UNIVERSITY OF CALICUT
(Abstract)
Scheme and Syllabus of M. Sc Computer Science-Choice based Credit Semester System-in University Teaching Departments-implemented with effect from 2011 admission-orders issued.

GENERAL & ACADEMIC BRANCH-IV ‘J’ SECTION

No. GA IV/J1/4639/10 Dated, Calicut University PO, 24.01.2012

Read:
2. Item No.1 of the Minutes of the meeting of Board of studies in Computer Science and application (Single Board) held on 15.11.2011
3. Orders of the Vice-Chancellor in the file of even no. dated 19.01.2012

ORDER

As per paper read as (1) above, Choice based Credit Semester System at Post Graduate level in University Teaching Departments/Schools has been implemented from the academic year 2008-2009 onwards.

Vide paper read as (2) above, the syllabus of M.Sc. Computer Science Programme under Choice based Credit Semester System (PG) was approved by the Board of Studies in Computer Science and Application.

The Vice-Chancellor, in view of exigency, exercising the powers of Academic Council has approved the minutes of the meeting of the Board, subject to ratification by the Academic Council.

Sanction has, therefore, been accorded to implement the scheme and syllabus of M.Sc. Computer Science programme under Choice based Credit Semester System (PG) in University Teaching Departments/Schools w.e.f 2011 admission.

Orders are issued accordingly. Scheme and Syllabus appended.

Sd/-

ASSISTANT REGISTRAR(G&A -IV)
For REGISTRAR

To
1. The HOD of Computer Science.
2. The Chairman
   Board of Studies in Computer Science

Copy to:
PS to Vice-Chancellor/
PA to PVC /PA to Registrar/
CE/Digital wing (with a request to upload in the University website)
/Enquiry/Information Centres/
GA I ‘F’ ‘A’ sections/GAII/
GAIII/DDLFA/SF/FC

Forwaded/By Order

SECTION OFFICER
UNIVERISTY OF CALICUT

Department of Computer Science
Regulations, Scheme of Evaluation Course, Structure Syllabus for
M.Sc. Computer Science
Under CCSS (with effect from 2011 Admission)

REGULATIONS

The existing regulations of Choice-based Credit Semester System (UO No. GA1/J1/1373/2008 Dated 01-07-2008) which are applicable for University Teaching Departments are also applicable for this Programme with the following exceptions.

1. **Duration** of the course shall be 2 years, divided into 4 semesters. The entire period of the fourth semester shall be divided for the two elective (Elective 3 and Elective 4) and for the Project Work.

2. **Selection and Eligibility for Admission** is based on the existing University rules.

3. **Evaluation** of all semester theory papers will be on the basis of existing CCSS norms.

4. **Conduct of Practical Examinations**: Odd semester Practical Examinations will be conducted internally by the Department and Even Semester Examinations will be conducted by the Controller of Examination.

5. **Project Work & Viva**: The Project work should be carried out over the period of 16 weeks in the final semester in an Industry / R & D organization / Department/Institution. If the project is carried out in an Industry / R & D organization outside the campus, then a co-guide shall be selected from the Department/ Institution concerned. Every student should do the Project individually and no grouping is allowed. All the candidates are required to get the approval of their synopsis and the guide before commencement of the project from the Department / Institution and the matter may be intimated to the University at the beginning of the semester by the Department / Institution. The project will be reviewed periodically every month by the Department / Institutional. The continuous assessment marks (CA) will be based on the periodic progress and progress report. At the end of the semester the candidate shall submit the Project report (two bound copies and one soft copy) duly approved by the guide, co-guide for End Semester Assessment. Evaluation for ESA should be conducted by a board of examiners appointed by the University. (Mark Distribution : Content 30% + Methodology 30% + Presentation 20%, and Via- voce 20%). If project work and the report are found to be not up to the expected standard, the examiners can ask the candidate to modify and resubmit the project report after incorporating the suggestions of the examiners. Such reports shall be resubmitted within the stipulated period suggested by the examiner(s).
### M.Sc. Computer Science
Under CCSS (with effect from 2011 Admission)

**COURSE STRUCTURE AND SCHEME OF EVALUATION**

#### Semester 1

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course</th>
<th>Instructional Hrs/week</th>
<th>Exam Duration</th>
<th>Marks</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>Lect./Lab</td>
<td>Tutorial</td>
<td>Theory</td>
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<tr>
<td>1</td>
<td>CS1C01</td>
<td>Discrete Mathematical Structures</td>
<td>3</td>
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<tr>
<td>2</td>
<td>CS1C02</td>
<td>Advanced Data Structures and Algorithms</td>
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<tr>
<td>3</td>
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<td>Object Oriented Programming with Java</td>
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<td>4</td>
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<td>Theory of Computation</td>
<td>3</td>
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<tr>
<td>5</td>
<td>CS1C05</td>
<td>Advanced Microprocessors &amp; Microcontroller</td>
<td>3</td>
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<tr>
<td>6</td>
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<td>Tutorial</td>
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<tr>
<td>1</td>
<td>CS2C07</td>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
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<tr>
<td>2</td>
<td>CS2C08</td>
<td>Advanced Database Management System</td>
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<td>3</td>
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<td>Operating System Concepts</td>
<td>3</td>
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<td>4</td>
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<td>Advanced Java Programming</td>
<td>3</td>
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<tr>
<td>5</td>
<td>CS2E01/CS2E02/CS2E03</td>
<td>Elective 1</td>
<td>3</td>
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<tr>
<td>6</td>
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<td>Practical 2</td>
<td>10</td>
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**Elective 1**

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<tr>
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<tr>
<td>CS2E01 - Artificial Intelligence</td>
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<tr>
<td>CS2E02 - Information Theory and Coding</td>
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<td>CS2E03 - Compiler Design</td>
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<td>Tutorial</td>
<td>Theory</td>
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<tr>
<td>1</td>
<td>CS3C12</td>
<td>Software Engineering</td>
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<td>Computer Graphics</td>
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<td>3</td>
<td>CS3C14</td>
<td>Data Communication and Networking</td>
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<td>CS3C15</td>
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**Elective 2**

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<td>Digital Image Processing</td>
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<tr>
<td>CS3E05</td>
<td>Simulation and Modeling</td>
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<td>CS3E06</td>
<td>Wireless and sensor Networks</td>
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## Semester 4

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### Elective 3 and Elective 4

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<tr>
<td>CS4E07</td>
<td>Pattern Recognition</td>
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<td>CS4E08</td>
<td>Soft Computing Techniques</td>
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<td>CS4E09</td>
<td>Natural Language Processing</td>
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<tr>
<td>CS4E10</td>
<td>Information Retrieval Systems</td>
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<tr>
<td>CS4E11</td>
<td>Distributed Computing</td>
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<tr>
<td>CS4E12</td>
<td>Bio Informatics</td>
<td>4</td>
</tr>
<tr>
<td>CS4E13</td>
<td>Mobile Communication</td>
<td>4</td>
</tr>
<tr>
<td>CS4E14</td>
<td>Grid Computing</td>
<td>4</td>
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<tr>
<td>CS4E15</td>
<td>Remote Sensing and GIS</td>
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<tr>
<td>CS4E16</td>
<td>Embedded Systems</td>
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General Pattern of Question Paper

Core and Elective courses in M.Sc. Computer Science Programme

Under CCSS (with effect from 2011 Admission)

Code:                                Reg. No:          Name :

1st/2nd/3rd/4th Semester M.Sc. Computer Science Degree Examination – 2011

CCSS – M.Sc. Programme

Course Code : (eg: CS1C02 )        Course : (Eg: Advanced Data Structures and Algorithms)

Time: 3 Hours                                                                                                                Total Marks: 80

Answer five full questions; Each Question carries 16 marks.

Question Numbers  1 to 8                                                        Total Marks = 5 x 16 Marks = 80 Marks

NOTE: Minimum one question from each of the five modules. Remaining three questions can be from any module. There should not be more than two questions from the same module.
M.Sc. Computer Science
Under CCSS (with effect from 2011 Admission)
SYLLABUS

CS1C01 - DISCRETE MATHEMATICAL STRUCTURES

Unit - I

Unit - II
Set Theory- Sets and subsets - Set operations and their properties - Cartesian Products, Relations – Relation matrices – Properties of relations - Composition of relations, Equivalence relations and partitions – Partial Ordering.

Unit - III
Functions – One-to-one, onto functions – Composition of Functions and Inverse Functions – Hashing Functions - Hasse digrams.

Unit - IV
Group Theory - Definition and Elementary Properties- Cyclic Groups- Homomorphism and Isomorphism - Subgroups- Cosets and Lagrange’s Theorem, Elements of Coding Theory.

Unit - V
Rings and Fields - Definitions and examples of Rings, Integral Domains and Fields- Elementary Properties and Substructures - Homomorphism and Isomorphism.

REFERENCES:
CS1C02 - ADVANCED DATA STRUCTURES AND ALGORITHMS

Unit - I

Unit - II

Unit - III

Unit - IV

Unit - V

REFERENCES:

8
Unit - I

Unit - II

Unit - III

Unit - IV

Unit - V

REFERENCE:
CS1C04 - THEORY OF COMPUTATION

Unit - I

Unit - II

Unit - III
Pushdown Automata (PDA) – Formal definition – Graphical notations - Language accepted by PDA – Deterministic and non Deterministic PDA - Equivalence of PDAs and CFGs - Pumping lemma for CFLs, Closure properties of CFLs - Decision properties of CFL.

Unit – IV
Turing Machines – Notation – Instantaneous Description – Transition Diagram – The language of a Turing Machine – Variants of TMs – Multitape TMs, Nondeterministic TMs. -TMs with semi - infinite tapes, multistack machines - Universal Turing Machines-Relation of the various variants with the basic model - Church-Turing Thesis.

Unit – V

REFERENCES:
2. Linz: P. An Introduction to Formal Languages and Automata, Narosa, 1998
CS1C05 - ADVANCED MICRO PROCESSORS AND MICRO CONTROLLER

Unit - I
8085 microprocessor - Architecture: Block diagram-addressing modes-instruction set-basic programs-stacks and subroutines-interrupts-machine cycles-time delays.

Unit - II
8086 microprocessor - Architecture : Block diagram-real mode memory addressing-addressing modes: data addressing, program memory, addressing, stack memory addressing-instructions: data movement instructions, arithmetic logic instructions, program control instructions-basic programs-procedures.

Unit - III

Unit - IV
Peripherals-memory interface-8255PPI-8254 PIT-8237 DMA controller-8279 keyboard and display controllers.

Unit - V

REFERENCES:
1. Ramesh S.Gaonkar, Microprocessor architecture, programming and applications with the 8085, , PenRam International Edition.
4. Muhammed Ali Mazidi, Janice GillisPie Mazidi, Rolin D.McKinlay, The 8051 micro controller and embedded systems,
Unit – 1  Java Programming

Develop programs to implement the following.

1. Classes, objects and methods.
2. Inheritance of different types.
3. Use of keywords super, abstract and final.
4. Method overloading and Method overriding
5. Packages and interfaces.
6. Exception handling
7. Use of static members in a class.
8. File operations.
9. Multithreaded Programming
10. Applets
11. String handling
12. AWT to work with text and graphics
13. Applications of Swing.

Unit-II : Data Structures and Algorithms

Implement the following

1. Singly linked list with operations to access data, add node and delete node.
2. Variations on linked lists.
4. PUSH, POP operations of stack using Arrays.
5. PUSH, POP operations of stack using linked lists.
6. Add, delete operations of a queue using Arrays.
7. Add, delete operations of a queue using linked lists.
8. Variations on queues.
9. Conversion of infix to postfix using stack operations.
11. Towers of Hanoi Problem
12. Addition of two polynomials using linked list.
13. Binary tree using linked lists
15. Variations on tree structures
17. Graph traversals
18. Shortest path algorithm
19. Sorting techniques.
20. Search algorithms.
CS2C07- DESIGN AND ANALYSIS OF ALGORITHMS

Unit - I

Unit - II

Unit - III

Unit - IV
Introduction to parallel algorithms: PRAM models – EREW, ERCW and CRCW – relation between various models – handling read and write conflicts – work efficiency – Brent’s theorem.

Unit - V
Parallel merging, sorting, and connected components, list rank, Euler tour technique, parallel prefix computation, deterministic symmetry breaking.

REFERENCES:
CS2C08- ADVANCED DATABASE MANAGEMENT SYSTEM

Unit - I
Database System Concepts, ER Datamodel, Relational data model and Relational database. Relational Database Query Languages- Basics of QBE and SQL. Integrity and security - domain constraints, referential integrity, assertions, triggers, authorization, views.

Unit - II

Unit - III

Unit - IV
Case Study of MySQL – Creating/Altering/Dropping Database and tables, Data types, Operators and Functions, Data Definition and Manipulation Statements.

Unit - V
Flow control constructs, CodeBlocks, Stored Procedures and Functions, Cursors, Triggers, Transactional and Locking statements, Account Management Statements.

REFERENCES:
CS2C09 - OPERATING SYSTEM CONCEPTS

Unit - I
System software Overview: Operating system, I/O Manager, Assembler, Compiler, Linker, Loader. Fundamentals of OS: OS services and components, multitasking, multiprogramming, time sharing, buffering, spooling.

Unit - II
Process & thread management: Concept of process and threads, process states, process management, context switching, interaction between processes and OS, multithreading.

Concurrency control: Concurrency and race conditions, mutual exclusion requirements, s/w and h/w solutions, semaphores, monitors, classical IPC problem and solutions, Dead locks - characterization, detection, recovery, avoidance and prevention.

Unit - III

Unit - IV

Unit - V

REFERENCES:
CS2C10 - ADVANCED JAVA PROGRAMMING

Unit - I
Java Database connectivity:- JDBC Architecture- Drivers- Database connections-Statements-Result sets-Transactions metadata-stored procedures-error handling-BLOBs and CLOBs
JNDI- Architecture-context-initial context class-Object in a context —listing the children of acontext-binding objects —accessing directory services-X.500 directories-Dir context interface-Attributes and attribute interface—creating directory entities and searching.

Unit -II
RMI -Architecture- Defining remote Objects-Creating stubs & skeletons —Seializable classes-Accessing Remote Objects-factory classes-Dynamically loaded classes-RMI activation-Registering remote objects-marshalling and unmarshalling.

Unit -III
CORBA —Architecture-Services-IDL-ORB-Naming service-Inter-ORB Communication-creating CORBA objects-simple server class-helper class-holder class-stubs and skeletons-registering with naming services- finding remote object-adding object to naming context-Using naming context. Different models for CORBA server/clients and their implementations.

Unit -IV
Java Servlets- Servlet life cycle-Servlet chaining-HTTP servlets-forms and interaction-POST-HEAD and other request-server-side includes-cookies-Session tracking-databases and non-HTML Content-Request dispatching-shared attributes-resource abstraction.

Unit -V

REFERENCES:
Unit-1

Advanced DBMS

1. DCL, DDL, DML, DQL statements in MySQL
2. Stored Procedures in MySQL
3. Cursors and Triggers
4. Transactional and Locking statements
5. Account Management statements

Unit-2

Advanced Java Programming

1. Programming with JDBC API to create, insert into, update, and query tables.
2. Programming using JNDI as naming and directory service.
3. RMI client/server programming
4. CORBA client/server programming
5. Server side programming using servlet
6. Development and deployment of EJB
CS2E01 – ARTIFICIAL INTELLIGENCE

Unit – I
Introduction: Artificial Intelligence- problems, scope and applications, Problem space and search- Production system- characteristics- the predicate calculus, Inference rules, Structures and strategies for state space search, strategies for space search, using state space to represent reasoning with the predicate calculus.

Unit – II
Heuristics Search: Control and implementation of state space search, Generate and test, Hill climbing, Best–first search, Problem Reduction, Constraint Satisfaction, Means-ends analysis, Heuristic in games, Complexity issues.

Unit – III
Knowledge representation issues, representation and mappings, Representing simple facts in logic, Representing instances and ISA relationships, Computable functions and Predicates, Resolution, Natural deduction, Knowledge representation using rules, logic programming, forward versus backward reasoning, Symbolic reasoning under uncertainty- Nonmonotonic reasoning, Depth first search, Breadth first search.

Unit – IV

Unit – V

REFERENCES:
CS2E02 – INFORMATION THEORY AND CODING

Unit – I
Information Theory: Information and entropy, source encoding, Noiseless coding, Shannon’s first fundamental theorem, Sources with finite memory: Markov sources, Discrete channel with discrete, Shannon’s second fundamental theorem on coding for memory less noisy channel, Discrete channel with continuous noise, continuous channel with continuous noise, Channel capacity theorem, Properties.

Unit – II
Waveform Coding Techniques: PCM Channel noise and error probability DPCM and DM Coding speech at low bit rates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra Nyquist criterion ISI and eye pattern Equalization

Unit – III
Error control coding: Galois fields, Vector spaces and metrics, Block codes, Binary cyclic codes, Multiple error correcting codes, Majority – logic decoding, convolutional codes, Burst error correcting codes, ARQ, Performance of codes.

Unit – IV
Digital Modulation Techniques: Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency. Bit error analysis, using orthogonal Signaling.

Unit – V
Discrete two dimensional linear processing: super position and Convolution, Finite area superposition and convolution, Circulant superposition and convolution, Unitary transforms, Generalized unitary transforms, Fourier transforms, Cosine, Sine & Hartely transforms, Hadamard, Har walsh hadamard, Karhanen- Loeve transforms, Linear processing techniques: Transform domain processing, transformed domain superposition, Fast Fourier Transformation convolution, Fourier transform filtering.

REFERENCES:
2. Vera Pless, Introduction to the theory of Error correcting codes: John Wiley & Sons, Inc.1998
CS2E03 – COMPILER DESIGN

Unit – I
Assemblers: Elements of Assembly Language Programming, Overview of Assembly Process, Design of two pass assembler, Macros and Macro processors, Macro definition, call and expansion , Nested Macro calls, Advanced macro facilities, Design of Macro preprocessor.

Unit – II
Linkers, linking and relocation concepts, Design of linkers, Self relocating programs, Linking for over-lays, Loaders, Introduction to compilers, Different phases. Lexical Analysis, input buffering, specification of tokens, Recognition of tokens, lexical Analyser generators, lex, Finite automata.

Unit – III

Unit – IV

Unit – V

REFERENCES:
CS3C12 – SOFTWARE ENGINEERING

Unit-I
The Product-software process models- Project management concepts- Software Project and Project Metrics-software measurement-metrics for software quality-Integrating metrics within the software engineering process.

Unit-II
Software Project Planning –software scope resources ,software project estimation-decomposition techniques-empirical estimation models-the make/buy decision- Risk Analysis and Management, risk identification, risk projection, risk refinement- Project scheduling and Tracking, relationship between people and effort, defining a task set for the software project, scheduling - Software Quality Assurance, software reviews and technical reviews , statistical SQA, software reliability, quality standards.

Unit-III

Unit-IV
Design concepts and Principles, Design processes, principles and concepts, effective modular design, Design heuristics for effective modularity, design model and documentation - Architectural Design -User Interface Design.

Unit-V
Component Level Design- Software Testing Techniques- Software Testing Strategies, test case design, white box testing ,basis path testing, control structure and black box testing- Technical Metrics for Software.

REFERENCES:
3. Theory and problems of Software Engineering, Schaum’s outline series
CS3C13 – COMPUTER GRAPHICS

Unit-I
Introduction, application and output devices for computer graphics: raster and random scan display, CRT, color CRT, flat panel, LCD, LED, DVST. Adapters: monochrome display adapter (MDA), CGA, hercules graphics card, enhanced graphics adapter, Professional graphics adapter, VGA, SVGA. Graphics software: GKS, PHIGS, OpenGL. Scan conversion: Points & lines, line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Mid-point circle algorithm, Ellipse generating.

Unit-II

Unit-III
Projection: 3D concepts & viewing pipeline, coordinate system, window to viewport coordinate transformation, parallel & perspective projection, projection matrix, view volume. 3D object representation: wireframe model, visible surface detection methods, depth comparison, Z-buffer algorithm, back face detection, BSP tree method, printer's algorithm, depth cueing.

Unit-IV
Curves & Fractals: curve representation, surfaces, designs, spline representation, Bezier curves, cubic spline, beta spline, B-spline curves. Fractal's geometry, fractal generation procedure, classification of fractal, fractal dimension, fractal construction methods.

Unit-V

REFERENCES:
CS3C14 – DATA COMMUNICATION AND NETWORKING

Unit-I
Data & signals - analog and digital signals, line configuration, topology, transmission mode, media, OSI model, TCP/IP layers, multiplexing, switching, networking devices-repeater bridges, routers & gateways, Backbone networks, Virtual Lans.

Unit-II

Unit-III

Unit-IV

Unit-V
SONET/SDH-configuration, layers, frame. Transport layers- P to P Delivery, UDP, TCP and SCTP. Session layer, Presentation layer, Application layer-DNS, TCP/IP protocols. Remote Logging, E-mail & FTP, WWW & HTTP. Network Management, Network security, Cryptography.

REFERENCES:
CS3C15 - WEB TECHNOLOGY

Unit -I

Unit -II
CGI/Perl: Creating link to a CGI Script – Using a link to send data to a CGI Script – parsing data sent to a Perl CGI script – Using CGI script to process form data – Using scalar variables in Perl – Using variables in Perl – Using arithmetic operators in Perl – Associating a form with a script.

Unit -III

Unit -IV
PHP: Defining PHP variables – variable types – operators – control flow constructs in PHP – Establishing connection with MySQL database – managing system data – parsing data between pages

Unit -V
Python: Data types, control structures, advanced data structures, I/O, classes, modules, packages, exception handling, standard library, internet programming with python.

REFERENCES:
CS3C16 – PRACTICAL-3

Unit-I

Web Technology

1. Create HTML, XHTML, DHTML, XML documents.
2. Programming and web development using CGI-Perl.
3. Creation of dynamic web content using JSP
4. Creation of dynamic database driven sites with PHP&MySQL
5. Programming and web development using Python

Unit-II

Open GL Programming

1. Creating Window
2. Draw Primitives (Points, Lines, Triangle, Quads, Polygons)
3. Use colour in drawing primitives
4. Filling Polygon with colours
5. Transformations
   a. Translation
   b. Scaling
   c. Rotation
6. Beziers Curve
Unit – I
Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model – sampling and quantization - basic relationship between pixels - image geometry

Unit – II
image transforms - introduction to Fourier transform - discrete Fourier transform (DFT) - properties DFT- other separable image transforms - Walsh, Hadamard and Discrete Cosine transforms. Hotelling transform.

Unit – III

Unit – IV
Image restoration - model of Image degradation/restoration process - noise models - inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - Boundary representation

Unit – V

REFERENCES:
2. B. Chanda and D.D. Majumder, Digital Image Processing and Analysis, PHI
Unit – I
Introduction - systems and models - computer simulation and its applications - continuous system simulation - modeling continuous systems - simulation of continuous systems - discrete system simulation - methodology – event scheduling and process interaction approaches - random number generation.

Unit – II
testing of randomness - generation of stochastic variates - random samples from continuous distributions – uniform distribution - exponential distribution m-Erlang distribution - gamma distribution - normal distribution – beta distribution - random samples from discrete distributions - Bernoulli - discrete uniform - binomial - geometric and poisson.

Unit – III
Evaluation of simulation experiments - verification and validation of simulation experiments – statistical reliability in evaluating simulation experiments - confidence intervals for terminating simulation runs - simulation languages - programming considerations - general features of GPSS - SIM SCRIPT and SIMULA.

Unit – IV

Unit – V

REFERENCES:
1. C. Deo N., System Simulation And Digital Computer, Prentice Hall of India.
Unit – I

Unit – II

Unit – III

Unit – IV
Infrastructure Establishment-Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Unit – IV

REFERENCES:
**Unit – I**
Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces – error probabilities and integrals - normal density - discriminant functions for normal density.

**Unit – II**

**Unit – III**

**Unit – IV**

**Unit – V**
Unsupervised learning and clustering – mixture densities and identifiability, maximum likelihood estimates, applications to normal mixtures, unsupervised Bayesian learning, data description and clustering.

**REFERENCES:**
3. Fu K.S., *Syntactic Pattern Recognition And Applications*, Prentice Hall, Eaglewood cliffs
CS4E08 – SOFT COMPUTING TECHNIQUES

Unit – I
Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces – error probabilities and integrals - normal density - discriminant functions for normal density.

Unit – II

Unit – III
Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Unit – IV
Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Unit – V
Advanced Topics: Support Vector Machines, Evolutionary computation (EC)- Evolutionary algorithms, Harmony search, Swarm intelligence.

REFERENCES:
Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V

REFERENCES:
**Unit – I**

**Unit – II**
Retrieval evaluation: Performance evaluation of IR: Recall and Precision, other measures, Reference Collections, such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.

**Unit – III**
Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching: Inverted files, Suffix trees, Suffix arrays, signature files, sequential searching, Pattern matching.

**Unit – IV**
Multimedia IR: Spatial access methods, Generic multimedia Indexing approach, Distance functions, feature extraction, Image features and distance functions. Searching the Web: Characterizing and measuring the Web.

**Unit – V**
Search Engines: Centralized and Distributed architectures, user Interfaces, Ranking, Crawling the Web, Web directories, Dynamic search and Software Agents. Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example – TREC results.

**REFERENCES:**
CS4E11 – DISTRIBUTED COMPUTING

Unit – I
Operating system fundamentals - distributed system concepts and architectures - major design issues - distributed computing environments (DCE).

Unit – II
Concurrent processes and programming - threads and processes - client server model - time services language mechanisms for synchronization - concurrent programming languages.

Unit – III
Inter-process communication and coordination - message passing communication - request/reply communication - transaction communication - name and directory services - distributed mutual exclusion - leader election.

Unit – IV
Distributed process scheduling - static process scheduling, dynamic load sharing and balancing – distributed process implementation.

Unit – V
Real-time scheduling - concepts of distributed file systems - distributed shared memory - distributed computer security

REFERENCES:
CS4E12 - BIO INFORMATICS

Unit – I
Cells-Prokaryotes and Eukaryotes-DNA double helix- central dogma – RNA, aminoacids, Proteins -string representations- different levels of protein structures-DNA cloning- A brief introduction to different mappings techniques of genomes- genome sequencing methods-DNA micro arrays –Human Genome Project-A glossary of biological terms.

Unit – II
Scope of bioinformatics-Genomics and Proteomics- Problems in bioinformatics - sequence alignment, phylogeny, gene finding, microarray analysis, Homology and evolutionary relationships; Homology analysis and function of an entire gene or of segments within it, secondary structure prediction, protein structure prediction, comparative genomics and drug design.

Unit - III
Data management, Data life cycle, An introduction to the major resources at NCBI, EBI and ExPASY- Nucleic acid sequence databases: GenBank, EMBL, DDBJ –Protein sequence databases: SWISS-PROT, TrEMBL, PIR_PSD - Genome Databases at NCBI, EBI, TIGR, SANGER – How to access these databases and to make use of the tools available. Various file formats for bio-molecular sequences like genbank and fasta, The concept of profiles- The derived databases- Prosite, Pfam, PRINTS, CATH, SCOP.

Unit – IV
Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Scoring matrices: basic concept of a scoring matrix, PAM and BLOSUM matrices, differences between distance & similarity matrix, Pairwise sequence alignments: basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments, BLAST and FASTA and their versions, Multiple sequence alignments (MSA): the need for MSA, basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.), Algorithm of CLUSTALW.

Unit – V
Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees, Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining, Gene Finding: The six reading frames-Computational gene finding in prokaryotes and eukaryotes Basic signals –start and stop codons, promoters etc- important coding measures- Regular expressions- Introduction to Hidden Markov models- Introduction to genomic signal processing Molecular visualization: Visualization of protein structures using Rasmol or Rastop

REFERENCES:
CS4E13 – MOBILE COMMUNICATION

Unit – I

Unit – II

Unit – III
Wireless LAN-Infra red Vs radio transmission -infra structure and adhoc networks-IEEE 802.11, hyperlan- Bluetooth -IEEE 802.15

Unit – IV

Unit – V

REFERENCES:
CS4E14 - GRID COMPUTING

UNIT-I
Introduction- Grid Computing values and risks – History of Grid computing – Grid computing model and protocols – overview of types of Grids

UNIT-II
Types of Grids- Desktop Grids- Background – Definition – Challenges – Technology – Suitability – Grid server and practical uses; Clusters and Cluster Grids; HPC Grids; Scientific in sight – application and Architecture – HPC application development environment and HPC Grids; Data Grids; Alternatives to Data Grid – Data Grid architecture.

UNIT-III

UNIT-IV

UNIT-V

REFERENCES:
CS4E15-REMOTE SENSING AND GIS

Unit- I

Unit-II
GIS and spatial data- Definition – maps spatial information – computer assisted mapping and analysis – components of GIS –people and GIS – maps and spatial data – thematic characteristics of spatial data ad GPS coordinate system– other sources of spatial data; census ad survey data, air photos, satellite images, field data. Data analysis operations in GIS, Terminologies measurements of lengths, perimeter and area in GIS – queries – reclassification buffering and neighborhood functions – integrated data.

Unit- III

Unit- IV

Unit- V

REFERENCES:
1. Lilesand, TM John, Remote sensing and Image interpretation, Wiley.
**CS4E16-EMBEDDED SYSTEMS**

**Unit- I**
Introduction to Embedded systems: Application areas categories of embedded systems; Standalone, Real time systems, Networked Information Appliances, Mobile devices. Overview of embedded system architecture, specialties of embedded systems; Reliability, Performances, Power consumption, Cost, Size, Limited User interface, Software upgradation capability. Recent tents in embedded Systems; Processor power Memory, Operating systems, Communication interfaces and networking capability, Programming languages, Developing tools, Programmable hardware

**Unit- II**
Architecture of Embedded System: Hardware architecture; CPU , Memory, Clock circuitry, Watchdog Timer/ Reset circuitry, Chip select, I/O devices , Debug port, Communication interfaces, Power supply units. Software architecture, services provided by an operating system, architecture of embedded operating system, categories of embedded operating systems. Application software, communication software. Development/ testing tools; Process of embedded system developments: Development process ,Requirements engineering ,Design, Implementation, integration testing , Packaging, configuration management

**Unit- III**
Hardware Platforms: Types of hardware platforms ; Single board computers, PC add-on cards, custom-built hardware plat forms. 89C51; architecture instruction set and programming. AVR microcontroller development board , PIC microcontrollers. 16F84 architecture, instruction set and programming .

**Unit- IV**
Communication interfaces: Need for communication interface, RS 232/USART. RS422/RS485 .USB Infrared, IEEE 1394 Fire wire, IEEE 802.11, Blue tooth

**Unit- V**
Embedded/ Real -time operating system concepts: Architecture of the Kernel, Task and task scheduler, Interrupt services routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion Problem , Case studies :RT Linux.

**REFERENCES:**