NATIONAL COLLEGE (AUTONOMOUS)

Nationally Accredited at "A" Level by NAAC

Tiruchirapalli – 620 001

Under Graduate Programmers Structure under CBCS

(For candidates admitted from the academic year 2016 – 2019 onwards)

M. Sc (Computer Science)

Aim:

I. To excel in problem solving and programming skills in the various computing fields of IT industries

II. To develop the ability to plan, analyze, design, code, test, implement & maintain a software product for real time system

III. To promote students capability to set up their own enterprise in various sectors of Computer applications

IV. To experience the students in finding solutions and developing system based applications for real time problems in various domains involving technical, managerial, economical & social constraints

V. To prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and research.

Objectives:

a) Understand and Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.

b) Identify, Analyze the computing requirements of a problem and Solve them using computing principles.

c) Design and Evaluate a computer based system, components and process to meet the specific needs of applications.

d) Use current techniques and tools necessary for complex computing practices.

e) Use suitable architecture or platform on design and implementation with respect to performance

f) Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

g) Apply the understanding of management principles with computing knowledge to manage the projects in multidisciplinary environments.

h) Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

i) Understand societal, environmental, health, legal, ethical issues within local and global contexts and the consequential responsibilities relevant to professional practice.

j) Function effectively in a team environment to accomplish a common goal.

k) Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.

l) Use knowledge to analyze, interpret the data and synthesis the information to derive valid conclusions using research methods.

m) Expertise in developing application with required domain knowledge.

Eligibility for Admission to the Programme:

Candidates for admission to the first year programme leading to the Degree of Master of Science in Computer Science (M. Sc-CS) will be required to possess:

A Pass with 50% of marks in B.Sc. Computer Science / BCA /B.Sc. Computer Technology / B.Sc. Information Technology / B.Sc. Information Science / B.Sc. Information Systems / B.Sc. Software Science / B.Sc. Software Engineering / B.Sc. Software Systems. In case of SC/ST candidates, a mere pass in any of the above Bachelors degree will be sufficient.

SEM	Course	Course Title	Instru. Hours/ Week	Credit	Marks		Total
					Int 25	Ext 75	
I year I sem	Core Course I P16CS1	Mathematical Foundations for Computer Science	6	5	25	75	100
	Core Course II P16CS2	Data Mining and Data Warehousing	6	5	25	75	100
	Core Course III P16CS3	Service Oriented Architecture	6	5	25	75	100
	Core Course IV P16CS4P	Service Oriented Lab	6	5	25	75	100
	Elective Course I P16CS5E	Distributed Operating System	6	4	25	75	100
		Paper : 5	**30**	**24**			**500**
I year II sem	Core Course V P16CS6	Resource Management Techniques	6	5	25	75	100
	Core Course VI P16CS7	Data Structure and Algorithm	6	5	25	75	100
	Core Course VII P16CS8	Compiler Design	6	5	25	75	100
	Core Course VIII P16CS9P	Data Structure Lab	6	5	25	75	100
	Elective Course II P16CS10E	Digital Image Processing	6	4	25	75	100
		Paper : 5	**30**	**24**			**500**
II year III sem	Core Course IX P16CS11	Cloud Computing	6	5	25	75	100
	Core Course X P16CS12	Programming in C#.Net	6	5	25	75	100
	Core Course XI P16CS13P	DotNet Lab	6	5	25	75	100
	Elective Course III P16CS14E	Multimedia and Graphics	6	4	25	75	100
	Elective Course IV P16CS15E	Network Security	6	4	25	75	100
		Paper : 5	**30**	**23**			**500**

IVsem	Core Course XII P16CS16	Big Data Analytics	6	5	25	75	100
	Core Course XIII P16CS17	Soft Computing	6	5	25	75	100
	Elective Course V P16CS18E	Software Quality Assurance And Testing	6	4	25	75	100
	Project Work: P16CSP19	Project	12	5	25	75	100
		Paper : 4	**30**	**19**			**400**
		GRAND TOTAL	**120**	**90**			**1900**

Elective – I 1. Resource Management Techniques 2. Distributed Operating System 3. Digital Asset Management	**Elective – II** 1. Digital Image Processing. 2. Grid Computing. 3. Real time Operating System
Elective – III 1. Multimedia & Graphics. 2. Pattern Recognition. 3. Parallel Computing.	**Elective IV** 1. Network Security. 2. Real Time and Embedded System. 3. Genetic Algorithm.
Elective V 1. Software Quality Assurance and Testing. 2. Artificial Neural Network. 3. Robotics	

Semester I **Hours/Week: 6**

Core Course I **Credit: 5**

P16CS1 MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE

Objectives:

1. To understand the concepts and operations of matrix algebra needed for computing graphics modeling.
2. To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
3. To impart discrete knowledge in computer engineering through finite automata and Context free grammars

Unit-I:

Graph theory: Basic concepts of graph theory-paths, reachability and connectedness - Matrix representation of graphs-Trees.

Unit-II :

Graph theory: Storage representation and manipulation of graphs: Trees and list structures and graphs-simple precedence grammars-PERT and related techniques.

Unit-III:

Coding theory: Introduction-cryptography-Caesar cipher coding-Matrix encoding-Scrambled codes-Hamming metric-Hamming distance-Error detecting capability of an encoding.

Unit-IV:

Mathematical Logic: Propositions-evaluation-precedence rules-Tautologies-reasoning using equivalence transformation-Laws of Equivalence-Substitution rules-a natural detection system-Detective proofs-Inference rules-Proofs and sub proofs.

Unit-V:

Probability theory: Historic perspective, Mathematical modelling-Equiprobable spaces-Mutually exclusive events-Conditional probability-Bayes theorem.

Text books :

1.Unit I&II- J.P.Tremblay,R.Manohar "Discrete mathematical structures with applications to computer science".2006

2.Unit III- James L.Fisher "Application oriented algebra",2004

3.Unit IV- David Gries "science of programming ",2007

4.Unit V- Harsh Bhasin,Dharminder Kumar "Discrete mathematical structures",

Reference Books:

1.Kenneth H.Rosen, " Discrete Mathematics and Its Applications", Tata McGraw Hill, Fourth Edition,2002 .

2. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.

3. A.Tamilarasi & A.M.Natarajan, "Discrete Mathematics and its Application", Khanna Publishers,2nd Edition 2005

Semester I **Hours/Week: 6**

Core Course II C**redit: 5**

P16CS2 DATA MINING AND DATA WAREHOUSING

Objective:

In this course students shall learn the mathematical & algorithmic details of various data association techniques to discover patterns in underlying data (namely mining data), also learn how to consolidate huge volume of data in one place efficiently.

UNIT 1

Data mining and data preprocessing: Data Mining – Motivation – Definition –Data mining on kind of data – Functionalities – Classification – Data Mining Task Primitives– Major issues in Data Mining – Data Preprocessing – Definition – Data Clearing –Integration and Transformation – Data Reduction.

UNIT 2

Data warehousing: Introduction – Multidimensional Data Model – Data WarehouseArchitecture – Data Warehouse Implementation – From data warehousing to DataMining –On Line Analytical Processing – On Line Analytical Mining.

UNIT-III:

Mining Frequent patterns: The Apriori algorithm-Generating Association Rules from Frequent Itemsets:Efficiency of Apriori-Mining various kinds of Association Rules:Mining Multilevel Assosiation Rules-Mining Multidimensional Assosiation Rules from Relational Databases and Datawarehouse.

Classification and Prediction: Decision Tree Induction-Bayesian-Rules Based classification-Classification by back propogation-Other classification methods.

UNIT-IV:

Cluster Analysis: Types of Data in Cluster analysis:(a)Interval-(b)Scaled variables-(c)Binary-(d)Categorical-(e)Ordinary-(f)Ratio_Scaled-(g)Vector objects.Categorization of major method:K-Means-K-Medoids Method-CLARANS.

Hierarachical Methods: Agglometrive and divise Hierarachical clustring-Birch-ROCK-Chameleon-Grid Based methods:String-Wave Cluster.

UNIT-V:

Spatial DM - Multimedia DM - Text Mining - WWWeb Mining - **DM Application**: Finance - Retail Industry – Telecommunication – Biological - Intrusion Detection - Social impacts of DM - Trends in DM.

Text Book:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, 2nd Ed.,Morgan Kaufmann, 2006.

Reference Books:

1. Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2003.

2. Arun K.Pujari, “ Data Mining Techniques”, University Press, 2001.

Semester I **Hours/Week: 6**
Core Course III C**redit: 5**

P16CS3 SERVICE ORIENTED ARCHITECTURE

Objective:

In this Course to provide fundamental concepts of Service Oriented Architecture and gain knowledge about SOAP, UDDI and XML to create web services. To know about the Cloud Computing architecture and services.

UNIT I

SOAbasics 9: Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation – Service Layers.

UNIT II

XML and Web Services 9: XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types,Attributes – XSL Transformations – Parser –Web Services Overview – Architecture.

UNIT III

WSDL, SOAP and UDDI 9: WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure –Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI.

UNIT IV

SOA in J2EE and .NET 9: SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET web services.

UNIT V

Cloud Computing 9: Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.

Text books:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2006.
2. HeatherWilliamson, “XML, The Complete Reference”, McGraw Hill Education, 2012.

Reference Books:

1. Frank. P. Coyle, “XML, Web Services And The Data Revolution”, Pearson Education,2002.
2. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services. An Architect’sGuide”, Pearson Education, 2005.
3. Newcomer, Lomow, “Understanding SOA with Web Services”, Pearson Education, 2005.
4. Dan woods and Thomas Mattern, “Enterprise SOA designing IT for Business Innovation”,O’REILLY, First Edition, 2006.
5. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”,McGraw Hill Education, 2013.

Semester I **Hours/Week: 6**

Core Course IV C**redit: 5**

P16CS4P SERVICE ORIENTED LAB

1. Write an XML Program to display a string.

2. Write an XML program for the following: Primary information Secondary information Tertiary information Name Nick name Birthday Title Contact source Spouse's name Purchases Anniversary Address Phone number E- mail.

3. Write an XML Program to prepare a sonnet.

4. Write an XML program for party invitation with an image.

5. Write an XML program for sending greeting using colorful borders.

6. Write an XML Program to display 10 different colors using Cascading Style Sheet.

7. Write an XML program for display baseball statistics.

8. Write an XML program for listing of job details of various employees using the following fields (job – title, job – id, country, company, salary, year of experience).

9. Write an XML program to create XSL for displaying various country names and their currency names.

10. Write an XML program to prepare a calendar for a month using XSL.

Semester I **Hours/Week: 6**

Elective Course I C**redit:4**

P16CS5E DISTRIBUTED OPERATING SYSTEMS

Objectives:

To enable the student to familiar with distributed systems and client server computing

Unit I

Fundamentals: What is Distributed Operating System – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Computing System – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment. Introduction to Computer Networks – Network types – LAN –WAN – Communication protocols – Internetworking – ATM Technology

Unit II

Message Passing: Introduction – Desirable features – Issues in PC Message Passing – Synchronization – Buffering – Multidatagram Messages – Encoding and Decoding – Process Addressing – Failure Handling – Group Communication

Unit III

Distributed Shared Memory: Introduction – General Architecture of DSM system – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory – Consistency Models – Replacement Strategy – Thrasing – Other Approaches to DSM – Heterogeneous DSM – Advantages Synchronization: Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithm

Unit IV

Distributed File System: Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles

Unit V

Security: Introduction – Potential Attacks to Computer System – Cryptography – Authentication – Access Control – Digital Signatures – Design Principles

Text Book :

1. Distributed Operating Systems – Concepts and Design, Pradeep K Sinha, PHI, 2003

Reference Book:

1. Distributed Operating Systems 1e, Andrew S Tanenbaum, PHI.

Semester II **Hours/Week: 6**

Core Course V(P16CS6) **Credit: 5**

RESOURCE MANAGEMENT TECHNIQUES

Objective:

To provide the concept and an understanding of basic concepts in Operations Research and the techniques for Analysis and Modeling in Computer Applications.

UNIT I

Linear Programming Models : Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method.

UNIT II

Transportation and Assignment models : Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem.

UNIT III

Integer Programming Models : Formulation – Gomory's IPP method – Gomory's mixed integer method – Branch and bound technique.

UNIT IV

Scheduling by PERT and CPM : Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling.

UNIT V

Queueing Models : Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / ∞ /∞), (M / M / 1) : (FIFO/ N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

Text Books:

1. Taha H.A., "Operations Research : An Introduction " 8th Edition, Pearson Education, 2008.
2. Gross, D. and Harris, C.M., "Fundamentals of Queueing Theory", Wiley Student, 3rd Edition, New Jersy, 2004.

Reference Books:

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia,2005.
2. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, 3rd, Edition , 2008.
3. John W. Chinneck "Feasibility and Infeasibility in Optimization Algorithms and Computational Methods' Springer, 2008
4. Ravindran, Phillips, Solberg,"Operations Research: Principles And Practice", 2ND ED, JohnWiley & Sons, 01-Jul-2007
5. Ibe, O.C. "Fundamentals of Applied Probability and Random Processes", Elsevier, U.P., 1st Indian Reprint, 2007.

Semester II **Hours/Week: 6**

Core Course VI C**redit: 5**

P16CS7 DATA STRUCTURE AND ALGORITHM

Objective:

To understand the linear and non linear data structures available in solving problems and to know about the sorting and searching techniques and its efficiencies.

UNIT I

Linear Data Structures : Introduction - Abstract Data Types (ADT) – Arrays and its representation –Structures – Stack – Queue – Circular Queue - Applications of stack – Infix to postfix conversion – evaluation of expression – Applications of Queue - Linked Lists – Doubly Linked lists – Applications of linked list – Polynomial Addition.

UNIT II

Tree Structures: Need for non-linear structures – Trees and its representation – Binary Tree – expression trees – Binary tree traversals – left child right sibling data structures for general trees – applications of trees – Huffman Algorithm - Binary search tree.

UNIT III

Balanced Search Trees, Sorting and Indexing: AVL trees –B-Trees - Sorting – Bubble sort - Quick Sort - Insertion Sort – Heap sort – Hashing - Hashing functions - Collision Resolution Techniques - Separate chaining - Open addressing – Multiple hashing.

UNIT IV

Graphs: Definitions – Representation of graph - Graph Traversals - Depth-first traversal – breadth- first traversal - applications of graphs - Topological sort – shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – biconnectivity – Euler circuits.

UNIT V

Algorithm Design and Analysis: Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Warshall's Algorithm for Finding Transitive Closure – Backtracking – Sum of Subset Problem – Branch and Bound –Travelling Salesman Problem.

Text Books:

1. . M. A. Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education Asia, 2013.
2. Anany Levitin "Introduction to the Design and Analysis of Algorithms" Pearson Education2003.

Reference Books:

1. Tanaenbaum A.S.,Langram Y. Augestein M.J " Data Structures using C" Pearson
2. Education , 2004.
3. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", UniversityPress, 2007.
4. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms/C++", Second Edition, UniversityPress, 2007.
5. Reema Thareja, "Data Structures using C", Oxford Press, 2012.
6. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education,1983.
7. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition

Semester II **Hours/Week: 6**

Core Course VII C**redit: 5**

P16CS8 **COMPILER DESIGN**

Objectives:

To understand the various phases of a compiler and to develop skills in designing a compiler.

Unit I :

Compiler - Phases of Compiler – Compiler writing tools – Lexical Analysis – Role of Lexical analyzer – Finite Automata – Regular Expression – From a Regular expression to an NFA , NFA to DFA – Design of Lexical Analyzer.

Unit II

Syntax Analyzer – CFG – Role of the Parser – CFG – Top Down Parsing – Recursive descent parsing, predictive Parsers – Bottom up Parsing – Shift reduce, operator precedence parsers, LR Parsers.

Unit III

Syntax directed definition :- Construction of Syntax trees – Intermediate code generation – Intermediate Languages – Syntax trees, post fix form, Three address code – Boolean expressions – Back Patching.

Unit IV

Symbol table – contents of Symbol table – Data Structures for Symbol table – Runtime storage Administration – Implementation of Stack allocation scheme block structured Languages – Storage allocation in Fortran.

Unit V

Code Optimization and code generation – principles sources of optimization – loop optimization – Dag Representation of Basic blocks. Code generation – problems in code generation – a simple code generator –Register allocation and Assignment – Peephole optimization.

Text Book:

1. Alfred V. Aho, Ravi Sethi Jeffrey D. Ullman, “Compilers- Principles, Techniques, andTools”,PearsonEducationAsia,2007.

Reference Books:

1. David Galles, “Modern Compiler Design”, Pearson Education Asia, 2007

2. C. N. Fisher and R. J. LeBlanc “Crafting a Compiler with C”, Pearson Education, 2000.

Semester II **Hours/Week: 6**

Core Course VIII C**redit: 5**

P16CS9P **DATA STRUCTURE LAB**

1. Polynomial Addition using array.
2. Array implementation of stack.
3. Array implementation of Queue.
4. Infix to postfix conversion.
5. Singly Linked List operations.
6. Insertion & Heap Sort.
7. Prim's and Kruskal Algorithm.
8. Sum of subset Problem using Back Tracking.
9. Warshall's Algorithm.
10. Greedy Method Algorithm.

Semester II **Hours/Week: 6**

Elective Course II **Credit: 4**

P16CS10E DIGITAL IMAGE PROCESSING

Objectives:

It presents the Introduction to Digital image Processing, fundamentals, image enhancement and image restoration techniques Goals To enable the students to learn the fundamentals of Digital Image Processing, image compression and segmentation

UNIT I

Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations**.**

UNIT II

Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

UNIT III

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

UNIT IV

Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

UNIT V

Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Threshold – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.

Text Book:

1.Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Third Edition, PHI/Pearson Education,2008

Reference Books:

1. B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.

2.Kenneth R. Castleman, Digital Image Processing, Pearson, 2006

3. Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson

Semester III **Hours/Week: 6**

Core Course IX **Credit: 5**

P16CS11 **CLOUD COMPUTING**

Objective:

To impart a knowledge on cloud computing, its architecture,authentication services, interconnecting services with web server

UNIT I:

Understanding Cloud Computing: Introduction to cloud computing-surveying the Role of Cloud Computing, developing the cloud services-Advantage of Auxiliary Cloud Services-Deploying Application and Services to the Azure Cloud.

UNIT-II

Understanding Windows Azure Platform Architecture: The Lifecycle- Securing and Isolating Services and Data,-Assuring Fabric Controller Availability-Virtualizing Windows Server for Azure.

UNIT III

Minimizing Risk When Moving to the Azure Cloud Service:Bypassing the Barrier to Cloud Computing- Implementing the Secure Sockets Layers Transmission-Encryption for Web Roles-Encrypting Personal Information in Azure Storage Services.

UNIT IV

Authenticating Users with .NET Access Control Services: Creating the .NET Services Solution, Installing the .NET Services SDK and other Tools, Crating the Card Space Credentials at Federatedidentity.net, Using a Managed Card Space Credential with ACS.

UNIT V

Interconnecting the Services with the .NET Service Bus: Creating .NET ServiceSolution and Installing Prerequisites, Relaying Message with SB. Exploring .NET Service Bus Queues and Routers: Persisting Messages in Service-Bus Queues, Delivering Message with Service Bus Routers.

Text Book:

1. Roger Jennings “Cloud Computing with the Windows Azure Platform”, Wiley,2009

Reference Books:

1. Michael Miller, “Cloud Computing”, Pearson Education,2008
2. Michael Morrison. “AJAX Construction Kit: Building Plug-and-Play Ajax Applications,” 2007
3. Billy Hoffman and Bryan Sullivan, “AJAX Security”, 2007

Semester III **Hours/Week: 6**
Core Course X **Credit: 5**
P16CS12

PROGRAMMING IN C#.NET

Objective:
To impart Knowledge on .Net Framework, building form with web controls, creating and using Rich Controls, Validation Controls and ADO.NET.

UNIT I

Introducing C# and the .NET platform: The philosophy of .NET- Introducing the building blocks of the .NET platform (CLR, CLS and CTS)- .NET assemblies – Common type system – Namespaces/types distinction

UNIT II

Core C# Programming Constructs : System. Environment class – System. Console class – String – Data types Conversion- C# iteration constructs – Decision Constructs – methods – arrays – structure – understanding values type and reference types – c# nullable.

UNIT III

Object Oriented Programming with C#: Introducing the C# class type – understanding constructor – keyword static keyword – defining pillars of OOP-c# access modifiers – inheritance and polymorphism understanding exception handling – understanding object lifetime – working with interfaces – delegates – events introducing LINQ.

UNIT IV

Windows Forms: window forms fundamentals – windows MDI forms – Handling events-controls to forms. Windows Controls: Textboxes – labels – Linkablebutton – checkboxes – radiobuttons – Listboxes- checkedListBoxes – ComboBoxes- pictureBox – ImageList – DateTimePicker – Listview – Richtextbox Toolbars – TabControl- Menustrip.

UNIT V

DataAccess with ADO.NET: ADO.NET Architecture – Advantages – ADO.NET Objects. **handling Database in code:** Connection class – Command class – DataAapter- DatasetClass- DataReader class- DataTable Class DataRow, DataColumn classes – DatarelationClass. The Data Controls : Datagrid control, automatically Generating Columns, Defining Columns Formatting the GridView Formatting Fields, Using styles, The Details View and FormView.

Text Book:

1. **"C# 2010 and .Net Platform"**, Andrew Troleson, A press 2010-**(Unit I, II, III)**
2. **"Beginning ASP.NET 4 in C# 2010"** Mathew macdonald **(Unit IV,V)**

Reference Book:

1. **"ASP.NET Bible"**, Mirudula Parihar, DreamTech Publications, 2007
2. **"The Complete Reference:C#",** Herbert Schildt, Tata McGraw Hill,2004
3. **"Programming in C#",** - E.Balagurusamy- Tata Mc-GrawHill, Second Edition2009.

Semester III **Hours/Week: 6**

Core Course XI **Credit: 5**

P16CS13P **DOT NET LAB**

1. Create a ASP.Net program using web controls.
2. Apply appropriate validation techniques in e-mail registration form using validation control.
3. Using Ad Rotator Control
4. Writer an ASP.NET application to retrieve data and display it. The client browser in a table format.
5. Create a web application using ADO.Net that uses which perform basic data manipulations.
6. Create an application using Data Grid control to access information from table in SQL Server.
7. Create an application using Data list control to access information from table in SQL server and display the result in neat format.
8. Job search portal using crystal report.
9. College Portal
10. Company portal.

Semester III **Hours/Week: 6**
Elective Course III **Credit: 4**

P16CS14E MULTIMEDIA & GRAPHICS

Objective:

To understand computational development of graphics with mathematics and to provide in-depth knowledge of display systems, image synthesis, shape modeling of 3D application.

UNIT I

Graphics :2D Transformations – Translation – Scaling – Rotation – Other Transformation: Reflection – Shearing. Clipping: Window-to-Viewport Transmission – Clipping: Point Clipping – Line Clipping – Text Clipping. GUI and interactive Input methods – Picture Construction Techniques – Virtual Reality Environment.

UNIT II

3D Graphics: 3 D Transformation –Visible Surface Detection – Back Face Detection – Depth Buffer Method – Scan Line Method.

UNIT III

Introduction to Multimedia : Components of multimedia – Overview of multimedia software tools – Multimedia authoring and tools: multimedia authoring – Some useful editing and authoring tools – popular file formats – color models in images – color models in video.

UNIT IV

Fundamental concepts in video: Types of video signals – Analog video – digital video – Basics of digital Audio: Digitization of Sounds – MIDI – Quantization and transmission of audio.

UNIT V

Digital Video and Animation: Video Capture and Playback Systems - Computer Animation. Computer and Multimedia Networks: OSI Network Layers – TCP/IP Protocols – Multiplexing Technologies: Basics of Multiplexing - Access Networks – Multimedia Network communications and Applications: Quality of Multimedia Data Transmission – Multimedia over IP.

Text books:

1. "Fundamentals of Multimedia", Ze-Nian Li, Mark S. Drew, Pearson Education, 2008.
2. "Computer Graphics in C Version", Donald Heam and M. Pauline Baker, Second Edition. Pearson Education

Reference books:

1. Tom McReynold – David Blythe " Advanced Graphics Programming Using OpenGL', Elsevier, 2010
2. Parag havaldar and General medioni, "Multimedia Systems- Algorithms, Standards and Industry Practices", Course Technology, Cengage Learining,2010
3. John F. Koegel Bufend, "Multimedia systems", Pearson Education, Delhi, 2002
4. Kurose and Ross, 'Computer Networks: A top down Approach' , Pearson Education, 2002
5. Mohammed Dastbaz, Designing Interactive Multimedia Systems.
6. Multimedia – Technology and applications David Hillman Galgotia publications, Delhi.
7. Ralf Steinmetz and Klara Nahrstedt " Multimedia Applications", Springer, 2007.

Semester III **Hours/Week: 6**

Elective Course IV **Credit: 4**

P16CS15E **NETWORK SECURITY**

Objectives:

To understand how the data send securely by using different encryption/decryption techniques and also it gives knowledge about the network security pracices like authentication,E-Mail ,Firewall works.

Unit I

Overview-Symmetric Ciphers: Classical Encryption Techniques

Unit II

Symmetric Ciphers: Block ciphers and the Data Encryption Standards Public-key Encryption and Hash Functions: Public-Key Cryptography and RSA

Unit III

Network Security Practices: Authentication applications-Electronic Mail Security

Unit IV

Network Security Practices: IP Security-Web Security

Unit V

System Security: Intruders-Malicious Software-Firewalls

Text Book:

1. William Stallings, "Cryptography and Network Security-Principles and Practices", Prentice-Hall, Forth Edition, 2003

Reference Books:

1. Johannes A. Buchaman , "Introduction to cryptography", Springer-Verlag.
2. Atul kahate ," Cryptography and Network Security", TMH.

Semester IV **Hours/Week: 6**

Core Course XII **Credit: 5**

P16CS16 **BIG DATA ANALYTICS**

Objectives:

To explore the fundamental concepts of big data analytics And also to learn to analyze the big data using intelligent techniques.

UNIT I

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis –Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools -Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop-Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud

UNIT V

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

Text Books:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing,2012
4. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications,2013

Reference Books:

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge
2. University Press, 2012.
3. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, JohnWiley & sons, 2012.
4. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
5. PeteWarden, “Big Data Glossary”, O’Reilly, 2011.
6. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition,
7. Elsevier, Reprinted 2008.
8. Da Ruan,Guoquing Chen, Etienne E.Kerre, GeertWets, Intelligent Data Mining, Springer,2007
9. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles ,
10. David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012
11. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

Semester IV **Hours/Week: 6**

Core Course XIII **Credit: 5**

P16CS17 **SOFT COMPUTING**

Objectives

To learn the key aspects of Soft computing and to know the components and building block hypothesis of Genetic algorithm,the features of neural network and its applications.

UNIT I

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II

Introduction, Building block hypothesis, working principle, Basic operators and Terminologies like individual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance of Genetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem),Differences & similarities between GA & other traditional methods, Applications of GA.

UNIT III

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks– Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in Neural Networks.

UNIT IV

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT V

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case Studies.

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”,Prentice-Hall of India, 2003
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall,1995.
3. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 2007.

Reference Books:

1. Kwang H.Lee, “First course on Fuzzy Theory and Applications”, Springer–Verlag BerlinHeidelberg, 2005.
2. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.
3. Mitsuo Gen and Runwei Cheng,”Genetic Algorithms and Engineering Optimization”, Wiley Publishers 2000.
4. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
5. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.
6. A.E. Eiben and J.E. Smith “Introduction to Evolutionary Computing” Springer, 2003
7. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems:Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", Vol. 7,River Edge, World Scientific, 1997.
8. ROSS TIMOTHY J, Fuzzy Logic with Engineering Applications, Wiley India Pvt Ltd, New Delhi,2010

Semester IV **Hours/Week: 6**

Elective Course V **Credit: 4**

P16CS18E SOFTWARE QUALITY ASSURANCE AND TESTING

Objectives:

To enable the students to learn the Concepts and Principles of SQA,Standards, Tools for SQA.

Unit I

Principles of Testing – Software Development Life Cycle Models

Unit II

White Box Testing-Integration Testing-System and acceptance testing.

Unit III

Testing Fundamentals -2 & Specialized Testing: Performance Testing-Regression testing-Testing of Object Oriented Systems-Usability and Accessibility Testing.

Unit IV

Test Planning, Management, Execution and Reporting.

Unit V

Software Test Automation-Test Metrics and Measurements

Text Book:

1.Software Testing -Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education 2006.

Reference Books:

1. Introducing Software testing-Louis Tamres, Addison Wesley Publications, First Edition.

2. Software testing, Ron Patten, SAMS Techmedia, Indian Edition 2001.

3. Software Quality-Producing Practical, Consistent Software-Mordechai

Elective Course I **1.COMPUTER NETWORKS**

Objectives:

To provide the fundamental concept of computer networks, networking technologies, applications and network security.

Unit-I

Introduction – Uses of Computer Networks: Business and Home Applications – NetworkHardware: LAN, WAN, MAN – Network Software: Protocol Hierarchies – Design Issuesfor the Layers – Connection Oriented and Connectionless Services – Service Primitives Reference model: The OSI Reference Model – TCP/IP Reference Model.

Unit-II

The Physical Layer: Guided Transmission Media – Public Switched Network – Structure of Telephone System – Trunks and Multiplexing – switching.

The Data link Layer: Data link layer Design Issues – Error Detection and Correction – Stop and Wait Protocol – Sliding Window Protocols.

Unit-III

The Network Layer: The Network Layer Design Issues: Store-and-Forward Packet Switching – Implementation of Connection-Oriented Service and Connectionless Service – Routing Algorithms: The Optimality Principle – Shortest Path Routing – Flooding –Distance Vector Routing – Hierarchical Routing – Broadcast Routing – Congestion Control Algorithms: General Principles of Congestion Control – Congestion Prevention Policies – Congestion Control in Virtual-Circuit Subnets and Datagram Subnets –Network Layer in the Internet: IP Protocol – IP addresses.

Unit-IV

The Transport Layer: The Transport Service – Elements of Transport Protocols – Internet Transport Protocols: Introduction to UDP – RPC – TCP: TCP Service Model – TCP Protocol – TCP Segment Header.

Unit-V

The Application Layer: The DNS Name Space – E-mail: Architecture and Services – Message Formats – Network Security: Cryptography – DES – RSA – Firewalls – VPN –E-mail Security: PGP – PEM.

Text Book:

1.Andrew S. Tanenbaum, *Computer Networks*, Fourth Edition, Prentice Hall of India.

Reference Books:

1. Behrouz A. Forouzan, "*Data Communications and Networking*", 2nd edition, TataMcGraw-Hill.
2. William Stallings, "*Data and Computer Communication*", Fifth Edition, PHI.

Elective Course I 3. DIGITAL ASSET MANAGEMENT

Objectives:

To provide the fundamental concept of digital document and its applications.

Unit I :

Creating Digital Content - Digital Primer, Any Content – Anywhere, Anytime, Digital Content Consumer, Tools And The Trade, Digital Recording, CGI And Digital Content Creation, Digital Audio, Rich Media, Streaming Media, Digital Interactive Television, Digital Cinema.

Unit II :

Compressing And Indexing - Document Databases, Compression, Indexes, Text Compression, Indexing Techniques, Image Compression, Mixed Text And Images.

Unit III :

Content Management - Systems For Managing Content, The Enterprise Content Management System (CMS), Major Parts Of A CMS, Need For A CMS, Roots Of Content Management, Branches Of Content Management.

Unit IV :

Design Of CMS - The Wheel Of CMS, Working With Metadata, Cataloging Audiences, Designing Publications, Designing Content Components, Accounting For Authors, Accounting For Acquisition Sources.

Unit V :

Building CMS - Content Markup Languages, XML And Content Management, Processing Content.

Text Books:

1. John Rice And Brian Mckerman (Editors), Peter Bergman, “Creating Digital Content”, Mcgraw-Hill, USA, 2001[Unit 1]

2. Ian H Witten, Alistair Moffat, Timothy C Bell, “Managing Gigabytes”, Academic Press, USA, 1999 [Unit 2]

3. Bob Boiko, “Content Management Bible”, John Wiley & Sons, USA, 2001 [Units 3,4,5]

Reference Books:

1 .Abdreas Ulrich Mauthe And Peter Thomas, “Professional Content Management Systems – Handling Digital Media Assets”, John Wiley & Sons, USA, 2004

2. Dave Addey, James Ellis, Phil Suh, David Thiemecke, “Content Management Systems (Tool Of The Trade)”, Apress, USA, 2003.

Elective Course II **2.GRID COMPUTING**

Objectives:

The course will provide an indepth introduction to grid technologies and applications.

Unit I

Introduction: Grid Computing & Key Issues – Applications – Other Approaches – Grid Computing Standards – Pragmatic Course of Investigation.

Unit II

Grid Benefits & Status of Technology: Motivations – History of Computing, Communications and Grid Computing – Grid Computing Prime Time – Suppliers and Vendors – Economic Value – Challenges.

Unit III

Components of Grid Computing Systems and Architectures: Basic Constituent Elements-A Functional View – A Physical View – Service View.

Unit IV

Grid Computing Standards-OGSI: Standardization – Architectural Constructs – Practical View – OGSA/OGSI Service Elements and Layered Model – More Detailed View.

Unit V

Standards Supporting Grid Computing-OGSA: Functionality Requirements – OGSA Service Taxonomy – Service Relationships – OGSA Services – Security Considerations.

Text Book:

1. A Networking Approach to Grid Computing, Daniel Minoli, Wiley Publication

Reference Book:

1. Grid Computing – A Practical Guide to Technology and Applications, Ahmar Abbas, Charles River Media Publication.

Elective Course II **3. REAL TIME OPERATING SYSTEMS (RTOS)**

Objectives:

The primary goal of this course is to understand the basics of realtime systems and give knowledge and skills to design and develop embedded applications by means of realtime operating systems.

Unit I

Introduction, Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues. Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organiazations, Standard OS and Concurrency – Architectures, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes

Unit II

Requirements and Design Specifications: Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine-Basic features, Timing and clocks, Semantics Tools and Extensions, State charts - Concepts and Graphical Syntax, Semantics and Tools. Declarative Specifications: Regular Expressions and Extensions, Traditional Logics - Propositional Logic, Predicates, Temporal logic, Real time Logic

Unit III

Deterministic Scheduling : Assumptions and Candidate Algorithms, Basic RM and EDF. Results, Process Interactions-Priority Inversion and Inheritance Execution Time Prediction: Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema. Practice, Prediction by optimisation, System Interference and Architectural Complexities

Unit IV

Timer Application, Properties of Real and ideal clocks, Clock Servers – Lamport's Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization- Centralized Synchronization, Distributed Synchronization. Programming Languages: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam

Unit V

Operating Systems: Real Time Functions and Sevices, OS Architectures-Real Time UNIX and POSIX, Issues in Task management- Processes and Threads, Scheduling, Synchronization and communication

Text book:

1. Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc,2002

Reference Book:

1.Jim Cooling,"Real time operating systems",Lindentree associates, 2003

Elective Course III 2.PATTERN RECOGNITION

Objective:

It gives the knowledge about the basic techniques and methods used in pattern rcognition

Unit I :

Introduction and Bayerian Decision Theory-Introduction to pattern recognition, Systems, design cycles, learning and adoptation,Bayerian decision theory, minimum error-rate classification, classifiers, discriminant functions and decisions surfaces.

Unit II:

Maximum – Likelihood and bayerian parameter estimation - Minimum – Likelihood estimation and bayerian parameter estimation, Guarian case and general theory, problems of dimeusability, Hidden marker models.

Unit III :

Nonparameter Techniques - Density estimation, parazen windows, Kn – Nearest neighbour, estimation, The nearest neghlaur, rode, metris and nearest – neghron, classification, fuzzy classification, approximation by series expansions.

Unit IV :

Linear Discriminant functions - Linear discriminant functions and decision surfaces, generalized linear discrminant functions, The two category unicorly separate case, minimizing the perception criterion function, relaxation procedures, nonrepersable behaviour, Minimum squared-error procedures, The Ho – Kashyap Procedures, support vexter machines, multicategory generalization.

Unit V :

Multilayer Neural Networks - Feed forward operations and classifications, back propagation algorithm, error factors, back propagation as feature & mapping, back propagation, bayer theory and probability, practical techniques for improving back propagation, regularization, complexity adjustment and pruning.

Text Book:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification” 2nd Edition, John Wiley

Reference Book:

1. John Hertz, Andres Krogh & Richard G. Palmer, “Introduction to the theory of Neural Computation”, Addison Wesley

Elective Course III 3.PARALLEL COMPUTING

Objectives:

To give knowledge about the parallelize programs and its algorithms.

Unit I

Introduction to Parallel Computing – Motivating Parallelism – Scope of Parallel Computing – parallel programming platforms : Implicit parallelism trend in microprocessor architecture – Limitations of memory system performances – Dichotomy of parallel platforms – Physical organization of platforms Communication cost in parallel machines – Routing mechanism for interconnection networks

Unit II

Principles of parallel algorithm Design – Preliminaries – Decomposition techniques – Characteristics of task and interactions – Mapping techniques for load balancing

Unit III

Methods for containing interaction overhead – Parallel Algorithm models – one –to – All Broadcast and All – to – One Reduction – All – to – All Broadcast and Reduction

Unit IV

Analytical Modeling of Parallel Programs – Sources of overhead in parallel programs – Performance metrics for parallel systems – The effect of Granularity on performances – Scalability of parallel systems – Minimum execution time and minimum cost – optimal execution time – Asymptotic analysis of parallel programs

Unit V

Sorting – Issues in sorting on parallel computers – Sorting Networks – Bubble sort and its variables – Quicksort – Bucket and sample sort – Others sorting algorithms

Text Book:

1. Introduction to Parallel Computing, Second edition, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education

Reference Books:

1. Introduction to Parallel Processing Algorithms and Architecture, Bchrooz Parhami, Plenum Series, 2002
2. Parallel Computation, Model and Methods, Prentice Hall, 1997.
3. An Introduction to Parallel Algorithms, Addison-Wesley Pub Co, Reading, MA, 1992.
4. F. T. Leighton, Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes, Morgan Kaufmann, CA 1992.

Elective Course IV **2.REAL TIME AND EMBEDDED SYSTEMS**

Objectives:

To enable the student to familiar with the concepts of embedded systems and its applications

Unit I

Introduction: Introduction to Embedded systems – Processor and memory organization-Devices and buses for Device Networks – Device drivers and Interrupt servicing mechanism.

Unit II

RTOS : RTOS – Programming tools – Case studies- Hardware- software Codesign in an Embedded system

Unit III

Real Time Systems : Basic Real time concepts – Computer hardware – Language issues – Software life Cycle

Unit IV

REAL TIME SPECIFICATIONS: Design techniques – Real-time kernels – Intertask communication and synchronization – Real –time memory management

Unit V

Multiprocessing Systems : Multiprocessing Systems - Hardware/Software integration- Real time Applications

Text Book:

1. Raj Kamal, 'Embedded Systems Architecture, Programming and Design', Tata Mc-Graw-Hill,2003 2. Phillip A.Laplante, "Real –Time Systems Design and Analysis, An Engineer's Handbook", Prentice-Hall of India,2002

Reference Books:

1. R.J.A.Buhr, D.L.Bailey, "An Introduction to Real Time Systems: Design to networking with C/C++", Prentice- Hall, International, 1999.

2. Grehan Moore and Cyliax, "Real Time Programming: A guide to 32 Bit Embedded Development Reading: Addison- Wisley-Longman", 1998.

3. Haeth, Steve, "Embedded systems Design", Newnes,1997.

Elective Course IV **3.GENETIC ALGORITHM**

Objectives:

To enable the student to familiar with the concepts of genetic algorithms and its applications

Unit I :

Basics of biological evolution - Darwin, DNA, etc. Basics of Gas – selection, recombination and mutation - Choices of algorithm: (mu,lambda) - (mu+lambda), steady-state, CHC, etc. Linkage and epistasis. The standard test functions. Fitness and objective functions: scaling, windowing etc. Representational issues: binary, integer and real-valued encodings; permutation-based encodings. Operator issues: different types of crossover and mutation, of selection and replacement. Inversion and other operators.

Unit II :

Constraint satisfaction: penalty-function and other methods; repair and write-back; feasibility issues. Experimental issues: design and analysis of sets of experiments by t-tests, F-tests, bootstrap tests etc.Some theory: the schema theorem and its flaws; selection takeover times; optimal mutation rates; other approaches to providing a theoretical basis for studying GA issues.Rival methods: hill-climbing, simulated annealing, population-based incremental learning, tabu search, etc. Hybrid/memetic algorithms.

Unit III :

Multiple-solutions methods: crowding, niching; island and cellular models. Multi-objective methods: Pareto optimisation; dominance selection; VEGA; COMOGA.

Unit IV :

Genetic programming: functions and terminals, S-expressions; parsimony; fitness issues; ADFs. Evolving rules and rule-sets. SAMUEL and related methods. Classifier systems: the Pittsburgh and Michigan approaches. Credit allocation: bucket-brigade and profit-sharing. Hierarchic classifier systems.

Unit V :

Genetic planning: evolving plans, evolving heuristics, evolving planners, optimising plans. Ant Colony Optimization: Basic method for the TSP, local search, application to bin packing.Applications: engineering optimisation; scheduling and timetabling; data-mining; neural net design; etc. Some further ideas: co-evolution; evolvable hardware; multi-level Gas; polyploid GAs.

Text Book:

1.M. Mitchell: “An Introduction to Genetic Algorithms”, MIT Press, 1996.

Reference Books:

1.W. Banzhaf, P. Nordin, R. E. Keller, F. D. Francone: “Genetic Programming: An Introduction”. Morgan Kaufmann, 1998.

2. E. Bonabeau, M. Dorigo, G. Theraulez: Swarm Intelligence: From Natural to Artificial Systems. Oxford University Press, 1999

Elective Course V **2.ARTIFICIAL NEURAL NETWORKS**

Objective:

To enable the student to familiar with to Fuzzy Set Theory, Fuzzy Systems Adaptive Resonance Theory and Back Propagation Networks

Unit I

Basics of artificial neural networks**:** Characteristics of Neural Networks – Historical development of Neural Network principles – Artificial Neural Networks: Terminology – Models of Neuron – Topology – Basic Learning Laws.

Unit II

Activation And Synaptic Dynamics : Introduction – Activation Dynamic Models – Synaptic Dynamic Model – Learning Models – Learning Methods.

Unit III

Functional Units Of Ann For Pattern Recognition Tasks **:**Pattern Recognition Problem – Basic Functional Units – Pattern Recognition Tasks by the Functional Units – FEED FORWARD NEURAL NETWORKS: Introduction – Analysis of Pattern Association Networks – Analysis of Pattern classification Networks – Analysis of Pattern Mapping Networks.

Unit IV

Feedback Neural Networks :Introduction – Analysis of Linear Auto Associative FF Networks – Analysis of Pattern Storage Networks. COMPETITIVE LEARNING NEURAL NETWORKS : Introduction – Components of a Competitive Learning Network – Analysis of Feed back Layer for Different Output Functions – Analysis of Pattern Clustering Networks – Analysis of Feed Mapping Network.

Unit V:

Applications Of Neural Systems : Applications of Neural Algorithms and Systems character Recognition – Expert Systems Applications – Neural Network Control Applications, Spatio – Temporal Pattern Recognition – Neocognitron and other Applications.

Text Books:

1. For Units I to IV : B.Yegnanarayanan, "Artificial Neural Networks", Eastern Economy edition – Chapter 1, 2.

2. For Unit – V: Jacek M.Zurada,"Introduction To Artificial Neural Systems" (1994) – Jaico Publishing House.

Reference Book:

1. J.Hertz, A.Krogh., and R.G. Palmer "Introduction to the theory of Neural Computation", -, Addison – Wesley 1991

Elective Course V **3.ROBOTICS**

Objective:

To understand the architecture and the mechanisms used in robots.

Unit I

Fundamentals of robot Technology: Robot anatomy. Work volume. Drive systems. Control - Systems and dynamic performance - Accuracy and repeatability - Sensors in robotics – Robot reference frames and coordinates and robot kinematics.

Unit II

Robot kinematics: Matrix representation - Homogeneous transformations - Forward and inverse kinematics - Robot dynamics - Differential motions of a frame - Jacobian static force analysis.

Unit III

Configuration of a robot controller : End effectors - Mechanical and other types of grippers - Tools as end effectors - Robot and effector interface - Gripper selection and design - Introduction to robot languages.

Unit IV

Applications for manufacturing - Flexible automation - Robot cell layouts – Machine interference - Other considerations in work cell design - Work cell control – Interlocks – Robot cycle time analysis.

Unit V

Simulation of robotic work cells - Typical applications of robots in material transfer, machine loading/unloading; processing operations; assembly and inspection.

Text Book:

1. “Introduction to Robotics analysis, Systems & Applications” - Saeed B. Niku – Pearson Education Singapore P. Ltd., 2002.
2. “Robotic Technology and Flexible Automation” - S.R. Deb, Tata McGraw Hill Publishing Co. Ltd., 2003.
3. “Robotics & Control”- R.K. Mittal,I.J. Nagrath - Tata McGraw & Hill, 2005.

Reference Book:

1."Fundamentals of Robotics, analysis & Control" Robert J. Schilling, Prentice Hall of India P.Ltd., 2002.