MASTER OF COMPUTER APPLICATIONS

SYLLABUS

FOR

CREDIT-BASED CURRICULUM

(Applicable for 2013-2014 onwards)

DEPARTMENT OF COMPUTER APPLICATIONS
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI-620 015
TAMIL NADU - INDIA
HEAD OF THE DEPARTMENT:

1. Dr. A. Vadivel

MEMBERS OF THE DEPARTMENT:

1. Dr. N. P. Gopalan
2. Dr. A. V. Reddy
3. Dr. B. Ramadoss
4. Dr. Michael Arock
5. Dr. S. Nickolas
6. Dr. S. R. Balasundaram
7. Dr. P. J. A. Alphonse
8. Dr. S. Domnic
9. Dr. (Mrs). B. Janet
10. Dr. S. Sangeetha
11. Dr. R. Eswari
12. Dr. U. Srinivasulu Reddy
13. Dr. M. P. Anuradha (On Contract)
14. Dr. V. Gayathri (On Contract)
15. Dr. S. Suresh (On Contract)
16. Dr. R. Siva Shankar (On Contract)
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<th>Semester</th>
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L: LECTURE | T: TUTORIAL | P: PRACTICAL | C: CREDITS
SEMESTER-I

CA711 PROBLEM SOLVING AND PROGRAMMING

Objective:
To learn problem solving methodologies and aspects of C programming.


C Language Fundamentals: Character set – Constants – Keywords – Primitive data types – Declaration - Sequential, selective and repetitive structures

Arrays – Declaration, initialization and accessing array elements - Passing array elements and arrays as arguments – Functions: Definition – call – prototypes - block structure -Storage Classes

Pointers – Address and indirection operators, Pointer type declaration, assignment, initialization – Pointer arithmetic – Functions and pointers – Arrays and pointers -Strings and pointers – Multi-dimensional arrays using pointers – Pointer to arrays – Pointers to functions – Dynamic memory management


REFERENCES:
Course Outcome:
Students will be able to:
1. Write structured pseudo codes for a given problem.
2. Write C programs for solving problems.
3. Design programs for complex problems applying the concepts of Arrays and pointers.
4. Design programs for complex problems applying the concepts of structures and files.

CA713    MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

Objective:
To learn the mathematical foundations applicable to computing.

Sets - Relations – Posets - Functions - Mathematical Inductions (Simple and strong) – Principles of Counting (Addition & Multiplication)


Recurrence Relations and Generating Functions - Homogeneous and non-homogeneous recurrences and their solutions - solving recurrences using generating functions

Mathematical Logic – Predicate Calculus – Scope – Binding – Resolution – Regular Grammars

Finite Automata – Context-Free Grammars – Chomsky’s Normal form -Griebach Normal Form - Push-down Automata - Equivalence of CFL’s and PDA’s - Non-context free languages

REFERENCES:
2. NarsinghDeo, “Graph theory and applications to Engineering and Computer Science”, PHI, 1986.

Course Outcome:
Students will be able to
1. Explain functions and related concepts and illustrate its direct application in Computer languages
2. Solve the problems using the concepts of Graphs, Trees.
3. Deduce complex task by various Mathematical logic.
4. Solve recurrence relations for a given problem.
<table>
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<th><strong>Objective:</strong></th>
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<td>To understand the basic structure of a digital computer and to study the operations of internal components.</td>
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<th>Number Systems - Binary Arithmetic - Boolean algebra - Map Simplifications - Gates - Combinational Circuits - Sequential Circuits.</th>
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<td>CPU: Arithmetic And Logic Unit - Instruction Sets - RISC - CISC - Instruction pipeline - Addressing modes and formats - Register organization - Control Unit Operation - Processor organization.</td>
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<td>External Devices: I/O modules - Programmed I/O - Interrupt Driven I/O - Direct Memory Access - I/O Channels - Asynchronous Data Transfer.</td>
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**REFERENCES:**

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<td>Students will be able to:</td>
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<tr>
<td>1. Define the Boolean algebra and explain its use in circuit design</td>
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<td>2. List the different types of memory and distinguish them.</td>
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<td>3. Discriminate the various functional units of CPU and illustrate functioning of I/O devices</td>
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<tr>
<td>4. Explain latest processor technologies and evaluate systems for one’s own requirements</td>
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Objective: To learn the fundamentals of accounting and financial management.

Assets – Liabilities – Types - Trading account – Accounting records and Systems – Limitations - Income statement – Preparation and Interpretation

Depreciation – Methods - Inventory methods, Sources of working capital, Fund flows, Cash flows – Financial Statement analysis

Ratio analysis - Use of ratios in interpreting Trading Accounts and Financial Statements, Limitations – Management Accounting

Variable costs – Fixed costs – Cost Volume Profit Analysis – Break even marginal and full costing contribution, Standard costing - Analysis of variance - Computer accounting and algorithms

Characteristics of Budgets - Forecasting – Long term, Short term – Methods of capital investment decision making, Sensitivity Analysis, Cost of capital

REFERENCES:

Course Outcome: Students will
1. Prepare and analyse the final accounts of the firm
2. Prepare and analyse the funds & cash flow statements of the firm
3. Perform basic analysis of financial statements and write a report on the financial performance, conditions and effectiveness of the firm
4. Analyse and evaluate costing systems
5. Prepare different types of budgets and policies
Objective:
To learn the fundamentals of probability and statistical methods.


Binomial, Poison and Normal Distributions – Fitting of Probability distributions – Correlation and Regression – Linear regression – Correlation coefficient – Multiple linear regression


Estimation : Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.

Test of Hypothesis- Testing for Attributes – Mean of Normal Population – One-tailed and two-tailed tests, F-test and Chi-Square test - ANOVA – One way and two way classifications

REFERENCES:


Course Outcome:
Students will be able to
1. Explain basic probabilistic and statistical models and illustrate their related applications
2. Estimate the likelihood of events from population
3. Propose, test and evaluate hypothesis.
CA701 PROGRAMMING IN C LAB
Exercises for learning basic features of C and exercises to solve various numerical methods

Course Outcomes:
Students will be able to:
1. Write C programs for solving any problems.
2. Develop programs for complex problems applying the concepts of Arrays and pointers.
3. Develop programs for complex problems applying the concepts of structures and files.

CA703 BUSINESS COMMUNICATION

Objective:
The Course aims to:
1. Introduce the dynamics of Communication in the Business world.
2. Help to familiarize and practice the different kinds of communication tools.
3. Give practice in the nuances of spoken communication.
4. Expose to the different forms of Business communication.

Communication in the Business World: Communication: Concepts and Goals – Theories of communication – Organizational and personal goals. Psychology of communication – Channels and Networks – Barriers to and cost of communication

Listening and Speaking Practice: Message Planning – Purposive Listening – – Familiarizing to different accents and tones – Listening Practice - Oral Communication – Extempore speech practice – Presentation skills – Group Discussion Practice - Interview skills. Telephone strategies

Writing practice: Business Correspondence – Different kinds of written communication in business Organizations - Marketing Language – Creativity and Appeal – Report writing practice

Technology and Communication: Practice in telephone etiquette – Limitations & possibilities of E mail - Use of Power point- Role of mass media in business communication

REFERENCES:

Course Outcome:
1. Students will be able to communicate in the business world using different communication tools
SEMESTER -II

CA710 DATA STRUCTURES AND APPLICATIONS

Pre Requisite: CA713

Course Objective:
To introduce different data structures; searching and sorting techniques and their applications.

Linear data Structures – Arrays, Structures, Linked Lists – Singly, Doubly, Circular, XOR, VList, Skip, Jump List, Stack: Definition and examples, Representing Stacks - Queues: Definition and examples, priority queue, Deque, IRD, ORD – Applications of Stack, Queue and Linked Lists - Hashing

Non-Linear data Structures - Graphs – Representation – Linked representation of Graphs – Graph Traversals - Binary Trees – Binary Tree Representations – node representation, internal and external nodes, implicit array representation - Operations on binary trees – Binary tree Traversals - Representing Lists as Binary Trees

Advanced data structures - Data structures for disjoint sets- Red-black trees – insertion and deletion – B-trees – Definition, insertion, deletion – Splay tree, Binomial heaps – operations – Geometric data structures: segment trees, range trees, partition trees

Single-source shortest path algorithms – Bellman-Ford algorithm and Dijkstra’s algorithm - Transitive closure - Topological sort

Basic sorting techniques – selection sort, bubble sort, insertion sort and merge sort – Basic Search Techniques – linear search and binary search – Search Trees – Tree searching

REFERENCES:

Course Outcome:
Students will be able to
1. Use linear and nonlinear data structures to solve real-time problems
2. Apply basic searching and sorting techniques in different application domains
3. Use design strategies to solve complex problems

CA712 DATABASE MANAGEMENT SYSTEMS

Pre Requisites: CA711, CA713

Objective:
To learn different database models and design of databases and to study query languages and transaction management.


Database Design – Pitfalls in Relational Database Design – Functional Dependencies – Decomposition – Normalization – I to V Normal Forms


REFERENCES:

Course Outcome:
Students will be able to:
1. Illustrate the features of DBMS & Models for designing databases
2. Describe the nuances of Data retrieval methods
3. Apply normalization techniques in DB design
4. Perform concurrency and Transaction Management operations
**CA714 OPERATING SYSTEMS**

**Pre Requisite:** CA715

**Objective:**
To introduce basic concepts and features of OS with case study on different operating systems.

Operating System concept- OS Structure –Services-System calls – Process management-
Process Concept-Operations on process-Cooperating processes- Inter-process communication-Process scheduling-Scheduling algorithms-Threads- Multithreading models.

Process synchronization- critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors Deadlock-
Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock

Memory management-Buddysystem-Paging-segmentation-Virtual Memory –Demand paging-Page replacement algorithms – Allocation of frames – Thrashing-Working set model

Files and Directories - Files System structure- Implementation –File allocation methods-Free space management. I/O systems – I/O interface –Kernel I/O subsystem. Disk scheduling algorithms- Disk management-Swap space management

Protection andsecurity -Case Study-Linux, Windows, Mac OS and Mobile OS

**REFERENCES:**

**Course Outcome:**
Students will be able to:
1. Use system calls to interact with OS
2. Synchronize multiple processes and handle issues in synchronization
3. Implement memory management techniques
4. Implement algorithms in secondary storage and file management techniques
5. Design the functionalities of OS
CA716  OBJECT ORIENTED PROGRAMMING

**Pre Requisite:** CA711

**Objective:**
To learn the basic principles of object-oriented programming paradigm using C++


Arrays – Pointers – this pointer – References – Dynamic memory Allocation – functions Overloading – Default arguments – Overloading Constructors – Pointers to Functions – Operator Overloading - Type Conversion

Inheritance – Types - Derived Class Constructors- Issues in Inheritance – Virtual base Class – Polymorphism – Virtual functions – Pure virtual functions

Class templates and generic classes – Function templates and generic functions – Overloading function templates – power of templates – Exception Handling – Derived class Exception – over handling generic functions – Exception handling Functions


**REFERENCES:**

**Course Outcome:**
Students will be able to:
1. Identify classes with attributes and functions for given problem
2. Analyze the relationship between the classes link them using appropriate concepts
3. Design and implement abstract data types.
4. Devise generic classes capable of manipulating primitive and user defined data types.
5. Perform object oriented analysis on the given problem and design a complete system to solve it.

CA718 RESOURCE MANAGEMENT TECHNIQUES

Pre Requisite: CA713

Objective:
To learn different resource management techniques.


Formulation of linear programming problems – Simplex method – Big M method – Two Phase method – Dual Simplex method – Primal Dual problems - Transportation problem – Assignment problem


Functions of inventories – Deterministic Inventory problems with or without shortage cost – Multi-item deterministic inventory problem – Inventory problem with price breaks – probabilistic models with uniform demand (discrete and continuous cases)

Queuing theory - notation and assumptions – characteristics of queue – Poisson input process – exponential service times – Queuing models – M/M/1 – M/M/C – M/M/1/N – M/M/C/N

REFERENCES:

Course Outcome:
Students will be able to:
1. Formulate and solve LP /NLP /DP Problems
2. Identify appropriate model for given inventory problems and solve the problems
3. Solve queuing problems using queuing models
CA702 DBMS LAB

Pre-requisite: CA 712

Exercises / case studies that require table design, normalization and query building.

Course Outcome

Students will be able to:
1. Design and work in databases, tables
2. Perform normalization and other database tasks
3. Build complex queries for data retrieval at multilevel

CA704 DATA STRUCTURES LAB

Pre-requisites: CA711, CA713, CA710

Exercises to implement various data structures.

Course Outcome

Students will be able to:
1. Implement linear and nonlinear data structures to solve real-time problems
2. Perform searching and sorting techniques to different application domains
3. Implement different design strategies to solve complex problems
Objective:
To introduce concepts of data mining techniques and its applications in knowledge extraction from databases.


Data Preprocessing: Summarization - Data cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation

Mining Frequent Patterns – Frequent Itemset Mining Methods. Classification: Classification by Decision Tree Induction – Bayesian Classification – Rule based Classification - Prediction – Accuracy and Error Measures

Cluster Analysis – Types of Data in Cluster Analysis – Categorization of clustering Methods – Partition Methods - Outlier Analysis – Mining Data Streams – Social Network Analysis – Mining the World Wide Web

Data Warehousing: OLTP Vs OLAP - Multidimensional Data Model -DW Architecture Efficient Processing of OLAP queries - Metadata repository – DWH Implementation - OLAM

REFERENCES:
3. K.P.Soman, ShyamDiwakar, V.Ajay, “Insight into Data Mining Theory & Practice, Prentice Hall India,2012,
4. G.H.Gupta, “Introduction to Data Mining with Case Studies” , 2nd Edition, PHI.

Course Outcome:
Students will be able to:
1. Explain the concepts in data mining and KDD, recognizing issues in Data Mining
2. Practice the preprocessing operations of Data
3. Define the methodologies in Data interpretation, transformation and reduction
4. Perform Association Rule Mining, Classify and Cluster the data sets into groups
CA723 GRAPHICS AND MULTIMEDIA

Pre-requisite: CA710

Objective:
To learn the principles of Graphics Algorithms and Multimedia Techniques


Two-dimensional Transformations – Scan Conversion Algorithms – Windowing – Clipping – Segmenting – Viewport Transformations


Multimedia communication systems – Multimedia Information Retrieval – Video conferencing – Virtual reality

REFERENCES:

Course Outcome:
Students will be able to:
1. Describe the basics of 2D drawing Algorithm and transformations
2. Explain the basics of 3D drawing Algorithm and Transformations
3. Develop interactive animations using multimedia tools
4. Explain multimedia transmission technologies
Objective:
To impart concepts of a comprehensive study on the theories, processes, methods, and techniques of building high-quality software in cost-effective ways.

Introductory concepts – The evolving role of software – Its characteristics, components and applications- A layered technology – the software process – Software process models - Software process and project metrics – Measures, Metrics and Indicators- ethics for software engineers.


Analysis and Design – Design concept and Principles, Methods for traditional, Real time of object oriented systems – Comparisons – Metrics- Quality assurance


REFERENCES:

Course Outcome:
Students will be able to:
1. State the proven principles/techniques/tools, current standards, and best practices of software Engineering.
2. Estimate cost, effort and risk involved in a project
3. Choose a suitable design model for software development
4. Develop a software using formal software engineering approaches
5. Describe the principles of re-engineering and reverse engineering
CA727 COMPUTER NETWORKS

Pre-requisites: CA714, CA711

Objective:
To learn various network architectures and protocols and the functions of different layers in line with IEEE standards.


Error Detection and Correction – VRC – LRC – CRC – Checksum – Hamming Distance for Error Correction – simulator development to capture various packets flowing in the Data Link Layer

Switching - Packet Switching – Switching and Forwarding – Bridges and LAN switches – Internetworking – Simple Internetworking – Routing - Selective routing protocol specification

Reliable Byte Stream (TCP) – Simple Demultiplexer (UDP) – TCP Congestion Control – Congestion Avoidance Mechanisms – Streaming Protocol

Domain Name Service (DNS) – Email - SMTP – MIME – HTTP – SNMP-TELNET-FTP

REFERENCES:

Course Outcome:
Students will be able to:
1. List the functionalities of networking layers of both OSI and TCP/IP reference model
2. Explain design issues of DLL and techniques to resolve it
3. Describe the principles of switching and routing algorithms
4. Distinguish TCP and UDP related formats, procedures.

Industrial Component:
Simulator development to capture various packets flowing in the Data Link Layer
Pre-requisites: CA710, CA713

Objective:
To learn about Time Complexity and various algorithmic design methodologies.


REFERENCES:

Course Outcome:
Students will be able to:
1. Analyze the complexity of polynomial algorithms.
2. Apply various design strategies for solving problems
3. Distinguish NP hard and NP complete problems from other problems

Course Outcome:
CA705 OS AND NETWORKS LAB

Pre-requisites: CA714, CA727

I. Exercises to learn various commands in operating systems and implement OS algorithms
II. Exercises to implement network principles

Course Outcome:

Students will be able to:
1. Work with various commands in operating systems.
2. Implement different algorithms in OS
3. Implement various network principles.

CA707 GRAPHICS AND MULTIMEDIA LAB

Pre-requisite: CA 723

Exercises related to:
- Realizing various graphics algorithms
- Implementing Multimedia coding schemes

Course Outcome:

Students will be able to:
1. Implement various graphics algorithms
2. Implement multimedia coding schemas
SEMESTER-IV

CA722 ORGANIZATIONAL BEHAVIOR

Pre-requisite: CA 703

Objective:
To learn the leadership skills and group behavior.


Conflicts - Individual conflict, Interpersonal conflict, Inter-group conflict - Conflict Resolution - Negotiation

Foundations of Organization Structure - Organizational Culture – Organizational Dynamics

REFERENCES:

Course Outcome:
Students will be able to:
1. Identify their personality type and behavioral pattern
2. Identify the basic skills of leadership
3. Apply the principles of conflict resolution and learn about group behavior
4. Adapt to the organization culture, structure and dynamics

Industrial Component:
A series of tutorials on Organisation development
CA724 INFORMATION SECURITY

Pre-requisite: CA 713

Objective:
To study the concepts and requirements of Information Security.


Cryptography: Classical Cryptography, Symmetric Cryptography, Public Key (Asymmetric cryptography), Modern Cryptography. Forensics: DRM technology (including watermarking and fingerprinting of images, video and audio), Steganography, Biometrics


Information Security Threats: Viruses, Worms and other malware, Email Threats, Web Threats, RFID, Identity Theft, Data Security Breaches, Hacking Tools and Techniques

REFERENCES:

Course Outcome:
Students will be able to:
1. Explain the models of information security
2. Apply cryptography techniques to data
3. Simulate the various network security issues
4. Experiment with application security
5. Explore the nature and logic behind the various security threats on the web

Industrial components:

Expert Lecture on Security Related Issues from Ethical Hackers.
CA726 DISTRIBUTED TECHNOLOGY

Pre-requisites: CA727, CA712, CA714

Objective:
To learn the various distributed objects and technologies.

Introduction - Different Forms of Computing - Architecture - Inter-process Communications: IPC Program Interface - Event Synchronization - Timeouts and Threading - Deadlocks and Timeouts - Data Representation - Data Encoding - Text-Based Protocols - Request-Response Protocols - Event Diagram - Sequence Diagram - Connection-Oriented Vs Connectionless IPC


Socket API and Group Communication: Background - The Socket Metaphor in IPC - The Datagram Socket API - The Stream Mode - Socket API - Sockets With Non-blocking I/O Operations - Secure Socket API. Group Communication – Unicasting - Multicasting and its types - Java Basic Multicast API - Reliable Multicast API

Distributed Objects: Message Passing Vs Distributed Objects - An Archetypal Distributed Object Architecture - Distributed Object Systems - Remote Procedure Calls- Remote Method Invocation: RMI Architecture, API for Java RMI, Sample RMI Application - Building an RMI Application - Testing and Debugging - Comparison of RMI And Socket APIs


REFERENCES:
Course Outcome:
Students will be able to:
1. Explain the principles and issues in Inter Process Communication
2. Use the concepts of client/server in developing applications
3. Implement IPC applications using sockets
4. Practice the distributed object technologies and use them in developing applications

CA728 OBJECT ORIENTED ANALYSIS AND DESIGN

Pre-requisites: CA716, CA729

Objective:
To learn the concepts of Object Oriented Analysis and Design; exposing the development of OOAD based applications.


Process of design, design principles, architectural patterns, design document, difficulties and risks in design - Frameworks: reusable subsystem. Design patterns – Singleton, observer, adapter, Façade, proxy with examples. - Pattern Categories - Relationships between patterns - Pattern descriptions – Patterns based Applications – Object Oriented Database


REFERENCES:

Course Outcome:
Students will be able to:
1. Define the fundamentals of OO approach
2. Design OO Application using design patterns.
3. Solve real world problems by applying OOAD principle
4. Acquire expertise in Java Programming

CA706 DISTRIBUTED TECHNOLOGY LAB

Pre-requisite: CA 726

- Simple Client and Echo Server Example.
- Graphical Client and Multithreaded Echo Server.
- Synchronization with shared data and threads
- Broadcasting and Multicasting
- Sending and Receiving Objects (Object Serialization)
- Database Communications
- Java RMI
- Any Middleware Application

Course outcomes:

Student will be able to implement

1. Graphical Client and Multimedia Echo Server
2. Synchronization with shared data and threads
3. Sending and Receiving Objects (Object Serialization)
4. Middleware Applications
Pre-requisite: CA 724

Exercises to learn information security related programming.

Course Outcome

Students will be able to:

1. Implement cryptography techniques to data
2. Simulate the various network security issues
3. Experiment with application security
4. Explore the nature and logic behind the various security threats on the web
SEMESTER-V

CA731 WEB TECHNOLOGY

Pre-requisites: CA716, CA726

Objective:
To learn the concepts web technologies; develop and deploy effective web applications;


Client side programming – Java script language – java script objects – host objects

Browsers and the DOM

Server side programming – Java servlets – basics – simple program – separating
programming and presentation – ASP/JSP - JSP basics ASP/JSP objects – simple ASP/JSP
pages.


Middleware Technologies – Ecommerce – Architectures – Technologies – Ajax – Advanced
Web Technologies and Tools.

REFERENCES:

Course Outcome:
Students will be able to:
1. Develop client side and server side applications.
2. Design and develop enterprise applications
3. List the various middleware technologies and use them to develop applications.
CA733  CLOUD COMPUTING

Pre-requisites: CA714, CA727, CA726

**Objective:**
To learn the various concept of Distributed and Cloud computing and to study the Architecture and service models in Cloud computing.


Cloud Programming and Software Environments – Features of Cloud and Grid Platforms – Parallel and Distributed Paradigms – Programming Support of Google App Engine – Amazon AWS and Microsoft Azure - Emerging Cloud Software Environments

REFERENCES:
Course Outcome:
Students will be able to:
1. Acquire Knowledge on the features and development of Cloud Computing.
2. Define the principles of virtualization
3. Use various performance criteria to evaluate the quality of the cloud architecture
4. Identify the Service-Oriented Architecture for Distributed Computing workflow.

Industrial components:
   Expert Lecture on current advancement in cloud and cloud support models.

CA709  WEB TECHNOLOGY LAB

Pre-requisite: CA 731

Exercises / case studies on HTML, XML, PHP, JSP etc. – Designing web portals

Course Outcome

With HTML, XML, PHP, JSP, students will be able to
1. Develop client side and server side applications.
2. Design and develop enterprise applications
3. Implement the various middleware technologies and use them to develop applications.

CA749  MINI PROJECT WORK

Pre-requisites: CA711,CA712,CA725

Course Outcome:

Students will be able to
1. Identify the problem related to the project work
2. Implement the case studies using the concepts and techniques in the curriculum
CA750 PROJECT WORK

Pre-requisites: CA711, CA712, CA725

6 Months internal/external project work with submission of project work and viva-voce examination

Course Outcome

Students will be able to
1. Implement the solution for the chosen problem using the concepts and techniques in the curriculum
2. Record the research to the development process of a particular problem
ELECTIVES –A

CA7A1 BUSINESS INTELLIGENCE

Pre-requisite: CA721

Objective:
To know the BI as expert information, knowledge and technologies efficient in the management of organizational and individual business.

Decision Support and Business intelligence - Changing Business environments and computerized decision support, managerial decision making and support for decision making - DSS concept and framework Business intelligence - Major tools and techniques of managerial decision support - BI architectures

Essentials of Business Intelligence-Origins and drivers of business intelligence, successful BI implementation, characteristics of BI-Architecting the Data, Enterprise Data Model and its Benefits, Granularity of Data in Data Warehouse and Role of Metadata

Advanced Data Warehousing principles- Data warehousing architectures, DW development, real time DW and DW Administration and security issues-Visualization of Dimension model-Star, snowflake and other advanced models-Aggregated Fact tables -Relational DBMS Support for Dimensional Modeling- Advanced Topics in Dimensional Modeling - Selecting a Modeling Tool - Populating Data Warehouse

Dimensional modeling in BI environment - Dimensional Modeling - Modeling considerations -Dimensional model design life cycle - Case studies - Business Analytics and data Visualization - Business analytics overview, reports and queries, Advanced business analytics, data visualization, Real time BI, Business analytics and web intelligence - Structure of mathematical models for decision support and visual interactive simulation

Business performance Management - Business Intelligence Applications: Marketing models, Logistic and production models and Data Development analysis.

REFERENCES:

Course Outcome:
Students will be able to:

1. Explain the concepts of decision support and framework for Business Intelligence
2. Identify the practical implications and functions of BI
3. Design & construct data mart and data warehouse
4. Describe dimensional modelling and analytics involved in BI

CA7A2 UNIX AND SHELL PROGRAMMING

Pre-requisite: CA714

Objective:
To learn the UNIX operating system concepts and shell programming


REFERENCES:

Course Outcome:

Students will be able to:

1. Explain the concepts of UNIX Operating System
2. Use various file and directory commands in UNIX Operating System
3. Write shell scripts for various tasks

CA7A3 VISUAL PROGRAMMING

Pre-requisite: CA716

Objective:
Understand the principles of graphical user interface design and develop desktop applications and web services using .NET


.NET - Form- Event-Form Controls - Containers - Menus - Data controls - Printing - Reporting - Dialogs - Components - Single and Multiple Document Interfaces.


REFERENCES:
**Course Outcome:**
Students will be able to:

1. Define the basics of .NET framework
2. Use components in .NET to solve various application related problems
3. Design and develop web applications with ASP.NET

**Industrial Component:**
A series of lectures on the latest trends and technology

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**CA7A4 SOFTWARE ARCHITECTURE AND PROJECT MANAGEMENT**

**Pre-requisite:** CA725

**Objective:**
To know the issues related to the design of complex software and to learn the project management concepts and the use of tools.

Software components - COTS and infrastructure - Software variability management - Software architecture design methods - Architecture evaluation and assessment methods - architectural styles

Design Patterns - Evolution patterns - Software artifact evolution processes - Case studies - Java Beans


**REFERENCES:**


**Course Outcome:**
Students will be able to:

1. Explain various design and evaluation methods
2. Employ design patterns in the software architecture
3. Apply various phases of life cycle models
4. List various process models and describe issues related with quality assurance
5. Apply engineering activities involved in various project management phases

**Industrial Component**
Presentation of Case studies on the design & development of complex software and current practices of successful project management activities by practicing professionals from leading industries

**CA7A5 BUSINESS ETHICS**

**Pre-requisite:** CA722

**Objective:**
To introduce business ethics and its practices.


Environmental Pollution and Society - Marketing Ethics (in Products, Pricing, Promotion and Place) and Consumer protection – Ethics in Human Resources management (Recruitment and promotion policies, Working Conditions, Down Sizing Workforce), Ethical issues at the top management, Ethics in financial markets and investor protection – Ethical responsibility towards competitors and business partners

A Historical Perspective from Industrial Revolution to Social Activism – Current CSR practices of the firms in India and abroad. Conflicts in decision making from ethical and economic point of view - Ethical Dilemma - Solving ethical dilemma - Managerial integrity and decision making

Personal Integrity and self-development – wisdom based leadership.
History of Corporate form and models - Corporate Objective and goals, Ownership pattern – Issues in managing public limited firms – Agency problems

REFERENCES:

Course Outcome:
Students will be able to:

1. Define the principles of ethics and morals of business

2. Convey ethical response with respect to Competitors & Business Partners

3. Enhance the leadership skills with respect to decision making & business management

ELECTIVES -B
CA7B1GREEN COMPUTING

Pre-requisites: CA715,CA731

Objective:
To introduce green computing in the ICT environments.

Importance of Green IT: The Growing Significance of Green IT and Green Data Centers -All Basic Steps towards Green IT - The Basics of Green IT

Collaboration is Key for Green IT - The Government’s Role - Regulation and EPA Activity - : Regulating Greenhouse Gases - Role of the EPA -IT Company Support of Government Regulation -Educational Institutions and Government Regulation

Magic of Incentive - The Role of Electric Utilities - A Most-Significant Step - "Virtualizing" ITSystems: Consolidation and Virtualization - Data Storage

Need for Standard IT Energy-Use Metrics: SPEC -EPA- LEED- Green Grid Data Center Power-Efficiency Metrics: PUE and DciE. Data Center - Strategies for Increasing Data Center -
Cooling Efficiency - Fuel Cells for Data Center Electricity - Emerging Technologies for Data Centers.


REFERENCES:
2. Frederic P. Miller, Agnes F. Vandome, John McBrewster, "Green Computing", Alpha script publishing,

Course Outcome:
Students will be able to:
1. Deduce the need and basics of Green IT
2. Compare the collaborative effort of various agencies for the effectiveness of the Green IT
3. State the need for virtualization and its impact
4. List and categorize various IT energy-use metrics
5. Use Green IT in various areas and the future needs and trends.

CA7B2 IMAGE PROCESSING

Pre-requisite: CA723

Objective:
To understand the fundamental algorithms in image processing and to gain experience in applying image processing algorithms to real time problems.


Model of Image Degradation/restoration process – Noise models – Spatial filtering -Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Geometric mean filter


REFERENCES:

Course Outcome:
Students will be able to:

1. Explain the fundamental concepts of digital image processing
2. Distinguish the processing of image in spatial & frequency domains
3. List and illustrate the various models that involved in image processing
4. Use the compression standards & implement various compression techniques

CA7B3 SOFTWARE AGENTS

Pre-requisite: CA7A4

Objective:
To learn the concepts (basic to advanced levels) of agent technologies and their applications in developing complex software systems
Agent and user experience: Interacting with Agents - Agent from Direct Manipulation to Delegation - Interface Agent Metaphor with Character - Designing Agents - Direct Manipulation versus Agent Path to Predictable


Agent communication and collaboration: Overview of Agent Oriented Programming - Agent Communication Language - Agent Based Framework of Interoperability

Agent Architecture: Agents for Information Gathering - Open Agent Architecture - Communicative Action for Artificial Agent

Mobile agents and advanced concepts: Mobile Agent Paradigm - Mobile Agent Concepts - Mobile Agent Technology - Case Study: Tele Script, Agent Tel - Emerging Agent Technologies.

REFERENCES:

Course Outcome:
Students will be able to:
1. Define the concepts and issues of agent technology
2. Explain the architecture of agent technology
3. Describe communication processes involved in agent technology
4. Apply the concepts of mobile agents.

CA7B4 MARKETING MANAGEMENT

Pre-requisites: CA717, CA722

Objective:
To facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.
Introduction to marketing, scope of marketing, core marketing concepts, new marketing realities, production concept, product concept, selling concept, marketing concept, Relationship Marketing, Integrated Marketing, Performance Marketing, new 4P’s


Product: Levels, hierarchy, Classification of products, Major product decisions, Product line and product mix; Branding, brand equity, Product life cycle – strategic implications, New product development and consumer adoption process. Pricing: Objective of pricing decision, factors affecting price determination, pricing policies, developing pricing strategies, strategies for new products and existing products

Promotion: Communication Process; Promotion mix – advertising, personal selling, sales promotion, publicity and public relations, direct marketing; Determining advertising budget; Copy designing and testing; Media selection; Advertising effectiveness; Sales promotion – tools and techniques

Market control: Annual plan control, sales analysis market share analysis, profitability control, marketing profitability analysis, efficiency control and strategic control. Trends in marketing, socially responsible marketing, internal marketing, green marketing, cause marketing, cause related marketing

REFERENCES:

Course Outcome:
Students will be able to:
1. Define the fundamentals of marketing
2. List the issues related to buying and target marketing
3. Apply the new product development strategies
4. Use product promotional techniques
5. Familiar with trends in analysis & control in marketing
CA7B5 SOFT COMPUTING

Pre-requisites: CA710, CA719

Objective:
- To introduce the techniques of soft computing
- To explain the hybridization of soft computing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.


Neural Network (NN), Biological foundation of Neural Network, 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

Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering

NeuroFuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN


REFERENCES:

Course Outcome:
Students will be able to:

1. Explain the basics of soft computing and their suitable industry related applications
2. Apply neural network principles and algorithms for given problems
3. Apply the principles of fuzzy algorithms for real time applications

Industrial Component:
A series of tutorials on MATLAB.
CA7B6 ADVANCED DATABASE TECHNOLOGY

Pre-requisites: CA712, CA721

Objective:
To learn advanced database models and design of databases


Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases – Location and Handoff Management – Mobile Transaction Models

REFERENCES:
**Course Outcome:**
Students will be able to:
1. Apply the principles of query optimization to a database schema
2. Design parallel and object database for real life application
3. Use distributed database management system

**CA7B7 MODELING AND COMPUTER SIMULATION**

**Pre-requisites:** CA707, CA713, CA719, CA723

**Objective:**
- To understand the techniques of random number generations and testing randomness.
- To design simulation models for various case studies like inventory, traffic flow networks, etc.
- To practice on simulation tools and impart knowledge on building simulation systems.

Simulation and Simulation Software - Systems – Models – Types, Components, Steps in Modeling – Simulation of statistical queuing, manufacturing and material handling


Random Numbers - Generation of Pseudo Random Numbers – Mid-Square Method – Linear Congruential Generators – Generating Random Variates from Continuous and Discrete Probability Distributions. System dynamics and object oriented approach in simulation


**REFERENCES:**
**Course Outcome:**

Students will be able to:
1. Practice simulation tools and build simulation systems
2. Assess the techniques of random number generations and testing its randomness
3. Design various simulation models for real time situation

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**CA7B8 BUSINESS PROCESSES MODELLING**

**Pre-requisites:** CA722, CA725

**Objective:**

- Identify and model core business processes at an organisational level
- Identify and model business processes at the process level

Procedure for business process modelling - Identification, Modelling, Analysis, Improvement, Implementation and Control; Approaches to business process modeling; hierarchy of business processes – organisation, process and task levels; differences between the process view and the functional view of an organization; advantages of the process view

Organisational model of processes - strategic context for business processes; Relationships between processes, including those at the same level and between levels of hierarchy; Building an organizational view of processes; Delivering value to customers and the value proposition

Modelling the business processes - Selected business process modelling technique(e.g., ontology) - Notation – actors, tasks, process flows, decisions and Rules; Modelling as-is business processes; Events that trigger business processes; External business events and Internal business events; Time-based business events The outcomes from business processes; Timelines for business processes; Business process measures

Evaluating and improving business processes - Identifying problems with the as-is business processes Analysing the process flow; Analysing the tasks; Staff performance issues; Challenging the business rules; Modelling the to-be business processes; Approaches to business process improvement

Transition - Integration of business process modeling and requirements definition; Implementation issues - Approaches – pilot run, direct changeover, parallel; Organisational design; Role definition; Staff development; Managing change implementation

**REFERENCES:**


**Course Outcome:**
Students will be able to:
1. Classify and analyze different types of business organization
2. Describe business process modeling
3. Visualize different business processes
4. Identify and solve issues related to Business Processes

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**ELECTIVES – C**

**CA7C1 HUMAN COMPUTER INTERACTION**

**Pre-requisites:** CA723, CA716

**Objective:**
To learn the concepts (basic to advanced levels) of user oriented aspects of product designs (physical to software); providing in depth study on Human Centric and Human oriented features in developing systems.

Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface. Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors

HCI and related fields – Cognition Theory – AI – Accessibility Issues – Assistive Technologies – Technologies for HCI – Research Directions in HCI

REFERENCES:
7. Soren Lauesen, “User Interface Design”, Pearson Education

Course Outcome:
To enable students to understand HCI principles and practice them in product designs.

Industrial Component:
Providing exposure to HCI based software development products.

CA7C2 BIOINFORMATICS

Pre-requisite: CA7B5

Objective:
To understand Genomic data acquisition and analysis, comparative and predictive analysis of DNA and protein sequence, Phylogenetic inference etc.

Introduction to bioinformatics, classification of biological databases, Biological data formats, application of bioinformatics in various fields. Introduction to single letter code of amino acids, symbols used in nucleotides, data retrieval – Entrez and SRS

Introduction to sequence alignment, substitution matrices, scoring matrices – PAM and BLOSUM. Local and Global alignment concepts, dot plot, dynamic programming methodology, Multiple sequence alignment – Progressive alignment. Database searches for homologous sequences – FASTA AND BLAST versions

Evolutionary analysis: distances - clustering methods – rooted and unrooted tree representation – Bootstrapping strategies.

Fragment assembly-Genome sequence assembly - Gene finding method, Gene prediction - Analysis and prediction of regulatory regions.

REFERENCES:

Course Outcome:
Students will be able to:
1. Describe user oriented aspects of product design
2. Analyze the screen designing principles
3. Apply HCI principles in product designs

CA7C3 MOBILE AND PERVASIVE COMPUTING

Pre-requisites: CA727, CA714

Objective:
To introduce the necessary concept of mobile communication system and pervasive computing.


Technology - CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

Pervasive Computing: Past, Present and Future Pervasive Computing - Pervasive Computing Market – m-Business – Application examples: Retail, Airline check-in and booking – Sales force automation – Health care – Tracking – Car information system – E-mail access via WAP


REFERENCES:

Course Outcome:
Students will be able to:
1. Analyze the architecture for Mobile computing platform
2. Identify and be able to use recent and advanced GSM architecture with emerging technologies
3. Explore, Evaluate different mobile computing methodologies
4. Apply the concepts of pervasive computing in real life problems

CA7C4 MULTI-CORE ARCHITECTURE

Pre-requisites: CA715, CA731

Objective:
To learn different multi-core programming techniques.

Multi-core – Definition and hybrid architectures – The software developer’s viewpoint – the bus connection – from single core to multi-core – Four effective multi-core designs

Challenges of multi-core programming – Sequential model – definition – Concurrency – Definition – challenges pertaining to software development – Processor architecture challenges – Operating system’s role

Communication and synchronization – synchronizing concurrency – Thread strategy approaches – Decomposition and encapsulation of work- Approaches to application design – PADL and PBS

UML – modeling the structure of a system – UML and concurrent behavior – Basic testing types – Defect removal for parallel programs – Standard software engineering tests

REFERENCES:

**Course Outcome:**
Students will be able to:
1. List the features of multi core systems and assess the challenges of multi core programming
2. Apply process techniques
3. Identify the approaches to application design
4. Describe the communication and fine issues

**CA7C5 MOBILE APPLICATION DEVELOPMENT**

**Pre-requisites:** CA727,CA714

**Objective:**
To learn the concepts mobile technologies; develop and deploy effective mobile applications.

The Mobile Ecosystem: Operators - Networks - Devices - Platforms - Operating Systems - Application Frameworks - Applications - Services


REFERENCES:
1. Mobile Design and Development by Brian Fling, O’Reilly Media, Inc 2009

Course Outcome:
Students will be able to:
1. Describe the basic concepts of Mobile ecosystems
2. Develop various mobile applications
3. Analyse the various mobile information architecture
4. Use JME development environment to develop applications

CA7C6 BIG DATA MANAGEMENT

Pre-requisites: CA712, CA721, CA726

Objective:
To gain ability to design high scalable systems.

Big Data – Unstructured Data - Introduction to data analytics, big data analytics, big data management

Data Management Techniques: Storage of large data – Analyze of large data - Extraction of business relevant, social relevant information

Columnar databases - Map Reduce as a tool for creating parallel algorithms - Processing very large amounts of data.
Big Data applications - Columnar stores - Distributed databases - Hadoop - Locality Sensitive Hashing (LSH) - Dimensionality reduction - Data streams - Unstructured data processing, NoSQL - NewSQL

Mining massive datasets - Socio-Business intelligence using big-data

REFERENCES:
1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics", John Willey, 2013

Course Outcome:
Students will be able to:
1. Explain the concepts of big data analysis
2. Identify the various Big data management, processing techniques
3. Analyse performance of big data analysis in Hadoop environment

CA7C7 EVOLUTIONARY COMPUTING

Pre-requisites: CA7B5, CA719

Objective:
To provide evolutionary Computation and global optimization techniques.

Evolutionary computing: Biological foundation of Evolutionary computing, Introduces evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory, capable of solving complex problems for which other techniques fail


Swarm Intelligence (SI): Biological foundation of SI, SI Techniques: Ant Colony Optimization (ACO) and Particle Swarm optimization (PSO). General steps in ACO, the "Invisible Manager" (Stigmergy), the Pheromone, Ant Colonies and Optimization, Ant Colonies and Clustering, Applications of Ant Colony Optimization. Applications of ACO

PSO: Social Network Structure: The Neighborhood Principle, PSO Algorithm, Fitness Calculation, Convergence, PSO System Parameters, Particle Swarm Optimization versus Evolutionary Computing and Applications of PSO
Mimetic algorithm, Firefly Algorithm, multi objective algorithms

REFERENCES:

Course Outcome:
Students will be able to:

1. Describe the Evolutionary algorithms and solve complex problem using evolutionary algorithms
2. Identify the issues in design and implementation of genetic algorithm
3. Explain the concepts of Swarm Intelligence techniques
4. Describe the social network structure

CA7C8 SOCIAL NETWORK ANALYSIS

Pre-requisites: CA710, CA721

Objective:
To introduce the concepts and methods of social network analysis.

Social network concepts – Development of social network and analysis – Online social networks – Social Network Data - Issues and challenges

Linked-based and structural analysis - Content-based analysis - Static and dynamic analysis
Mathematical Representation of social networks

Social networking systems and API - Statistical Analysis of Social Networks- Community Detection in Social Networks - Node Classification in Social Networks - Evolution in Dynamic Social Networks

Social Influence Analysis - Link Prediction in Social Networks - Data Mining in Social Media
Text Mining in Social Networks - Social Tagging - Building social services
Tools for Social network analysis: UCINET – PAJEK – NETDRAW – StOCNET - SPlus - R – NodeXL- SIENA and RSIENA - Real-world networks (Facebook graph, Twitter networks, etc.)

REFERENCES:

2. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, 2010

Course Outcome:

Students will be able to:
1. Describe the issues and challenges in social network functions
2. Mathematically represent social networks for analysis
3. Use various tools for social network analysis