Overview, Linear

Dynamic Models, Drifting Points, Constant Velocity, Constant Acceleration, Periodic Motion, Higher Order Models, Kalman Filtering, The Kalman Filter for a ID State Vector, The Kalman Update Equations for a General State Vector, Forward-Backward Smoothing, Data Association, Choosing the Nearest-Global Nearest Neighbours, Gating and Probabilistic Data Association, Applications and Examples, Vehicle Tracking

UNIT V:

MODEL-BASED VISION: Initial Assumptions, Obtaining Hypotheses, Obtaining Hypotheses by Pose Consistency, Pose Consistency for Perspective Cameras, Affine and Projective Camera Models, Linear Combinations of Models, Obtaining Hypotheses by Pose Clustering, Obtaining Hypotheses Using Invariants, Invariants for Plane Figures, Geometric Hashing, Invariants and Indexing, Verification, Edge Proximity, Similarity in Texture, Pattern and Intensity, Application: Registration in Medical Imaging Systems, Imaging Modes, Applications of Registration, Geometric Hashing Techniques in Medical Imaging, Curved Surfaces and Alignment **FINDING TEMPLATES USING CLASSIFIERS:** Classifiers, Using Loss to Determine Decisions, Overview: Methods for Building Classifiers, Example: A Plug-in Classifier for Normal Class-conditional Densities, Example: A Nonparametric Classifier Using Nearest Neighbors, Estimating and Improving Performance, Building Classifiers from Class Histograms, Finding Skin Pixels Using a Classifier, Face Finding Assuming Independent Template Responses, Feature Selection, Principal Component Analysis, Identifying Individuals with Principal Components Analysis, Canonical Variates, Neural Networks, Key Ideas, Minimizing the Error, When to Stop Training, Finding Faces Using Neural Networks, Convolutional Neural Nets, Support Vector Machines for Linearly Separable Daiasets, Finding Pedestrians Using Support Vector Machines **ASPECT GRAPHS:** Visual Events: More Differential Geometry, The Geometry of the Gauss Map, Asymptotic Curves, The Asymptotic Spherical Map, Local Visual Events, The Bitangent Ray Manifold, Multilocal Visual Events, Computing the Aspect Graph, Step I: Tracing Visual Events, Step 2: Constructing the Regions, Remaining Steps of the Algorithm, An Example, Aspect Graphs and Object Localization

Books:

1. Computer Vision: A Modern Approach, Forsyth Ponce , Pearson Education
2. Image Processing, Analysis and Machine Vision, Milan Sonka, Thomson Learning

References:

1. Machine Vision, Jain R C Kasturi R, McGrawHill
2. Three Dimensional Computer Vision, Y Shirai, Springer Verlag
3. Computer And Robot Vision Vo I and II, Haralick R M And Shapiro L G, Addison Wesley
4. Computational Vision, Wechsler, Academic Press
5. Robot Vision, Horn B K P, Cambridge MIT press
6. Digital Image Processing & Computer Vision, Robert J Schalkoff, John Willey Publication

Lab Exercise: CSC553 Practical based on CSC503

At least two experiments should be carried out on each unit.

Elective-I

Subject Reference no	CSC421	Subject Title	Advanced Embedded System
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: Studying the various practical aspects of micro controller and microprocessor in terms of Embedded Systems design.

Prerequisite: Student must aware of microprocessor programming using ALP, Microprocessor Architecture, Instruction set and machine code generations, and C Programming.

UNIT I:

Introduction to Embedded Systems: Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System,Examples of Embedded Systems, Embedded System-on-chip (Soc) and Use of VLSI Circuit Design Technology, Complex Systems Design and Processors,Design Process in Embedded System, Formalization of System Design,Design Process and Design Examples,Classification of Embedded Systems, Skills Required for an Embedded System Designer **8051 and Advanced Processor Architectures, Memory Organization and Real-world Interfacing:** 8051 Architecture,Real World Interfacing, Introduction to Advanced Architectures, Processor and Memory Organization,Instruction-Level Parallelism, Performance Metrics, Memory-Types, Memory-Maps and Addresses,Processor Selection, Memory Selection, **Devices and Communication Buses for Devices Network** :Types and Examples, Serial Communication Devices,Parallel Device Ports, Sophisticated Interfacing Features in Device Ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer,Real Time Clock, Networked Embedded Systems,Serial Bus Communication Protocols, Parallel Bus Device Protocols-Parallel Communication Network Using ISA, PCI, PCI-X and Advanced Buses, Internet Enabled Systems-Network Protocols, Wireless and Mobile System Protocols

UNIT II:

Device Drivers and Interrupts Service Mechanism: Programmed-I/O Busy-wait Approach without Interrupt Service Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing (Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processors Interrupt Service Mechanism from Context-Saving Angle, Direct Memory Access, Device Driver Programming, **Programming Concepts and Embedded Programming in C, C++ and Java:** Software Programming in Assembly Language (ALP) and in High-Level Language 'C' 235 , C Program Elements: Header and Source Files and Preprocessor Directives, Program Elements: Macros and Functions, Program Elements: Data Types, Data Structures, Modifiers, Statements, Loops and Pointers, Object-Oriented Programming, Embedded Programming in C++, Embedded Programming in Java, **Program Modeling Concepts:** Program Models, DFG Models, State Machine Programming Models for Event-controlled Program Flow, Modeling of Multiprocessor Systems, UML Modelling

UNIT III:

Interprocess Communication and Synchronization of Processes, Threads and Tasks: Multiple Processes in an Application, Multiple Threads in an Application, Tasks, Task States, Task and Data, Clear-

cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Interprocess Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions, **Real-Time Operating Systems** : OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and 10 Subsystems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-time Operating Systems, Basic Design Using an RTOS, Rtos Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues,

UNIT IV:

***R*eal-time Operating System Programming-I:** MicrodOS-II and VxWorks, Basic Functions and Types of RTOSES, RTOS mCOS-II, RTOS VxWorks, **Real-time Operating System Programming-II:** Windows CE, OSEK and Real-time Linux Functions,Windows CE, OSEK, Linux 2.6.x and RTLinux, **Design Examples and Case Studies of Program Modeling and Programming with RTOS-I:** Case Study of Embedded System Design and Coding for an Automatic, Chocolate Vending Machine (ACYM) Using Mucos RTOS, Case Study of Digital Camera Hardware and Sofware Architecture, Case Study of Coding for Sending Application Layer Byte Streams on a TCPIIP Network Using RTOS Vxworks

UNIT V:

Design Examples and Case Studies of Program Modeling and Programming with RTOS-2: Case Study of Communication Between Orchestra Robots, Embedded Systems in Automobile, Case Study of an Embedded System for an Adaptive Cruise Control (ACC) System in a Car, Case Study of an Embedded System for a Smart Card, Case Study of a Mobile Phone Software for Key Inputs, **Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design, **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine: Simulators, Laboratory Tools

Books:

1. Embedded Systems: Architecture, Programming and Design, Raj Kamal, McGraw Hill

References:

1. "Embedded System Design" Frank Vahid&Tony Givargis; John Wiley &sons, Inc.
2. "Real – Time Systems and software"Alan C. Shaw ; John Wiley &Sons Inc
3. "Fundamentals of embedded Software", Daniel W. Lewis, Pearson
4. "Real time Systems", J. W. S. Liu, Pearson
5. "Embedded Realtime System Programming", S. V. Iyer and P. Gupta, TMH
6. "An Embedded System Primer" David E. Simon; Addison-Wesley Pub
7. "Embedded System Design" Steve Heath; Butterworth-Heinemann Pub.
8. "Embedded System Computer Architecture" Graham Wilson, Butterworth-Heinemann

Lab Exercise: CSC422 Practical based on CSC421

At least two experiments should be carried out on each unit.

Subject Reference no	CSC423	Subject Title	Data Warehousing
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Course Objective:

A student completing this course unit should:

1) Have an understanding of the foundations, the design, the maintenance, the evolution and the use of data warehouses, by looking at these topics in a rigorous way.
2) Have mastered the basic range of techniques for creating, controlling and navigating dimensional business databases, by being able to use a powerful tool for dimensional modeling and analysis.

Prerequisite: Student must aware of Relational Database management system, its organization and management using Queries

UNIT I:

Data Warehousing Concepts: Data Warehouse Architectures, **Logical Design in Data Warehouses:** Logical Versus Physical Design in Data Warehouses, Data Warehousing Schemas, Data Warehousing Objects, **Physical Design in Data Warehouses:** Physical Design, Data Segment Compression, Integrity Constraints, Indexes and Partitioned Indexes, Materialized Views, Dimensions

UNIT II:

Hardware and I/O Considerations in Data Warehouses: Overview of Hardware and I/O Considerations in Data Warehouses, Automatic Striping, Manual Striping, Local and Global Striping, Analyzing Striping, Striping Goals, RAID Configurations, Striping, Mirroring, and Media Recovery, RAID 5, The Importance of Specific Analysis, **Parallelism and Partitioning in Data Warehouses:** Granules of Parallelism, Block Range Granules, Partition Granules, Partitioning Design Considerations, Types of Partitioning, Partitioning Methods, Performance Issues for Range, List, Hash, and Composite Partitioning, Partitioning and Data Segment Compression, Data Segment Compression and Bitmap Indexes, Partition Pruning, Avoiding I/O Bottlenecks, Partition-Wise Joins, Full Partition-Wise Joins, Miscellaneous Partition Operations, **Indexes:** Bitmap Indexes, Benefits for Data Warehousing Applications, Cardinality, Bitmap Join Indexes, Bitmap Join Index Restrictions, B-tree Indexes, Local Indexes Versus Global Indexes

UNIT III:

Integrity Constraints: Overview of Constraint States, Typical Data Warehouse Integrity Constraints, UNIQUE Constraints in a Data Warehouse, FOREIGN KEY Constraints in a Data Warehouse, RELY Constraints, Integrity Constraints and Parallelism, Integrity Constraints and Partitioning, **Materialized Views:** Creating, Registering Existing Materialized Views, Partitioning Materialized Views, Materialized Views in OLAP Environments, Choosing Indexes for Materialized Views, Invalidating Materialized Views Security Issues with Materialized Views, Altering Materialized Views, Dropping Materialized Views, Analyzing Materialized View Capabilities, **Dimensions:** Creating Dimensions, Viewing Dimensions, Using Dimensions with Constraints, Validating Dimensions, Altering Dimensions, Deleting Dimensions, Using the Dimension Wizard, **Overview of Extraction, Transformation, and Loading:** Overview of ETL, ETL Tools

UNIT IV:

Managing the Warehouse Environment: Overview of Extraction, Transformation and Loading, Extraction in Data Warehouses Transportation in Data Warehouses, Loading and Transformation, Maintaining the Data Warehouse, Change Data Capture, Summary Advisor, **Loading and Transformation:** Overview of Loading and Transformation in Data Warehouses, Loading Mechanisms, Transformation Mechanisms, Loading and Transformation Scenarios. **Maintaining the Data Warehouse:** Using Partitioning to Improve Data Warehouse Refresh, Optimizing DML Operations During Refresh, Refreshing Materialized Views, Using Materialized Views with Partitioned Tables, **Change Data Capture:** About Change Data Capture, Installation and Implementation, Security, Columns in a Change Table, Change Data Capture Views, Synchronous Mode of Data Capture, Publishing Change Data, Managing Change Tables and Subscriptions, Subscribing to Change Data, Export and Import Considerations

UNIT V:

Summary Advisor: Overview of the Summary Advisor in the DBMS_OLAP Package, Using the Summary Advisor, Estimating Materialized View Size, Is a Materialized View Being Used Summary Advisor Wizard, **Warehouse Performance:** Schema Modeling Techniques, SQL for Aggregation in Data Warehouses, SQL for Analysis in Data Warehouses, OLAP and Data Mining, Using Parallel Execution, Query Rewrite, **SQL for Aggregation in Data Warehouses:** Overview of SQL for Aggregation in Data Warehouses, ROLLUP Extension to GROUP BY, CUBE Extension to GROUP BY, GROUPING Functions, GROUPING SETS Expression, Composite Columns, Concatenated Groupings, Considerations when Using Aggregation, Computation Using the WITH Clause

REFERENCES:

1. Kimball, Reeves Ross, Thornthwaite, The Data Warehouse Lifecycle Toolkit, John Wiley & Sons, 1998.
2. Jiawei Han and MichelineKamber, Data Mining Concepts and Techniques, Elsevier Second edition.
3. Arun K Pujari, Data Mining Techniques, University Press, Tenth edition 2006, ISBN 81 7371 380 4
4. *Oracle9i* Data Warehousing Guide Release 2 (9.2) Part Number A96520-01 by Oracle Press.

Lab Exercise: CSC424 Practical based on CSC423

At least two experiments should carried out on each unit.

Subject Reference no	CSC425	Subject Title	Geographical Information Technology
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To provide the mechanics for representation and analysis of remotely sensed data.

Prerequisite:

UNIT I:

GIT: A CONCEPTUAL FRAMEWORK Introduction to GIT: Earth-A Unique Planet, Socio-Economic Challenges, Operation, Administration and Maintenance, Environmental and Natural Resource Management, **History and Evolution:** Ancient Period, Modern Period, Development of Computers, Development of

Remote Sensing, Indian Space Research, **Surveying and Mapping:** Measuring Techniques, Distance and Angle Measurements, Theodolites, Total Station, Data Accuracy and Precision, **Global Positioning System:** How GPS Works, Triangulation from Satellites, Satellite Signals, Code Measurement, Common Errors,, Differential Global Positioning System (DGPS), GPS Receivers,

UNIT II:

Projections and Coordinate Systems: Coordinates, Geographic Reference, Datum, Projection, Types of Map Projection, Cylindrical Projection, Conic Projections, Azimuthal Projections, **Data Diversity and Standards:** Modeling the Spatial Phenomena, Modeling Spatial Features, From Conceptualization to Implementation, Spatial Registration, Metadata, Data Standards, **Maps and Themes:** Map Symbols, Colour, Map Layout, Text, Thematic Representaiton of Data Maps, **GEOGRAPHIC INFORMATION SYSTEM: AN INSIGHT- Fundamentals of GIS:** GIS Database, The Real World Vs. GIS, Data Model, **GIS Data Models:** Vector Model, Digital Coding in GIS, Spaghetti Model, Topology Model, Raster Model, Advanced Models, GIS Processes,

UNIT III:

Data Quality: GIS Data Quality, Positional accuracy, Attribute Accuracy, Logical Consistency, Resolution/Precision, Completeness, Old Maps, Map Scales, Data Representation Format, Aerial Coverage, Accessibility, **Database Management System:** Database Fundamentals, Data Organization in the Computer, File-Based Systems, Databases and the Relational Model, File-Based Systems, Database Systems, Three-Level Architecture of Databases, Mappings Between Levels, Relational Data Structure, Characteristics of Relations, Entity and Entity Type, Relationship and Relationship Types, Relational Database Design Methodology, Creating the External Design, Creating the Conceptual Design, Creating the Internal Design, Structured Query Language (SQL), Spatial Database, **Hardware and Software:** ERDAS, Autocad Map, Planning Phase, Analysis Phase, Implementation Phase, Critical Success Factors for GIS, **Spatial Analysis:** Overlay Analysis of Raster Data, Overlay Analysis of Vector Data, Reclassification and Rebuilding, Shape and Measurement Analysis, Surface Analysis, Surface Models, Grid and TIN Data Structures,

UNIT IV:

GIS and the Internet: Annexure: GIS: An Analytical Case Study, **REMOTE SENSING General Background of Remote Sensing, Techniques of Remote Sensing:** Principle of Remote Sensing, Interaction of Earth Surface Features with EMR, Interactions with the Atmosphere, Atmospheric Windows, Spectral Characteristics of Water, Soil, Rocks and Vegetation Cover, Thermal Remote Sensing,**Remote Sensing Platforms and Sensors:** Across-Track Scanning (Whiskbroom), Along-Track Scanning (Pushbroom), False Colour Composite, Landsat Multispectral Scanner and the Matic Mapper, Return Beam Vidicon Camera (RBV), Multispectral Scanner (MSS), Thematic Mapper (TM), Spot, IRS-Series, Sensors in Microwave Region, SeasatSar, High Resolution Satellites,

UNIT V:

Digital Image Processing: What is Digital Image Processing, Why Digital Image Processing, Image Rectification, Image Enhancement, Digital Data Formats, **Aerial Photographs:** Process of Aerial Photography, Types of Aerial Photographs, Photo Indexing, Mosaics, Photo Scale, Stereoscope, Relief (Radial) Displacement, Vertical Exaggeration, Parallax, Some Terms Associated with Aerial Photograph, **Image Interpretation:** Image Elements or Photo-Recognition Elements, Terrain Elements, Process of Interpretation, Applications of Remote Sensing

Books:

1. An Introduction To Geographic Information Technology, SujitChoudhary, IK International
2. Fundamental Of Remote Sensing, George Joseph, Universities Press

UNIT V:
The Law and the Use of Biometrics.- Biometric System Security.- Spoof Detection Schemes.- Linkages between Biometrics and Forensic Science.- Biometrics in Government Sector.- Biometrics in the Commercial Sector.- Biometric Standards.- Biometrics Databases.- Index.

Text Book

1. Handbook of Biometrics, Jain, Anil K.; Flynn, Patrick; Ross, Arun A. (Eds.), 2008, Springer, ISBN 978-0-387-71040-2

Lab Exercise: CSC428 Practical based on CSC427
At least two experiments should be carried out on each unit.

Subject Reference no	CSC429	Subject Title	Mobile Computing
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To study and provide mechanism of wireless computing.
Prerequisite: Student must aware with computer networking, computer communication basics.

UNIT I:
Mobile Communications: An Overview: Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security **Mobile Devices and Systems:** Mobile Phones, Digital Music Players, Handheld Pocket Computers, Handheld Devices: Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems **GSM and Similar Architectures:** GSM-Services and System, Architecture, Radio Interfaces, Protocols, Localization, Calling Handover, Security, New Data Services, General Packet Radio Service, High-speed Circuit Switched Data, DECT

UNIT II:
Wireless Medium Access Control and CDMA-based Communication: Medium Access Control, Introduction to CDMA-based Systems, Spread Spectrum in CDMA Systems, Coding Methods in CDMA, IS-95 cdmaOne System, IMT-2000, i-mode, OFDM, **Mobile IP Network Layer:** IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation Route Optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer, Conventional TCP/IP Transport, Layer Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP-layer Transmission for Mobile Networks, TCP Over 2.5G/3G Mobile Networks,

UNIT III:
Databases: Database Hoarding Techniques, Data Caching, Client-Server Computing and Adaptation, Transactional Models, Query Processing, Data Recovery Process, Issues relating to Quality of Service, **Data Dissemination and Broadcasting Systems:** Communication Asymmetry, Classification of Data-Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques, Digital Audio Broadcasting, Digital Video Broadcasting, **Data Synchronization in Mobile Computing Systems:** Synchronization, Synchronization Software for Mobile Devices, Synchronization Protocols, SyncML Synchronization Language for Mobile Computing, Sync4J (Funambol), Synchronized Multimedia

Books:

1. Decision Support and Business Intelligence Systems

References:

1. Decision Support Systems, George M. Marakas, 2nd Edition, Pearson Education
2. Decision Support Systems, Janakiraman V.S. and Sarukesi. K., Prentice Hall of India
3. Decision Support System and Management, Lofti, McGraw Hill Inc., International Edition, New Delhi.

Lab Exercise: CSC434 Practical based on CSC433
At least two experiments should be carried out on each unit.

Subject Reference no	CSC435	Subject Title	Data Mining
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective:
To develop an understanding of the strengths and limitations of popular data mining techniques and to be able to identify promising business applications of data mining. Students will be able to actively manage and participate in data mining projects executed by consultants or specialists in data mining. A useful take away from the course will be the ability to perform powerful data analysis.

Prerequisite: Student must aware with Database management systems

UNIT I:
Introduction to Data Mining: Why Mine Data? Commercial Viewpoint, Scientific Viewpoint Motivation, Definitions, Origins of Data Mining, Data Mining Tasks, Classification, Clustering, Association Rule Discovery, Sequential Pattern Discovery, Regression, Challenges of Data Mining, **Data Mining-Data:** What is Data? Attribute Values, Measurement of Length, Types and Properties of Attributes, Discrete and Continuous Attributes, Types of data sets, Data Quality, Data Preprocessing, Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Attribute Transformation, Density.

UNIT II:
Data Mining: Exploring Data: Data Exploration Techniques, Summary Statistics, Frequency and Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Visualization, Representation, Arrangement, Selection, Visualization Techniques: Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Other Visualization Techniques, OLAP : OLAP Operations, **Data Mining Classification: Bask Concepts, Decision Trees, and Model Evaluation:** Classification: Definition, Classification Techniques, Tree Induction, Measures of Node Impurity, Practical Issues of Classification, ROC curve, Confidence Interval for Accuracy, Comparing Performance of Two Models, Comparing Performance of Two Algorithms.

UNIT III:

Data Mining Classification: Alternative Techniques: Rule-Based Classifier, Rule Ordering Schemes, Building Classification Rules, Instance-Based Classifiers, Nearest Neighbor Classifiers, Bayes Classifier, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.

UNIT IV:

Data Mining Association Analysis: Basic Concepts and Algorithms: Association Rule Mining, Frequent Itemset Generation, Association Rule Discovery : Hash tree, Factors Affecting Complexity, Maximal Frequent Horible Closed Itemset, Alternative Methods for Frequent Itemset Generation, FP-growth Algorithm, Tree Projection, Rule Generation, Pattern Evaluation, Statistical Independence, Properties of A Good Measure, Support-based Pruning, Subjective Interestingness Measure.

UNIT V:

Data Mining Cluster Analysis: Basic Concepts and Algorithms: Applications of Cluster Analysis, Types of Clusters, **Clustering Algorithms:** K-means and its variants, Hierarchical clustering, Density-based clustering. Graph-Based Clustering, Limitations of Current Merging Schemes, Characteristics of Spatial Data Sets, Shared Near Neighbor Approach, ROCK (RObust Clustering using linKs), Jarvis-Patrick Clustering, SNN Clustering Algorithm, **Data Mining Anomaly Detection:** Anomaly/Outlier Detection, Importance, Anomaly Detection Schemes, Density-based: LOF approach

REFERENCES:

1. Introduction to Data Mining by Tan, Steinbach, Kumar.
2. Data Mining: Concepts and Techniques by Jiawei Han, MichelineKamber, Morgan Kaufmann Publishers.
3. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann, 2nd Edition (2005).
4. Principles of Data Mining: David Hand, HeikkiMannila&Padhraic Smyth, PHP Publication.

Lab Exercise: CSC436 Practical based on CSC435

At least two experiments should be carried out on each unit.

Subject Reference no	CSC437	Subject Title	Cryptography and Network Security
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To study the main security threats of communication networks. To establish certain security mechanisms that avoids or considerably diminishes these threats. To introduce modern cryptography techniques. To study specific cryptography techniques that guarantee security in certain applications (e-mail, e-commerce, web access, etc.). To introduce the most widely known standards for each case.

Prerequisite: Student must aware of data communication principals, computer networks , communication basics and concept of information theory is mandatory.

UNIT I:

Introduction: Security Trends, the OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A model for network security.

UNIT II:
Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition techniques, Steganography, Block Cipher Principles, The data Encryption Standard, Block Cipher Design Principles.

UNIT III:
Public-Key Encryption And Hash Functions: Introduction to Number Theory, Public-Key Cryptography and RSA, Key Management; Other Public –Key Cryptosystems, Message Authentication and Hash Functions, Digital Signatures and Authentication Protocols.

UNIT IV:
Network Security Practice And System Security: Electric Mail Security, IP Security, Web Security

UNIT V:
System Secutity: Intruders, Malicious Software, Firewalls.

Practical:

A) Seminar Presentation: In this a group of 2-3 students is required to read some new materials that are not covered in the class, and then present it in the class| each presentation lasts 20 minutes, including questions. Student also has to write a formal report (about 15 pages) of your presentation material and hand in before the final exam. The total number of presentation projects allowed in this course is 3- the topics will be given by instructor, and students choose topics based on First Coming First Service (FCFS).

B) Programming project: In this project, each student is required to program some existing protocols. Your program has to run correctly to be graded. You have to hand in the documentation of your programming in addition to the code itself.

Text Book:
1. Cryptography and Network Security: Principles and Practice; Fourth or Fifth Edition. By William Stallings, Prentice Hall, Hardcover.
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press, hardcover, Published March, 1995. ISBN 0-8493-8521-0.
3. Network Security Essentials: Applications and Standards by William Stallings.Prentice Hall, Hardcover, Published November 1999, 366 pages, ISBN 0130160938.

Lab Exercise: CSC438 Practical based on CSC437
At least two experiments should be carried out on each unit.

Subject Reference no	CSC439	Subject Title	Introduction to MEMS Pro+
No of Credits	4 Theory, 2 Practical	Assignment/ Sectionals (Internal)	20%
Total Contact Hrs/Week	4 Theory, 4 Practical	External (Semester Exam)	80%

Objective: To learn the MEMS Technology for Nanotechnology applications.
Prerequisite:

UNIT-I:

Introduction: history of MEMS, market for MEMS, overview of MEMS processes properties of silicon, a sample MEMS process, **Basics of Microtechnology:** definitions and terminology, a sample process, lithography and etching.MEMS **Biosensors:** Bio Flow Sensors, MEMS Images. Introduction to MEMS Pro design software. **Micromachining:** subtractive processes (wet and dry etching), additive processes (evaporation, sputtering, epitaxial growth). Fundamental Devices and Processes: basic mechanics and electrostatics for MEMS, parallel plate actuators, pull-in point, comb drives.

UNIT-II:

Fundamental Devices and Processes: more electrostatic actuators; MEMS foundries, Cronos MUMPs (multi user MEMS process). **MUMPs Multi User MEMS Process:** JDS Uniphase MUMPs processing sequence and design rules. **MUMPs and SUMMIT:** design rules; applications; micro hinges and deployment actuators.

UNIT-III:

CMOS MEMS: CMOS foundry processes, integrated IC/MEMS, MEMS postprocessing, applications. Cleanroom lab techniques: clean rooms, gowning procedures; safety, fire, toxicity; acids and bases; photolithography. MicroOptoElectroMechanical Systems (MOEMS): micro scanners, digital mirror display, retinal scanning display. Grating light valve, corner cube retroreflector, optical switches, other micro-optical devices.

UNIT-IV:

Thermal Transducers: bimorphs, "heatuators", cilia arrays, Piezoresistivity; **Scanning Probe Microscopy:** scanning tunneling microscope (STM), atomic force microscope (AFM), Scaling Laws **Wireless MEMS:** mechanical and electrical resonators, Q-factor, switches, filters. **Power for MEMS:** thin film batteries, micro fuel cells, energy fields.

UNIT-V:

MEMS Packaging and Assembly: microassembly: serial and parallel, deterministic and stochastic; **Microgrippers:** HexSil process; packaging techniques, **The Future of MEMS:** bioMEMS - neural implants, gene chips, diagnostic chips; MEMS in space; mechanical computers; invisible and ubiquitous computing.

Text Book

1. HSU, TAI RAN, MEMS AND MICROSYSTEMS Design And Manufacture, Tata McGraw-Hill,2002.
2. Mems and Moems Technology and Applications,Rai-Choudhury, Prosenjit; SPIE 2000.
3. Http://jntu.ac.in/dap/syl.html

Lab Exercise: CSC440 Practical based on CSC439

At least two experiments should be carried out on each unit.

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