

**MAHAMAYA TECHNICAL UNIVERSITY,  
NOIDA**



**Syllabus**

**For**

**MASTER OF COMPUTER APPLICATIONS  
Of  
SECOND YEAR**

(Effective from the Session: 2013-14)

**Evaluation Scheme of MCA Second Year**  
**Semester –III (Effective from the session: 2013-14)**

S No	Code	Subjects	Periods			Evaluation Scheme						Total	Credit
			L	T	P	Sessional				End Semester			
						CT	TA	TOT	P	Th	P		
1	CA-301	Operating Systems	3	1	2	30	20	50	25	100	25	200	5
2	CA-302	Modelling and Simulation	3	1	0	30	20	50	-	100	-	150	4
3	CA-303	Software Engineering	3	1	0	30	20	50	-	100	-	150	4
4	CA-304	Database Management Systems	3	1	4	30	20	50	25	100	50	225	6
5	CA-305	Web Technology-1	3	1	4	30	20	50	25	100	50	225	6
6	CA-306	Comprehensive Viva-Voce (On All Subjects)	0	0	2	-	-	-	50	-	-	50	1
7	AU-301	Human Values & Professional Ethics	2	1	0	10	10	20	-	80	-	100	Comp Audit Course
			15/17	5/6	12							1000	26

*L: Lecture      T: Tutorial      P: Practical/Project      CT: Class Test      TA: Teacher's Assessment*

*Th: Theory      TOT: Total*

*TA=10 (5 for Teachers assessment plus 5 for attendance)*

*TA=20 (10 for Teachers assessment plus 10 for attendance)*

*P=25 (10 marks for practical exam, 5 marks viva. 5 marks for lab records and 5 marks for quiz)*

*P=50 (15 marks for practical exam, 15 marks viva. 10 marks for lab records and 10 marks for quiz)*

**Note: AU-301/AU-401 may be offered in both the Semesters. A student has to clear this subject in second year or in any semester after second year.**

**Evaluation Scheme of MCA Second Year**  
**Semester –IV (Effective from the session: 2013-14)**

S No	Code	Subjects	Periods			Evaluation Scheme						Total	Credit
			L	T	P	Sessional				End Semester			
						CT	TA	TOT	P	Th	P		
1	CA-401	Design and analysis of algorithms	3	1	2	30	20	50	25	100	25	200	5
2	CA-402	Computer Based Optimization Techniques	3	1	0	30	20	50	-	100	-	150	4
3	CA-403	Computer Graphics and Multimedia	3	1	4	30	20	50	25	100	50	225	6
4	CA-404	Web Technology- 2	3	1	4	30	20	50	25	100	50	225	6
5	CA-40?	Elective –I	3	1	0	30	20	50	-	100	-	150	4
6	CA-413	Mini Project	0	0	2	0	0	0	50	-	-	50	1
7	AU-401	Human Values & Professional Ethics	2	1	0	10	10	20	-	80	-	100	Comp Audit Course
			17/15	6/5	11							1000	26

*L: Lecture      T: Tutorial      P: Practical/Project      CT: Class Test      TA: Teacher's Assessment  
Th: Theory      TOT: Total*

*TA=10 (5 for Teachers assessment plus 5 for attendance)*

*TA=20 (10 for Teachers assessment plus 10 for attendance)*

*P=25 (10 marks for practical exam, 5 marks viva. 5 marks for lab records and 5 marks for quiz)*

*P=50(15 marks for practical exam, 15 marks viva. 10 marks for lab records and 10 marks for quiz)*

**Note: AU-301/AU-401 may be offered in both the Semesters. A student has to clear this subject in second year or in any semester after second year.**

## Electives –I

CA-405	Advance Computer Architecture
CA-406	Network Security and Cryptography
CA-407	Data Ware Housing and Data Mining
CA-408	Software Testing
CA-409	Image Processing and Pattern Recognition
CA-410	Compiler Design
CA-411	Component Based Programming
CA-412	Human Computer Interaction and User Interface Design

## Semester –III (Effective from the session: 2013-14)

### CA-301: Operating Systems

#### PREREQUISITES

Students should be familiar with the concepts of Computer architecture and C programming.

#### OBJECTIVES:

##### The objectives of this course are:

To acquire knowledge of Operating System in terms of design.

To be familiar with Linux Environment.

To increase proficiency in Linux programming using C.

#### LEARNING OUTCOME

Concepts introduced in this course will help students to:

Understand the designing of operating system.

Distinguish between a resource, a program, and a process

Recognize critical resources and explain the behavior of semaphores

Describe various Process scheduling and memory page replacement algorithms

Understand files management in secondary storage.

### SYLLABUS

#### Unit-I

**Introduction:** Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

**8 hrs.**

#### Unit-II

**Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

**8 hrs.**

#### Unit-III

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

**8 hrs.**

## Unit-IV

**Storage management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Swap-Space management, Disk reliability.

**8 hrs.**

## Unit-V

**Security & Case Study:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security **8 hrs.**

### **Text Books:**

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Fifth Edition, Addison-Wesley
2. Richard Peterson, "Linux: The Complete Reference", Osborne McGraw-Hill.
3. Andrew Tanenbaum " Operating System "

### **Reference Books**

1. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.
2. Harvey M Deital, "Operating Systems", Addison Wesley

### **Lab Book**

1. Sumitabha Das "Your Unix/Linux: The Ultimate Guide" (Tata Mc.Graw Hills)

### **Web References:**

1. [www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)
2. [www.stanford.edu](http://www.stanford.edu)
3. [www.ics.uci.edu](http://www.ics.uci.edu)

### **Week wise Lecture Plan**

Week	Lecture 1	Lecture 2	Lecture 3	Lab Session <b>CA-301P</b>	Reference s
Week 1	Introduction Types of OS	User view System View	System Calls and Library	Simulation of Basic Linux commands	TB-1,TB- 3,L-1

		Structure of OS: System Components and Services	Functions	using C	
Week 2	System Programs, Concept of Virtual machines	Process Concept, Process Control Block , Process Scheduling	operations on process and CPU Scheduling Algorithms and Evaluation	Implement the following CPU Scheduling Algorithms.	TB-1
Week 3	Cooperating processes and Threads	Inter Process Communication, Process Scheduling Concept and Criteria	Inter Process Communication, Process Scheduling Concept and Criteria	Implement a Inter-Process communication using using shared memory, pipes or message queues	TB-1
Week 4	Process Synchronization Concept, Synchronization Hardware	Critical Section Problem and Semaphores	Classical problems of synchronization,	Implement Producer-Consumer Problem Using Semaphores.	TB-1
Week 5	Critical regions, Monitors,	Deadlocks-System model, Characterization	Deadlock prevention, Avoidance and Detection,	Implement Producer-Consumer Problem Using Monitors.	TB-1,R-1
Week 6	Recovery from deadlock, Combined approach to deadlock handling	Logical and Physical Address Space, Swapping	Contiguous Allocation, Paging,	Implement Banker's Algorithm for Deadlock Avoidance	TB-1
Week 7	Segmentation with paging	Virtual Memory, Demand paging and its performance,	Page replacement algorithms,	Implement Page Replacement Algorithms	TB-1,TB-3
Week 8	Allocation of frames, Thrashing,	Page Size ,Demand segmentation and other considerations	File systems, secondary Storage Structure,	Programs Using Linux System Calls for file management (opendir,closedir,create file, delete file, open, close, read , write, repositioning	R-1,T-1,L-1

				etc.)	
Week 9	File concept, access methods	directory implementation and allocation methods	Free Space Management, Efficiency and Performance	File Allocation Technique ( Contiguous, Linked, Shared)	TB-1, TB-3
Week 10	Recovery and Log Structured File System	Disk structure, Disk scheduling methods,	Disk management, Recovery, Swap-Space management, Disk reliability	Memory management scheme-I	TB-1
Week 11	Goals of protection, Domain of protection, Access matrix,	Implementation of access Matrix, Revocation of Access Rights,	The Security problem, Authentication, One Time passwords,	Memory management scheme-II	TB-1
Week 12	Program threats, System threats	Threat Monitoring, Encryption.	Linux system-design principles,	Programs Using Linux System Calls(fork, exec, getpid, exit, wait, , stat)	TB-2,
Week 13	Kernel Modules,	Process Management, Scheduling ,	Input and Output, Inter process communication	Programs using Unix I/O System calls	TB-2,
Week 14	File Systems,	Memory management	Network structure, security		TB-2,



## CA-302: Modelling and Simulation

### PREREQUISITES

Students should be familiar with the concepts of mathematics.

### Learning Objective:

In this course, students will analyze specified systems such as Call centers, Inventory system, Queuing models, and environmental dynamics

### Learning Outcomes:

To analyze and predict the behavior of existing or proposed systems by experimenting with representative models of the systems

To study complex systems in many areas such as: Manufacturing, Public & Private services, traffic analysis, War gaming, etc.

## SYLLABUS

### Unit-I

[8]

System definition and components, stochastic activities, continuous and discrete systems, system modelling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

TB<sub>1</sub>-ch<sub>1,2</sub>

### Unit-II

[8]

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>4</sub>

### Unit-III

[8]

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

**Unit-IV**

[8]

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

TB<sub>1</sub>-ch<sub>5,11</sub>TB<sub>2</sub>-ch<sub>8</sub>

**Unit-V**

[8]

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression based languages, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

TB<sub>2</sub>- ch<sub>8,5,</sub>

TB<sub>1</sub>-CH<sub>4</sub>

and

Web

Resources

**Text Books:**

1. Geoftrey Gordon, " **System Simulation**", PHI
2. Narsingh Deo “**System Simulation with Digital Computers**” PHI

**References:**

1. Averill M. Law, W. David Kelton, "**System Modelling and simulation and Analysis**", TMH
2. A.F. Seila, V. Ceric and P. Tadikamalla, **Applied Simulation Modelling** (International Student Edition), Thomson Learning, 2004
3. Averill Law, **Simulation Modelling and Analysis** (3rd ed.), Tata McGraw-Hill, 2007
4. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, "**Discrete Event System Simulation**", Pearson Education

**Web Resources:**

<http://www.iitg.ernet.in/trivedi/Downloads/scilab/book.pdf>

<http://www.solver.com/monte-carlo-simulation-tutorial>

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter
Week-1	System definition and components	<b>TB<sub>1</sub>-ch<sub>1</sub></b>	stochastic activities,	<b>TB<sub>1</sub>-ch<sub>1</sub></b>	continuous and discrete systems,	<b>TB<sub>1</sub>-ch<sub>1</sub></b>
Week-2	types of models,	<b>TB<sub>1</sub>-ch<sub>1</sub></b>	static and dynamic physical models,	<b>TB<sub>1</sub>-ch<sub>1</sub></b>	system modelling,	<b>TB<sub>1</sub>-ch<sub>2</sub></b>

Week-3	static and dynamic mathematical models,	<b>TB<sub>1</sub>-ch<sub>2</sub></b>	full corporate model	<b>TB<sub>1</sub>-ch<sub>2</sub></b>	types of system study.	<b>TB<sub>1</sub>-ch<sub>2</sub></b>
Week-4	System simulation,	<b>TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>1</sub></b>	why & when to simulate,	<b>TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>1</sub></b>	nature and techniques of simulation,	<b>TB<sub>1</sub>-ch<sub>3</sub></b>
Week-5	comparison of simulation and analytical methods,	<b>TB<sub>1</sub>-ch<sub>3</sub></b>	types of system simulation,	<b>TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>4</sub></b>	real time simulation,	<b>TB<sub>1</sub>-ch<sub>4</sub></b>
Week-6	hybrid simulation,	<b>TB<sub>1</sub>-ch<sub>4</sub></b>	simulation of pure-pursuit problem,	<b>TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>1</sub></b>	single-server queuing system and an inventory problem,	<b>TB<sub>2</sub>-ch<sub>4</sub></b>
Week-7	Monte-Carlo simulation,	<b>TB<sub>1</sub>-ch<sub>3</sub>,TB<sub>2</sub>-ch<sub>3</sub></b>	Distributed Lag models, Cobweb model.	<b>TB<sub>1</sub>-ch<sub>3</sub></b>	Simulation of continuous systems, analog vs. digital Simulation,	<b>TB<sub>1</sub>-ch<sub>4</sub></b>
Week-8	Simulation of water reservoir system,	<b>TB<sub>2</sub>-ch<sub>2</sub></b>	Simulation of a servo system, simulation of an autopilot,	<b>TB<sub>1</sub>-ch<sub>4</sub></b>	Discrete system simulation, fixed time-step vs. even to even model,	<b>TB<sub>1</sub>-ch<sub>8</sub></b>
Week-9	generation of random numbers, test for randomness,	<b>TB<sub>2</sub>-ch<sub>3</sub></b>	Monte-Carlo computation vs. stochastic simulation.	<b>TB<sub>2</sub>-ch<sub>3</sub></b>	System dynamics, exponential growth models, exponential decay models,	<b>TB<sub>1</sub>-ch<sub>5</sub></b>
Week-10	modified exponential growth models,	<b>TB<sub>1</sub>-ch<sub>5</sub></b>	logistic curves, generalization of growth models,	<b>TB<sub>1</sub>-ch<sub>5</sub></b>	system dynamic diagrams	<b>TB<sub>1</sub>-ch<sub>5</sub></b>
Week-11	Introduction to SIMSCRIPT: Program,	<b>TB<sub>1</sub>-ch<sub>11</sub>TB<sub>2</sub>-ch<sub>8</sub></b>	system concepts, origination, and statements,	<b>TB<sub>1</sub>-ch<sub>11</sub>TB<sub>2</sub>-ch<sub>8</sub></b>	defining the telephone system model.	<b>TB<sub>1</sub>-ch<sub>11</sub>TB<sub>2</sub>-ch<sub>8</sub></b>
Week-12	Simulation of PERT Networks, critical path computation,	<b>TB<sub>3</sub>-ch<sub>5</sub></b>	uncertainties in activity duration,	<b>TB<sub>3</sub>-ch<sub>5</sub></b>	resource allocation and consideration.	<b>TB<sub>3</sub>-ch<sub>5</sub></b>
Week-13	Simulation languages and software,	<b>TB<sub>1</sub>-ch<sub>13</sub>TB<sub>3</sub>-ch<sub>8</sub></b>	continuous and discrete simulation languages,	<b>TB<sub>3</sub>-ch<sub>8</sub></b>	expression based languages,	<b>TB<sub>3</sub>-ch<sub>8</sub></b>
Week-14	general purpose vs. application - oriented simulation packages	<b>TB- ch<sub>5, 8</sub></b>	general purpose vs. application - oriented simulation packages	<b>TB<sub>2</sub>-ch<sub>8</sub></b>	CSMP-III, MODSIM-III.	<b>TB<sub>1</sub>-ch<sub>4</sub></b>

## CA-303 : Software Engineering

### Learning Objective:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development and management of software systems. It will help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain.

### SYLLABUS

#### Unit-I: Introduction

8hrs

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models. (TB1: chpt1, TB2: chpt1, chpt2, TB3:chpt1, chpt2)

#### Unit-II: Software Requirement Specifications (SRS)

8hrs

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model. (TB2: chpt3, chpt7, TB3:chpt3)

#### Unit-III: Software Design

8hrs

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs. (TB2: chpt5, chpt 6, chpt 8)

#### Unit-IV: Software Testing and Maintenance

8hrs

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Inspections), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.

(TB2: chpt8, chpt 9, TB3: chpt 2)

### **Unit-V: Software Project Management and Other Software Engineering methodologies**

**8hrs**

Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Component based software engineering, Aspect oriented software engineering, Agile software development: extreme programming. (TB2: chpt4, chpt 9, TB3: chpt 2, TB1: chpt3, chpt4)

#### **References:**

##### **Text books**

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
3. Pankaj Jalote, Software Engineering, Wiley

##### **Reference books**

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
2. Jibitesh Mishra and Ashok Mohanty, Software Engineering : Pearson

##### **Web Links:**

- 1.) <http://www.codeproject.com/Tips/351122/What-is-software-testing-What-are-the-different-ty>
- 2.) <http://istqbexamcertification.com/what-are-the-software-development-life-cycle-phases/>
- 3.) [http://www.pearsonhighered.com/assets/hip/us/hip\\_us.../0321200195.pdf](http://www.pearsonhighered.com/assets/hip/us/hip_us.../0321200195.pdf)
- 4.) <http://www.cs.nsu.edu/courses/csc380/lab38006.htm>

### 3. Week Wise Lecture Plan

<b>Week</b>	<b>Lecture 1</b>	<b>Lecture 2</b>	<b>Lecture 3</b>	<b>Tutorials</b>
Week-1	Introduction to Software Engineering, Software Components	Software Characteristics, Software Crisis	Software Engineering Processes	Functions of Software system Engg.
Week-2	Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes	. Software Development Life Cycle (SDLC) Models: Water Fall Model	Prototype Model, Spiral Model	Software Project Management Techniques
Week-3	Evolutionary Development Models, Iterative Enhancement Models	Requirement Engineering Process: Elicitation, Analysis, Documentation	Review and Management of User Needs, Feasibility Study, Information Modelling	Software Platform Techniques
Week-4	Data Flow Diagrams, Entity Relationship Diagrams	Decision Tables, SRS Document	IEEE Standards for SRS. Software Quality Assurance (SQA):	Software Engg. Profession
Week-5	SQA Plans, Software Quality Frameworks	Verification and Validation	ISO 9000 Models, SEI-CMM Model	History of software Engg.
Week-6	Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization	Design Structure Charts, Pseudo Codes, Flow Charts	Coupling and Cohesion Measures	Software Engg. in different languages
Week-7	Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science	Cyclomatic Complexity Measures: Control Flow Graphs	Function Point (FP) Based Measures Design	Software Applications

Week-8	Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing	Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing	Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs	Software Quality Assurances tools and organizations
Week-9	Structural Testing (White Box Testing), Functional Testing (Black Box Testing)	Test Data Suit Preparation, Alpha and Beta Testing of Products	Static Testing Strategies: Formal Technical Reviews (Inspections), Walk Through	Retesting and Reverse Testing
Week-10	Code Inspection, Compliance with Design and Coding Standards	Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance	Cost of Maintenance, Software Re-Engineering	Search Based Software Engineering
Week-11	Reverse Engineering	Software Configuration Management Activities	Change Control Process	Software Engineering for Object oriented programming
Week-12	Software Version Control	An Overview of CASE Tools	Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration	Rational Unified Process
Week-13	Constructive Cost Models (COCOMO)	Resource Allocation Models	Software Risk Analysis and Management	Lean software Development
Week-14	Component based software engineering	Aspect oriented software engineering	Agile software development: extreme programming	ISO/IEC 12207 Software lifecycle

## CA-304: DATABASE MANAGEMENT SYSTEMS

### PREREQUISITES

Students should be familiar with the concepts of mathematics

### OBJECTIVES :

#### The objectives of this course are:

To acquire knowledge of DBMS both in terms of use and design.

To be familiar with SQL

To increase proficiency with the programming

### LEARNING OUTCOME

Concepts introduced in this course will help students to:

Know the structure and functions of a database management system

Understand the rules and is able to use the relational data model

Know and use the database schema normalization rules and techniques

Know the different techniques of modelling data and can create a database ERD diagram

choose the database management system suitable for a specific project and know its structure and functions

Know the SQL language and can write queries in SQL

Know how to effectively back up data from the database

## SYLLABUS

### Unit- I

8 Hrs

**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

(TB2: chpt2, Ref2: chpt1, Ref3: chpt1,2, ref4: chpt1)

**Data Modelling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

(TB2:chpt3,4,9,Ref3: chpt12, ref4: chpt 1,3)

### Unit- II

8 Hrs

**Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

(TB2:chpt7,Ref3:chpt3,4, ref4-chpt13)

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes,



Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.

(TB2: chpt8,TB3:chpt6,7,9, Ref3:chpt5)

### **Unit- III**

**8 Hrs**

**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

(TB2: chpt14, ref5: chpt6,7 ,Ref1:chpt5, Ref3: chpt9,13, ref4: chpt14)

### **Unit- IV**

**8 Hrs**

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

(TB1: chpt15,16,17,TB2:chpt19,Ref3:chpt19)

### **Unit- V**

**8 Hrs**

**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

(TB1: chpt15,16,17,19, TB2:chpt20,21,24, Ref2:chpt22, ref5:chpt12)

### **References**

#### **Text Books**

- 1 Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
- 2 Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley
3. Ivan Bayross, "SQL,PL/SQL The programming language of Oracle", BPB Publication.

#### **Reference Books**

- 1 Majumdar & Bhattacharya, "Database Management System", TMH
- 2 Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
3. Connolly Thomas, Beg Carolyn," Database Systems", Pearson Education.
- 4 Date C J, "An Introduction To Database System", Addison Wesley
- 5 Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication

### **A few web-links for tutorials/resources:**

<http://www.nptel.iitm.ac.in/video.php?subjectId=106102064>  
[www.w3schools.com/sql/](http://www.w3schools.com/sql/)

## Week Wise Lecture Plan

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Lab Meeting CA-304P
Week-1	An overview of database management system, Database System Vs File System, Database system concepts and architecture	TB2: chpt2, Ref3: chpt1, Ref4: chpt1	Data models schema and instances	TB2: chpt2, Ref4: chpt1	data independence and data base language and interfaces, Data definitions language, DML	TB2: chpt2, Ref4: chpt1,2	Get familiar with the differences between database system and file system, data definition language, DML
Week-2	ER model concepts, notation for ER diagram	TB1: chpt2 TB2: chpt3	mapping constraints, keys, Concepts of Super Key	TB1: chpt2, TB2: chpt3, Ref2:ch pt2	Candidate key, primary key, Generalization	TB1: chpt2, TB2: chpt3, Ref2:ch pt2	Case study for ER model design
Week-3	aggregation, reduction of an ER diagrams to tables	TB2: chpt3,	extended ER model, relationships of higher degree	TB2: chpt9,	Relational data model concepts	TB2: chpt7	Example to reduce an ER model to relational model.
Week-4	Integrity constraints : entity integrity, referential integrity, keys constraints, domain constraints	TB2: chpt7,	Relational algebra	TB2: chpt7	Relational calculus	Ref4: chpt13, Ref3: Chpt4	Examples based on relational algebra and calculus
Week-5	Tuple and domain calculus	Ref4: chpt13 Ref3:ch pt4	Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL	TB2:ch pt8	Queries and sub queries, Aggregate functions, Insert, update and delete	TB2:ch pt8	Exercises based on SQL queries, tuple and domain calculus

			commands, SQL operators and their procedure, Tables, views and indexes		operations, Joins, Unions, Intersection, Minus		
Week-6	PL/SQL	TB3:ch pt6	Cursor	TB3:ch pt7	Triggers, clusters	TB3:ch pt9	Exercise based on PL/SQL,cursors, triggers and clusters
Week-7	Functional dependencies	Ref4:ch pt14, TB2:ch pt14	Normal forms: first, second	Ref4:ch pt14, TB2:ch pt14	Third normal form, BCNF	ref4:chpt14, TB2:ch pt14	Examples based on normal forms
Week-8	inclusion dependencies, loss less join decompositions	Ch-4:chpt6	normalization using FD	Ch-4:chpt6	MVD, and JDs, alternative approaches to database design	Ch-4:chpt6	Exercises based on normalization, MVD,JD
Week-9	Transaction system	TB1:ch pt15, TB2:ch pt19	Testing of serializability	TB1:ch pt15, TB2:ch pt19	Serializability of schedules	TB1:ch pt15, TB2:ch pt19	Schedule design
Week-10	conflict & view serializable schedule	TB1:ch pt15	recoverability	TB1:ch pt15	Recovery from transaction failures	TB1:ch pt17	Designing serializable schedule and checking for recoverability.
Week-11	log based recovery	TB1:ch pt17	checkpoints, deadlock handling	TB1:ch pt17	Concurrency control	TB1:ch pt16, TB2:ch pt20	Familiar with transaction log table
Week-12	locking Techniques for concurrency control	TB1:ch pt15, TB2:ch pt20	Time stamping protocols for concurrency control	TB1:ch pt16, TB2:ch pt20	validation based protocol	TB1:ch pt16	Designing wait for graph

Week-13	multiple granularity	TB1:ch pt16	Multi-version schemes	TB1:ch pt16	Recovery with concurrent transaction	TB1:ch pt17	Example based on multiple granularity
Week-14	Transaction Processing in Distributed system	TB1:ch pt19, TB2:ch pt24	data fragmentation. Replication and allocation techniques for distributed system	TB1:ch pt19, TB2:ch pt24	overview of concurrency control and recovery in distrusted database	TB2:ch pt24, Ref2:ch pt22	Examples based on fragmentation

## CA-305:Web Technology -1

### PREREQUISITES:

Students should be familiar with the concepts Object Oriented Programming and World Wide Web Consortium.

### OBJECTIVES :

#### The objectives of this course are:

To familiarize with Client Web Side Technologies like J2SE, HTML,XML, JavaScript and Ajax

### LEARNING OUTCOME:

Concepts introduced in this course will help students to:

Become familiar with Object Oriented Programming Concepts using Java.

Familiar with Collections of Java, JDBC, JFC.

Get the flavor of how to develop application using Collections, JFC, JDBC

Know the different scripting languages like HTML,XML, JavaScript and Ajax.

Choose technology suitable for a specific project and know its structure and functions

## SYLLABUS

### Unit I

8 Hours

**Introduction to Java programming :** Brief history of JAVA, The Java Virtual Machine, The Byte Code. (TB1:chpt2)

**Identifiers, Keywords, and Types, Expressions and Flow Control, Object-Oriented Programming concepts:** Class, object ,member, static member, method, nesting method ,constructor, overloading, overriding, final variables and method, final classes, abstract method and classes. array, string, vector , interface, inheritance, package, (TB1:chpt2-11, TB2:chpt2-9,13)

**Exception handling:** Fundamental, Exception Types, try catch block, nested try statements, throw ,throws and finally, Java's built-in exceptions, creating user defined exception

(TB2:chpt-10, TB1:chpt13)

**Multithreading:** Introduction, Life cycle of a Thread, Creating threads, Thread priority, Synchronization, Inter-thread Communication.

(TB1:chpt-12, TB2:chpt11)

**Applets:** introduction, difference between application and applet, applet lifecycle, building applet code.

TB1:chpt-14

## Unit II

**8Hours**

**Input/Output Files:** concepts of streams, Stream classes, Byte stream classes, character stream classes, using the File class, creation of Files, concatenating and Buffering Files

(TB1:chpt16)

**Collections and Generics Framework:** Collection overview, collection interfaces and Collection classes.

(TB2:chpt15)

**Networking:** Socket programming using TCP and UDP

(TB2:chpt-18)

## Unit III

**8 Hours**

### GUIs Using the Swing and JDBC

**Database Connectivity:** The design of JDBC, JDBC drivers, Connection to database using JDBC API classes and interfaces: concepts of Statement, PreparedStatement interface and BatchUpdate.

(Ref1:chpt4)

**Event Handling :** The Delegation Event Model, Event classes, Event Listener interfaces, Using the delegation Event Model: Handling Mouse Events, Handling Keyboard Events, Adapter classes

(TB2)

**Building Java GUIs Using the Swing API:** What are Java Foundation Classes(JFC), Swing features, swing packages and classes, Model-View Controller Architecture, Describe the GUI building blocks: containers, components, and layout managers, Build a GUI using Swing components

(TB2:chpt-20,26, ref2:chpt1-14)

## Unit IV

**8 Hours**

### JAVA Script

**Introduction to JavaScript:** Introduction to Scripting, Difference between Java and JavaScript, JavaScript Characteristics, JavaScript and Common Programming Concepts: Variables, JavaScript Expressions, Operators, Inline Scripting, Keywords and Reserved Words, control flow, array, built-in functions, user defined function, dialog box.

(TB3:chpt8)

**The JavaScript Document Object Model (DOM):** Introduction, javascript assisted style sheets DOM(JSSS DOM), Handling events using JavaScript, Built-in objects in JavaScript, session and cookies.

(TB3:chpt9,10)

**Unit V**

**8 Hours**

**Client Side Scripting:**

**Introduction HTML:** HTML Tags, list, table, images, frames, forms, Introduction to CSS.

(TB3:chpt2-4,7)

**XML:** Introduction ,transition from HTML to XML,DTD, XML schemas, building blocks of XML document, creating elements, creating attributes, creating entities.

(Ref3)

**JavaScript and AJAX:** Introduction to AJAX, How Ajax works, Ajax-Form, Ajax-Browser support, Ajax-JavaScript.

(Web-link1)

**Text-Books:**

1. Balagurusamy, “Programming with Java A Primer”, McGraw Hill
2. Schildt Herbert, “The Complete Reference Java 2”, McGraw Hill
3. Ivan Bayross, ” Web Enabled Commercial Application Development using.HTML,DHTML,JavaScript,Perl, CGI”, ”BPB”

**Ref Books:**

1. Cay S. Horstmann, Gary Cornell, ”Core Java VolumeII-Advanced Features”, Pearson Education Asia
2. Robert Eckstein, Marc Loy and Dave Wood, ”Java Swing”, O’Reilly
3. A Navarro, “Mastering XML”, BPB

A few web-links for tutorials/resources:

1. [www.w3schools.com/ajax](http://www.w3schools.com/ajax)
2. [www.w3schools.com/xml](http://www.w3schools.com/xml)

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Lab Meeting
							<b>CA-305P</b>
Week-1	Brief history of JAVA, The Java Virtual Machine, The Byte Code	TB1:ch pt2	Identifiers, Keywords, and Types, Expressions and Flow Control	TB1:ch pt3-11, TB2:ch pt2-9,13	Class, object ,member, static member, method, nesting method ,constructor	TB1:ch pt3-11, TB2:ch pt2-9,13	Examples illustrating the use of class, object member, constructor etc
Week-2	overloading, overriding, final variables and	TB1:ch pt2-11, TB2:ch pt2-	array, string, vector , interface	TB1:ch pt2-11, TB2:ch pt2-	inheritance, package	TB1:ch pt2-11, TB2:ch pt2-	Examples depicting the Use of overloading overriding, interface

	method, final classes, abstract method and classes.	9,13		9,13		9,13	inheritance ,string vector etc
Week-3	Fundamental, Exception Types, try catch block, nested try statements, throw ,throws and finally, Java's built-in exceptions, creating user defined exception	TB2:ch pt-10, TB1:ch pt13	Introduction, Life cycle of a Thread, Creating threads,	TB1:ch pt-12, TB2:ch pt11	Thread priority, Synchronization, Inter-thread Communication.	TB1:ch pt-12, TB2:ch pt11	Examples of exception Handling, thread and Thread synchronization
Week-4	introduction, difference between application and applet, applet lifecycle, building applet code.	TB1:ch pt-14	concepts of streams, Stream classes, Byte stream classes,	TB1:	character stream classes, using the File class, creation of Files, concatenating and Buffering Files	TB1:	Examples illustrating the use of applet and streams
Week-5	Collection overview, collection interfaces and <b>Collection classes.</b>	TB2:ch pt15	Socket programming using TCP	TB2:ch pt-18	Socket programming using UDP	TB2:ch pt-18	Get familiar with Java Collections and socket programming
Week-6	The design of JDBC, JDBC drivers	Ref1:ch pt4	Connection to database using JDBC API classes and interfaces: concepts of Statement, Prepared	Ref1:ch pt4	Concept of BatchUpdate.	Ref1:ch pt4	Programming illustrating the use of Statement and PreparedStatement Interface also get familiar With Batch



			Statement interface				Update
Week-7	The Delegation Event Model, Event classes, Event Listener interfaces	TB1&TB2	Using the delegation Event Model: Handling Mouse Events	TB1&TB2	Using the delegation Event Model: Handling Keyboard Events	TB1&TB2	Examples depicting the handling of Mouse Events  And Keyboard Events
Week-8	Adapter classes	TB1&TB2	What are Java Foundation Classes(JFC), Swing features	TB2:ch pt-20,26, ref2:ch pt1-14	swing packages and classes,	TB2:ch pt-20,26, ref2:ch pt1-14	Get familiar with Adapter  Classes and Swing  Packages and classes
Week-9	Model-View Controller Architecture	TB2:ch pt-20,26, ref2:ch pt1-14	GUI building blocks: containers, components	TB2:ch pt-20,26, ref2:ch pt1-14	building blocks: layout managers	TB2:ch pt-20,26, ref2:ch pt1-14	Programming using GUI  Building blocks:containers,  Components and layout manager
Week-10	Build a GUI using Swing components	TB2:ch pt-20,26, ref2:ch pt1-14	Introduction to Scripting, Difference between Java and JavaScript, JavaScript Characteristics	TB3:ch pt8	JavaScript and Common Programming Concepts: Variables, JavaScript Expressions, Operators, Inline Scripting, Keywords and Reserved Words	TB3:ch pt8	Get familiar with  Java Script concepts

Week-11	control flow, array, built-in functions	TB3:ch pt8	user defined function, dialog box	TB3:ch pt8	javascript assisted style sheets DOM(JSSS DOM	TB3:ch pt9,10	Examples illustrating the use of java scrip functions  And JSS DOM
Week-12	Handling events using JavaScript	TB3:ch pt9,10	Built-in objects in JavaScript	TB3:ch pt9,10	session and cookies	TB3:ch pt9,10	Programming on sessio and cookie creation
Week-13	HTML Tags, list, table, images	TB3:ch pt2-4,7	HTML frames, forms, Introduction to CSS.	TB3:ch pt2-4,7	Introduction ,transition from HTML to XML,DTD, XML schemas	Ref3	Get familiar with HTML  Tags, CSS, XML, DTI and XML schemas
Week-14	building blocks of XML document, creating elements, creating attributes, creating entities.	Ref3	Introduction to AJAX, How Ajax works, Ajax-Form	Web-link1	Ajax-Browser support, Ajax-JavaScript.	Web-link1	Simple program illustrating Ajax-JavaScript

## **Human Values & Professional Ethics**

**(Syllabus for the Value Education Course to be introduced in MTU Colleges/Institutes)**

**Subject Code-AU-301/AU-401**

### **Course Objective**

This introductory course input is intended

- a. To help the students appreciate the essential complementarity between ‘VALUES’ and ‘SKILLS’ to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.
- c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with nature.

Thus, this course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

### **Course Methodology**

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration and not of giving sermons. Whatever is found as truth or reality is stated a proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself family.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

## Human Values & Professional Ethics

Course Code-AU-301/AU-401

Total No.of Lectures : 28  
Total No.of Practice Sessions: 14 (of 1 hr. each)

L-T-P:2-1-0

### Content for Lectures:

#### Unit-I

##### **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (6)**

1. Understanding the need, basic guidelines, content and process for Value Education.
2. Self Exploration-what is it? - its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self exploration
3. Continuous Happiness and Prosperity-A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities-the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

#### Unit-II

##### **Understanding Harmony in the Human Being-Harmony in Myself (6)**

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya  
-Practice Exercised and Case Studies will be taken up in Practice Sessions.

#### Unit-III

##### **Understanding Harmony in the Family and Society -Harmony in Human-Human Relationship (6)**

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;  
Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
15. Understanding the meaning of Vishwas; Difference between intention and competence

16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): Samadhan, samridhi, Abhay, Sah-astitva as comprehensive Human Goals
18. Visualizing a universal harmonies order in society-Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family.  
-Practice Exercise and Case Studies will be taken up in Practice Sessions.

#### **Unit-IV**

#### **Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

(5)

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulations in nature
21. Understanding existence as Co-existence (Sah-astitva) of mutually interacting unites in all-pervasive space.
22. Holistic perception of harmony at all levels of existence

-Practice Exercise and Case Studies will be taken up in Practice Sessions.

#### **Unit-V**

#### **Implications of the above Holistic Understanding of Harmony on Professional Ethics**

(5)

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis of Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics;
  - a. Ability to utilize the professional competence for augmenting universal human order.
  - b. Ability to identify the scope and characteristics of people friendly eco-friendly production systems
  - c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to universal Human Order;
  - a. At the level of individual: as socially and ecologically responsible engineers, technologies and managers.
  - b. At the level of society: as mutually enriching institutions and organizations

## **Content for Practice Sessions:**

### **Unit-I**

#### **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

**PS 1:** Introduction yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

**Expected Outcome:** the students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

**PS 2:** Now a days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environment pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be man-made problems threatening the survival of life on Earth- What is the root cause of these maladies & what is the way out in your opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

**Expected Outcome:** the students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all problems and the sustained solution could emerge only through understanding of human values and value based living. Any solution brought fear, temptation or dogma will not be sustainable.

#### **PS 3:**

1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of:
  - (i) What is Naturally Acceptable to you in relationship-Feeling of respect or disrespect?
  - (ii) What is Naturally Acceptable to you - to nurture or to exploit others?  
Is your living the same as your natural acceptance or different?
2. Out of the three basic requirements for fulfillment of your aspirations-right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

## **Expected Outcome**

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or nay other person cannot enable them to verify with authenticity; it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time and all they need to do is to refer to their natural acceptance to remove this disharmony.
3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

## **Unit-II**

### **Understanding Harmony in the Human Being-Harmony in Myself**

**PS 4:** List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

**Expected Outcome:** the students are able to see that they can enlist their desires and the desires are not vogue. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the Physical facility is related to the body. They are also able to see that 'I' and 'Body' are two realities , and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

### **PS 5:**

1. (a) Observe that any physical facility you use, follows the given sequence with time:  
Necessary & tasteful-unnecessary & tasteful-unnecessary & tasteless-intolerable  
  
(b) In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment.
2. List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.
3. Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

## **Expected Outcome:**

1. The students are able to see that all physical facilities they use are required for limited time in limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.
2. The students are able to see that activities like understanding, desire, thought and selection are the activities of 'I' only, the activities like breathing, palpitation of different parts of the body are fully the activities of body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.
3. The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

## **PS 6:**

1. Chalk out programs to ensure that you are responsible to your body-for the nurturing, protection and right utilization of the body.
2. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

**Expected Outcome:** The Students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases

## **Unit-III**

### **Understanding Harmony in the Family and Society -Harmony in Human-Human Relationship**

**PS 7:** From small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

- |   |  |
|---|--|
| <b>1 a.</b> Do I want to make myself happy?       | <b>1b.</b> Am I able to make myself always happy?      |
| <b>2 a.</b> Do I want to make the other happy?    | <b>2b.</b> Am I able to make the other always happy?   |
| <b>3a.</b> Does the other want to make him happy? | <b>3b.</b> Is the other able to make him always happy? |
| <b>4a.</b> Does the other want to make me happy?  | <b>4b.</b> Is the other able to make me always happy?  |
| What is the answer?                               | What is the answer?                                    |
| <u>Intention (Natural Acceptance)</u>             | <u>Competence</u>                                      |

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others & competence.



**Expected Outcome:** The students are able to see that the first four questions are related to our Natural Acceptance i.e. intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intentions as a result we conclude that I am a good person and other is a bad person.

**PS 8:**

1. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

**Expected Outcome:** the students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problem in the society are and outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms, and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

**PS 9:**

1. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group
2. Develop three chapters to introduce 'social science-its need, scope and content' in the primary education of children

**Expected Outcome:** The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the exiting model.

**Unit-IV**

**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

**PS 10:** List down units (things) around you. Classify them in for orders. Observe and explain the mutual fulfillment of each unit with other orders.

**Expected Outcome:** The students are able to differentiate between the characteristics and activities of difference orders and study the mutual fulfillment among them. They are also able to

see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participants (in terms of nurturing, protection and utilization) in the nature.

### **PS 11:**

1. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
2. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

**Expected Outcome:** The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study related to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

### **Unit-V**

#### **Implications of the above Holistic Understanding of Harmony on Professional Ethics**

**PS 12:** Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

**Expected Outcome:** the students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

### **PS: 13**

1. Suggest ways in which you can use your knowledge of Technology/Engineering/Management for universal human order, from your family to the world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected Outcome:** The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management to ensure mutually enriching and recyclable production systems.

**PS:14** The course is going to be over now. Evaluate your state before and after the course in terms of:

- a. Thought
- b. Behavior
- c. Work
- d. Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected Outcome:** The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant.

They are also able to make us of their understanding in the course for a happy and prosperous society.

## **Term Paper**

### **Text Book and Reference Material**

**a. The text book:**

- R.R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books Private Limited, New Delhi

**b. Teacher's Manual:**

- R.R. Gaur, R Sangal, G P Bagaria, 2009, Teachers Manual: A Foundation Course in Human Values and Professional Ethics, Excel Books Private Limited, New Delhi

Video CD of Teacher Orientation Workshop will be made available on website.

**c. Reference Books**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Haper Collings, USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the other Half Dies, Penguin Press, Reprinted 1986, 1991.
4. Donella H, Meadows, Dennis L. Meadows, Jorgen Randders, William W. Behrens III, 1972, Limits to Growth-Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
6. P.L. Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. AN Tripathy, 2003, Human Values, New Age International Publishers
8. Subhas Palekar, 2000, How to practice Natural farming, Pracheen (vaidik) Krishi Tantra Shodh, Amravati
9. EG Seebauer & Robert L Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M Govindrajran S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B.P. Banerjee, 2005, Foundation of Ethics and Management, Excel Books.
12. B.L. Bajpai 2004, Indian Ethos and Modern Management, New Royal Book CO. Lucknow. Reprinted 2008

**d. Relevant websites, CDs, Movies and Documentaries:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of stuff, <http://www.storyofstuff.com>
3. AL Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology-the Untold Story
6. Anand Gandhi, Right here right now, Cyclewala Production

# Semester –IV

## CA-401 :DESIGN AND ANALYSIS OF ALGORITHMS

Prerequisite:

Good knowledge of Data Structures and their implementation. Knowledge of basic mathematics

Course Objective:

The primary objective of this course is to introduce the topic of algorithms as a precise mathematical Concept, and study how to design algorithms, establish their correctness, study their efficiency and Memory needs. The course consists of a strong mathematical component in addition to the design of Various algorithms. By the end of the course, the successful student will be able to:

1. Understand, explain, model, and analyze a given problem as an algorithm.
2. Investigate whether the algorithm found is the most efficient.
3. Formulate the time order analysis for an algorithm.
4. Formulate the space needs for the implementation of an algorithm.
5. Prove the correctness of an algorithm.

### SYALLABUS

#### Unit-I

Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Growth of functions, Recurrences and their solution methods.

Sorting in polynomial Time: Insertion sort, Selection Sort, Merge sort, Heap sort, and Quick sort

Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort

#### Unit-II

Advanced Data Structures: B Trees, Binomial Heaps, Fibonacci Heaps, Red-Black Trees, Data Structures for Disjoint Sets. All kinds of Algorithms on these data structures

#### Unit-III

Advanced design and analysis techniques:

Dynamic Programming: Matrix Chain Multiplication, Elements of Dynamic Programming, Longest Common Subsequence.

Greedy Algorithm: Activity Selection Problem, Elements of Greedy Strategy, Huffman Codes, Task Scheduling Problem

Amortized Analysis

#### Unit-IV

Graph Algorithms: Elementary Graph Algorithms, Minimum Spanning Trees, Single Source Shortest Paths, All Pairs Shortest Paths, Maximum Flow

#### Unit-V

Selected Topics: Sorting Network, Matrix Operations, Polynomials and FFT, String Matching, Approximation Algorithms, Number Theoretic Algorithms, Theory of NP-Hard and NP-Completeness

Text Book:

1. Introduction to Algorithms by Thomas H Cormen et al, PHI , Second edition

References

1. Design and Analysis of Computer Algorithms, Aho, Pearson Education
2. Fundamentals of Computer Algorithms by Horowitz and Sahani, Galgotia
3. Computer Algorithms : Introduction to Design and Analysis by Sara Baase and Allen Van Gelder, Pearson Education
4. Algorithms Design by M T Goodrich et al, John Wiley
5. The Design and analysis of Algorithms by A V Aho et al, Pearson Education

Week	Lecture 1	Lecture 2	Lecture 3	Chapter	Lab Meeting CA-401P
Week-1	Algorithms, Analysis of Algorithms, Design of Algorithms	Complexity of Algorithms, Growth of functions,	Recurrences and their solution methods: (Substitution and Iteration Method)	T.B 1 : Ch: 1,2,3,4	Revision of Algorithms from Data structure
Week-2	Recurrences and their solution methods: Master Method	Insertion sort, Selection Sort, Merge sort	Heap sort, and Quick sort	T.B 1 : Ch:4,6,7	Insertion Sort, Selection Sort, Merge Sort
Week-3	Counting sort	Radix Sort, Bucket Sort	B Trees: Basic Operations	T.B 1 : Ch: 8, 18	Heap Sort
Week-4	B Trees : Deleting a Key	Binomial Heaps : Operations on Binomial Heaps	Fibonacci Heaps: Structure, Mergeable Heap Operations	T.B 1 : Ch:18, 19, 20	Quick Sort
Week-5	Fibonacci Heaps: Decreasing a key and deleting a node	Red-Black Trees: Properties, Rotations	Red-Black Trees: Inserting a Key	T.B 1 : Ch:20,13	Counting Sort
Week-6	Data Structures for Disjoint Sets	Matrix Chain Multiplication	Matrix Chain Multiplication Contd.	T.B 1 : Ch:21, 15	Implement Matrix Chain Multiplication
Week-7	Elements of Dynamic Programming, Longest Common Subsequence	Greedy Algorithm: Activity Selection Problem	Elements of Greedy Strategy, Huffman Codes	T.B 1 : Ch:15, 16	Implement LCS Problem
Week-8	Task Scheduling Problem	Amortized Analysis: Aggregate and Accounting Method)	Amortized Analysis: Potential Method, Dynamic Tables	T.B 1 : Ch: 16, 17	Implement Activity selection Problem

Week-9	Representation of Graphs, BFS, DFS	Topological Sorting, Strongly Connected Component	Minimum Spanning Trees (Algorithm for Kruskal and Prim)	T.B 1 : Ch:22, 23	Finding Huffman codes
Week-10	Dijkstra's Algorithm	Bellman Ford Algorithm, Single Source shortest Path in DAG	All pairs Shortest Path: Floyd Warshall Algorithm	T.B 1 : Ch:24, 25	Implement Dijkstra's Algorithm
Week-11	Maximum Flow: Flow Networks	Max Flow Min-Cut Theorem, The Ford Fulkerson Method	Sorting Network : Bitonic Sorting network, Merging and sorting networks)	T.B 1 : Ch:26, 27	Implement Floyd Warshall Algorithm
Week-12	Matrix Operations: Strassen's Algorithm, Solving Systems of Linear equations, Inverting Matrices	Polynomials and FFT: DFT, FFT and FFT Implementations	String Matching: Rabin Karp Algorithm, String Matching using FSA	T.B 1 : Ch: 28, 30, 32	Implement string Matching using FSA
Week-13	String Matching: KMP and Boyer Moore Algorithms.	Approximation Algorithms (Vertex Cover, TSP, Set Covering and Sub-set sum Problems)	Number Theoretic Algorithms: (GCD, Chinese Remainder Theorem, RSA Public Key cryptosystem)	T.B 1 : Ch: 32, 35, 31	Implementation of Strassen's Formulae
Week-14	Theory of NP-Hard and NP-Completeness (Fundamental concepts only)	Revision	Revision	T.B 1 : Ch: 34	Implement LUP decomposition

## CA-402 :COMPUTER BASED OPTIMIZATION TECHNIQUES

### Course Objective:

Students learn about the fundamental optimization methods of operations research. They become capable of determining which models are appropriate to use in practical situations. They become knowledgeable in applying the operations research models in practical situations.

### Prerequisite:

Basic knowledge of Mathematics is required.

## SYLLABUS

### Unit -I

Origin & development of Operation Research: Nature & Characteristic features of O.R., Models & Modeling in operation research, Methodology of O.R., General methods for solving O.R. & decision making, Application, use & limitations of O.R.

Linear Programming Problems (LPP): Definition of LPP, Canonical and Standard forms of linear programming problems, Mathematical formulation of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Big-M Method, Sensitivity Analysis, Duality, Dual Simplex Method.

### Unit -II

Integer Linear Programming Problems: Integer Linear Programming Problems Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method.

Transportation Problems: Introduction to Transportation Model, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution – MODI Method.

Assignment Problems: Definition, Hungarian Method for AP.

### Unit- III

Network analysis: CPM & PERT- Network minimization, shortest route problem, maximal-flow problem, project scheduling, critical path calculation, PERT calculation.

Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

### Unit- IV

Inventory Models and Replacement problems: Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure- group replacement.

### Unit V

Queuing Theory Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson queuing models:  $\{(M/M/1): (\infty/FIFO)\}$ ,  $\{(M/M/1): (\infty/SIRO)\}$ ,  $\{(M/M/1): (N/FIFO)\}$ ,  $\{(M/M/c): (\infty/FIFO)\}$ ,  $\{(M/M/c): (N/FIFO)\}$ , Non-Poisson queuing models:  $\{(M/E/1): (\infty/FIFI)\}$ ,  $\{(M/E/1): (1/FIFI)\}$ ,  $\{(M/G/1): (\infty/GD)\}$ .

Text Books:

1. Taha, H.A, "Operations Research – An Introduction", Prentice-Hall, India.
2. Swarup K etal, "Trends in Operation Research", S. Chand & Sons, New Delhi, India.

References:

1. Sharma, S.D., "Operations Research", Kedar Nath Ram Nath & Co., Meerut, India.
2. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day
4. Harvey M. Wagner, "Principles of Operations Research with Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Assignments Tutorials
Week-1	Origen and development of O.R., Features of O.R., Models and Modeling in O.R., Advantages and limitations of models, General solution methods for O.R. Models, Applications of O.R.	TB2: chpt1	Introduction to linear programming problem (LPP), Mathematical Formulation of LPP.	TB2:chpt2	Mathematical Formulation of LPP contd.  Graphical solutions of LPP.	TB2: Chpt2-3	Examples of mathematical formulation of LP and their solution through graphical method.
Week-2	Special cases in graphical solution: unbounded solution, alternate solution and infeasible solutions	TB2:chpt3	General LPP, Canonical and Standard forms of LPP.  Introduction to Simplex method.	TB2:chpt3-4	Introduction to artificial variable. Big-M method.	TB2: Chpt4	Examples of solving LPP by graphical method and Simplex method.
Week-3	Two-Phase Method. Special cases in simplex method application: Unbounded, infeasible and alternate solutions.	TB2: Chpt4	Definition of Dual Problem, Formulating a Dual problem, Duality theorems	TB2: Chpt5	Dual-Simplex method.  Sensitivity analysis: changes affecting feasibility and changes affecting optimality.	TB1: chpt4  TB2: Chpt6	Examples of solving LPP using artificial variable technique and Dual-Simplex method. Primal-Dual Computations.



Week-4	<p>Sensitivity analysis cond.</p> <p>Changes in the structure of LPP: addition of new variable or constraint, deletion of new variable or constraint.</p>	<p>TB2: Chpt6</p> <p>Ref1: chpt12</p>	<p>Introduction to Integer linear programming problem. Branch &amp; bound algorithm.</p>	<p>TB1: Chpt9</p> <p>TB2: chpt7</p>	<p>Cutting-plane Algorithm for ILPP. Mixed ILPP</p>	<p>TB1: Chpt9</p> <p>TB2: chpt7</p>	<p>Examples illustrating the use of sensitivity analysis in LPP. Examples of B&amp;B and cutting-plane algorithms.</p>
Week-5	<p>Introduction and Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Methods for Obtaining Initial BFS: N-W Corner Rule, Matrix Minima Method.</p>	<p>TB1: Chpt5</p> <p>TB2: chpt10</p>	<p>Vogel's method for obtaining initial BFS of a TP. MODI's method for Obtaining Optimal Basic Feasible Solution of a TP.</p>	<p>TB1: Chpt5</p> <p>TB2:chp10</p>	<p>Degeneracy in TP: Initial phase (BFS), Solution Phase.</p>	<p>TB1: Chpt5</p> <p>TB2:chpt10</p>	<p>Examples on TP.</p>
Week-6	<p>Special Cases in TP:</p> <p>Unbounded TP, Solving TP in case of maximization.</p>	<p>TB1: Chpt5</p> <p>TB2:chp10</p>	<p>Introduction to the Assignment model. Hungarian method.</p> <p>Special cases: Unbalanced AP,</p> <p>Maximization in AP</p>	<p>TB1: Chpt6</p> <p>TB2:chp11</p>	<p>Network definition and scope of applications. Shortest route problem, maximal flow model. Basic components of a network.</p>	<p>TB1: chpt6</p> <p>TB2: Chpt24-25</p>	<p>Problems illustrating the use of Assignment models. Examples of special TP and an assignment problem: Problems on network analysis.</p>
Week-7	<p>Logical sequencing, rules of network construction, CPM: network representation, critical path computations,</p>	<p>TB1: chpt6</p> <p>TB2: Chpt24-25</p>	<p>PERT: critical path computations, Project scheduling, PERT calculations</p>	<p>TB1: chpt6</p> <p>TB2: Chpt25</p>	<p>Introduction to Dynamic Programming, Bellman's principle of optimality, Mathematical formulation of</p>	<p>TB1: chpt10</p> <p>TB2: chpt13</p>	<p>Examples on CPM and PERT. Solving minimum path problems by dynamic programming approach.</p>

	time scheduling				multistage decision problems, Minimum path problem		
Week-8	Backward and forward recursive approach.  Applications of DP: Optimal sub-division problem	TB1: chpt10  TB2: chpt13	Applications of DP: Cargo-loading problem, Product allocation	TB1: Chpt-10  TB2: chpt-13	Applications of DP: Solution of LPP as a Dynamic Programming problem	TB1: chpt10  TB2: chpt13	Examples on solving of multistage problems and LPPs and dynamic programming problems.
Week-9	Introduction to inventory control, types of inventories, cost associated and factors affecting inventory control. Concept of EOQ.  Deterministic inventory problems with no shortage (The fundamental problem of EOQ)	TB2: chpt-19, Ref1: chpt17	Problem of EOQ with several production runs of unequal length.  Deterministic inventory problems with no shortage: The problem of EOQ with Finite Replenishment	TB2: chpt-19, Ref1: chpt17	Deterministic inventory problems with shortage:  (i) Problem of EOQ with Instantaneous production, variable and fixed order cycle time.  (ii) Problem of EOQ with finite replenishment	TB2: chpt-19, Ref1: chpt17	Examples on deterministic inventory models
Week-10	Problems of EOQ with price breaks: One and more than one price breaks.	TB2: chpt-19, Ref1: chpt17	Stochastic inventory: Safety-stock when lead-time is fixed.  stochastic inventory models: Instantaneous demand with no set-up cost (Discrete case)	TB2: chpt-20, Ref1: chpt-18	Stochastic inventory models: Instantaneous demand with no set-up cost (Continuous case).	TB2: chpt-20, Ref1: chpt18	Examples of EOQ with price breaks and various stochastic inventory models.

Week-11	Stochastic inventory models:  One period problems with set-up cost	TB2: chpt-20, Ref1: chpt18	Introduction to replacement problem, failure mechanism of items. Replacement of items that deteriorates.	TB2: Chpt-18 Ref1: chpt-16	Replacement of items that fails suddenly: individual replacement, group replacement.	TB2: chpt-18 Ref1: chpt-16	Examples illustrating the use of java scrip functions  And JSS DOM
Week-12	Introduction to Queuing system, its elements and characteristics. Queue disciplines, Role of Exponential and Poisson Distributions,	TB1: chpt 17  TB2: chpt-21	Markov Process, state and transient probabilities, characteristics of Markov process, State transition matrix, transition diagram, Construction of state transition matrix, steady-state conditions	TB1:chpt 19  TB2: chpt-15	Probability distributions in queuing systems: Distribution of arrivals (Pure birth process)  Distribution of inter-arrival times. Distribution of departures (Pure death process).	TB1:chpt 17  TB2: chpt-21	Concepts of Markov process and probability distributions.
Week-13	Classification of queuing models. Transient and steady states. Poisson queuing systems: Model-I $\{(M/M/1):(\infty/FIFO)\}$ .	TB1:chpt 17  TB2: chpt-21	Characteristics of Model-I, waiting time distribution.  Model-II $\{(M/M/1):(\infty/SIRO)\}$ ,	TB1:chpt 17  TB2: chpt-21	Model-III $\{(M/M/1): (N/FIFO)\}$  Model-IV Birth-Death process.	TB1:chpt 17  TB2: chpt-21	Mathematical problems on Model-II, III and IV.

Week-14	<p>Model-V  <math>\{(M/M/c):(\infty/FIFO)\}</math></p> <p>Non-Poisson queuing Models, Erlangian service time distribution,</p>	<p>TB1:chapter 17</p> <p>TB2: chpt-21</p>	<p>Non-Poisson queuing Models,</p> <p>Model-I: <math>\{(M/E/1):(\infty/FIFO)\}</math>, Model-II: <math>\{(M/E/1):(1/FIFO)\}</math>. Numerical problems</p>	<p>TB2: chpt-21</p>	<p>Non-Poisson queuing Models, Model-III <math>\{(M/G/1):(\infty/GD)\}</math> Numerical problems, Queuing control.</p>	<p>TB2: chpt-21</p>	<p>Examples on Model-I and non-Poisson queuing Models.</p>
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## CA-403 : COMPUTER GRAPHICS AND MULTIMEDIA

### PREREQUISITE:

Student should be aware of basic programming, data structures and basics of linear algebra, matrices and vectors.

### OBJECTIVE:

The objectives of this course is to familiarize students with the principle of displaying images as well as drawing and displaying 2D and 3D geometrical objects and curves on the screen along with basics of multimedia.

### LEARNING OUTCOME:

Concepts introduced in this course will help students to:

Become familiar with various graphical input and output display devices.

Get knowledge of various algorithms used to draw geometrical figures.

Get knowledge of various transformations applied on these figures.

Get familiar with components of multimedia.

### SYLLABUS

#### UNIT- I

Introduction of computer graphics system: Application areas of computer graphics,

Input Devices, Display Technologies- Cathode Ray Tube Basics, Raster Refresh (Raster-Scan) and Random Scan Graphics Displays, Color CRT Raster Scan Basics, LCD displays, Raster Scan System- Video Controller, Raster Scan Display Processor, Random-Scan Systems.

Scan conversion- line, circle and ellipse: Line drawing algorithms- DDA Algorithm, Bresenham's Line Algorithm, Frame Buffers, Aliasing effects & anti-aliasing, Circle and ellipse generating algorithms- Midpoint Circle Algorithm, Midpoint Ellipse Algorithm.

#### UNIT -II

Polygon Filling and Clipping Algorithms:

Filled Area Primitives, Scan-Line Polygon Fill Algorithm, Inside-Outside Tests, Boundary-Fill Algorithm, Flood - Fill Algorithm.

Two-Dimensional Viewing- Viewing Pipeline, Window to Viewport Mapping, Clipping Operations:- Point Clipping, Line Clipping, Clipping Lines algorithms- Cohen-Sutherland, Clipping Polygons- Sutherland-Hodgeman Polygon Clipping, problem with multiple components.

2-D Geometric Transformations- Basic Transformations: Translation, Scaling, Rotation. Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composite Transformation: Translation, Scaling, Rotation, Rotation about fixed point, fixed-point Scaling, Reflection and shearing transformations.

### UNIT- III

3-D Geometric Transformations-Basic Transformation: Introduction, Three-Dimensional Translation, Scaling & Rotation transformation with matrix representation. Multiple Transformation- Fixed point Scaling, fixed point Rotation about an Arbitrary Axis in Space, 3D Reflection & reflection through an arbitrary Plane, Three-Dimensional Concepts: Three-Dimensional Display Methods- Parallel Projection, Perspective Projection.

### UNIT -IV

Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Classifications of algorithms, Back-face removal, Depth-buffer algorithm, A-Buffer Algorithm, Scan-line method, Three-Dimensional Object Representations: Representing Spline- Interpolation & Approximation Splines, Parametric & geometric continuity, Bezier Curves and surfaces, B-Spline Curves.

### UNIT -V

Multimedia: Introduction to Multimedia, Scope of multimedia in business & work, Multimedia Skills, Introduction to multimedia building blocks- Text, Audio, Images, Animation & Video, Introduction to authoring Concepts.

#### Text Books:

1. D. Hearn and M. Pauline Baker, *Computer Graphics (C Version)*, Pearson Education, 2nd Edition.
2. R. Plastock and G. Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, McGraw Hill.
3. Tay Vaughan, "Multimedia: Making it Work, 7th ed", McGraw-Hill Osborne Media

#### Reference Books:

1. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, *Computer Graphics - Principles and Practice*, Second Edition in C, Pearson Education.
2. Prajapati A. K, "Computer Graphics", PPM Ed 2
3. Ze-Nian Li and Mark S Drew. "Fundamentals of Multimedia", Prentice Hall.
4. Nigel Chapman and Jenny Chapman, "Digital Multimedia 2nd ed", Wiley.
5. Buford, "Multimedia Systems", Addison Wesley.

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Lab Meeting CA-403P
Week-1	Application areas of computer graphics	TB1: chpt-1	Input Devices	TB1: chpt-2, 80	Cathode Ray Tube Basics	TB1: chpt-2, 57	Understanding basic graphic functions & using them in C or C++.
Week-2	Raster Refresh (Raster-Scan) Graphics Displays, Random Scan Graphics Displays	TB1: chpt-2, 60,61	Color CRT Raster Scan Basics, LCD displays.	TB1: chpt2-62,67	Raster Scan System-Video Controller, Raster Scan Display Processor, Random-Scan Systems.	TB1: chpt2- 73	Get familiar with working of CRT , raster frame buffer
Week-3	Line drawing algorithms- DDA Algorithm.	TB1: chpt-3, 106	Bresenham's Line drawing Algorithm,	TB1: chpt-3, 108	Frame Buffers , Aliasing effects & Anti-aliasing	TB1: chpt3-114, chpt4-191 TB2: chpt3- 64	Implementation of DDA and Bresenham line drawing algorithm in C or C++.
Week-4	Midpoint Circle drawing algorithm.	TB1: chpt-3, 117	Midpoint Ellipse drawing algorithm.	TB1: chpt-3, 122	Filled Area Primitives, Scan-Line Polygon Fill Algorithm, Inside-Outside Tests	TB1: chpt-3, 137	Implementation of drawing circle and ellipse using midpoint algorithm.
Week-5	Boundary-Fill Algorithm, Flood - Fill Algorithm.	TB1: chpt-3, 147	Two-Dimensional Viewing- Viewing Pipeline, Window to Viewport Mapping	TB1: chpt-6, 237, 240	Point Clipping, Line Clipping, Cohen Sutherland line clipping algorithm–	TB1: chpt-6, 245	Examples illustrating the use of mapping and clipping.

Week-6	Sutherland-Hodgeman Polygon Clipping, problem with multiple components.	TB1: chpt-6, 257	Basic 2D Transformations: Translation, Scaling, Rotation.	TB1: chpt-5, 204 TB2: chpt-4	Homogeneous Coordinates and Matrix Representation of 2D Transformations.	TB1: chpt-5, 208 TB2: chpt-4	Implementation of 2D Transformations
Week-7	Composite Transformation: Translation, Scaling, Rotation	TB1: chpt-5, 211 TB2: chpt-4	Rotation about fixed point, fixed-point Scaling	TB1: chpt-5, 212 TB2: chpt-4	2D Reflection transformation.	TB1: chpt-5, 221 TB2: chpt-4	Implementation of 2D Transformations
Week-8	2D Shearing transformations.	TB1: chpt-5, 223 TB2: chpt-4	Three-Dimensional Translation and scaling transformation with matrix representation.	TB1: chpt-11, 428,440 TB2: chpt-6	Three-Dimensional Rotation transformation with matrix representation.	TB1: chpt-11, 429 TB2: chpt-6	Examples illustrating 3D transformations.
Week-9	3D Fixed point Rotation about an Arbitrary Axis in Space, fixed point Scaling,	TB1: chpt-11, 428 TB2: chpt-6	3D Reflection & reflection through an arbitrary Plane	TB1: chpt - 11, 442 TB2: chpt-6	Parallel Projection	TB1: chpt-12, 458 TB2: chpt-7	Examples illustrating 3D transformations and projections.
Week-10	Perspective Projection	TB1: chpt-12, 463 TB2: chpt-7	Visible-Surface Detection Algorithms and their Classifications, Back-face removal	TB1: chpt-13, 490	Depth-buffer & A-Buffer Algorithm	TB1: chpt-13, 492	Examples illustrating projections.
Week-11	Scan-line method	TB1: chpt- 13, 496	Interpolation & Approximation Splines, Parametric & geometric continuity	TB1: chpt- 10, 335	Bezier Curves and surfaces	TB1: chpt- 10, 347	Examples illustrating continuity of splines.
Week-12	B-Spline Curves	TB1: chpt- 10, 354	Introduction to Multimedia, Scope of multimedia in business & work	TB3: chpt-1, 1	Multimedia Skills	TB3: chpt-3	Implementing Bezier curves in C or C++.



Week-13	Multimedia building blocks-Text	TB3: chpt-4	Multimedia building blocks-Audio	TB3: chpt-5, 96-115	Images: bitmaps, vector drawing and image file formats	TB3:chpt -6, 134-144, 161	Get familiar with Multimedia building blocks in Multimedia applications
Week-14	Animation: Principle of animation & animation techniques	TB3: chpt-7, 170-179	Video: Working & analog display standards	TB3: chpt-8, 194-201	Introduction to authoring Concepts	TB3: chpt-11, 284-293	Get familiar with Multimedia building blocks in Multimedia applications

## CA-404 :Web Technology- 2

### PREREQUISITES:

Students should be familiar with the concepts Object Oriented Programming and Client side web technologies.

### OBJECTIVES :

The objectives of this course are:

To familiarize with server side web Technologies like Servlet, JSP, PHP and beans.

### LEARNING OUTCOME:

Concepts introduced in this course will help students to:

Become familiar with server side web processing using Java.

Gets the flavor of how to develop application using PHP

Choose technology suitable for a specific project and know its structure and functions

### SYLLABUS

#### **Unit -I**

8 Hrs

EJB: Introduction to EJB, Types of EJB, Advantages of EJB, Lifecycle of enterprise beans, Working with Session Bean, Introduction to Java message service(JMS), JMS Architecture, JMS Programming API, Steps for writing JMS clients (sender and receiver), JMS and message driven bean, Entity bean, session bean, Message driven bean

(TB1: chpt1,2,4,5,6,7,8, Ref1: chpt23)

#### **Unit -II**

8 Hrs

J2EE: Overview of J2EE Technologies, Why J2EE?, J2EE Architecture, J2EE APIs, J2EE Containers, Java Server Pages: Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JNDI: The Java Naming and Directory Interface, Java Mail: An overview of the Java Mail API.

(TB2: chpt3,5,11,13)

#### **Unit -III**

*8 Hrs*

Servlets: Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Handling Request and Response, Initializing a Servlet, The Servlet API, , HTTP Servlets, HTTP request and Response, Developing and Deploying Servlets , Accessing Database, Session Tracking & Management, Dealing with cookies, Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, Sharing information using scope object, Controlling concurrent access, User Authentication

(TB3: chpt1,2,3,4,5,7,9, Ref2: chpt1,5)

## Unit –IV

10 Hrs

PHP : Introduction, Benefits Of Using PHP ,MYSQL, Server /Client Environment, Development Concept: How PHP Script Work, PHP Syntax, Write your First PHP Program, Embed PHP In HTML/HTML In

PHP, PHP Data Types, Variable In PHP, Operator in PHP, Control Structure, Looping Structure, Function, File Inclusion: Include()/ Require(), Array, String Function: Chr()/ strlen()/ strpos()/strcmp(), State Management : Creating Cookies, Set Cookies, Destroying Cookies, Creating Session, Set Session, Destroying Session

Working with MYSQL Admin: Working with PHP My Admin: Types Data Type, Creating Database & Tables, Dropping Database & Tables, Adding Fields, Selecting Table

MySQL Function in PHP : Database Connections, Managing Database Connections, Performing Queries, Closing Connection.

(TB4)

## Unit -V

6 Hrs

Internet Business: Introduction to IT Business and Careers, Web Browsing, Databases and Web Search Engines, Protecting Yourself Online, Internet Services and Tools for Business, IT Project and Program Management

Web Security: Elements of Security, Applied Encryption, Types of Attacks, General Security Principles, Firewalls and Virtual Private Networks, Levels of Firewall Protection, Detecting and Distracting Hackers, Incident Response.

### References

#### Text Books

- 1 Sierra, Bates "Head first EJB", SPD Publication
- 2 Keogh, "J2EE the Complete reference", Mc Graw Hill
- 3.Hunter, william, "java servlet programming", SPD Publication.
- 4.Mercer, Kent, "Beginning PHP5", Willey -India

#### Reference Books

1. Zukowski "Java 2 J2SE 1.4", BPB publication
- 2.Maruyama, Tamura,Uramoto "XML and Java Developing Web Application", Pearson Education

#### Web resources

<http://www.apl.jhu.edu/~hall/java/Servlet-Tutorial/>

<http://www.w3schools.com/php/>

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting CA-404P
Week-1	Introduction to EJB, Types of EJB, Advantages of EJB	Lifecycle of enterprise beans, Working with Session Bean	Introduction to Java message service(JMS), JMS Architecture	Examples illustrating the use of Session Bean
Week-2	JMS Programming API	JMS Programming API	Steps for writing JMS clients (sender and receiver),	Examples depicting the Use of JMS Programming API
Week-3	JMS and message driven bean	Entity bean, session bean, Message driven bean	Overview of J2EE Technologies, Why J2EE?, J2EE Architecture	Examples of message driven Entity bean, session bean,  Thread synchronization
Week-4	J2EE APIs	J2EE Containers	Java Server Pages: Basic JSP Architecture	Examples illustrating the use of J2EE APIs and Java Server Pages
Week-5	Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions	Role of JSP in MVC-2, JSP with Database	JNDI: The Java Naming and Directory Interface	Get familiar with interaction of JSP page with backend database
Week-6	Java Mail: An overview of the Java Mail API.	Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet	Servlet life cycle	Programming illustrating java mail,
Week-7	Handling Request and Response, Initializing a Servlet	The Servlet API	HTTP Servlets, HTTP request and Response	Examples depicting the handling of Request and Response

Week-8	Accessing Database, Session Tracking & Management , Dealing with cookies	Accessing Web Context, Passing and INIT CONTEXT Parameter	Sharing information using scope object, Controlling concurrent access, User Authentication	Get familiar with session tracking, user authentication
Week-9	Benefits Of Using PHP	MYSQL	Server /Client Environment	Programming Servlets
Week-10	How PHP Script Work, PHP Syntax	Embed PHP In HTML/HTML In	PHP Data Types, Variable In PHP	Writing PHP programs
Week-11	Operator in PHP, Control Structure, Looping Structure, Function	File Inclusion: Include()/ Require(), Array, String Function: Chr()/ strlen()/ strpos()/strcmp(),	State Management : Creating Cookies, Set Cookies, Destroying Cookies	Examples illustrating the use of PHP programming concepts
Week-12	Creating Session, Set Session, Destroying Session	Working with MYSQL Admin: Working with PHP My Admin: Types Data Type, Creating Dropping Database & Tables, Adding Fields, Selecting Table	Database Connections, Managing Database Connections, Performing Queries, Closing Connection.	Programming with MUSQL
Week-13	Introduction to IT Business and Careers, Web Browsing, Databases and Web Search Engines	Internet Services and Tools for Business	IT Project and Program Management	Programming with MUSQL

Week-14	Elements of Security, Applied Encryption	General Security Principles, Firewalls and Virtual Private Networks,	, Levels of Firewall Protection, Detecting and Distracting Hackers, Incident Response	Programming with MUSQL
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## LIST OF ELECTIVES-I

### CA-405: ADVANCED COMPUTER ARCHITECTURE

Course Objective: Computer architecture course aims towards study of problem specific advanced computer architecture in detail. In particular Advanced Computer Architecture includes parallel architectures. The course includes broadly parallel architecture using ILP, Data Parallel and Thread & Process Level Parallel architecture. Apart from that, the course objective is to learn parallel programming skills using Pragmatic and Non-pragmatic approach.

Prerequisite: This course has a requirement that students have undergone topics of Computer Organization, process and thread in operating system and compilers in their undergraduate.

### SYLLABUS

#### Unit -I: Introduction & Fundamentals:

The concept of computer Architecture: Interpretation of concept of computer architecture at different level abstraction, Multi level hierarchical framework, description of computer architecture,

Introduction to parallel processing: Basic concept, types of level of parallelism, classification of parallel architecture, Basic parallel techniques, relationship between language and parallel architecture.

Principles of scalable performance: Performance Metrics and Measures, Speedup Performance Law, Scalability Analysis & approaches

Processor and memory hierarchy: Design Space of Processor, ISA, CISC & RISC, Memory Hierarchy Technology, Virtual Memory Technology

#### Unit -II: Instruction Level Parallel Processor (Parallelism)

Pipelined Processors: Basic concept, ILP: Basics, Exploiting ILP, Limits on ILP, design space of pipelines, performance of pipeline, reservation table, And DLX Case Study.

VLIW architecture, Superscalar Processor: Super Scalar and super-pipeline Design

#### Unit -III: Data parallel Architecture

SIMD Architecture: Design space, fine grain SIMD architecture, coarse grain SIMD architecture

Associative and Neural Architecture, Systolic Architecture, Vector Architectures: Word length, vectorization, pipelining, and vector instruction format

#### Unit -IV: Thread and Process Level Parallel Architecture (MIMD Architecture)

Multi-threaded Architecture: Design space, computational model, Data flow architecture, hybrid multi shared architecture

Distributed memory MIMD Architecture: Design space, interconnection networks, topology, fine grain system, medium grain system, coarse grain system, Cache Coherence and Synchronization Mechanism

Shared memory MIMD Architecture.

## Unit -V: Parallel Algorithm and Programming

MPI: Basics of MPI

OpenMP: OpenMP Implementation in 'C', Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs

POSIX thread: IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads

Text Books/ references:

- (i) Advanced Computer Architectures, DEZSO SIMA, Pearson Education.
- (ii) Advance Computer Architecture, Kai Hwang, TMH
- (iii) Parallel Programming in C with MPI and Open MP, Quinn, TMH
- (iv) Open MP Specification and Usage ([www.openmp.org](http://www.openmp.org))



## CA -406 : NETWORK SECURITY AND CRYPTOGRAPHY

### PREREQUISITES:

Students should be familiar with the concepts of Computer Networks. Basic understanding of number theory and some probability theory are also required.

### OBJECTIVES:

To understand cryptography which is the most common tool for providing network security since the Internet as an open forum has created security problems. To learn the difference between Symmetric and asymmetric key cryptography and how security is provided at the Application, Transport and network layers.

### LEARNING OUTCOME:

Concepts introduced in this course will help students to:

- Develop Practical Network Security knowledge and skills in professional environment.
- Become familiar with Cryptography Concepts.
- Become familiar with Symmetric, asymmetric and Hash algorithms.
- Familiar with Network security technology.
- Students will aware about the security concerns in implementing E-commerce.

## SYLLABUS

### UNIT -I

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services.

Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.

### UNIT -II

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2

Placement & Encryption Function: Key Distribution, Random Number Generation, Placement Of Encryption Function.

### UNIT - III

Mathematics of Cryptography: Primes, Primality testing, Chinese Remainder Theorem. Fermat's & Euler's Theorem.

Public-Key Cryptography: Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management.

### UNIT - IV

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS

Cryptographic Hash Algorithm: MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

#### UNIT - V

Authentication Applications: Kerberos, Public key distribution X.509, Directory Authentication Service.

Security at the Application layer: Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime.

IP Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management.

Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set).

System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

#### Text-Book:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, New Jersey.

#### Ref Books:

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

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Assignments/ Tutorial
Week-1	Need for Security, Types of Attacks, Security Services, Security Mechanism	TB1: chap 1.1	Introduction to Cryptography, Symmetric Cipher Model, Substitution Techniques	TB1: chap 2.1, 2.2	Transposition Techniques & Introduction to Steganography	TB1: chap 2.3, 2.5	Examples illustrating various substitution & transposition techniques like monoalphabetic, play cipher, hill cipher, rail fence one time pad etc
Week-2	Block Cipher Principles, Feistel Cipher Structure	TB1: chap 3.2	Simplified DES scheme, S-DES key Generation, S-DES Encryption	TB1: chap 3.1	DES: encryption, Single round of DES Algo, Strength of DES	TB1: chap 3.3, 3.4	Examples depicting the key Generation of S-DES
Week-3	Introduction to cryptanalysis: Linear and Differential, Brute Force attack	TB2: chap 3.5	Block Cipher Design Principles and Modes of operation	TB1: chap 3.6, 3.7	Double DES, Meet in middle attack, Triple DES with two and three keys	TB1: chap 6.1	Cryptanalysis done on various Substitution and Transposition techniques

Week-4	Blowfish and CAST-128	TB1: chap 6.2	IDEA: Basic Principles, Rounds, Sub – key generation & output transformation	Ref 2: chap 3.5	RCS & RC-2	TB1: chap 6.3	Examples illustrating mathematics under IDEA, Blowfish like Addition Modulo multiplication modulo, Bitwise XOR etc
Week-5	Placement of Encryption function & Random number generation	TB2: chap 7.1, 7.4	Key Distribution in symmetric cryptography	TB2: chap 7.3	Prime Numbers, Testing of Primality	TB2: chap 8.1, 8.3	Get familiar with Random number generation through programming.
Week-6	Fermat's Theorem, Euler's Totient Function, Euler's Theorem	TB1: chap 8.2	Chinese Remainder Theorem	TB1: chap 8.4	Introduction to public-key cryptography & principles of public-key cryptography	TB1: chap 9.1	Example of Chinese remainder theorem Difference between symmetric & asymmetric key cryptography
Week-7	RSA Algorithm	TB1: chap 9.2	Key Management in public key cryptography	TB1: chap 10.1	Authentication Requirement & Authentication Function	TB1: chap 11.1, 11.2	Examples depicting the working of RSA algo, difference between key management in symmetric & asymmetric cryptography
Week-8	Message Authentication Code	TB1: chap 11.3	Hash Function, Security of Hash function and MAC	TB1: chap 11.4, 11.5	Message Digest Algo : MD5	TB2: chap 12.1	Example to explain MD5 process
Week-9	Message Digest Algo: SHA	TB1: chap 12.2	Birthday attack and Introduction to Digital Signature	TB1: chap 11.4 Ref2: chap 4.6	Digital Signature Standard & Algo	TB1: chap 13.3	Example to explain SHA process, DSA

Week-10	Prof of Digital Signature Algorithm. Authentication protocol	TB1: chap 13.2, 13.3	Authentication Application : Kerberos	TB1: chap 14.1	Authentication Application: X.509 service	TB1: chap 14.2	Difference between various version o Kerberos
Week-11	Electronic mail security: Pretty Good Privacy (PGP)	TB1: chap 15.1	Introduction to MIME, Electronic mail security: S/MIME	TB1: chap 15.2	Introduction to IP Security, IP security Architecture	TB1: chap 16.2	Difference between various E-mail Security
Week-12	Authentication Header & Encapsulating Security payload	TB1: chap 16.3, 16.4	Combining Security Association & Key management	TB1: chap 16.5, 16.6	Introduction to Web Security, Secure Socket Layer: Architecture, Handshaking	TB1: chap 17.1, 17.2	Comparison between SSL and TLS
Week-13	Secure Electronic Transaction	TB1: chap 17.3	Introduction to System Security: Intruders, Viruses	TB1: chap 18.1, 19.1	Firewall Design Principles and types of Firewall	TB1: chap 20.1	Explain the SE <sup>T</sup> participants and purpose of Dual Signature.
Week-14	Trusted Systems	TB1: chap 20.2	-	-	-	-	-

## CA-407: DATA WARE HOUSING AND DATAMINING

### Course Objective:

We are deluged by data—scientific data, medical data, demographic data, financial data, and marketing data. People have no time to look at this data. Human attention has become the precious resource. So, we must find ways to automatically analyze the data, to automatically classify it, to automatically summarize it, to automatically discover and characterize trends in it, and to automatically flag anomalies. Data Mining is one of the most active and exciting areas of the database research community.

### Prerequisite:

Students should be familiar with the concepts of Data Base Management System and World Wide Web.

### Learning Out Come:

At the end of this elective, student will be able to:

1. Differentiate between Transaction Processing and Analytical applications and describe the need for Data Mining & Business Intelligence
2. Demonstrate understanding of technology and processes associated with data mining
3. Demonstrate understanding of Data Mining implementation methodology and project life cycle.
4. Design an enterprise dashboard that depicts the key performance indicators which helps in decision making
5. Demonstrate application of concepts using open source tools.

## SYLLABUS

### UNIT-I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems. (RB 1 :Chpt: 1,2)

Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation. (TB 1 : Chpt 1,2)

Further Development of Data Cube Technology, From Data Warehousing to Data Mining, (TB1: Chpt 3(3.4))

### UNIT-II

Introduction to OLTP and OLAP, Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches. (TB1 : Chpt 2,3)

Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction (TB 1: Chpt 3)

### UNIT-III

Mining Frequent Patterns, Associations: Basic Concepts, Efficient and Scalable Frequent Item set Mining methods ( Apriori Algorithm, improving efficiency of Apriori, Mining frequent Item

sets without Candidate generation, using vertical data formats, closed frequent item sets). (RB 1: Chpt 2,3,4)

Mining various kinds of association rules, from association analysis to Correlation analysis, constraint-based association mining (TB 1: Chpt 5(5.6,5.7) 6)

#### **UNIT-IV**

Classification and Prediction: What is classification? What is Prediction? Classification by Decision tree Induction, Bayesian classification, Rule based classification, Prediction: Linear Regression, non-linear regression (TB 1: Chpt 7,8 & RL 1) (RB 1: Chpt 6,7)

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis. (TB 1: Chpt 8, RL 2)

#### **UNIT-V**

Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web. Introduction to Interactive Visual Data Analysis. (TB 1+2 :Chpt 10,11)

#### **TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER  
Harcourt India.
2. Data Warehousing, Data Mining and OLAP – Alex Berson & Stephen J Smith.

#### **REFERENCE BOOKS:**

1. Data Mining Introductory and advanced topics –MARGARET H DUNHAM, PEARSON EDUCATION
2. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
3. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION
4. The Data Warehouse Life cycle Tool kit – RALPH KIMBALL WILEY STUDENT EDITION

A few web-links for tutorials/resources:

1. <http://www.cise.ufl.edu/~ddd/cap6635/Fall-97/Short-papers/2.htm>
2. [www.cs.uiuc.edu/~hanj](http://www.cs.uiuc.edu/~hanj)

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter
Week-1	Introduction: Fundamentals of data mining, Data Mining Functionalities, Major issues in Data Mining,	(RB1 :Chpt: 1,2)	Data mining   on what kind of data? Relational databases Data warehouses Transactional databases Advanced database systems and advanced database applications .	(TB 1 : Chpt 1,2)  (RB 1: Chpt 1+2)	Data mining functionalities   what kinds of patterns can be mined?  Concept/class description: characterization and discrimination  Association analysis	(TB1: Chpt 1)  (RB1: Chpt 1+2)
Week-2	Classification and prediction Clustering analysis Evolution and deviation analysis.	(TB1: Chpt 1)  (RB1: Chpt 1+2)	Major issues in Data Mining,	(TB 1 : Chpt 1,2)	A classification of data mining systems  Major issues in data mining	(TB 1 : Chpt 1,2)
Week-3	Data Warehouse and OLAP Technology for Data Mining. What is a data warehouse  A multidimensional data model	(TB1: Chpt 2(2.1 – 2.2))	From tables to data cubes  Stars, snow fakes, and fact constellations: schemas for multidimensional databases Examples for, fact constellation schemas	(TB1: Chpt 2(2.3) )	Measures: their categorization and computation .  Introducing concept hierarchies  OLAP operations in the multidimensional data model  A starlet query model for querying multidimensional databases	(TB1: Chpt 2)  (2.3)
Week-4	Data warehouse architecture  Steps for the design and construction of data warehouses. A three-tier data warehouse architecture	(TB1: Chpt 2) (2.3)	OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP  SQL extensions to support OLAP operations	(TB1: Chpt 2) (2.3+2.4)	Data warehouse  Efficient computation of data. Indexing OLAP data Efficient processing of OLAP queries  Metadata repository  Data warehouse back-end tools and utilities	(TB1: Chpt 2)  (2.4)

Week-5	<p>Further development of data cube</p> <p>Discovery-driven exploration of data</p> <p>Complex aggregation at multiple granularities:</p> <p>Multifeature cubes</p> <p>From data warehousing to data mining. Data warehouse usage</p> <p>From on-line analytical processing to on-line analytical mining</p>	(TB1: Chpt 2) (2.5+2.6)	<p>Introduction to OLTP and OLAP, Concepts of data integration and advantages of using data integration, introduction to common data integration approaches</p>	(TB1 : Chpt 2,3)	<p>Data Preprocessing</p> <p>Why preprocess the data. Data cleaning</p> <p>Missing values Noisy data</p> <p>Inconsistent data.</p> <p>Data integration and Data integration Data transformation.</p>	(TB1: Chpt 3)
Week-6	<p>Data Preprocessing</p> <p>Why preprocess the data. Data cleaning</p> <p>Missing values Noisy data</p> <p>Inconsistent data.</p> <p>Data integration and Data integration Data transformation</p>	(TB1: Chpt 3)	<p>Data reduction Data cube aggregation.</p> <p>Dimensionality reduction</p> <p>Data compression</p>	(TB1: Chpt 3)	<p>Data reduction Data cube aggregation.</p> <p>Dimensionality reduction</p> <p>Data compression</p>	(TB1: Chpt 3)
Week-7	<p>Discretization and concept hierarchy</p> <p>Discretization and concept hierarchy generation for numeric data</p> <p>Concept</p>	(TB1: Chpt 3)	<p>Mining Association Rules in Large Databases</p> <p>Association rule mining. Market basket analysis: A motivating example for association rule mining. Basic</p>	<p>(RB1: Chpt 2,3,4)</p> <p>(TB1: Chpt 6(6.1))</p>	<p>Mining single-dimensional Boolean association rules from transactional databases. The Apriori algorithm: Finding frequent item sets</p> <p>Generating association</p>	<p>(RB1: Chpt 2,3,4)</p> <p>(TB1: Chpt 6(6.2,6.3))</p>



	hierarchy generation for categorical data		concepts Association rule mining: A road map .		rules from frequent item sets Variations of the Apriori algorithm  Mining multilevel association rules from transaction  Multilevel association rules  Approaches to mining multilevel association rules	
Week-8	Mining various kinds of association rules, from association analysis to Correlation analysis, constraint-based association mining	(TB 1: Chpt 5(5.6,5.7) 6)	Classification and Prediction. What is classification? What is prediction?  Issues regarding classification and prediction  Classification by decision tree induction	(TB 1: Chpt 7,8 & RL 1) (RB 1: Chpt 6,7)	Decision tree induction  Tree Extracting classification rules from decision trees.	(TB 1: Chpt 7,8 & RL 1) (RB 1: Chpt 6,7)
Week-9	Bayesian classification Bayes theorem. Naive Bayesian classification Bayesian belief networks Training Bayesian belief networks	(TB 1: Chpt 7& RL 1)	Other classification methods.k-nearest neighbor classifies  Case-based  Genetic algorithms	(TB 1: Chpt 7& RL 1)	Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods	(TB 1: Chpt 8, RL 2)
Week-10	Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering	(TB 1: Chpt 8, RL 2)	Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods,	(TB 1: Chpt 8, RL 2)	Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods,	(TB 1: Chpt 8, RL 2)

	Methods		Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.		Model-Based Clustering Methods, Outlier Analysis.	
Week-11	Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.	(TB 1: Chpt 8, RL 2)	Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.	(TB 1: Chpt 8, RL 2)	Comparison of classification and clustering techniques with examples and case studies.	(RB 1: Chpt 6,7,8)
Week-12	Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data	(TB 1+2 :Chpt 10,11)	Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data	(TB 1+2 :Chpt 10,11)	Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data	(TB 1+2 :Chpt 10,11)
Week-13	Mining Text Databases, Mining the World Wide Web. Introduction to Interactive Visual Data	(TB 1+2 :Chpt 10,11)	Mining Text Databases, Mining the World Wide Web. Introduction to Interactive Visual Data Analysis.	(TB 1+2 :Chpt 10,11)	Mining Text Databases, Mining the World Wide Web. Introduction to Interactive Visual Data Analysis.	(TB 1+2 :Chpt 10,11)

	Analysis.					
Week-14	Case study with practical examples	(TB 1+2)	Case study with practical examples	(RB 1)	Case study with practical examples	(TB 2 & RB 1)

## CA-408 : SOFTWARE TESTING

### PREREQUISITES:

Students should be familiar with the basic concepts of SDLC (Software Development Life Cycle ) and STLC (Software Testing Life Cycle) ..

### OBJECTIVES:

To familiarize with software testing methods and design strategies to test the defects with possible tools.

### LEARNING OUTCOME:

Concepts introduced in this course will help students to:

Become familiar with bugs, defects in software and their effectiveness in testing.

Get the flavor of how to test a program with all possible solutions.

Know the different testing behavior in static and dynamic nature.

Choose tools suitable for a specific project and know its structure and functions

## SYLLABUS

### **Unit -I**

Introduction: - Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

### **Unit -II**

Transaction Flow Testing:-transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing, Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

### **Unit -III**

Paths, Path products and Regular expressions:- path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing:- overview, decision tables, path expressions, kv charts, specifications.

### **Unit- IV**

State, State Graphs and Transition testing:- state graphs, good & bad state graphs, state testing, Testability tips

### **Unit -V**

Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

Text-Books:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Effective methods of Software Testing- William E. Perry, John Wiley.

Ref Books:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
5. Art of Software Testing – Meyers, John Wiley.

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter	Assignments / Tutorials
Week-1	Purpose of testing, Goal of testing, some dichotomies like test vs. defect, function vs. structure.	TB1:chpt 1	small vs. large testing ,  STLC, model for software testing .	TB1:chpt1,  TB2:chpt2	Testing and their levels.  ,  Importance of bugs, consequences of bugs, Taxonomy for bugs – requirement, feature and functionality bugs.	TB1:chpt 2.	Examples illustrating the use of software testing tool like jmeter or Winrunner. Introduction to IDE with small set of two programs.
Week-2	Taxonomy continues- structural bugs, Data bugs, dynamic vs. static, coding bugs.	TB1:chpt 2.	Introduction to testing and its design style w.r.to application. software Testing methodology , design bugs and system	TB1:chpt3,  TB2:chpt3	basic path testing  Path testing- path, nodes and links. Selection criteria, strategies	TB1:chpt 3.	Examples depicting the Use of tool to find bugs in unit testing, integrating testing, and system testing. Run one small module with full injections of bugs.

			bugs		to choose the path, use of loops.		
Week-3	effectiveness of path testing  Path testing-predicate with example, variables and expressions, predicate coverage,	TB1:chpt-3.	Path sensitizing based on achievable and unachievable paths with example.  path instrumentation-  General strategy, links marker, link counters.	TB1:chpt-3	Application of path testing on modules.  Transaction flow testing-definition and implementation with example.	TB1:chpt-4.	Examples of transaction flow testing in simple, medium module.
Week-4	Transaction flow structure.  Testing technique in transaction flow  Data flow testing-object state ,	TB1:chpt-5.	anomalies, data flow state graph,  Data flow model with example.	TB1: Chpt-6	Data flow strategies-AU,ADU, AD, APU  Domain testing-Set , path and domain.	TB1: Chpt6.	Examples illustrating the use of data flow and domain testing.
Week-5	Nice domain with linear and nonlinear boundaries.  Ugly domain with all boundaries.	TB1:chpt 8.	Domain and range, values in domain,  Testing one and two dimensional	TB1:chpt-10	Path products, path sums,  Steps in path procedure	TB1:chpt-10	Get familiar with domain and logic path testing with simple and complex examples.

Week-6	Application of path testing.  Regular expression	TB1:chpt 10	Logic based testing- Concept of logic in Hw, knowledge based system programming	TB1:chpt10	Test case design based on decision table.  and in Path and domain	Ref1:chpt 4	Programming illustrating the use of path testing , regular expression
Week-7	Test case design  KV charts with simple, three and four variables	TB1&TB2 chpt 10	Use of logics with doesn't care conditions.  Translation of logics	TB1 chpt 1	Testability tips in logic testing with simple to complex programming.	TB1 chpt1	Examples depicting the handling of logics in programs and creating test cases to test such programs With example.
Week-8	Introduction to state, state graphs, input and transitions.	TB1chpt 1	Introduction on state table.  State output	TB1:chpt-11	Use of state graph in software implementation.	TB1:chpt-11	Get familiar with state transition in programs.
Week-9	Explanation of good state graph and bad state graph with example.	TB1:chpt -11	Bugs in state , impossible state,  Equivalent state with example	TB1:chpt-11	Transition bugs in unreachable states with examples.	TB1:chpt-11	Programming to test state behavior in different situations. Take example with finite state and infinite state.
Week-10	State testing with injection of bugs.  Selection of model fitted to state testing	TB1:chpt -11	Use of tool in state testing ,  State behavior in testing	TB1:chpt11	Testing tips and guidelines in state testing	TB1:chpt 11	Use functional testing tool to verify the state's validity.  Apply minimum and maximum set of covering tests.
Week-11	Introduction to graph matrices.  Origin of graph matrices.	TB1:chpt 12	Graphs and their matrices with their simple weight and further notations.	TB1:chpt12	Use of relations in graph matrices. Properties of relations.	TB1:chpt 12	Examples illustrating the use of graph matrices on JMeter Tool

Week-12	Equivalence relations  Partial ordering relations with example.	TB1:chpt-12	Power of matrix  Their principles  Matrix powers and products.	TB1:chpt12	Set of all pats to be tested ,  Loops, partition algorithm	TB1:chpt, 12	Working with graph matrices on the tool.
Week-13	Node reduction algorithm with example	TB1:chpt 12	Node reduction optimization with example	TB1:chpt12	Building tools available in market for testing	TB2:chpt-5	Programs on node reductions in jmeter
Week-14	Software testing tools for all levels of testing	Ref4	Case study on Mini project with bugs for path, domain and state testing	Ref 3	Group discussion and questionnaires on the selective topics,		Single Program with implementation of all above testing in a single module with other tool win-runner.



# CA-409: IMAGE PROCESSING AND PATTERN RECOGNITION

## SYLLABUS

### UNIT -I: BASIC CONCEPTS

Pattern Recognition Systems, Fundamental Problems in pattern recognition system design, Design concepts and Methodologies: Character recognition ,Speech recognition, Finger print Recognition. Pattern Recognition Model

DECISION FUNCTIONS: Linear Decision functions, Distance functions. Minimum distance and Maximum distance classification, clustering concepts, Cluster seeking algorithms, K- means Algorithms.

### UNIT -II: BAYE'S CLASSIFIER

Bayes classified decision function for Baye's classifier, Baye's Classifier for normal patterns. Trainable pattern classifiers — deterministic approach, perception, approach - reward — punishment concept

GRADIENT APPROACH : Gradient approach, Gradient Descent algorithms, LMSE Algorithms, Multi category classification.

### UNIT- III: TRAINABLE PATTERN CLASSIFIERS

Trainable pattern classifiers, statistical approach, stochastic approximation methods, Robbin Minro algorithms, increment correction algorithms, LMSE algorithms. Syntactic patter recognition, formulation — syntax directed recognition — picture descript.

### UNIT -IV: DIGITAL IMAGE FUNDAMENTALS

Representation, elements. Image transforms: Fast Fourier transform, DCT and DWT. IMAGE ENHANCEMENT: Spatial domain, frequency domain methods, Histogram equalization, Modification techniques: Image Smoothing, image sharpening.

### UNIT -V: IMAGE ENCODING

Fidelity criteria, Encoding process, Mapping — Quantizer coder — Image Segmentation — Masks — Point detection — Line Detection — Edge Detection.

### TEXT BOOKS :

Digital Image Processing — by R.C. Gonzalez & RE. Woods, Addison Wesley  
Pattern Recognition Principles — J.T.TOU.R.C. Gonzalez, Addison Wesley.

### REFERENCE BOOKS:

Fundamentals of Digital Image Processing — by A.K. Jam, Pill Pearson Education

## CA-410 : COMPILER DESIGN

### Prerequisite

Familiarity with programming languages, Basic knowledge in Theory of Computation and Data Structures and Algorithms

### Course Objective

To understand the theory and practice of compiler implementation.

To learn finite state machines and lexical scanning.

To learn context free grammars, compiler parsing techniques, construction of abstract syntax trees, symbol tables, intermediate machine representations and actual code generation

### Learning outcomes

Implementing a small compiler using modern compiler writing tools.

Providing the student with skills and knowledge (such as lexical analysis and parsing) which are applicable to a broad range of computer science application areas (such as text editors, information retrieval, etc.)

## SYLLABUS

### UNIT – I : INTRODUCTION TO COMPILER

Introduction to compiler-The structure of compiler, Lexical analysis-The Role of Lexical analyzer, Input Buffering, Specification of tokens , Recognition of tokens , Lexical analyzer generator

### UNIT- II : LEXICAL ANALYSIS

Finite Automata, Regular expressions to an NFA, Optimization of DFA , The Role of parser Context free grammars, Writing a Grammar, Top Down parsing -Recursive Descent Parsing Predictive parsing , Bottom up parsing-Shift reduce parsing , Operator Precedence parsing

### UNIT – III : SYNTAX ANALYSIS

Introduction to LR parsing & SLR parser, Canonical LR parser and LALR parser generator, intermediate languages, Declarations ,control flow and Boolean expressions, Switch statements Back patching

### UNIT – IV: CODE GENERATION

Issues in the design of code generator, The target Language, Addresses in target code, Basic Blocks and Flow Graphs, A simple Code generator, DAG representation of Basic Blocks

### UNIT – V CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS

Introduction– Principal Sources of Optimization, Peephole optimization, Optimization of basic Blocks, Loops in Flow Graphs, Run time environments-Storage organization, Stack allocation of space, Access to non local data on the stack

## Text Book

1. Compilers principles, techniques and tools, Alfred Aho, Ravi Sethi, V.Jeffery Ullman D/ Pearson Education

## Reference Books

- 1.Compiler Design in C, Allen Holub I/ Prentice Hall of India
- 2.Crafting a compiler with C, Charles N.Fischer Richard J.LebLANC/Benjamin Cummings
- 3.Introduction to Compiler Techniques, J.P. Bennet /Tata McGraw-Hill
- 4.Practice and Principles of Compiler Building with C, Henk Alblas and Albert Nymeyer/ PHI
5. Compiler Construction: Principles and Practice, Kenneth C. Louden/ Thompson Learning

## Useful We blinks

<http://dragonbook.stanford.edu/>

[www.holub.com/software/compiler.design.in.c.docs.pdf](http://www.holub.com/software/compiler.design.in.c.docs.pdf)

<http://163.21.82.150/compiler/>

<http://www.macs.hw.ac.uk/~gabbay/teaching/2007-f23pf2/index.html>

<http://www.aue.auc.dk/~akbar/2007/complierconst07.html>

## Lesson Plan

S.No	Topic Name	Reference Book	No. of Periods
<b>UNIT – I INTRODUCTION TO COMPILER (08 HOURS)</b>			
1.	Introduction to compiler-The structure of compiler	T1(4-12)	1
2.	Lexical analysis-The Role of Lexical analyzer	T1(109-114)	1
3.	Input Buffering	T1(115-116)	1
4.	Specification of tokens	T1(116-128)	2
5.	Recognition of tokens	T1(128-140)	2
6.	Lexical analyzer generator	T1(140-146)	1

UNIT -II : LEXICAL ANALYSIS (08 HOURS)			
7.	Finite Automata	T1(147-152)	1
8.	Regular expressions to an NFA, Optimization of DFA	T1(152-187)	2
9	The Role of parser, Context free grammars	T1(192-208)	1
10	Writing a Grammar	T1(209-216)	1
11	Top Down parsing -Recursive Descent Parsing, Predictive parsing	T1(217 – 228)	1
12	Bottom up parsing-Shift reduce parsing	T1(233-238)	1
13	Operator Precedence parsing	Course material	1
UNIT – III: SYNTAX ANALYSIS (08 HOURS)			
14.	Introduction to LR parsing & SLR parser	T1(241-256)	2
15	Canonical LR parser and LALR parser generator	T1(259-275)	2
16	Intermediate languages	T1(363-369)	1
17	Declarations ,control flow and Boolean expressions	T1(373) T1(399-408)	2
18	Switch statements, Back patching	T1(410-420)	1
UNIT – IV: CODE GENERATION (08 HOURS)			
19	Issues in the design of code generator	T1(506-511)	1
20	The target Language	T1(512-515)	1
21	Addresses in target code	T1(518-522)	1
22	Basic Blocks and Flow Graphs	T1(525-531)	1
23	A simple Code generator	T1(542-547)	2
24	DAG representation of Basic Blocks	T1(533 – 540)	2

UNIT – V : CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS (08 HOURS)			
25	Introduction– Principal Sources of Optimization	T1(584 – 596)	1
26	Peephole optimization	T1(549-552)	1
27	Optimization of basic Blocks	T1(533 – 540)	1
28	Loops in Flow Graphs	T1(655-667)	2
29	Run time environments-Storage organization	T1(427-429)	1
30	Stack allocation of space	T1(430-438)	1
31	Access to non local data on the stack	T1(441-449)	1

# CA-411: Component Based Programming

## PREREQUISITES

Students should have good hand knowledge in Software Development through Object Oriented Programming and Fundamental of Software Engineering

## OBJECTIVES:

To familiarize with Component Based Software Development

## LEARNING OUTCOME:

Concepts introduced in this course will help students to:

- Become familiar with Component Based Software Development
- Gets good hand knowledge of how to select right component for proposed system
- Gets the domain engineering knowledge of how to integrate the components which are developed in different Technologies.
- Familiar with Component Technologies like CORBA, EJB, Java Bean, and COM+.

## SYLLABUS

Unit -I: Introduction to Component Based Software Engineering (CBSE): Introduction to CBSE, Objective of CBSE, Advantages and Disadvantages of CBD , Future of CBSE, Software Components,, Component Models, Elements of Component Model, Component Based Software Life Cycle Process. Business Case for Components, Software Component Project Management, Challenges in Maintaining Component-Based System.

Unit-II: Engineering of Component-Based Systems: Engineering of Component Based System ,Component-Based Software Engineering Process, Domain Engineering: Domain Analysis and Design Process, Domain Modeling, Component Engineering, Component Adaptation Techniques, Selection Methodology of Commercial Off-The-Shelf (COST) Software, Measurement and Metrics for Software Component, Analysis and Design for reuse. Role-Based Component Engineering for WebApps.

Unit- III: Component-Based Design and Reuse: Principles of Component Design and Reuse, Component Design Layers, Designing Class-Based Components, Designing Modularity Models for Software Components, Techniques for Designing Component Infrastructures: Connector Design, Designing Interaction Standards, Designing Component Interfaces, Component-Based Reuse Metrics, Reusable Components and its implementation, Component-Based Software Reuse, Challenges with Reusing Components.

Unit- IV: Component-Based Software Development: Software Development Challenges, Component-Based Development Process, Software Component Specification, Component Model and Software Architecture, Component Service, Component Selection, Component Qualification, Component Adaptability, Component Certification, Component Integration and Composition, Trusted Components, Composition predictability, Component Configurations, Software Component Testing, Maintenance and Management of Component-Based Systems, An OPEN Process for Component Based Development.

Unit -V: Component-Based Technology: Component Object Model (COM), Distributed Component Object Model (DCOM), COM+, Java-Based Component Models: Java Beans, Remote Method Invocation (RMI), Enterprise Java Beans, Common Object Request Broker Architecture (CORBA), Software Agents as Next Generation Software Components.

Text/ Reference Books:

1. George T. Heineman, William T. Councill: Component-Based Software Engineering: Putting the Pieces Together, Addison Wesley, 2001.
2. G Sudha Sadasioam, Component-Based Technology, Wiley India, 1<sup>st</sup> Edition, 2008.
3. Pressman Roger S., Software Engineering: Practitioner’s Approach, McGraw-Hill Inc. 6<sup>th</sup> Edition, 2010.
4. Ian Sommerville .: Software Engineering, Pearson 9<sup>th</sup> Edition, 2012

Web Links:

- [1] <http://arxiv.org/ftp/arxiv/papers/1011/1011.2163.pdf>
- [2] <file:///C:/DOCUME~1/student/LOCALS~1/Temp/10.1.1.46.5549.pdf>
- [3] <http://www.mrtc.mdh.se/publications/0953.pdf> = lifecycle
- [4] [http://esem.cs.lth.se/esem2012/idoese/pdf/164\\_IDoESE\\_AnguswamyFrakes.pdf](http://esem.cs.lth.se/esem2012/idoese/pdf/164_IDoESE_AnguswamyFrakes.pdf)
- [5] <http://pswlab.kaist.ac.kr/courses/cs350-08/ch11.pdf>
- [6] <http://www.cs.utexas.edu/ftp/predator/icsrtemp.pdf>
- [7] [https://www.google.co.in/#sclient=psyab&q=challenges+with+reusing+components+in+cbse%2Cpdf&oq=challenges+with+reusing+components+in+cbse%2Cpdf&gs\\_l=hp.3...689384.705175.9.705521.48.41.1.6.6.2.409.6843.0j37j2j1j1.41.0...0.0...1c.1.17.psyab.0LbMs4Y8Pzc&pbx=1&av=on.2,or.r\\_qf.&bvm=bv.47883778,d.bmk&fp=3d096261bc095ca7&biw=1024&bih=625](https://www.google.co.in/#sclient=psyab&q=challenges+with+reusing+components+in+cbse%2Cpdf&oq=challenges+with+reusing+components+in+cbse%2Cpdf&gs_l=hp.3...689384.705175.9.705521.48.41.1.6.6.2.409.6843.0j37j2j1j1.41.0...0.0...1c.1.17.psyab.0LbMs4Y8Pzc&pbx=1&av=on.2,or.r_qf.&bvm=bv.47883778,d.bmk&fp=3d096261bc095ca7&biw=1024&bih=625)

Week	Lecture 1	Chapter	Lecture 2	Chapter	Lecture 3	Chapter
Week-1	Introduction to CBSE, Objective of CBSE,	TB1: chpt2,  TB4: chpt17,  Web link1	Advantages and Disadvantages of CBD , Future of CBSE, Software Components,	TB1: chpt1, Web link1,Web link7	Component Models, Elements of Component Models	TB1: chpt3,  TB4: chpt17
Week-2	Component Model Implementation and	TB1: Chpt3	Component Based Software Life Cycle Process Model	Web Link3	Business Case for Components	TB1: Chpt5

	Services					
Week-3	Software Component Project Management	TB2:chpt-10, TB1:chpt13	Challenges in Maintaining Component Based System	TB1:chpt-12, TB2:chpt11	Engineering of Component Based System ,	Web link1
Week-4	Component Based Software Engineering Process ,  Component Engineering	TB4: chpt17, web link1	Domain Engineering, domain Analysis Process, Domain Modeling	TB3: chpt 10, Web link1	Component Adaptation Techniques	Web link2
Week-5	Selection Methodology of COTS	TB1: 25	Measurement and Metrics for Software Component	TB1:chpt-23	Analysis and Design for Reuse	TB3:chpt 10, web link1
Week-6	Role Based Component Engineering for Web Apps	TB3: chpt10	Principle of Component Design and Reuse	TB1: chpt17, web link4	Component Design Layers	TB1: chpt15, Web link4
Week-7	Designing Class-Based Component	TB3:chpt10 , web link5	Designing Modularity Models for Software Components	TB1: chpt19	Techniques for Designing Component Infrastructures	TB1: chpt17
Week-8	Component Based Reused Metrics	TB1: chpt23	Reusable Components and its implementation	TB1: chpt9, Web link6	Component Based Software Reuse	TB4: chpt17,w eb link6
Week-9	Challenges with Reusing Components	TB1: chpt24,We b link7	Software Development Challenges, Component Based Development Process	TB2: chpt2, Web link1, web link7	Software Component Specifications	Web link1, Web link7
Week-10	Component Models and Software Architecture	TB1:chpt21 , Web link1	Component Selection, Component Integration and Composition	Web link7	Component Adaptability, Component Certification, Component	Web link1, Web link7



					Qualification	
Week-11	Trusted Components, Composition predictability, Component Configurations	Web link7	Software Component Testing	TB1: Chpt28	Maintenance and Management of Component –Based System	TB1:chpt 30
Week-12	An OPEN Process for Component Based Development	TB1:chpt18	Introduction to Component Technology	TB2: chpt2	Component Object Model (COM, COM+	TB2:chpt 8,9, TB1: chpt32
Week-13	Distributed Component Object Model (DCOM)	TB2:chpt8, 9,	COM+	TB1: chpt 32	Java Bean, Remote Method Invocation (RMI)	TB2: chpt4
Week-14	Enterprise Java Bean	TB2: chpt4	Common Object Request Broker Architecture (CORBA)	TB1:chpt3 1, TB2:chpt6 ,7	Software Agents as Next Generation Software Components	TB1:chpt 36

SYLLABUS

Unit- I

Introduction:

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.

Unit -II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and 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.

UNIT -III

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.

UNIT -IV

Software tools – Specification methods, interface – Building Tools.

Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

REFERENCE BOOKS:

1. Human – Computer Interaction. Alan Dix, Janet Finckay, Gre Goryd, Abowd, Russell Bealg,  
Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech,
3. User Interface Design, Soren Lauesen , Pearson Education

## CA-413: Mini Project

A student shall submit the Mini Project on a given topic under the guidance of a faculty member of the College/ Institute. The Mini Project shall be evaluated by the concerned faculty member and Head of the Department.