

## Structure of the MCA Programme:

The MCA programme is of 150 credits. The distribution of credits over the semesters is given below.

Course Type	SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	Total Credits	EoTE Univ./Institute.
Compulsory Theory-Core	3*4 =12C 15 H	3*4 =12C 15 H	3*4 =12C 15 H	3*4 =12C 15 H	2*4 =8C 10 H	-	56 C 70 H	University
Compulsory Theory-Mathematics	1*3 =3 C 4 H	1*3 =3 C 4 H	1*3 =3 C 4 H	1*3 =3 C 4 H	-	-	12 C 16 H	University
Compulsory Theory-Management	1*3 =3 C 4 H	1*3 =3 C 4 H	1*3 =3 C 4 H	-	-	-	9 C 12 H	University
Compulsory LAB Courses	2*4 =8 C 12 H	1*4 =4 C 6 H	1*4 =4 C 6 H	1*4 =4 C 6 H	-	-	20 C 30 H	University
Project Work	-	1*2 = 2 C 4 H	1*2 = 2 C 4 H	1*2 = 2 C 4 H	1*2 =2 C 4 H	-	8 C 16 H	University
Internship	-	-	-	-	-	1*10 =10C	10 C	University
							<b>115 C</b>	
Elective Theory	-	-	-	1*4 =4 C 4 H	3*4 =12C 12 H	-	16 C 16 H	Institute
Elective LAB Courses	-	-	1*3 =4 C 5H	1*3 =4 C 5H	1*3 =4 C 5H	-	3*3= 9 C 15 H	Institute
General Courses	1*2 = 2C 4 H	1*2 = 2C 4 H	1*2 = 2C 4 H	1*2 = 2C 4 H	1*2 = 2C 4 H	-	10 C 10 H	Institute
Total Credits Per Semester	28	26	29	30	30	10	150	
Total Hours Per week	39	37	42	42	40	30	230	

### SEMESTER III

Course Number	Course Title	Credit Value	#Lec.	#Tut.	#Lab.	Weightage for EoTE/IA	EoTM
301	Operating System Concepts	4	3	2	-	0.7/0.3	Univ.
302	Computer Networks	4	3	2	-	0.7/0.3	Univ.
303	Software Engineering	4	3	2	-	0.7/0.3	Univ.
304	Empirical Methods for Researching Information Systems	3	2	2	-	0.7/0.3	Univ.
305	Organizational Behaviour	3	2	2	-	0.7/0.3	Univ.
306 <sup>#</sup>	Programming with Java	4	2	-	4	0.7/0.3	Univ.
307	Project II	2	-	-	4	0.7/0.3	Univ.
308	LAB Elective I	3	1	-	4	Continuous Assessment	Institute
309	General Course III	2	-	-	4	Continuous Assessment	Institute
Total		29	16	10	16		

### SEMESTER IV

Course Number	Course Title	Credit Value	#Lec.	#Tut.	#Lab	Weightage for EoTE/IA	EoTM
CC401	Applied Data Structures	4	3	2	-	0.7/0.3	Univ.
CC402	Design Patterns and HCI	4	3	2	-	0.7/0.3	Univ.
CC403	Probability and Simulation	3	2	2	-	0.7/0.3	Univ.
EC	Elective Course I	4	4	-	-	Continuous Assessment	Institute
EC	Elective Course II	4	4	-	-	Continuous Assessment	Institute
CC406 <sup>#</sup>	Dot Net Technologies	4	2	-	4	0.7/0.3	Univ.
<b>PR03</b>	<b>Project III</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>4</b>	<b>0.7/0.3</b>	<b>Univ.</b>
EL02	LAB Elective II	3	1	-	4	Continuous Assessment	Institute
GC04	General Course IV	2	-	-	4	Continuous Assessment	Institute
Total		30	18	08	16		

**MASTER OF COMPUTER APPLICATIONS (MCA) PROGRAMME**  
**Semester III**

**CC301: Operating System Concept**  
(4 Credits, 3L + 2T)

**Objectives:** The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.

**Learning Outcomes:** At the end of this course, student should be able to

- Explain the concepts of process, address space, and file
- Compare and contrast various CPU scheduling algorithms
- Understand the differences between segmented and paged memories, and be able to describe the advantages and disadvantages of each
- Compare and contrast polled, interrupt-driven and DMA-based access to I/O devices
- Understand functioning and working of Windows as well as Unix operating system.

**Text Book(s):**

1. **Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull**
2. **Operating systems concept and design by Milan Milenkovic**

**Unit1: Introduction to Operating system: (8L)**

Definition, Importance and functions of operating systems, Types: Batch, Timesharing, Multitasking, multiprogramming, multiprocessing, Online operating system, Real time, distributed operating systems. Various Views: Command language users view, system call users view. Operating system concept: Processes, Files, The shell. Structures: Monolithic system, layered system, Virtual Machine, Client server model.

Case Study: Unix History, General Structure of Unix, The shell of Unix operating system, The shell of Unix operating system, Windows History, Design principles and architecture.

**Unit2: Processes: (8L)**

Process concept, Implicit and explicit tasking, process relationship (cooperation and competitions). Operating systems view of processes OS services for process management. Scheduling and types of Schedulers, Scheduling algorithms: First come first served, shortest remaining time next, Time slice scheduling, Priority based preemptive scheduling, multiple level queues, multiple level queues with feedback, Guaranteed scheduling, Lottery scheduling. Performance Evolution.

Case Study: Unix processes and scheduling, Windows processes and scheduling

**Unit3: Memory Management: (8L)**

Basic Memory Management, monoprogramming without paging or swapping, multiprogramming with fixed partitions. Swapping: Memory Management with bit maps, and linked list. Virtual Memory, Page replacement algorithms: Optimal Page replacement algorithm, Not recently Page replacement algorithm, First in first out Page replacement algorithms, second chance Page replacement algorithms, clock Page replacement algorithms, least recently Page replacement algorithms, simulating LRU in software. Design issues for paging. Segmentation: Implementation of pure segmentation, segmentation with paging with example.

Case study: Memory management in UNIX and windows.

**Unit4: Interprocess communication and Synchronization: (9L)**

Need, Mutual Exclusion, Semaphore definition, Busy-wait implementation, characteristics of Semaphore. Queuing implementation of semaphore, Producer consumer problem. Critical region and conditional critical region, what are monitors? Need of it, format of monitor with example. Messages: Basics, issues in message implementation, naming, copying, Synchronous vs asynchronous message exchange, message length, ICS with messages, interrupt signaling via messages. Deadlock: Conditions to occur the deadlock, Reusable and consumable resources, deadlock prevention, Deadlock Avoidance, resource request, resource release, detection and recovery,

Case study: Unix case study Windows case study

**Unit5: File systems: (7L)**

Files- naming, structure, types, access, attributes, operation. Directories- system, path and operations. Implementing file and directories, disk space management, file system reliability and performance. Environment, Security flaws, Security attacks, principles for Security, user authentication. Protection domains, access control lists, capabilities.

Case Study: Unix file management and security, Windows file management and security

**Unit6: Input/ output: (5L)**

Principles of I/O hardware: I/O devices, device controller, DMA, Principles of I/O software : goals, interrupt handler, device drivers, Device independent I/O software. RAM Disk Hardware and software, DISK Hardware and software.

Case Study: Input output management in Unix, Input output management in Windows

## **CC302: Computer Networks** (4 Credits, 3L + 2T, Level 4)

**Objectives:** The key objective is to acquire a foundational understanding of computer network and communication technologies. Networking concepts will be illustrated using TCP/IP networks.

**Learning Outcomes: At the end of this course, student should be able to**

1. Students will acquire a good knowledge of the computer network, its architecture and operation.
2. Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters).
3. Students will be able to follow trends of computer networks. So, students will get exposed to advanced network technologies like MANET, WSN, and 4G.

**Pre-requisites: Basic Knowledge of Computer System**

**Text Books:**

- A) A.S. Tanenbaum, **Computer Networks** (4<sup>th</sup> ed.), Prentice-Hall of India, Latest Edition
- B) W.Behrouz Forouzan and S.C. Fegan, **Data Communication and Networking**, McGraw Hill, Latest Edition

**Reference Books:**

1. Network Essential Notes GSW MCSE Study Notes
2. Internetworking Technology Handbook CISCO System
3. Introduction to Networking and Data Communications Eugene Blanchard
4. Computer Networks and Internets with Internet Applications Douglas E. Comer

### **UNIT-1**

**Introduction to Computer Networks:** What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, **Network software:** Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, **Network Models:** The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, **Examples of some networks:** Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless Lans- (wi-fi)

### **UNIT-2**

**Data Transmission and Physical Layer: Signals:** Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum **Transmission Media& its Characteristics:** Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching, **Mobile Telephone Systems:** 1G, 2G, And 3G

### **UNIT-3**

**Network Layer: Network Layer Design Issues; Routing Algorithms:** Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, **Congestion Control Algorithms:** General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, **IP Addressing:** IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6

## UNIT-4

**Transport and Application Support Protocols**, Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, **Session Layer:** Token Concept **Presentation Layer:** Data Encryption and Data Security, Message Authentication, **Application Layer:** Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP

## UNIT-5

**Advance Networks:** Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, **Mobile Ad-hoc Networks:** Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, **Wireless Sensor Networks:** Sensor networks overview: Introduction, applications, design issues, requirements.

# CC303: Software Engineering

## (4 Credits, 3L + 2T, Level 4)

**Objectives:** To introduce the current methodologies involved in the development and maintenance of Software over its entire life cycle.

**Learning Outcomes:** At the end of this course, student should be able to

- Understand life cycle models, Requirement elicitation techniques, understand the concept of Analysis and Design of software.
- Implement software engineering concepts in software development to develop quality software which can work on any real machine.

**Pre-requisites:** Students should have basic knowledge of Business Information System

**Text Book(s):-** SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition.

**Syllabus:-**

### **Unit 1: Introduction to Software Engineering**

Software, software characteristics, Difference between software engineering and software programming, Members involved in software development.

Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis.

General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, Spiral and Rapid Application Development model).

### **Unit 2: Requirement Engineering Concepts and Methods**

What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process.

Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent,

modifiable, traceable, Understandable

Case study on DFD and ERD mechanism.

### **Unit 3: Design Concept and Methods**

Software Design and software Engineering. Software Design process and principles,

Design concepts: Abstraction, Refinement, Modularity, Architecture, Control hierarchy, Structural partitioning, Data structure, Procedure and Data hiding

Modular design: Functional independence, Cohesion and Coupling concepts

Architectural design process: Transform flow and Transaction flow

User Interface design: - Elements of good design, design issues, Features of modern GUI, Guidelines for interface design

Procedural design: - Structured Programming, Program Design Language

Report Design

### **Unit 4: Software Quality Assurance**

Quality concept: (quality, quality control, quality assurance, cost of quality), SQA activities, SQA plan.

Formal Technical review: Review meeting, review reporting and review guidelines

Software Configuration Management: - What is configuration management, Baseline, Software

Configuration items.

SCM process- Identification of objects, Version control and Change control

## **Unit 5: Software Testing and Testing Strategies**

Software Testing Fundamentals:-Testing Objectives and Testing Principles.

White Box Testing, Black Box Testing: - Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis.

Testing Strategies for Conventional Software: - Unit Testing, Integration Testing (Top-down and

Bottom-up Integration)

Validation Testing: - Validation Test Criteria, Configuration Review, Alpha and Beta Testing

System Testing: - Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing

The Art of Debugging – The Debugging Process.

## **Unit 6: Maintenance and Reengineering**

Software maintenance: - Importance and types of maintenance , Concept of Re-engineering, Software reengineering process model Reverse engineering: - to understand process, data and user interfaces

Restructuring: Code and Data restructuring

Forward engineering: - for client server architecture and user interfaces

## **Unit 7: Computer Aided Software Engineering**

What is CASE? Importance of CASE tools

Various Tools: -

1) Information engineering	2) Project planning tools
3) Risk analysis tools	4) Project management and testing tools
5) Tools for Quality assurance	6) Software Configuration Management
7) Analysis and design	8) Database management
9) Interface design and programming tools.	

## **Unit 8: AGILE Development**

Agile concept, Agile Process: - Principles and human factors

Agile Process Models: - 1) Adaptive Software Development (ADS)

2) Scrum model

3) Dynamic Systems Development Method (DSDM)

4) Agile Modeling (AM)

5) Agile Unified Process (AUP)



# CC304: Empirical Methods for Researching Information Systems

(Credit Value: 3, Lectures: 2 hours, Lab: 2 hours)

## Objectives:

The objectives of this course include a brief introduction to various research strategies that are applicable to study information systems in detail and make them effective and efficient. Also, quantitative and qualitative techniques for analysis of resulting data in such studies will be taught.

## Learning Outcomes:

At the end of the course, a learner should be able to (a) understand components of research project (b) identify important research strategies (c) understand and apply simple statistical techniques to analyze the data of various kinds.

**Prerequisites:** XII level Mathematics.

## Text Book:

Researching in Information System by Oates

## Syllabus:

### UNIT-1:

Nature of computing disciplines and need for research in those disciplines. Definition of research and models of research process- analogy with Software Development Life Cycle and 6P model of research process. Discussion of the components of 6P model. (6L)

### UNIT-2:

Concept of Research patterns - discussion and illustrations of Design and Creation, Survey, Experiment, Case Study, Action Research, and Ethnography as research strategies for researching information systems. (6L)

### UNIT-3:

Questionnaires, Interviews, Observations, and Documents as data gathering methods. Main characteristics and applicability of various methods. Concept of triangulation, triangulation types. Details of questionnaire design, interviewing techniques. Illustration of various data gathering techniques.

### UNIT-4:

Data analytic techniques – Quantitative and qualitative methods. Detailed study of quantitative methods- Descriptive statistics and computational algorithms for computation of mean, median, and mode; variance, mean deviation, and coefficient of variation; frequency distributions, empirical distributions, measures of symmetry. Properties and importance of above measures.

### UNIT-5:

Bivariate and multivariate frequency distributions, concepts of correlation coefficients- Pearson and rank correlation coefficients. Regression and prediction. Related algorithms. Use of statistical packages and interpretation of results.

**UNIT-6:** Concepts of statistical hypotheses – simple and compound hypotheses, Type-I and Type-II errors, level of significance and power of tests, significance tests – tests for proportion, equality of means, paired sample tests, equality of variances. Chi-squared tests based on contingency tables. Tests for significance of correlation and regression coefficients. Concept of analysis of variance.

**UNIT-7:** A brief introduction to analysis of qualitative data.

# CC305: Organizational Behaviour

(3 Credits, 2L + 2T, Level )

**Objectives: To understand the dynamics of individual and group behaviour in organisational setting to achieve optimum utilisation of human resources.**

**Learning Outcomes:** At the end of the course, a learner should be able to (a) understand the importance of models of Organizational Behavior (b) Understand effect of attitude & values on Organizational outcome (c) apply leadership theories for delivering best results for organization.

## **Text Books:**

- Stephen Robbins, Organizational Behaviour
- Ashwathappa, Organizational Behaviour
- P.K.Agarwal, Organizational Behaviour
- Uma Sekaran, Organizational Behaviour

## **Unit I**

### **Introduction to OB**

Definition and importance of Organization Behaviour, Organization Management and OB, Multi-disciplinary approach to OB, Models of OB-Autocratic, Custodial, Supportive, Collegial, SOBC, Recent developments and challenges in OB

## **Unit II**

### **Individual Behaviour in Organizations**

Attitude - Definition, Components, Sources

Perception – Definition, Process, Implications for Management, Perceptual Errors

Values – Deification and meaning, Types of value

Personality – Nature and Traits, Psycho-Analytical Theory

## **Unit III**

### **Foundation of Group Behaviour**

Group- Definition, Stages of Group Development, Classification of Groups, Advantages of Group Decision Making

Team – Difference between Group and Team, Creating Effective Team

## **Unit IV**

### **Conflict and Stress Management**

Conflict – Definition, Conflict Process, Types – Constructive and Destructive Conflicts, Levels of Conflicts and Management,

Stress – Definition, Causes or Sources of stress, Symptoms of stress, Management of Stress

## **Unit V**

### **Motivation and Leadership**

Motivation – Definition, Process, Theories – Maslow Hierarchy Theory of Needs, Herzberg's Two Factor Theory, Equity Theory, Vroom's Expectancy Theory

Leadership- Definition, Traits of good leader, Difference between Leader & Manger, Types of Leadership Style, Likert's 4-M management styles, Managerial Grid and its application

## **Unit VI**

### **Organization Change Management**

Need for Change, Reasons for Resistance of Change, Building Support for Change, Role of Change Agent, Process of Change Implementation

Creating Learning Organization

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## **Recommended Books:**

- Stephen Robbins, Organizational Behaviour
- Ashwathappa, Organizational Behaviour
- P.K.Agarwal, Organizational Behaviour
- Uma Sekaran, Organizational Behaviour

# CC306: Programming with Java

(4 Credits, 2L + 4P, Level 3)

## Objective:

The Objectives of the course is to introduce Object Oriented Programming using Java, Make student to use Java for implementing OO Concepts and also make them familiarize to use JDK and Java API for concurrent programming, input/output, Java data structures and GUI (AWT) programming using java.

## Learning Outcomes:

At the end of this course, student should be able to

- Design interfaces, abstract and concrete classes
- Use concurrent programming, java Collections and utility classes
- Able to achieve object persistence using object serialization.
- Design applications using event driven programming.

## Pre-requisites:

Any Programming Language

## Reference Books:-

- Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007
- Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008
- Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition

## Syllabus:

### Unit 1: Introduction to Java: (4L)

Features of Java, Java compiler, JVM, Garbage collection, Data types, concept of class and object, java naming conventions wrapper classes, control structures in java, arrays in java, array of objects.

### Unit 2: Class and Object Concepts: (8L)

Defining a class, creating objects from class, adding attributes and methods to the class, using constructors,

Passing values to the functions – pass by value, pass by reference, Function overloading.

Modifiers – public, private, protected, default, static, final

Concept of package, Intoduction to Exception Handling.

### Unit 3: Inheritance and Polymorphism: (5L)

Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Throws keyword and method overriding.

Using abstract and final keywords with class declaration, Concept of interface, Compression of Interface and class.

Access modifiers and data accessibility in derived classes, method access modifier and method overriding.

#### **Unit 4: Concurrent Programming : (6L)**

Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods.

#### **Unit 5: Java Input/Output (6L)**

Concept of streams, types of streams – byte streams, character streams

The Console: System.out, System.in, and System.err

InputStream class, OutputStream class, File class, FileInputStreams, FileOutputStream,

Reader class, Writer class, FileReader, FileWriter.

Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter.

Object Streams, issue of ‘Serialization’.

#### **Unit 6: Java Collections and Utility Classes: (7L)**

Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, Using a Iterator, Set: HashSet, LinkedHashSet, TreeSet , Comparable and Comparator interfaces, Map, Hashmap, HashTable, TreeMap, LinkedHashMap

Generics – Basics, class parameters, bounded types, erasures.

#### **Unit 7: Java Applets and GUI: (8L)**

Applet concept, creating basic applet, applet lifecycle, controlling applet content, introduction to AWT controls – Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc. ( Only AWT Component)

Event delegation model, AWT Event handling, Event Listen

# Semester IV

## **CC401: Applied Data Structure**

(4 Credits, 3L+2T, Level 4)

Objectives: The purpose of this course is to familiarize the students with linear and hierarchical data structures and their applications.

Learning Outcomes: At the end of the course the student should be able to

- (a) Specify application specific abstract data types;
- (b) Identify efficient implementation of an abstract data type given the specification;
- (c) develop code in a chosen language, preferably Java, for the chosen implementation; (d) be familiar with some standard applications of simple data structures.

Text Book: Data Structure Tenanumbam

Detailed Syllabus:

### **Unit 1: Elementary Data Structures –**

Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade card etc. [06 L]

### **Unit 2: Linear Data Structures –**

Finite sequences and their implementations as one and two dimensional arrays; Implementations of finite sequences as linked lists of various kinds; relative merits of array and linked list implementations. [09 L]

### **Unit 3: Particular Linear Data Structures –**

The finite sequences Stacks, queues, and dequeues as abstract data types; Array and linked list implementations of stacks, queues, and dequeues, 111<:111y applications of stacks, queues, and dequeues. [09 L]

**Unit 4: Hierarchical data structures -** General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms. [06 L]

**Unit 5: The problem of search -** linear and binary search algorithms and their efficiency; binary search trees and operations on binary search trees; Improving the efficiency of search through balanced trees - AVL trees and Red-black trees, concepts of rotation. Hash tables and related concepts in detail. [09 L]

**Unit 6: The problem of sorting -** The standard sort algorithms and their efficiencies; Merge sort and quick sort algorithms and their efficiencies. The binary heaps, their array implementation; operations on heaps and heap sort algorithm. [06 L]

# CC402: Design Patterns & HCI

(4 Credits, 3L+2T, Level 4)

## Objectives:

The objective of the course to emphasize how to use design patterns as general reusable solution to a commonly occurring problem and also introduce HCI concepts, models and principles.

## Learning Outcomes:

After completing this course, students will be able to:

- Understand meaning and types of design Patterns
- Identify structure and describe structure of Design Pattern
- Given a problem able to decide which design Pattern is used
- Understand Models and principles of HCI
- Describe Characteristics of UI and designing effective UI

## Pre-requisites:

This course assumes students should have following knowledge:

- OOAD and UML.
- Software Engineering

## Text Book(s) :

- Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,
- Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richjard Helm, Ralph Jonson and Jon Vlissides
- Ben Shneiderman, Designing the User Interface, Pearson Education, 1998

## Syllabus:

### Unit 1: Introduction to Design Patterns (2L)

Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, Describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases.

### Unit 2: Creational Patterns (4L)

Factory Method, Abstract Factory, Builder, Prototype, Singleton

### Unit 3: Structural Patterns (6L)

Adapter(class), Adapter(object), Bridge, Composite, Decorator, Façade, Flyweight and Proxy.

### Unit 4: Behavioral Patterns (6L)

Interpreter, Template Method, Chain of Responsibility, Command, Iterator, Mediator, Memento, Observer, State, Strategy, Visitor

### Unit 5: Introduction to Human Computer Interface (2L)

Need & Importance of HCI, HCI & human diversity, Goals and Objectives of HCI

### Unit 6: Models of HCI(5L)

Conceptual, semantic, Syntactic and Lexical Model , GMOS Model, Object-Action Interaction model, Action-Object Interaction model

### Unit 7: Principles of Design (4L)

Recognition and Diversity, Eight golden rules of interface design, Error Prevention

**Unit 8: Interaction style of Design (5L)**

Guidelines for Data Display and Data Entry, Direct and Menu selection, Form fillin, Command Language

**Unit 9: Computer Supported co-operation (6L)**

Goals of co-operation, Synchronous Interactions, asynchronous and face to face Interactions

**Unit 10: Application to education and social issues (3L)**

Future Applications of HCI

**Tutorials:**

Tutorials should be conducted in LAB using JAVA for implementing design patterns as well as for HCI concepts

# CC403: Probability and Simulation

(Credit Value: 3, Lectures: 2, Tutorials: 2)

**Objectives:** Performance evaluation of computer systems, both hardware and software, involves modeling of the systems in terms of random variables. In this course basic concepts of probability and simulation modeling will be studied. Applications of simulation to various systems, particularly, computer systems will be emphasized.

## Learning Outcomes:

At the end of the course, the student will be able to (a) to perform simple random experiments, (b) analyse the data from simulation experiments using appropriate statistical methods, and (c) aware of some important applications of probability and statistics in the analysis of information systems.

**Prerequisites:** Combinatorics

**Text Book:**

## Syllabus:

**Unit-1:** Random experiments, sample space, classes of events, probability measures on a class of events. Examples of finite, countably infinite, and uncountable probability spaces. Conditional probabilities, Proofs and applications of Total probability and Bayes' theorems. Independence of events. (6L)

**Unit-2:** Random variables, distribution functions- discrete, continuous, and mixed. Probability mass function and density functions of random variables. Expected value, variance, and moments of random variables. Independent random variables and properties of expectation and variance. (6L)

**Unit-3:** Standard discrete distributions- Degenerate, Bernoulli, Binomial, Discrete Uniform, Geometric, Poisson, and negative binomial- and their form, probability mass functions, expectations and variances. (6L)

**Unit-4:** Standard continuous distributions- Uniform, Triangular, exponential, Gamma, and Normal distributions- and their density functions, expectations and variances. Properties of exponential and normal distributions. Statement of Central Limit theorem. (6L)

**Unit-5:** Relationship of above distributions to Uniform distribution; Chi-square, t, and F-distributions. Poisson Process and its properties (without proof), Queue properties, M/M/1 queue. Applications to model sampling and simulation. (6L)

**Unit-6:** Model sampling and basics of simulation modeling. Applications to performance evaluation of computer systems. (15L)



# CC406: Dot Net Technologies

(Credit Value : 4 , 2L +4P)

**Overview:** This Paper deals with Microsoft Dot Net Technology. It fulfills almost all types of requirements of the developers involved in complex application development.

**Learning Outcomes:** The student after completing this course should have gained:

1. The ability to effectively use visual studio Dot Net.
2. An understanding of the goals and objectives of the .NET Framework. .NET is a revolutionary concept on how software should be developed and deployed.
3. An understanding of how to use forms to develop GUI programs under dot NET.

**Pre-requisites : Basic knowledge of Object Oriented Programming**

**Text Book(s) :**

- 1) c#3.0 Visual Studio-wrox-beginning-guides.
- 2) C# 3.0 Herbert Schildt- Mcgraw-hill
- 3) Beginning Microsoft Visual C#
- 4) Microsoft .Net Framework Web-Based Client Development (Training Kit MCTS 70-528)

**Unit 1 :** Introduction to .NET Framework and C# Programming.NET Overview, Limitations of exe files, Managed vs Unmanaged Code, Compilation strategies, CLR, Classes provided by Framework. Versions Available for development Common Types Concept .NET Vs Java Technology comparison. Writing C# Program on console, CSC Compiler, Writing Program in IDE Variables, Expressions, Functions, Error Handling

**Unit 2 :** OOP in C# Classes, Collections, Conversions, Generics, Built in Classes, Initializers, Anonymous Types

**Unit 3 :** Windows Programming Form, Button, Label, Textbox, LinkLabel, Radio buttons, Check boxes, List box, list view controls & their properties, events; SDI & MDI, Menues, Toolbars, Creating controls, Using dialogs, Files, Applications. Deploying windows applications

**Unit 4 :** ADO.NET Data Reader, Dataset Concepts, Accessing database tables, Updating database. Security concepts, Developing Database application

**Unit 5 :** Web Programming Overview, Browser, Web Server, Creating Simple web page, Asp.net runtime, Server controls, Event Handlers, Input validations, State Management, Login Controls, Data Controls, Reading and writing from SQL Server, Navigation Controls, Web Part Concepts, Web Part Controls

**Unit 6 :** Advanced Web Programming Master Pages, User Controls, Themes and Skins, Session Variables, Cookies, Web service concept, Web Services architecture, XML, Creating Simple Web Service, Testing Web Service, IIS Concept and configuration, Publishing web site.

**Unit 7 :** Ajax Programming Ajax Overview, Using Ajax extension Controls, LINQ Varieties, LINQ Query, Ordering query results, aggregate operators, querying complex objects, Group queries, set operators, Joins, LINQ to SQL Query, XML Documents, Using XML Documents.

CC106, CC107, CC206, CC306, and CC406.

The four electives, the three Lab electives, and General Courses are finalized by the respective institutes.

**(EC01) Elective Group: Business Intelligence  
(EC0101): Data Warehousing**

- Introduction to Data Warehousing
  - Need for a Data Warehouse
  - Concepts Involved in Data Warehouse
  - Transactional Databases vs. Data Warehouses
- Data Warehouse and Data Mart
  - Operational Data Store
  - Operational Database System vs. Data Warehouse
  - Enterprise Data Warehouse
  - Data Mart
- Multidimensional Data Models
  - Tables
  - Spreadsheets
  - Data Cubes
- Schemas for Multidimensional Databases
  - Start Schema
  - Snowflake Schema
  - Fact Constellation Schema
- Data Preprocessing
  - Need for Data Preprocessing
  - Data Cleaning
  - Data Integration and Transformation
  - Data Reduction
  - Discretization and Concept Hierarchy Generation
- Architecture of a Data Warehouse
  - Steps for the Design and Construction of Data Warehouse
  - Three Tier Data Warehouse Architecture
  - Types of OLAP Servers
  - Data Warehouse Implementation

**(EC01) Elective Group: Business Intelligence  
(EC0102): Data Mining**

- Introduction to Data Mining
  - Advanced Database Systems and Advanced Database Applications
  - Need for Data Mining
  - Evolution of Data Mining
- Data Sources for Data Mining
  - Relational Databases
  - Data Warehouses
  - Transactional Databases
- Data Mining Process
  - Data Cleaning
  - Data Integration
  - Data Selection
  - Data Transformation
  - Data Mining
  - Pattern Evaluation
  - Knowledge Presentation
- Introduction to Data Mining Techniques
  - Association Rule Mining
  - Classification
  - Cluster Analysis
- Association Rule Mining
  - Overview
  - Algorithms
  - Case Studies
- Classification
  - Overview
  - Algorithms
  - Case Studies
- Cluster Analysis
  - Overview
  - Algorithms
  - Case Studies

**(EC02) Elective Group: Cloud Computing  
(EC0201): Virtualization**

- Overview of Virtualization
  - Introduction to Virtualization
  - Virtualization Approaches
  - Virtualization for Server Consolidation and Containment
  - Hardware Support for Virtualization
  - Para-Virtualization
  - vmWare's Virtualization Solutions
  
- Tools for Virtualization
  - Virtualization with Xen
  - Virtualization with Bochs and QEMU
  - Virtualization with Lguest
  - Virtualization with KVM
  
- Understanding Virtualization
  - The Roots of Virtualization
  - Making Better Use of Your Systems with Virtualization
  - Approaches to Virtualization
  - Understanding the Virtualization Ecosystem
  - Reasons to Invest in Virtualization Hardware
  
- Virtualization for Businesses
  - Need for Virtualization in a Business
  - Implementation of Virtualization in a Business
  - Cost-Benefit Analysis of Virtualization
  - Xen Hypervisor
  - OpenVZ Hypervisor
  - MS Virtual Server 2005 R2
  - Oracle VM

**(EC02) Elective Group: Cloud Computing**  
**(EC0202): Cloud Computing Concepts**

- Virtualization and Cloud Computing
  - Visualizing Virtualization
  - Managing Virtualization
  - Taking Virtualization into the Cloud
  
- Service Oriented Architecture and the Cloud
  - Defining Service Oriented Architecture
  - Understanding the Coupling
  - Implementation of Service Oriented Architecture (SOA)
  - Understanding Services in the Cloud
  - Serving the Business with SOA and Cloud Computing
  
- Cloud Computing
  - Prerequisites for Cloud Computing
  - Understanding Cloud Computing
  - Trends in Cloud Computing
  - Creation of a Private Cloud
  - Usage of a Cloud
  - Introduction to a Public Cloud
  - Introduction to Cloud Services
  - Office Infrastructure on the Cloud
  - MS-Office Web Apps
  - Cloud Computing and Project Management
  
- Security in Cloud Computing
  - Introduction to Security Issues involved in Cloud Computing
  - Crises in Cloud Computing
  - Encrypting the Cloud
  - Risks and Benefits

**(EC14) Elective Group: Information Systems**  
**(EC1401): Enterprise Resource Planning**

**Objective of the Course :**

The objective of the course is to enable students in learning basic concepts of Enterprise Resource Planning so that they can understand how to use the organizational resources effectively.

**UNIT - I**

**Introduction to ERP**

- (a) Overview of ERP, MRP, MRPII and Evolution of ERP
- (b) Integrated Management Systems
- (c) Reasons for the growth of ERP
- (d) Business Modeling
- (e) Integrated Data Model
- (f) ERP Market.
- (g)

**UNIT - II**

**ERP Technologies**

- (a) Business Process Re-engineering (BPR)
- (b) BPR Process
- (c) Clean Slate Re-engineering Technology Enabled Re-engineering
- (d) Myths regarding BPR
- (e) Business Intelligence Systems-Data Mining, Data Warehousing
- (f) On-Line Analytical Processing (OLAP)
- (g) Supply Chain Management
- (h) Best Practices in ERP.

**UNIT - III**

**ERP Modules**

- (a) Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System
- (b) ERP System Options and Selection
- (c) ERP proposal Evaluation.

**UNIT - IV**

**ERP Implementation, Maintenance and Benefits of ERP**

- (a) Implementation Strategy Options
- (b) Features of Successful ERP Implementation
- (c) Strategies to Attain Success
- (d) User Training, Maintaining.

## **UNIT - V**

### **ERP & IS. Benefits of ERP**

- (a) Reduction of Lead Time
- (b) On-Time Shipment
- (c) Reduction in Cycle Time
- (d) Improved Resource Utilization
- (e) Better Customer Satisfaction
- (f) Improved Supplier Performance
- (g) Increased Flexibility
- (h) Reduced Quality Costs
- (i) Improved Information Accuracy and Decision Making Capabilities.

### **Reference Books:**

1. Alexis Leon, ERP (Demystified Hrs), 5/E, Tata McGraw-Hill, 2006.
2. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2006.
- 3 Sinha; Enterprise Resource Planning , Cengage Learning, New Delhi,

**(EC14) Elective Group: Information Systems**  
**(EC1401): E-Commerce**

**Objective of the Course**

This course explores the basics of working with internet including WWW, Email, Browsing, Chatting etc., and understands the potential of secured electronic transactions, E-mail security and electronic publishing.

**Unit – I**

**Electronic Commerce Environment and Opportunities:**

- (a) Background - The Electronic Commerce Environment
- (b) Electronic Marketplace Technologies.
- (c) Modes of Electronic Commerce:
- (d) Electronic Data Interchange,
- (e) Migration to Open EDI
- (f) Electronic Commerce with www/Internet
- (g) Commerce Net Advocacy
- (h) Web Commerce Going Forward.

**UNIT - II**

**Approaches to Safe Electronic Commerce:**

- (a) Secure Transport Protocols
- (b) Secure Transactions
- (c) Secure Electronic Payment Protocol (SEPP)
- (d) Secure Electronic Transaction (SET)
- (e) Certificates for authentication Security on web Servers and Enterprise Networks.
- (f) Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash.

**UNIT - III**

**Internet/Intranet Security Issues and Solutions:**

- (a) The need for Computer Security
- (b) Specific Intruder Approaches
- (c) Security Strategies, Security Tools
- (d) Encryption
- (e) Enterprise Networking and Access to the Internet
- (f) Antivirus Programs
- (g) Security Teams.



## **UNIT – IV**

### **Master Card/Visa Secure Electronic Transaction:**

- (a)** Introduction
- (b)** Business Requirements Concepts
- (c)** payment Processing
- (d)** E-Mail and Secure E-mail
- (e)** Technologies for Electronic Commerce: Introduction
- (f)** The Means of Distribution
- (g)** A model for Message Handling
- (h)** E-mail working
- (i)** Multipurpose Internet Mail Extensions
- (j)** Message Object Security Services
- (k)** Comparisons of Security Methods
- (l)** MIME and Related Facilities for EDI over the Internet.

## **UNIT - V**

### **Internet Resources for Commerce**

- (a)** Introduction, Technologies for web
- (b)** Servers
- (c)** Internet Tools Relevant to Commerce
- (d)** Internet Applications for Commerce
- (e)** Internet Charges
- (f)** Internet Access and Architecture
- (g)** Searching the Internet.
- (h)** Advertising on Internet: Issues and Technologies.
- (i)** Advertising on the Web,
- (j)** Marketing creating web site
- (k)** Electronic Publishing Issues
- (l)** Approaches and Technologies: EP and web based EP.

### **Reference Books:**

1. Web Commerce Technology Handbook, by Daniel Minoli, Emma Minoli, McGraw-Hill.
2. Frontiers of electronic commerce by Galgotia.
3. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, John Wiley.
4. E-Commerce, S. Jaiswal – Galgotia.
5. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.
6. Electronic Commerce – Gary P. Schneider – Thomson.
7. E-Commerce – Business, Technology, Society, Kenneth C. Taudon, Carol Guyerico Traver.

**(EC11) Elective Group: Net-Centric Computing  
(EC1101): HTML5**

Introduction to HTML	<ul style="list-style-type: none"> <li>▪ MIME Types</li> <li>▪ Standards for the Internet</li> <li>▪ Evolution of HTML</li> <li>▪ Introduction to XHTML</li> <li>▪ Introduction to Working Group</li> <li>▪ W3C</li> </ul>
Features of HTML5	<ul style="list-style-type: none"> <li>▪ Detection of HTML5 Support</li> <li>▪ Modernizr: An HTML5 Detection Library</li> <li>▪ Canvas</li> <li>▪ Canvas Text</li> <li>▪ Video</li> <li>▪ Video Formats</li> <li>▪ Local Storage</li> <li>▪ Web Workers</li> <li>▪ Offline Web Applications</li> <li>▪ Geolocation</li> <li>▪ Input Types</li> <li>▪ Placeholder Text</li> <li>▪ Form Autofocus</li> <li>▪ Microdata</li> </ul>
Elements of HTML5	<ul style="list-style-type: none"> <li>▪ The Doctype</li> <li>▪ The Root Element</li> <li>▪ The &lt;head&gt; Element</li> <li>▪ New Semantic Elements in HTML5</li> <li>▪ Handling of Unknown Elements by the Browsers</li> <li>▪ Headers</li> <li>▪ Articles</li> <li>▪ Dates and Times</li> <li>▪ Navigation</li> <li>▪ Footers</li> </ul>
Drawing Surface	<ul style="list-style-type: none"> <li>▪ Introduction to Canvas</li> <li>▪ Simple Shapes</li> <li>▪ Canvas Coordinates</li> <li>▪ Paths</li> <li>▪ Text</li> <li>▪ Gradients</li> <li>▪ Images</li> </ul>
Video on the web	<ul style="list-style-type: none"> <li>▪ Video Containers</li> <li>▪ Video Codecs</li> <li>▪ Audio Codecs</li> </ul>
Geolocation	<ul style="list-style-type: none"> <li>▪ Geolocation API</li> <li>▪ Handling Errors</li> <li>▪ geo.js Library</li> </ul>
Local Storage for Web Applications	<ul style="list-style-type: none"> <li>▪ Evolution of Local Storage</li> <li>▪ Introduction to HTML5 Storage</li> </ul>
Offline Web Application	<ul style="list-style-type: none"> <li>▪ Introduction to Offline Web application</li> <li>▪ The Cache Manifest</li> </ul>
Web Forms	<ul style="list-style-type: none"> <li>▪ Introduction to Web Forms</li> <li>▪ Placeholder Text</li> <li>▪ Autofocus Field</li> <li>▪ e-Mail Addresses</li> <li>▪ Web Addresses</li> </ul>

- |  |                                                                                                                                                                           |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>▪ Numbers as Spinboxes</li><li>▪ Numbers as Sliders</li><li>▪ Date Pickers</li><li>▪ Search Boxes</li><li>▪ Color Pickers</li></ul> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**(EC11) Elective Group: Net-Centric Computing  
(EC1102): JavaScript Programming**

Introduction to Javascript	<ul style="list-style-type: none"> <li>▪ JavaScript Overview</li> <li>▪ JavaScript Programming Basics</li> </ul>
Variables and Operators	<ul style="list-style-type: none"> <li>▪ Variables and Data Types</li> <li>▪ Using Variables and Literals</li> <li>▪ Operators</li> </ul>
Control Statements	<ul style="list-style-type: none"> <li>▪ Controlling the Flow: JavaScript Control Statements</li> </ul>
Functions and Objects	<ul style="list-style-type: none"> <li>▪ Functions</li> <li>▪ Objects</li> </ul>
The Window Object	<ul style="list-style-type: none"> <li>▪ The Window Object</li> <li>▪ Dialog Boxes</li> <li>▪ Status Bar Messages</li> <li>▪ Window Manipulations</li> </ul>
The Document Object	<ul style="list-style-type: none"> <li>▪ The Document Object</li> <li>▪ Writing to Documents</li> <li>▪ Dynamic Documents</li> </ul>
Frames	<ul style="list-style-type: none"> <li>▪ HTML Frames Review</li> <li>▪ Scripting for Frames</li> </ul>
Forms and Forms-based Data	<ul style="list-style-type: none"> <li>▪ The Form Object</li> <li>▪ Working With Form Elements and Their Properties</li> </ul>
The String and RegExp Objects	<ul style="list-style-type: none"> <li>▪ The String Object</li> <li>▪ Using String Object Methods to Correct Data Entry Errors</li> <li>▪ Creating Dynamic Effects with Substring Methods</li> <li>▪ The RegExp Object</li> </ul>
Form Validation	<ul style="list-style-type: none"> <li>▪ Form Validation: A Process</li> <li>▪ Testing Data</li> <li>▪ Preparing Data for Validation and Reporting Results</li> <li>▪ Validating Non-text Form Objects</li> </ul>
Dates and Math	<ul style="list-style-type: none"> <li>▪ The Date Object</li> <li>▪ Using and Manipulating Dates</li> <li>▪ The Math Object</li> <li>▪ Doing Math with JavaScript</li> </ul>
Cross-browser Compatibility	<ul style="list-style-type: none"> <li>▪ Examining the Compatibility Landscape</li> <li>▪ Detecting Browsers and Platforms</li> </ul>