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M. Sc. (Computer Science)

Academic Year 2013-16

1. About Admission Procedure

1.1 M. Sc. Computer Science

Duration: (Four Semesters means Two Academic Years)

Intake: 32

Eligibility: i) B.Sc. Computer Science **OR** B.Sc. IT **OR** B. Sc. Computer Application **OR** B.E/B. Tech. in Computer Science and Engineering/IT.**OR ii)**. Any Science Graduate with at least one Optional Subject as Computer Science.

Objective: The overall objective of this course is to cater the need of computational field. The content of this course is according to the current trends of research in Computer Science field. Some of the objectives of this course are to develop analytical, presentation, strategy formulation and personality development skills among the students, through which the students get prepared and trend for building their carrier in computer science and its related applied technology, research and development.

M. Sc. Computer Science per Semester

Sr. No	Head	Fees
1	Tuition	3,500/-
2	Registration	50/-
3	Admission	200/-
4	Library	100/-
5	Laboratory	1,250/-
6	Medical Exam	100/-
7	MKCL	50/-
8	Avishkar, Indradhanushya and Other Students Activities	200/-
	Total	**5,450/-***

Note: In second and fourth semesters students should pay only Tuition and Laboratory Fess. Fees likely to be modified as per the university rule and regulation from time to time and will be applicable to the concern students

Admission to the M. Sc. Computer Science and M. Sc. Information Technology course in the department will be done on the performance of CET score and on their performance in the qualifying graduate level examination. The student will apply on the application form of the University provided with the prospectus/e- prospectus. Once the student is admitted to the concern department/ course, he/she will be promoted to next semester with full carryon; subject to the registration of student in every consecutive semester. Dropout student will be allowed to register for respective semester as and when the concerned courses are offered by the department, subject to the condition that his/her tenure should not exceed more than twice the duration of course from the date of first registration at parent department. The admission of concern student will be automatically get cancelled if he/she fails to complete the course in maximum period (Four years/Eight semesters).

2. About CBCS System

2.1 *The CBCS System*

Department of Computer Science and Information Technology adopted a credit-based system under the Academic Flexibility Program of the University from the academic year 2011-12. It is a flexible, cafeteria-type learning system with an inbuilt horizontal mobility for students to all desire units of education in the Department/Departments with provision for even inter Departmental mobility for students. CBCS operates on modular pattern based on module/units called "credits", wherein 'credit' defines the quantum of contents/syllabus prepared for a course/paper and determines the minimum number of teaching-learning hours required.

CBCS permits students to: I) Learn at their own pace, II) Choose electives from a wide range of elective courses offered by the department, III) Undergo additional/value added courses and acquire more than the required number of credits, depending upon the learner aptitude, IV) Adopt an interdisciplinary approach in learning, V) Make best use of the expertise of faculty across the Department, beside the particular department faculty and VI) Acquire knowledge, skill and attitude of learning outcomes through participatory teaching and learning and continuous evaluation process. This provides the flexibility to make the system more responsive to the changing needs of our students, the professionals and society. The credit-based system also facilitates the transfer of credits.

Credits and Degrees

- A candidate who has successfully completed all the core courses, Elective/ Specialized courses and, seminars and project prescribed and or optional service courses approved by the University for the program with prescribed CGPA shall be eligible to receive the degree.
- One Credit shall mean one teaching period of one hour per week for one semester (of 15 weeks) for theory courses and two practical/laboratory/field/demonstration hours/ week for one semester.
- Every student will have to complete at least 100 credits to obtain the master's degree of M. Sc. Computer Science/ M. Sc. Information Technology (Post graduate degree) out of which 96 credits should be from this Department and four or eight credits of service courses from this or other Department. However the Department can design the curriculum of more credits and it will be compulsory for the students of this Department to complete the credits accordingly.

Courses

- Core Course: - A core course is a course that a student admitted to M. Sc. Computer Science/ M. Sc. Information Technology program must successfully completes to receive the degree. Normally no theory course shall have more than 4 credits.
- Elective Course: Means a optional course from the basic subject or specialization.
- Service course (SC): The service courses will be offered in third and fourth semesters in the department. Student should complete one service course in each semester.
- Each Course shall include lectures / tutorials / laboratory or field work / Seminar / Practical training / Assignments / midterm and term end examinations/ paper / Report writing or review of literature and any other innovative practice etc., to meet effective teaching and learning needs.
- Attendance: - Students must have 75% of attendance in each Core and Elective course for appearing the examination. However student having 65% attendance with medical certificate may apply to the H.O.D. for commendation of attendance.

Registration for Service Course:-

i) The student will register the service course of his interest after the start of semester in the concerned department on official registration form. The teacher in-charge of the respective course will keep the record of the students registered. Maximum fifteen days period will be given from the date of admission for completion of registration procedure. The Departmental Committee shall follow a selection procedure after counseling to the students etc. to avoid overcrowding to particular course(s) at the expense of some other courses.
ii) No student shall be permitted to register for more than one service course in a semester.
iii) The University department shall decide the maximum number of students in each service course taking into account the teachers and Physical facilities available in the Department.
iv) The University may make available to all students a listing of all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the instructor who is giving the courses, the time and place of the classes for the course. This information shall be made available on the University website.
v) Normally no service course shall be offered unless a minimum of 10 Students are registered.
vi) The student shall have to pay the prescribed fee per course per semester/year for the registration as decided by the University.

Departmental Committee:-

Every P.G. program of the University/College shall be monitored by a committee constituted for this purpose by the Department. The Committee shall consist of H.O.D. as a Chairman and some/all the teachers of the Department. as its members .

Results Grievances Redressal Committee:-

The University shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD. This Committee shall solve all grievances relating to the Assessment of the students.

Grade Awards:-

i). A ten point rating scale shall be used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Master's Program. Grade points are based on the total number of marks obtained by him/her in all the heads of examination of the course. These grade points and their equivalent range of marks are shown separately in Table-I.

Table I: Ten point grades and grade description

Sr. No.	Equivalent percentage	Grade points	Grade	Grade description
1.	90.00-100	9.00-10	O	Outstanding
2.	80.00-89.99	8.00-8.99	A++	Excellent
3.	70.00-79.99	7.00-7.99	A+	Exceptional
4.	60.00-69.99	6.00-6.99	A	Very good
5.	55.00-59.99	5.50-5.99	B+	Good
6.	50.00-54.99	5.00-5.49	B	Fair
7.	45.00-49.99	4.50-4.99	C+	Average
8.	40.01-44.99	4.01-4.49	C	Below average
9.	40	4.00	D	Pass
10.	< 40	0.00	F	Fail

ii.) Non appearance in any examination/ assessment shall be treated as the students have secured zero mark in that subject examination/assessment.

iii). Minimum D grade (4.00 grade points) shall be the limit to clear /pass the course/subject. A student with F grade will be considered as 'failed' in the concerned course and he/she has to clear the course by reappearing in the next successive semester examinations. There will be no revaluation or recounting under this system.

iv.) Every student shall be awarded Grade points out of maximum 10 points in each subject (based on 10 Point Scale). Based on the Grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and cumulative Grade card with CGPA will be given on completion of the course.

Computation of SGPA (Semester grade point average) &CGPA (Cumulative grade point average)

The computation of SGPA &CGPA,will be as below:

- Semester Grade Point Average (SGPA) is the weighted average of points obtained by a student in a semester and will be computed as follows:

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$$SGPA = \sum_i C_i G_i / \sum_i C_i$$

Where, C_i=credit for i^{th} course; G_i=grade point secured by the student.

T h e $\sum$ *is overall the courses credited by the student in the semester.*

Semester Grade Point Average (SGPA) for all the four semesters willbe mentioned at the end of every semester.

- The Cumulative Grade Point Average (CGPA) will be used to describe the overall performance of a student in all semesters of the course and will be computed as under:

$$CGPA = \frac{Sum(All\ four\ semester\ SGPA)}{Total\ Number\ of\ Semesters}$$

OR

$$CGPA = \sum_{k} C_k G_k / \sum_{k} C_k$$

Where, C_k = credit for k^{th} course, G_k = grade point secured by the student.

- *is overall the courses credited by the student in all the completed semesters.*

~~The SGPA and CGPA shall be rounded off to the second place of decimal.~~

Evaluation method:-

Each theory course will be of 100 Marks and be divided in to internal examination (Sessional) of 20 Marks and Semester end examination of 80 Marks. (20+80 = 100 Marks). Each Practical course will be of 50 marks. Research project if any, will be of 100 marks.

- Internal Evaluation Method

  There shall be two mid semester examinations, first based on 40 percent syllabus taught and second based on 60 percent syllabus taught. The setting of the question papers and the assessment will be done by the concerned teacher who has taught the syllabus. Average score obtained out of two mid semester examinations will be considered for the preparation of final sessional marks/grade.
- Term end examination and evaluation

i. Semester end examination time table will be declared by the departmental committee and accordingly the concern course teacher will have to set question paper, conduct theory examination, conduct practical examination with external expert, evaluate, satisfy the objection / query of the student (if any) and submit the result to DC.

ii. The semester end examination theory question paper will have two parts (20+60 = 80 Marks) Part A will carry short question of 2-3 marks (fill in the blanks/ multiple choice questions/ match columns / state true or false / answer in one sentence) as compulsory questions and it should cover entire syllabus. (20 Marks)

Part B will carry 7 questions out of which there shall be at least one question from each unit student will have to answer any five questions out of 7

iii. Semester end Practical examinations will be of 50 marks each and students will be examined by one external and one internal examiner. Seminar and Project work (if any) will be evaluated by the external examiners along with guide.

iv. At the end of each semester the Committee of Department shall assign grade points and grades to the students.

v. The Committee of Department shall prepare the copies of the result sheet in duplicate.

vi. Every student shall have the right to scrutinize answer scripts of

Mid semester/Term end semester examinations and seek clarifications from the teacher regarding evaluation of the scripts immediately thereafter or within 3 days of receiving the evaluated scripts.

- The Head of the department shall display the grade points and grades for the notice of students.
- The head of the department shall send all records of evaluation for Safekeeping to the Controller of Examinations as soon as all the formalities are over.

The University shall issue at the beginning of each semester a grade card for the student, containing the grades obtained by the student in the previous semester and his Semester Grade Point Average (SGPA). The grade card shall list:

(a) The title of the courses along with code taken by the student
(b) The credits associated with the course,
(c) The grade and grade points secured by the student,
(d) The total credits earned by the student in that semester.
(e) The SGPA of the student,
(f) The total credits earned by the students till that semester and
(g) The CGPA of the student (At the end of the IVth Semester).

Cumulative Grade Card

At the end of the IVth semester, the University shall issue Cumulative Grade Card to the Students showing details of Grades obtained by the student in each subject in all semesters along with CGPA and total credits earned.

3. Course Structure Academic Year 2013-14

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	-

4. Detailed Syllabus

4.1 Semester-I

1. Advanced Java

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.

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: Generic Servlet, Servlet Request, and Servlet Response, HTTP Servlets: Http Servlet Request, Http Servlet Response and Http Servlet, Accessing Parameters, Additional Servlet Capabilities, HTTP headers and MIME types Request Dispatcher: 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,

Http Session, 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, Single Thread Model interface, Additional JSP Capabilities, JSP Directives, JSP Er 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

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

2. Neural Network

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 Network

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.

3. Digital Signal Processing

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 rate conversion 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 duration observation 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 the Normal 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.
4. **Lab Exercise: CSC453 Practical based on CSC403**
At least two experiments should carried out on each unit.

4. Advanced Operating System

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.

4.2 Semester II

- **Data Structure and Analysis of Algorithm**

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

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.

- **Advanced Neural Network and Fuzzy System**

Subject Reference	**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 Networks, Building Blocks of Adaptive Resonance, Substrate of Resonance, Structural Details of the Resonance Model, Adaptive Resonance Theory I (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:

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: CSC456 Practical based on CSC406

At least two experiments should carried out on each unit.

3. Image Processing

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.

4. Parallel Computing

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 1soefficiency Metric of Scalability, Cost-Optimality and the efficiency Function, A Lower Bound on the Iso

efficiency Function, The Degree of Concurrency and the efficiency 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- 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 P threads, Mutual Exclusion for Shared Variables, Condition Variables for Synchronization, Controlling Thread and Synchronization Attributes, Attributes Objects for Threads, Attributes Objects for Mutexe, Thread Cancellation, Composite Synchronization Constructs, Read-Write Locks, Barriers, Tips for Designing Asynchronous Programs, Open MP: a Standard for Directive Based Parallel Programming, The Open MP Programming Model, Specifying Concurrent Tasks in Open MP, Synchronization Constructs in Open MP, Data Handling in Open MP, Open MP Library Functions, Environment Variables in Open MP, Explicit Threads versus Open MP 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 Formulation for a CRCW PRAM, Parallel Formulation for 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 Optimization Problems:** 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 Framework for 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 Speed-up 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, Nonserial Polyadic 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, Ananth Grama, 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.

4.3 Semester III

1. Java Network Programming

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.

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 Inet Address Class, Inet4Address and Inet6Address, The Network Interface Class, Some Useful Programs, URLs and URIs: The URL Class, The URL Encoder and URL Decoder 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 Server Socket Class, Some Useful Servers, **Secure Sockets:** Secure Communications, Creating Secure Client Sockets, Methods of the SSL Socket Class, Creating Secure Server Sockets, Methods of the SSL Server Socket 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 Datagram Packet Class, The Datagram Socket Class, Some Useful Applications, Datagram Channel, Multicast Sockets: What Is a Multicast Socket, Working with Multicast Sockets, Two Simple Examples, URL Connections: Opening URL Connections, 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 URL Connections, Guessing MIME Content Types, Http URL Connection, Caches, Jar URL Connection

UNIT V: Protocol Handlers

What Is a Protocol Handler, The URL Stream Handler Class, Writing a Protocol Handler, More Protocol Handler Examples and Techniques, The URL Stream Handler Factory Interface, **Content Handlers:** What Is a Content Handler, The Content Handler Class, The Content Handler Factory

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 Java Mail **API:** What Is the Java Mail API, Sending Email, Receiving Mail, Password Authentication, Addresses, The URL Name 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

- www.java.com
- 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.

2 Advanced Software Engineering and Technology

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 to Objects 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 7THEditionby R. S. Pressman.

Lab Exercise: CSC552 Practical based on CSC502

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

- **Computer Vision**

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, Inter reftections: Global Shading Models, An Inter reflection Model, Solving for Radiosity, The Qualitative Effects of Inter reftections, **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

References:

1. Machine Vision, Jain R C Kasturi R, Mc Graw Hill
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

1. Advanced Embedded System

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 Process, 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: Real-time Operating System Programming-I
Micro OS-II and Vx Works, Basic Functions and Types of RTOSES, RTOS COS-II, RTOS Vx Works, **Real-time Operating System Programming-II:** Windows CE, OSEK and Real-time Linux Functions, Windows CE, OSEK, Linux 2.6.x and RT Linux, **Design Examples and Case Studies of Program Modeling and Programming with RT OS-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 Vx works

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.

2. Dataware Housing

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 Micheline Kamber, 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.

3. Geomorphological Information Technology

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

- To be aware about information technology

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:

- An Introduction To Geographic Information Technology, Sujit Choudhary, IK International
- Fundamental Of Remote Sensing, George Joseph, Universities Press

References:

- Principles of geographical information systems, P. A. Burrough and R. A. Mcdonnel, Oxford.
- Remote sensing of the environment, J. R. Jensen, Pearson
- Exploring Geographic Information Systems, Nicholas Chrismas, John Wiley & Sons.
- Getting Started with Geographic Information Systems, Keith Clarke, PHI.
- An Introduction to Geographical Information Systems, Ian Heywood, Sarah Cornelius, and Steve Carver. Addison-Wesley Longman

Lab Exercise: CSC426 Practical based on CSC425
At least two experiments should be carried out on each unit.

- **Biometrics**

Subject Reference No	**CSC427**	**Subject Title**	**Biometrics**
No of Credits	**4 Theory, 2 Practical**	**Assignment/ Sectionals (Internal)**	**20%**
Total Contact Hrs/Week	**4 Theory, 4 Practical**	**External (Semester Exam)**	**80%**

Objective

- Biometric recognition, or simply biometrics, is a rapidly evolving field with applications ranging from accessing one's computer, to gaining entry into a country. Biometric systems rely on the use of physical or behavioral traits, such as fingerprints, face, voice and hand geometry, to establish the identity of an individual. The deployment of large-scale biometric systems in both commercial (e.g., grocery stores, amusement parks, airports) and government (e.g., US-VISIT) applications, increases the public's awareness of this technology. This rapid growth also highlights the challenges associated with designing and deploying biometric systems. Indeed, the problem of biometric recognition is a grand challenge in its own right. The past five years have seen a significant growth in biometric research resulting in the development of innovative sensors, robust and efficient algorithms for feature extraction and matching, enhanced test methodologies and novel applications. These advances have resulted in robust, accurate, secure and cost effective biometric systems. The main objective of this course is study the basics and advanced development of biometrics.

Prerequisite

- Student must aware with image processing, pattern recognition methods.

Course Contents

UNIT I:

Foreword by James L. Wayman, San Jose State Fingerprint Recognition.- Face Recognition.- Iris Recognition.-University.- Preface.- Introduction to Biometrics.- Recognition.- Hand Geometry Recognition.- Gait

UNIT II:

The Ear as a Biometric.- Voice Biometrics.- A Palmprint Authentication System.- On-Line Signature Verification.- 3D Face Recognition.-

UNIT III:

Automatic Forensic Dental Identification.- Hand Vascular Pattern Technology.-

UNIT IV:

Introduction to Multibiometrics.- Multispectral Face Recognition.- Multibiometrics Using Face and Ear.- Incorporating Ancillary Information in Multibiometric Systems.-

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

- 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.

- **Mobile Computing**

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 cdma One System, IMT- 2000, i - m o d e , O FDM, **Mobile IP Network Layer:** IP and Mobile IP Network Layers, P a c k e t D e l i v e r y a n d H a n d o v e r 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 Markup Language (SMIL),

UNIT IV:Mobile Devices-Server and Management

Mobile Agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems, Security, **Mobile Ad-hoc and Sensor Networks**: Introduction to Mobile Ad-hoc Network, MANET, Wireless Sensor Networks, Applications **Wireless LAN, Mobile Internet Connectivity, and Personal Area Network:** Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0, Architectures, XHTML-MP (Extensible Hypertext Markup Language Mobile Profile), Bluetooth-enabled Devices Network, Layers in Bluetooth Protocol, Security in Bluetooth Protocol, IrDA, ZigBee

UNIT V:Mobile Application Languages-XML, Java, J2ME, and JavaCard
Introduction, XML, JAVA, Java 2 Micro Edition (J2ME), JavaCard, **Mobile Operating Systems :** Operating System Palm OS, Windows CE, Symbian OS, Linux for Mobile Devices 530

Books:

1. Mobile Computing, Raj Kamal, Oxford University Press

References:

- Mobile Communications Jochen Schiller, Addison-Wesley.
- Handbook of Wireless Networks and Mobile Computing, Stojmenovic and Cacute, Wiley,
- Mobile Computing Principles: Designing and Developing Mobile
- Applications with UML and XML, Reza Behravanfar, Cambridge University Press,

Lab Exercise: CSC430 Practical based on CSC429

At least two experiments should carried out on each unit.

4.2 Semester-IV

1. Pattern Recognition

Subject Reference No	**CSC505**	**Subject Title**	**Pattern Recognition**
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 general mechanism and design of Automatic system recognition.

Prerequisite

- Student must have knowledge of Digital image processing, neural networks, function analysis.

UNIT I: Introduction to Pattern Recognition, Bayesian decision theory
Classifiers, Discriminant functions, Decision surfaces, Normal density and Discriminant functions, discrete features

UNIT II: Maximum Likelihood and Bayesian Estimation
Parameter estimation methods, Maximum- Likelihood estimation, Bayesian estimation, Bayesian Parameter Estimation, Gaussian Case, General Theory, Problem of Dimensionality, Accuracy, Dimension, and Training Sample Size, Computational Complexity and Overfitting, Component Analysis and Discriminants, Principal Component Analysis (PCA), Expectation Maximization (EM), Hidden Markov models for sequential pattern classification, First-Order Markov Models, First-Order Hidden Markov Models, Hidden Markov Model Computation, Evaluation, Decoding and Learning.

UNIT III: Non-parametric
Density estimation, Parzen-window method, Probabilistic Neural Networks (PNNs), K-Nearest Neighbour, Estimation and rules, Nearest Neighbour and Fuzzy Classification. **Linear Discriminant function based classifiers:** Perceptron, Linear Programming Algorithm, Support Vector
Machines (SVM)

UNIT IV: Multilayer Neural Network
Feed Forward Classification, Back Propagation Algorithm, Error Surface **Stochastic Data:** Stochastic search, Boltzmann Learning, Evolutionary method and Genetic Programming.

UNIT V: Non-metric methods for pattern classification
Decision trees, Classification and Regression Trees (CART) and other tree methods, String recognition and Rule Based method. **Unsupervised learning and clustering :** Mixture Densities and Identifiability, Maximum Likelihood estimation, Application Normal Mixture, Unsupervised

Bayesian Learning, Data Description and Clustering, Hierarchical Clustering, Graph theory method, Problem of validity, Component analysis

Books Recommended:

- R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification 2nd Edition", John Wiley, 2007
- Christopher M. Bishop, "Neural Network for Pattern Recognition", Oxford Ohio Press.

References:

1. E. Gose, R. Johansonbargh, "Pattern Recognition and Image Analysis", PHI
2. EthenAlpaydin, "Introduction to Machine Learning", PHI
3. Satish Kumar,"Neural Network- A Classroom Approach", McGraw Hill.
4. Dr. J. V. Rao,Neural Network & Fuzzy Logic
5. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press,
6. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006

Web: 1. http://www.rii.ricoh.com/~stork/DHS.html

Lab Exercise: CSC555 Practical based on CSC505

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

Elective-II

1. Theoretical Computer Science

Subject Reference no	**CSC-431**	**Subject Title**	**Theoretical Computer Science**
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 understand syntax and semantics of programming languages to build system software.

Prerequisite

- Student must aware with discrete mathematical structures, set theory, set operations.

UNIT-I: Introduction

Strings, Alphabets & Languages, Graphs & Trees, Set Notations, Relations.

UNIT-II: Finite Automata & Regular Expressions

Definition, Description, Transition Systems, Transition Function, DFA, NFA, Finite Automata with Є-Moves, Regular Expressions, Convert Regular Expression into FA, Construct FA from Regular Expression, Applications of Finite Automata.

UNIT-III: Regular Expression

Pumping Lemma for Regular Sets, Applications of Pumping Lemma, Closure properties of Regular Sets, Decision Algorithm for regular Sets.

UNIT-IV: Context Free Grammars
Introduction to Context free grammars, Derivations Trees, Simplification of Context free grammar, Useless Symbols, ∈ Production, Unit Production, Normal forms for CFG, Chomsky Normal Form (CNF),Greibach Normal Form (GNF).

UNIT-V: Pushdown Automata
Informal Description, Definitions, Pushdown Automata & Context free languages. **Turing Machines:** Basics, Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines.

Text Book:

Theory of Computer Science, By-K.L.P. Mishra, N. Chandrasekaran.
Introduction to Computer Theory, By-Daniel A. Cohen.

References:

Introduction to Automata theory, Languages & Computations, By-John E. Hopcraft, Jeffery D. Ullman.
Theory of Computer Science, By-Dr. Shirish S. Sane.

Lab Exercise: CSC432 Practical based on CSC431
At least 10 experiments should be carried out on each unit.

2 Decision Support System and Intelligent System

Subject No	CSC433	**Subject Title**	**Decision Support System and Intelligent 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
- To design and implement the logic based frameworks for Decision Support and Intelligent systems.

Prerequisite:
- To aware about intelligent classifiers

UNIT I: Decision Support and Business Intelligence
Decision Support Systems and Business Intelligence: Opening Vignette: Toyota Uses Business Intelligence in Excel, Changing Business Environments and Computerized Decision Support, Managerial Decision Making, Computerized Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS), A Framework for Business Intelligence (BI), A Work System View of Decision Support, The Major Tools and Techniques of Managerial Decision Support, Implementing Computer-Based Managerial Decision

Support Sy... is, Computerized **Decision Support, Decision Making, Systems, Modeling, and Support:** ...ning Vignette: Decision Making at the U.S. Federal Reserve, Decision Making: Introduction and Definitions, Models, Phases of the Decision Making Process, Decision Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision M... The Implementation Phase, How Decisions are Supported, **Decision Support Systems C...** p... Methodologies, and **Technologies: An Overview:** Opening Vignette: Decision Support Sy... ures for Healthcare. DSS Configurations, DSS Description, DSS Characteristics and Capab... s, ... of DSS, The Data Management Subsystem, The Model Management Subsystem, ... (Dialog) Subsystem, The Knowledge-Based Management Subsystem, The User, ... Hardware, DSS Classifications

UNIT II: ... ...s

Opening ... ...n't Everything... But Losing Isn't Anything:" Professional Sports Modeling ... ...ISS Modeling, Static and Dynamic Models, Certainty, Uncertainty, and Risk, ...preadsheets, Decision Analysis with Decision Tables and Decision Trees, The ... ...Mathematical Models for Decision Support, Mathematical Programming Optimizati... ...Goal, Sensitivity Analysis, What-IF, and Goal Seeking Problem Solving Search M... ...Simulation, Visual Interactive Simulation, Quantitative Software Packages and Model, Ba... ...ess Intelligence Special Introductory Section: The Essentials of **Business I...** ...w of the Content of Chapters, The Origins and Drivers of Business Intelligenc... ...s of Intelligence Creation and Use, The Major Characteristics of Business ... ...Competitive Intelligence and Advantage, The Typical Data Warehous... ...Quality, Successful BI Implementation, Structure and Components of BI, Concl... ...ata Warehousing:** Opening Vignette: Continental Airlines Flies Higl... ...Data Warehouse, Data Warehousing Definitions and Concepts, Data Warehous... ...Warehousing Architectures, Data Integration, and the Extraction ... ...Load (ETL) Process, Data Warehouse Development, Real-Time Data War... ...Administration and Security Issues

UNIT III ... ...Visualization

Opening ... ...Improves Operations with BI, The Business Analytics Field-An... ...Analytical Processing (OLAP), Reporting and Queries, Multidime... ...Business Analytics, Data Visualization, Geographic Information Systems, ...Automated Decision Support, and Competitive Intelligen... ...Web Intelligence and Web Analytics, Usage, Benefits, and Succe... ...Text, **and Web Mining:** Opening Vignette: Highmark, Inc., Dat... ...tics, Data Mining Techniques and Tools, Data Mining Project Pr... ...ng Neural Networks for Data Mining:** Opening Vignette: Using Ne... ...lavors From Chemical Analysis, Basic Concepts of Neural Networks ... ...Networks, Developing Neural Network Systems, A Sample Neural N... ...tworks Paradigms, Applications of Neural Networks, A Neural N... ...Business Performance Management:** Opening Vignette: Cisco and ... ...rformance Management Overview, Strategize: Where Do We Want ... ...? Monitor: How are We Doing? Act and Adjust: What Do We N... ...Measurement, Bpm Methodologies, Bpm Architecture and Appl... ...s, Business Activity Monitoring (BAM)

UNIT IV: ..., C... ...ation, **Group Support Systems, and Knowled... ...ent-**
Collabor... ...ng-Supp... ...chnologies and Group Support Systems: Opening Vignette: ...Design a... ...n-Rocketdyne, Making Decisions in Groups: Characteristics, Process, ...ysfunctio... ...pporting Groupwork with Computerized Systems, Tools for Indirect S... ...sion Mak... ...tegrated Groupware Suites, Direct Computerized Support for Decision ... ...n GDSS ... ...SS, Products and Tools for GDSS/GSS and Successful, Implemen... ...g Col... ...Support Tools: From VoIP to Wikis, Collaborative Efforts in Planni... ...l the I... ...ement. Creativity, Idea Generation and Computcrized Support ... ...nagem... ...ping Vignette: Simens Knows What It Knows through Knowled... ...t, Introd... ...to Knowledge Management, Organizational Learning and Transfor... ...ege Ma... ...ent Activities, Approached to Knowledge Management, Informati... ...y in ... ...edge Management, Knowledge Management Systems Implemen... ...f Peop... ...wledge Management, Ensuring the Success of Knowledge Manage... ...telligc... ...rtificial **Intelligence and Expert Systems:** Opening Vignette: ...Busine... ...Support Treatment Request Approval, Concepts and Definitio... ...Intelligc... ...ne ...ificial Intelligence Fields, Basic Concepts of Expert Systems, ...Expert ... ...ns, Structure of Expert Systems, How Expert Systems Work- Inference ...Problem... ...Suitable for Expert Systems, Development of Expert Systems, Benefits, ...Succes... ...s of Expert Systems, Expert Systems on the Web

UNIT V: ...lligen...
Opening ...oving ... ...achine Management in the City of Verdum, Machine Learning ...se-base... ...ning, Genetic Algorithms Fundamentals, Developing Genetic Algorithi... ...s, Fuzzy ... ...ic Fundamentals, Natural Language Processing, Voice Technol... ...ng Integ... ...Advanced System. **Intelligent Systems over the Internet:** Opening ...Flix C... ...ng, ...er Satisfaction from DVD Recommendation, Web-Bas... ...System... ...Agents: An Overview, Characteristics of Intelligent Agents, ...gent A... ...ication, and Types of Intelligent Agents, Internet- Based Software ...Agent... ...ge in Semantic Web: Representing Knowledge for Intellige... ...Cased ... ...mentation Systems, Managerial Issues of Intelligent Agents **Implem... ...Supp... ...stems- Systems Development and Acquisition:** Opening Vignette: ...a Thi... ...s Big- Develops the InfoNet HR Portal System, What T... ...t Syst... ...ild? The Landscape and Framework of MSS Applicat... ...nt, De... ...tio... for MSS Applications, Prototyping: A Practical MSS D... ...hodol... ...for Selecting a Development Approach, Third-Party Provide... ...are I... ...ntifi... Connecting to Databases and Other Enterprise Systems. ...rvices ... ...and Service-Oriented Architecture, End-user Developed MSS, Vendor ...electi... ...ment. Putting the MSS Together and Implementation Issues I... ...cts, a... ...of ...agement Support Systems:** Opening Vignette: Elite-Ca... ...Intel... ...s, S...ms Integration: An Overview, Types of MSS Integrati... ...ith E... ...ems ... Knowledge Management, The Impacts of MSS: An Ove... ...acts ... ...ons, ...S Impacts on Individuals, Automating Decision Making ...'s Jo... ...egal ...Privacy, and Ethics, Intelligent and Automated Systems ...nt Le... ...ocie... Impacts and the Digital Divide, The Future of Manage... ...stems

Books:

pport a atelli ce Systems

Referen

pport rge M. arakas, 2nd Edition, Pearson Education
pport akiraman V.S. and Sarukesi. K., Prentice Hall of India
pport Management, Lofti, McGraw Hill Inc., International
Delh

Lab Exe Pract b **CSC-**
At ents ried ou n each unit.

- I

Subject SC4		**Subject Title**	**Data Mining**
No			
No of The al		**Assignment/ Sectionals (Internal)**	**20%**
Total Theo Pra al **Hrs/W**		**External (Semester Exam)**	**80%**

Objecti

- To engths d limitations of popular data mining techniques and tify, sin, usines ations of data mining. Students will be able to a d par ate i ata min ojects executed by consultants or specialists in d ful t vay the course will be the ability to perform powerful data ana

Prereq

- Stu agem systems

UNIT I Data ng
Why M pot cien ewpoint Motivation, Definitions, Origins of Data M tion, ng, Association Rule Discovery, Sequential Pattern s of ta Mining, **Data Mining-Data:** What is Data? Attribu th, Ty es and Properties of Attributes, Discrete and Contin ata Data Preprocessing, Aggregation, Sampling, Dimensi lectio re creation, Discretization and Binarization, Attribut

UNIT I
Data Ex atisti , Frequency and Mode, Percentiles, Measures of Locati s of Spread: Range and Variance, Visualization, Repres sual echniques: Histograms, Box Plots, Scatter Plots, C Coordina , Other Visualization Techniques, OLAP : OLAP fication: Basic **Concepts, Decision Trees, and Model**

Evalua sification Techniques, Tree Induction, Measures of Node
Impurity es on, ROC curve, Confidence Interval for Accuracy,
Compar of T mparing Performance of Two Algorithms.

UNIT I Cla ernative Techniques
Rule-Ba hem Building Classification Rules, Instance-Based
Classifi ayes Classifier, Naive Bayes Classifier, Artificial Neural
Networ

UNIT I Ass sis: Basic Concepts and Algorithms
Associa , I t Generation, Association Rule Discovery : Hash tree,
Factors que Closed Itemset, Alternative Methods for
Freque Alg Tree Projection, Rule Generation, Pattern
Evaluat erties of Good Measure, Support-based Pruning,
Subject

UNIT V lus sic Concepts and Algorithms
Applic An f C Clustering Algorithms: K-means and its
variant g. Graph-Based Clustering, Limitations of
Curren of Spatial Data Sets, Shared Near Neighbor Approach,
ROCK Jarvis- Patrick Clustering, SNN Clustering Algorithm, **Data**
Mining ier Detection, Importance, Anomaly Detection Schemes,
Density pac

REFE
1.Intr
2.Da by Jiawei Han, Micheline Kamber, Morgan Kaufmann
Pub
3.Da g Tools and Techniques by Ian H. Witten and Eibe
Fra an 2005
4.Pri nin ficial Intelligence & Padhraic Smyth, PHP Publication.

Lab
At le it.

4 Cryp

Subj	C t Title	**Cryptography and Network Security**
No		
No of	ment/ ls (Internal)	**20%**
Total Hrs/	External (Semester Exam)	**80%**

Obj
- To ts n networks. To establish certain security me s these threats. To introduce modern

cry techni ues study specific cryptography techniques that guarantee security in ce: ations e-commerce, web access, etc.). To introduce the most widely kn rds for

Prer

- St aware tion principals, computer networks , communication ba: cept o ation t s mand

UNIT tion

Securi the O ecture, Security Attacks, Security Services, Security Mecha odel fo

UNIT tric Ci

Symm Mode ation ques. osition techniques, Steganography, Block Cipher The da tion Stan ard, Block Cipher Design Principles.

UNIT Key E Func

Introd mber ryptography and RSA, Key Management; Other Public –Key ems, M tion and Hash Functions, Digital Signatures and Auther tocols.

UNIT k Sec

Electri M rity, IP Web rity

UNIT Securi

Intrude us Softw

Pract

- resent of 2-3 students is required to read some new materials ot cover then pr t it in the class| each presentation lasts 20 ncluding also h write a formal report (about 15 pages) of entation d in b the final exam. The total number of n projec ourse i he topics will be given by instructor, and hoose top a d on oming Service (FCFS).
- ing pr j , each t is required to program some existing Your p corre o be graded. You have to hand in the tion of n addi the code itself.

Text l

1. phy and N work Security: Principles and Practice; Fourth or Fifth Edition. By tallings, Pr Hall. H lcover.
2. hy: Th by Doug R. Stinson, CRC press, hardcover, March, -8521-0
3. ecurity ions a ndards by William Stallings.Prentice cover, P 1999, ges, ISBN 0130160938.

Lab E SC438 Pr n CSC437
At leas riments sh out on each unit.

5 Intro	**MEMS**		
Subjec	**CSC43**	Su itle	**Introduction to MEMS Pro+**
Refere			
No of	**4 Theory**	As t/ Sections (Internal)	**20%**
Total Hrs/	**4 Theor**	Ex (Semester End)	**80%**

Obje

- To EMS Tec gy for nanotechnology applications.

Prere

UNIT- ion
history market f rview processes properties of silicon, a sample MEM **Basics** o logy: d s and terminology, a sample process, lithogr ching. M sors: Bio Fl ensors, MEMS Images. Introduction to MEMS software, ining: subtractive processes (wet and dry etching), additive proces tion, spu xial growth). Fundamental Devices and Processes: basic mecha trostatic arallel p tors, pull-in point, comb drives.

UNIT ental D esses
more actuato ndries, MUMPs (multi user MEMS process). **MUM** er MEM S Uniphase Ps processing sequence and design rules. **MUM** MIT: d plications: micro inges and deployment actuators.

UNIT MEMS
CMOS esses, f EMS, M processing, applications Cleanroom lab techni room: rocedur y. fire, toxicity; acids and bases; photo MicroO ical S EMS): micro scanners, digital mirror displa ning c , light v er cube retroreflector, optical switches, other devices

UNIT
bimor tors" iezores ning **Probe Microscopy:** scanning tunne pe (ST e micr M). Scaling Laws **Wireless MEMS:** mech ical tor. ers. **Power for MEMS:** thin film batte ne.

UNIT ackaging **bly**

micro[illegible] dial[illegible] el, d[illegible]ministic and [illegible]hastic; **Microgrippers:** HexSil process; packa[illegible] ues [illegible] e of [illegible] **MS:** bio M[illegible] neural implants, gene chips, diagnostic chips; [illegible] pace; mecha[illegible] l computers; invisible and ubiquitous computing.

Text Bo[illegible]

1. [illegible] R[illegible] M[illegible] AND MICROSYSTEMS Design And Manufacture, Tata [illegible] ill,2[illegible]
2. [illegible] Mo[illegible] Bed[illegible] ooy a[illegible] Applic[illegible]ions [illegible] Choudhury, Prosenjit; SPIE 2000.
3. [illegible] ac,i[illegible]

Lab E[illegible] **SC440 Practi[illegible]** **ase[illegible] on CSC439**
At lea[illegible] iments shoul[illegible] carri[illegible] d out on each unit.