**Osmania University** 

**Faculty of Informatics** 

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# Two years MCA Program Master of Computer Applications 2022-23

# Syllabi for Semesters – I and II With Effect from Academic Year 2022 – 2023

Osmania University Hyderabad

Master of Computer Applications

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~~~	Course	Course	Hours/					Scheme Examin	of ation		
SNo	Code	Title	Wee	Week		Max	Max Marks		Duration (hrs)	ation No of Credits	
		THEORY	L	Т	Р	CIE	SEE	Total Marks	SEE		
1	PCC101	Mathematical Foundations of Computer Science	4	-	-	30	70	100	3	4	
2	PCC102	Data Structures using C	4	-	-	30	70	100	3	4	
3	PCC103	Object Oriented Programming using Java	3	-	-	30	70	100	3	3	
4	PCC104	Computer Architecture	3	1	-	30	70	100	3	3	
5	PCC105	Probability & Statistics	3	1	-	30	70	100	3	3	-
6	MGC106	Managerial Economics and Accountancy	3	1	-	30	70	100	3	3	
			PR	ACT	[CA]	LS					-
7	LCC151	Data Structures using C Lab	_	-	3	25	50	75	3	2	-
8	LCC152	Java Programming Lab	-	-	3	25	50	75	3	2	
9	HSC153	Soft Skills Lab	_	-	3	25	50	75	3	2	1
			20	3	9	255	570	825	-	26	1

#### SCHEME OF INSTRUCTION MASTER OF COMPUTER APPLICATIONS (MCA) SEMESTER- I

Abbreviation	Full Form	AbbreviationFull Form			
PCC	Professional Core Course	CIE	Continuous Internal Evaluation		
PEC	Professional Elective Course	SEE	Semester End Evaluation		
MGC	Management Course	L	Lecture		
LCC	Laboratory Core Course	Р	Practical		

Note: Each lab should be made with 30 students for batch

# **PCC101** Mathematical Foundations of Computer Science

Credits : 4

Instruction	4L hrs per week	Duration of SEE	3 hours
CIE	30 marks	SEE	70 marks

## **Course Objectives**

- 1. To learn logic theory and Boolean algebra related to computer science
- 2. To understand relations and functions
- 3. To gain insights into recurrence relation
- 4. To comprehend algebraic structure
- 5. To study graph theory and concepts of trees

## Course Outcomes – Students will learn to

- 1. Solve logic problems
- 2. Represent the relations and functions
- 3. Create recurrence relation
- 4. Apply algebraic structures
- 5. Work on various graph and tree concepts

## UNIT- I

**Fundamentals of Logic**: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.

**Set Theory**: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams.

**Properties of the Integers**: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

#### UNIT-II

**Relations and Functions**: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.

**Relations:** Partial Orders, Equivalence Relations and Partitions.

**Principle of Inclusion and Exclusion:** Principles of Inclusion and Exclusion, Generalization of Principle.

UNIT-III

Generating Functions: Introductory Examples, Definition And Examples, Partitions of Integers.

**Recurrence Relations:** First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients.

# UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, Groups, Residue Arithmetic.

# UNIT -V

**Graph Theory:** Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles.

**Trees:** Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

## **Suggested Readings:**

- 1. Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, **Discrete Mathematics** for Computer Scientists & Mathematicians, Prentice Hall NJ, 2<sup>nd</sup> Edition, 2015.
- 2. Jr. P. Tremblay and R Manohar Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill, 1987.
- 3. R.K.Bisht and H.S.Dhami, Discrete Mathematics Oxford Higher Education, 2015
- 4. Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, **Mathematical Foundation of Computer Science**, BSP, 2016
- 5. Ralph P. Grimaldi **Discrete and Combinatorial Mathematics**, 5<sup>th</sup> Edition, Pearson, 2004.

# PCC102

# Data Structures using C

Credits : 4

Instruction 4L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

## **Course Objectives**

- 1. To learn the features of C
- 2. To learn the linear and non-linear data structures
- 3. To explore the applications of linear and non-linear data structures
- 4. To learn to represent data using graph data structure
- 5. To learn the basic sorting and searching algorithms

Course Outcomes - Upon completion of the course, students will be able to:

- 1. Implement linear and non-linear data structure operations using C
- 2. Suggest appropriate linear / non-linear data structure for any given data set.
- 3. Apply hashing concepts for a given problem
- 4. Modify or suggest new data structure for an application
- 5. Appropriately choose the sorting algorithm for an application

## **UNIT I - C PROGRAMMING BASICS**

Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

#### **UNIT II - FUNCTIONS, POINTERS, STRUCTURES AND UNIONS**

Functions – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic. Structures and unions – definition – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives.

#### **UNIT III - LINEAR DATA STRUCTURES**

Arrays and its representations Stacks and Queues – Applications Linked lists – Single, circular and doubly Linked list-Application

## **UNIT IV - NON-LINEAR DATA STRUCTURES**

Trees – Binary Trees – Binary tree representation and traversals , – Applications of trees. Binary Search Trees , AVL trees. Graph and its representations – Graph Traversals.

# **UNIT V - SEARCHING AND SORTING ALGORITHMS**

Linear Search – Binary Search. Sorting: Selection Sort, Bubble Sort, Insertion sort, Merge sort, Quick Sort Hashing, Types of Hashing. Collision resolution techniques

#### **Suggested Readings:**

- 1. Brian W. Kernighan / Dennis Ritchie ,The C Programming Language ,Second Edition , Pearson 2015
- 2. Pradip Dey and Manas Ghosh, —Programming in C, Second Edition, Oxford University Press, 2011.
- 3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008.
- 4. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 1996
- 5. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, 1983.

# PCC103 Object Oriented Programming using Java

Instruction 3L hrs per week CIE 30 marks *Credits : 3* Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Learn the basics of object oriented programming
- 2. Study Java I/O mechanisms
- 3. Explore Java API
- 4. Develop graphics based Java programs
- 5. Learn swing framework

## **Course Outcomes**

- 1. Explain OOPs features and concepts
- 2. Write basic Java programs
- 3. Write I/O programs in Java
- 4. Use various built-in Java classes and methods
- 5. Create window based Java programs

#### UNIT-I

**Object Oriented System Development**: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.

**Java Programming Fundamentals**: Introduction, Overview of Java, Data Type, Variables and Arrays, Operators, Control statements, Classes, Methods, Inheritance, Packages and Interfaces, Inner Classes.

#### UNIT-II

I/O basics, Stream and Byte classes, Character Streams, Reading Console input and output, Print Writer Class, String Handling, Exceptions Handling, Multithreaded Programming.

#### UNIT-III

Exploring Java Language, Collections Overview, Collections Interfaces, Collections Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy classes and interfaces, Sting Tokenizer, BitSet, Date, Calendar, Timer.

#### UNIT-IV

Introducing AWT working With Graphics: AWT Classes, Working with Graphics.

**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.

**AWT Controls:** Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, CheckboxGroup, Choice Controls, Using Lists, Managing Scroll Bars, Using TextField, Using TextArea, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, FileDialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

## UNIT-V

Introduction to Swing Package, Java I/O classes and interfaces, Reading and Writing Files, Serialization, Introduction to Java Network Programming, Object Class, Exploring Image package.

#### **Suggested Readings**

- 1. Herbert Schildt, **The Complete Reference Java**, 9th Edition, Tata McGraw Hill, 2005.
- 2. Bruce Eckel, Thinking in Java, 4th Edition, Pearson Education
- 3. Dietel and Dietel, Java: How to Program, 5th Edition, Prentice Hall
- 4. James M Slack, **Programming and Problem solving with JAVA**, Thomson Learning, 2002
- 5. C Thomas Wu, An Introduction to Object Oriented programming with Java, Tata McGraw Hill, 2005.
- 6. Kathy Sierra, Bert Bates ,**Head First Java**, 2nd Edition, **A Brain-Friendly Guide**, Publisher: O'Reilly Media, February 2005.

# PCC104

# Computer Architecture Credits : 3

Instruction 4(3L+1T) hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Learn the basics of data representation
- 2. Study register transfer micro operations
- 3. Explore CPU
- 4. Comprehend computer arithmetic algorithms
- 5. Learn I/O organization

#### **Course Outcomes**

- 1. Apply data representation methods
- 2. Write logic diagrams for microoperations
- 3. Write general register organization diagrams
- 4. Analyze computer arithmetic algorithms.
- 5. Explain I/O organization

## UNIT -I

**Data Representation:** Data types, Complements, Fixed and Floating Point representations, and Binary codes.

**Overview of Computer Function and Interconnections**: Computer components, Interconnection structures, Bus interconnection, Bus structure, and Data transfer.

#### UNIT-II

**Register Transfer Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift Unit. **Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instruction, Input-Output and Interrupt.

#### UNIT-III

**Micro programmed Control:** Control memory, Address Sequencing, Micro program example, Design of Control Unit.

**Central Processing Unit:** General Register Organization, Stack Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, and Program control.

**Computer Arithmetic:** Addition and Subtraction, Multiplication, Division, and Floating Point Arithmetic Operations.

# UNIT-IV

**Memory Organization:** Memory Hierarchy, Main Memory, RAM and ROM, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory Management hardware.

# UNIT-V

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), I/O Processor, Serial Communication.

Pipeline Processing: Arithmetic, Instruction and RISC Pipelines.

Assessing and Understanding Performance: CPU performance and its factors, Evaluating performance.

## **Suggested Readings**

- 1. Morris Mano M, **Computer System Architecture**, Pearson Education India, 3rd Edition, 2007.
- 2. William Stallings, **Computer Organization and Architecture**, PHI, 7th Edition, 2008.
- 3. David A Patterson, John L Hennessy, **Computer Organization and Design**, Morgan Kaufmann, 5th Edition, 2013.
- 4. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, Tata<br/>McGraw-HillEducation,5thEdition,2002

# PCC105

# **Probability and Statistics**

Instruction 3L hrs per week CIE 30 marks Credits : 3 Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Understand the Linear Algebra concepts through vector spaces.
- 2. Basic concepts of probability and concepts of various discrete and continuous probability distributions.
- 3. Learning sampling procedure and various kinds of estimate techniques.
- 4. Learning hypotheses testing and acquiring knowledge of basic statistical Inference and its applications.
- 5. The concept of association between two variables and forecast future values by regression equations.

## **Course Outcomes**

- 1. Understanding of Linear Algebra will boost the ability to understand and apply various data science algorithms.
- 2. Calculate probabilities by applying probability laws and theoretical results, knowledge of important discrete and continuous distributions, their inter relations with real time applications.
- 3. Understanding the use of sample statistics to estimate unknown parameters.
- 4. Become proficient in learning to interpret outcomes.
- 5. Compute and interpret Correlation Analysis, regression lines and multiple regression analysis with applications.

# UNIT-I

**Vector Spaces -** Vector Spaces and Subspaces -Null Spaces, Column Spaces and Linear Transformations. Linearly Independent Sets - Bases - Coordinate Systems.

# UNIT-II

**Probability** - Basic terminology, Three types of probability, Probability rules, Statistical independence, statistical dependency, Bayes' theorem.

**Probability Distributions** - Random variables, expected values, binomial distribution, Poisson distribution, normal distribution, choosing correct distribution.

#### UNIT-III

**Sampling and Sampling Distributions** - Random sampling, Non-Random Sampling distributions, operational considerations in sampling.

**Estimation** - Point estimates, interval estimates, confidence intervals, calculating interval estimates of the mean and proportion, t-distribution, determination of sample size in estimation.

## **UNIT-IV**

**Testing Hypothesis - one sample tests -** Hypothesis testing of mean when the population standard deviation is known, powers of hypotheses test, hypotheses testing of proportions, hypotheses testing of means when standard deviation is not known.

**Testing Hypotheses - Two sample tests -** Tests for difference between means - large sample, small sample, with dependent samples, testing for difference between proportions – Large sample.

# UNIT-V

**Chi-square and Analysis of Variance -** chi-square as test of independence, chi-square as a test of goodness of fit, analysis of variance, inferences about a population variance, inferences about two population variances.

**Regression and Correlation** – Simple Regression - Estimation using regression line, correlation analysis, making inferences about population parameters, limitations, errors and caveats in regression and correlation analysis. Multiple Regression and correlation analysis. Finding multiple regression equations and making inferences about population parameters.

## Suggested Reading

- 1. David C Lay, Linear Algebra and its Applications 4e
- 2. Richard I Levin, David S Rubin Statistics for Management, Seventh Edition, PHI 1997
- 3. R D Sharma "Theory and Problems of Linear Algebra", International Publishing House Pvt. Limited, 2011.
- 4. A K Sharma, "Linear Algebra", Discovery Publishing House Ltd., 2019.
- 5. Gilbert Strang, Linear Algebra and its Applications, 2010
- 6. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics Sultan Chand & Sons, New Delhi.

## PCC106 Managerial Economics and Accountancy Credits : 3

Instruction 3L+1T hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

- 1. To learn important concepts of Managerial Economics and apply them to evaluate business decisions.
- 2. To understand various parameters that determine the consumers' behavior.
- 3. To evaluate the factors that affect production
- 4. To understand the concepts of capital budgeting and payback period.
- 5. To study the concepts of various book-keeping methods.

#### **Course Outcomes**

- 1. Apply the fundamental concepts of managerial economics to evaluate business decisions Understand types of Demand and factors related to it.
- 2. Identify different types of markets and determine price –output under perfect competition.
- 3. Determine working capital requirement and payback
- 4. Analyze and interpret financial statements through ratios

#### UNIT – I

**Meaning and Nature of Managerial Economics:** Managerial Economics and its usefulness to Engineers, Fundamental Concepts of Managerial Economics-Scarcity, Marginalism, Equi-marginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

#### UNIT – II

Law of Demand and Supply: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium. (Theory questions and small numerical problem can be asked)

#### UNIT – III

**Theory of Production and Markets:** Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price - Output determination under Perfect Competition and Monopoly (theory and problems can be asked)

#### UNIT – IV

Working Capital Management and Capital Budgeting: Concepts, Significance, determination and estimation of fixed and variable, working capital requirements, sources of capital.

Introduction to capital budgeting, methods – traditional and modern methods with problems.

(Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

## UNIT - V

Accounting: Meaning-Significance-Principles of double entry book keeping, Journal, Ledger accounts, Subsidiary books, , Trial Balance, preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios. (Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios)

#### **Suggested Readings:**

- 1. Mehta P.L., Managerial Economics Analysis, Problems and Cases, Sultan Chand & Sons Educational Publishers, 2011
- 2. Maheswari S.N., Introduction to Accountancy, Vikas Publishing House, 2005
- 3. Pandey I.M., Financial Management, Vikas Publishing House, 2009
- S P Jain and K L Narang, "Financial Accounting", Kalyan Publishers, 2018
  M Hanif and A Mukherjee "Modern Accountancy", McGraw Hill, 3<sup>rd</sup> Edition, 2018.

# LCC151 Data Structures using C Lab

Instruction 3P hrs per week CIE 25 marks Credits : 2 Duration of SEE 3 hours SEE 50 marks

#### **Course Objectives**

- 1. To understand and implement basic data structures using C
- 2. To apply linear and non-linear data structures in problem solving.
- 3. To learn to implement functions and recursive functions by means of data structures
- 4. To implement searching and sorting algorithms

Course Outcomes - Upon completion of the course, the students will be able to:

- 1. Write basic and advanced programs in C
- 2. Implement functions and recursive functions in C
- 3. Implement data structures using C
- 4. Choose appropriate sorting algorithm for an application and implement it in a modularized way

#### Programs

- 1. Basic C Programs looping, data manipulations, arrays
- 2. Programs using strings string function implementation
- 3. Programs using structures and pointers
- 4. Programs involving dynamic memory allocations
- 5. Array implementation of stacks and queues
- 6. Linked list implementation of stacks and queues
- 7. Application of Stacks and Queues
- 8. Implementation of Trees, Tree Traversals
- 9. Implementation of Binary Search trees
- 10. Implementation of Linear search and binary search
- 11. Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
- 12. Implementation Hash functions, Collision resolution techniques

# LCC152

# Java Programming Lab

Instruction 3P hrs per week CIE 25 marks Credits : 2 Duration of SEE 3 hours SEE 50 marks

# **Course Objectives**

- 1. Learn how to write simple java programs
- 2. Learn how to write multithreaded programs
- 3. Learn how to write I/O programs
- 4. Learn how to write serialization programs
- 5. Learn how to write program using URL class

#### **Course Outcomes**

- 1. Be able to write simple java programs
- 2. Be able to write multithreaded programs
- 3. Be able to write I/O programs
- 4. Be able to write serialization programs
- 5. Be able to write URL class program

#### Programs

- 1. Write a program to calculate salary of n employees using concept of classes with constructors and methods.
- 2. Write a program to demonstrate e-commerce website using inheritance, abstract class and dynamic polymorphism.
- 3. Write a program to demonstrate various arithmetic calculations using packages.
- 4. Write a program to demonstrate client-server environment using multithreading.
- 5. Write a program to demonstrate mutual exclusion using thread synchronization.
- 6. Write a program to demonstrate Linked list class.
- 7. Write a program to demonstrate Hash set and Iterator classes.
- 8. Write a program to demonstrate Enumeration and Comparator interfaces.
- 9. Write a program to accept data and display output in key, value pair.
- 10. Write a program to create a registration form with different controls, menus and demonstrate event handling.
- 11. Write a program to copy data from one file to another file.
- 12. Write a program to merge contents of two files and display output on console.
- 13. Write a program to illustrate Serialization.
- 14. Write a program to retrieve web page using URL class.
- 15. Write a program to load and display image and perform gray scale.

# **HSC153**

Instruction 3P hrs per week CIE 25 marks

#### **Course Objectives**

- 1. Learn conversational skills
- 2. Learn reading strategies
- 3. Learn time management
- 4. Learn stress management
- 5. Learn career planning

#### **Course Outcomes**

- 1. Express conversational skills
- 2. Specify reading strategies
- 3. Perform time management
- 4. Perform stress management
- 5. Explore career planning

#### Activities

- 1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
- 2. Group discussion
- Interview skills, Making presentation
  Listening to Lectures and News Programmes, Listening to Talk show
  Watching videos on interesting events on Youtube,
- 6. Reading different genres of tests ranging from newspapers to philosophical treatises
- 7. Reading strategies graphic organizers, Reading strategies summarizing
- 8. Reading strategies interpretation, Reports
- 9. Cover letter, Resume,
- 10. Writing for publications, Letters, Memos, Emails and blogs
- 11. Civil Service (Language related), Verbal ability
- 12. Motivation, Self image
- 13. Goal setting, Managing changes
- 14. Time management, Stress management
- 15. Leadership traits
- 16. Team work
- 17. Career and life planning.
- 18. Multiple intelligences
- 19. Emotional intelligence
- 20. Spiritual quotient (ethics)
- 21. Intercultural communication
- 22. Creative and critical thinking
- 23. Learning styles and strategies

#### **Suggested Readings:**

- 1. Business English Certificate Materials, Cambridge University Press.
- 2. Graded Examinations in Spoken English and Spoken English for Work downloadable

Soft Skills Lab

materials from Trinity College, London.

- 3. International English Language Testing System Practice Tests, Cambridge University Press.
- 4. Interactive Multimedia Programs on Managing Time and Stress.
- 5. Personality Development (CD-ROM), Times Multimedia, Mumbai
- 6. Robert M Sherfield "Developing Soft Skills" 4<sup>th</sup> Edition, Pearson Education, 2009.

# Web Sources

http://www.slideshare.net/rohitjsh/presentation-on-group-discussion http://www.washington.edu/doit/TeamN/present\_tips.html http://www.oxforddictionaries.com/words/writing-job-applications http://www.kent.ac.uk/careers/cv/coveringletters.htm http://www.mindtools.com/pages/article/newCDV\_34.htm

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SNo	Course	rse Course	Hours/ Week				Sche Exam	eme of ination	No of	
91NU	Code	Title			Max Marks			Duration (hrs)	Credits	
	Т	HEORY	L	Τ	Р	CIE	SEE	Total Marks	SEE	Cr
1	PCC 201	Operating Systems	3	1	-	30	70	100	3	3
2	PCC 202	Database Management System	4	-	-	30	70	100	3	4
3	PCC 203	Design and Analysis of Algorithms	3	1	-	30	70	100	3	3
4 *	PCC 204	Data Engineering with Python	4	-	-	30	70	100	3	4
5	PCC 205	Machine Learning	3	-	-	30	70	100	3	3
6	MGC 206	Operations Research	3	1	-	30	70	100	3	3
			PRA	CTI	CALS					
7	LCC 251	Operating Systems Lab	-	-	3	25	50	75	3	2
8 *	LCC 252	Data Engineering with Pyt	-	-	3	25	50	75	3	2
9	LCC 253	Database Management Systems Lab	-	-	3	25	50	75	3	2
10	SIP 321	Summer Internship*	-	-	-	-	-		-	-
			20	3	9	255	570	825	-	26

# SCHEME OF INSTRUCTION MASTER OF COMPUTER APPLICATIONS (MCA)

**\*Summer Internship**: After second semester, the students are expected to do summer internship and Its grade will be credited in the third semester memo after evaluation.

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
HSC	Humanities and Social Science Course	L	Lecture
LCC	Laboratory Core Course	Р	Practical

#### Note: Each lab should be made with 30 students for batch

#### **Operating Systems PCC201**

Credits : 3

Instruction 3L + 1T hrs per week CIE 30 marks

Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. To gain the understanding of operating system and unix operating system in specific
- 2. To comprehend the details of process.
- 3. To learn the types and architecture of computer memory
- 4. To study file system and its implementation
- 5. To realize the operating system concepts into case studies.

## **Course Outcomes – Learners on completion of the course, be able to**

- 1. Explain operating systems and Unix OS, illustrate the workings of various OS components.
- 2. Analyze the process, its states and process scheduling algorithms.
- 3. Demonstrate paging, demand paging, page replacement and segmentation with illustrations.
- 4. Elaborate the file access and allocation methods and mass storage structures.
- 5. Describe concrete implementations of Linux system and Windows 7.

## **UNIT-I**

Unix: Introduction, commands, file system, security and file permission, regular expression and grep, shell programming, awk.

Introduction to Operating Systems: OS structure and strategies, Process concepts, Multithreaded Programming, Process scheduling, Process synchronization, Deadlocks.

# **UNIT-II**

Memory management strategies with example architectures: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory management : Demand paging, Page replacement, Thrashing.

# **UNIT-III**

File System Interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation of file systems, Mass storage structures, I/O systems

# **UNIT-IV**

System Protection : Principles and Domain, Access Matrix and implementation, Access control and access rights, Capability based systems, Language based Protection, System Security: Problem, Program threats, cryptography, user authentication, implementing security defenses, Firewalling, Computer security Classification

#### **UNIT-V**

Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process Master of Computer Applications

communication. Windows 7 –Design principles, System components, Terminal services and fast user switching File systems, Networking, Programmer interface.

#### **Suggested Readings:**

- 1. Abraham Silberschatz, Peter B Galvin, Operating System Concepts, 9th edition, Wiley, 2016
- 2. William Stallings, Operating Systems-Internals and Design Principles, 8th edition, Pearson, 2014
- 3. Andrew S Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2016.

# PCC202 Database Management System

Credits : 4

Instruction 4L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Introduce database concepts along with ER modelling
- 2. Learn about relational databases and SQL query language
- 3. Define advanced SQL
- 4. Study DB transactions and explore concurrency concepts
- 5. Introduce NoSQL

#### **Course Outcomes**

- 1. Explain the DB concepts and model requirements as ER-model
- 2. Suggest relational algebra queries from text specification
- 3. Write SQL queries for the given questions
- 4. Elaborate indexing and hashing and describe concurrency control concepts
- 5. Comprehend NoSQL technology

## UNIT – I

**Introduction**: Database System Applications, Purpose of Database Systems, View of Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations Data, Database Languages, Relational Databases, Database Design, Object-based and Semi-structured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators. Database Design and the **E-R Model**: Overview of the Design Process, The Entity- Relationship Model, Constraints, Entity-Relationship Diagrams, Entity – Relationship Design Issues, Weak Entity Sets, Extended E-R Features, Database Design for Banking Enterprise, Reduction to Relational Schemas, Other Aspects of Database Design

# UNIT – II

**Relational Model**: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational – Algebra Operations, Extended Relational - Algebra Operations, Null Values, Modification of the Databases. Structured Query Language: Data Definition, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null

#### UNIT – III

Advanced SQL: SQL Data Types and Schemas, Integrity Constraints, Authorization, Embedded SQL, Dynamic SQL, Functions and Procedural Constructs, Recursive Queries, Advanced SQL Features. Relational Database Design: Features of Good Relational Design, Atomic Domains and First Normal Form, Functional-Dependency Theory, Decomposition using Functional Dependencies.

## $\mathbf{UNIT} - \mathbf{IV}$

**Indexing and Hashing**: Basic Concepts, Ordered Indices, B+-tree Index Files, B-tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices. Index Definition in SQL Transactions: Transaction Concepts, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability

## UNIT – V

**Concurrency Control**: Lock-based Protocols, Timestamp-based Protocols, Validationbased Protocols, Multiple Granularity, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations, Weak Levels of Consistency, Concurrency of Index Structures. Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques, Remote Backup Systems

**NoSQL:** Need for NoSQL, aggregate data models, more details on data models, distribution models, consistency, version stamps, map-reduce, key-value databases, document databases, column-family stores, graph databases, Schema Migrations

## **Suggested Readings**

- 1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6<sup>th</sup> Edition, 2010.
- 2. Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3<sup>rd</sup> Edition, 2003.
- 3. Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education,4<sup>th</sup>Edition,2004.
- 4. Shashank Tiwari, "Professional NoSQL", 1<sup>st</sup> Edition, Wiley publishers, 2011.

# PCC203

# **Design and Analysis of Algorithms**

Credits : 3

Instruction 4(3L+1T) hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

## **Course Objectives**

- 1. Learn algorithms time complexity
- 2. Learn divide and conquer approach
- 3. Learn greedy method
- 4. Learn dynamic programming
- 5. Learn backtracking

#### **Course Outcomes**

- 1. Carry out algorithms time complexity
- 2. Explain divide and conquer approach
- 3. Illustrate greedy method
- 4. Elaborate dynamic programming
- 5. Explore backtracking

#### Unit I

**Introduction to Algorithms**: Algorithm Specification, Performance Analysis, Randomized Algorithms. **Elementary Data Structures**: Stacks and Queues, Trees, Dictionaries, Priority Queues, Sets and Disjoint Set Union, Graphs.

#### Unit II

**Divide and Conquer**: Binary Search, Finding the Maximum and Minimum, Merge Sort; Quick Sort, Selection sort, Strassen's Matrix Multiplication, Convex Hull.

**The Greedy Method**: Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths.

#### Unit III

**Dynamic Programming:** General Method, Multistage Graphs, All-Pairs Shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, The Traveling Salesperson Problem.

**Basic Traversal and Search Techniques**: Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS.

#### Unit IV

**Back Tracking**: General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem. **Branch-Bound**: The Method, 0/1 Knapsack Problem, Traveling Sales Person.

# Unit V

**NP-Hard and NP-Complete Problems:** Basic Concepts, Cook's Theorem, NP-Hard. Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation, Some Simplified NP-Hard Problems.

# **Suggested Readings**

- 1. E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007.
- 2. R. Pannerselvam, "Design and Analysis of Algorithms", PHI, 2007.
- 3. Hari Mohan Pandey, "Design, Analysis and Algorithm", University Science Press, 2009.
- 2. TH Cormen, CE Leiserson, RL Rivert, C Stein, "Introduction to Algorithms", Third Edition, PHI, 2010.

# Data Engineering with Python

3 Periods per week
4 Hours
70 Marks
30 Marks
4

Course Objectives: The main objectives of this course are to teach

- how to extract raw data,
- clean the data,
- perform transformations on data,
- load data and visualize the data

#### **Outcomes:**

At the end of the course the student will be able to:

- Understand the basics of Python Programming Language
- Handle different types of files and work with text data
- Use regular expression operations
- Use relational databases via SQL
- Use tabular numeric data
- Use the data structures: data series and frames
- Use PyPlot for visualization
- Use Python for basic Machine Learning

#### Unit – I

**Introduction, Parts of Python Programming Language, Control Flow Statements, Functions, Strings** [Reference 2 – Chapter 1 to Chapter 5]

#### Unit- II

**Lists, Dictionaries, Tuples and sets, Files, Regular** expressions [Reference 2- Chapter 6 to Chapter 10]

#### Unit-III

Introduction to Data Science [Reference 2- Chapter 12], Data Science: Data Analysis Sequence, Data Acquisition Pipeline, Report Structure [Reference 1(Chapter 1-Unit1 to Unit 3)]] Files and Working with Text Data: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.pathModules. [Reference 2, Chapter 9)] Working with Text Data: JSON and XML in Python[Reference 2, Section12.2]

**Working with Text Data**: Processing HTML Files, Processing Texts in Natural Languages [Reference 1(Chapter3 – Unit 13, and Unit16)

**Regular Expression Operations:** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with *glob* Module [Reference 2-Chapter 10]

## PCC 204

# Unit – IV

**Working with Databases:** Setting Up a MySQL Database, Using a MySQL Database: Command Line, Using a MySQL Database, Taming Document Stores: MongoDB [Reference 1 (Chapter4-Unit17toUnit20)]

**Working with Data Series and Frames:** Pandas Data Structures, Reshaping Data, Handling Missing Data, Combining Data, Ordering and Describing Data, Transforming Data, Taming Pandas File I/O [Reference 1 (Chapter 6-Unit 31 to Unit 37)]

**Plotting**: Basic Plotting with PyPlot, Getting to Know Other Plot Types, Mastering Embellishments, Plotting with Pandas [Reference 1 (Chapter8-Unit 41 to Unit 44)]

# Unit – V

**Probability and Statistics:** Reviewing Probability Distributions, Recollecting Statistical measures, Doing Stats the Python way [Reference 1 (Chapter9-Unit 45 to Unit 47) ] Machine Learning: Designing a Predictive Experiment, Fitting a linear regression, Grouping Data with K- means Clustering. Surviving in Random Decision Forests. [Reference 1( Chapter 10 - Unit 48 to Unit-51 )]

# **References:**

- 1. Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value. Dmitry Zinoriev, The Pragmatic Programmers LLC, 2016
- Introduction to Python Programming. Gowrishankar S., Veena A. CRC Press, Taylor & Francis Group, 2019

# **Suggested Reading**

- 3. Python for Everybody: Exploring Data Using Python 3. Charles R Severance, 2016
- 4. Python Data Analytics Data Analysis and Science using Pandas, matplotlib and the Python Programming Language. Fabio Nelli, Apress, 2015
- 5. Website Scraping with Python. Using BeautifulSoup and Scrapy. GáborLászlóHajba, Apress, 2018
- 6. Machine Learning with Python Cookbook:.Practical Solutions from Preprocessing to Deep Learning. Chris Albon, O'Reilly 2018

# PCC205

# **Machine Learning**

Instruction 4(3L+1T) hrs per week CIE 30 marks Credits : 3 Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Learn regression techniques
- 2. Learn dimensionality reduction methods
- 3. Learn classification schemes
- 4. Learn clustering mechanisms
- 5. Learn evaluation metrics

#### **Course Outcomes**

- 1. Solve regression problems
- 2. Apply dimensionality reduction methods
- 3. Analyze classification schemes
- 4. Explore clustering mechanisms
- 5. Explain evaluation metrics

#### Unit I

**Basic Maths**: Probability, Linear Algebra, Convex Optimization **Background**: Statistical Decision Theory, Bayesian Learning (ML, MAP, Bayes estimates, Conjugate priors)

#### Unit II

**Regression**: Linear Regression, Ridge Regression, Lasso **Dimensionality Reduction**: Principal Component Analysis, Partial Least Squares

#### Unit III

**Classification**: Linear Classification, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Perceptron, Support Vector Machines + Kernels, Artificial Neural Networks + Back Propagation, Decision Trees, Bayes Optimal Classifier, Naive Bayes.

#### Unit IV

**Evaluation measures**: Hypothesis testing, Ensemble Methods, Bagging, Adaboost Gradient Boosting, Clustering, K-means, K-medoids, Density-based Hierarchical, Spectral

#### Unit V

Miscellaneous topics: Expectation Maximization, GMMs, Learning theory

# Introduction to Reinforcement Learning Graphical Models: Bayesian Networks.

# Suggested Readings

- 1. Ethem Alpaydin. Introduction to Machine Learning 3e(Adaptive Computation and Machine Learning Series). The MIT Press, 2004.
- 2. Tom M. Mitchell, Machine Learning McGraw Hill Education, 2013

# **PCC206**

# **Operations Research**

Instruction 3L + 1T hrs per week CIE 30 marks Credits : 3 Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Learn linear programming
- 2. Learn transportation problem
- 3. Learn assignment problem
- 4. Learn dynamic programming
- 5. Learn gaming theory

# **Course Outcomes**

- 1. Solve linear problems
- 2. Apply transportation problems
- 3. Analyze assignment problems
- 4. Explore dynamic programming
- 5. Explain gaming theory

# UNIT I

**Linear Programming**: Introduction, Concept of Linear Programming Model, Development of LP models, Graphical Method, Linear Programming Methods, Special cases of Linear Programming, Duality, Sensitivity Analysis.

# UNIT II

**Transportation Problem:** Introduction, Mathematical Model for 'Transportation Problem, Types of Transportation Problem, Methods to solve Transportation Problem, Transshipment Model.

#### UNIT III

**Assignment Problem:** Introduction, Zero-One Programming Model, Types of Assignment Problem, Hungarian Method, Branch-and-Bound Technique for Assignment Problem.

**Integer Programming**: Introduction, Integer Programming Formulations, The Cutting-Plane Algorithm, Branch-and-Bound Technique, Zero-One Implicit Enumeration Algorithm.

# UNIT IV

**Dynamic Programming**: Introduction, Applications of Dynamic Programming, Solution of Linear Programming Problem through Dynamic Programming. Basics of Queuing theory.

# UNIT V

Game Theory: Introduction, Game with Pure Strategies, Game with Mixed Strategies, Dominance Property, Graphical Method for 2 x n or m x 2 Games, Linear Programming Approach for Game Theory.

#### **Suggested Reading:**

- 1.
- Pannarselvam, "*Operations Research*", 3<sup>rd</sup> Edition, PHI, 2009. Prem Kumar Gupta, DS Hira, "*Problems in Operations Research*", S. Chand, 2. 2010.
- 3. Rathindra P Sen, "Operations Research - Algorithm and Application", PHI, 2010.
- J K Sharma, "Operations Research", Fourth Edition, MacMillan, 2009. 4.

# LCC251

# Operating Systems Lab Credits : 2

Instruction 3P hrs per week CIE 25 marks Duration of SEE 3 hours SEE 50 marks

## **Course Objectives**

- 1. Learn shell commands and scripting
- 2. Learn CPU scheduling algorithms
- 3. Learn memory management algorithms
- 4. Learn synchronization problems
- 5. Explore file allocation strategies and disk scheduling algorithms

#### **Course Outcomes**

- 1. Be able to execute shell commands and write shell scripts
- 2. Be able to write programs on CPU scheduling
- 3. Be able to create memory management algorithms
- 4. Be able to execute programs to demonstrate synchronization problems
- 5. Be able to implement file allocation methods and be able to create disk scheduling algorithms

#### Programs

- 1. Unix Shell Commands
  - a) File handling commands
  - b) Directory handling commands
  - c) General purpose commands
- 2. Unix Shell Scripts
  - a) Print Multiplication table of a given no. using all loops
  - b) Perform all arithmetic operations
  - c) Print the type of a file
  - d) Rename all files whose names end with .c as .old
  - e) Display the no. of lines in each of text file in a given dir
- 3. Simulate the following CPU scheduling algorithms.
  - a. FCFS
  - b. SJF
  - c. Round Robin
  - d. Priority.
- 4. Write a C program to simulate producer-consumer problem using Semaphores
- 5. Write a C program to simulate the concept of Dining-philosophers problem.
- 6. Simulate MVT and MFT.
- 7. Write a C program to simulate the following contiguous memory allocation techniques

- a. Worst fit
- b. Best fit
- c. First fit.
- 8. Simulate following page replacement algorithms
  - a. FIFO
  - b. LRU
  - c. OPTIMAL
- 9. Simulate following File Organization Techniques
  - a. Single level directory
  - b. Two level directory
- 10. Simulate following file allocation strategies
  - a. Sequential
  - b. Indexed
  - c. Linked.
- 11. Simulate Bankers Algorithm for Dead Lock Avoidance.
- 12. Simulate Bankers Algorithm for Dead Lock Prevention.
- 13. Write a C program to simulate disk scheduling algorithms.
  - a. FCFS
    - b. SCAN
    - c. C-SCAN

# LCC252

# Data Engg. With Python Lab

Instruction 3P hrs per week CIE 25 marks Credits : 2 Duration of SEE 3 hours SEE 50 marks

## **Course objectives:**

- Understand the process of Importing and Exporting the data.
- Learn how to collect, store and manage data from multiple data sources.
- Know the insights of data using statistical methods
- Identify different techniques for data analysis and data visualization.
- Put into practice the ETL (extract, transform, load) pipeline which will extract raw data, clean the data, perform transformations on data, load data and visualize the data.
- •

**Course Outcomes:** students would be able to:

- Demonstrate various data types in python and develop programs using files, exception handling, functions, classes in Python.
- Examine the process for importing and exporting the data.
- Apply appropriate data collection and pre-processing methods.
- Identify different data analysis Techniques suitable for a given applications
- Demonstrate data visualization techniques for Data Analysis.

## 1

#### Libraries

In this course students are expected to extract, transform and load input data that can be text files, CSV files, XML files, JSON, HTML files, SQL databases, NoSQL databases etc.,. For doing this, they should learn the following Python libraries/modules:

pandas, numpy, BeautifulSoup, pymysql, pymongo, nltk, matplotlib

# Datasets

For this laboratory, appropriate publicly available datasets, can be studied and used. Example: MNIST (<u>http://yann.lecun.com/exdb/mnist/</u>),

UCI Machine Learning Repository(<u>https://archive.ics.uci.edu/ml/datasets.html</u>), Kaggle(<u>https://www.kaggle.com/datasets</u>) Twitter Data

I white Data

# Exercises

- 1. Write programs to parse text files, CSV, HTML, XML and JSON documents and extract relevant data. After retrieving data check any anomalies in the data, missing values etc.
- 2. Write programs for reading and writing binary files
- 3. Write programs for searching, splitting, and replacing strings based on pattern matching using regular expressions
- 4. Design a relational database for a small application and populate the database. Using SQL do the CRUD (create, read, update and delete) operations.
- 5. Create a Python MongoDB client using the Python module pymongo. Using a collection object practice functions for inserting, searching, removing, updating, replacing, and aggregating documents, as well as for creating indexes

- 6. Write programs to create numpy arrays of different shapes and from different sources, reshape and slice arrays, add array indexes, and apply arithmetic, logic, and aggregation functions to some or all array elements
- 7. Write programs to use the pandas datastructures: Frames and series as storage containers and for a variety of data-wrangling operations, such as:
  - Single-level and hierarchical indexing
  - Handling missing data
  - Arithmetic and Boolean operations on entire columns and tables
  - Database-type operations (such as merging and aggregation)
  - Plotting individual columns and whole tables
  - Reading data from files and writing data to files

## Additional Exercises (for learning and practice):

- 1. Introduction to Python Programming:
  - A. Running instructions in Interactive interpreter and a Python Script.
  - B. Write a program to purposefully raise Indentation Error and Correct it
  - C. Write a program to compute distance between two points taking input from the user
  - D. Write a program add python that takes 2numbers as command line arguments and prints its sum.

E. Program to display the following information: Your name, Full Address, Mobile Number, College Name, Course Subjects

- F. Write a Program for checking whether the given number is a even number or not.
- 2 Control Structures, Lists
  - A. Program to find the largest three integers using if-else
  - B. Program that receives a series of positive numbers and display the numbers in order and their sum
  - C. Program to find the product of two matrices and
  - D. Program to display two random numbers that are to be added, the program should allow the student to enter the answer.
  - E. If the answer is correct, a message of congratulations should be displayed.
  - F. If the answer is incorrect, the correct answer should be displayed.
  - G. Using a for loop, write a program that prints out the decimal equivalents of 1/2,1/3,1/4, .1/10.
  - H. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
  - Functions and Recursion

3

- A. Write recursive and non-recursive functions for the following
- B. To find GCD of two integers
- C. To find the factorial of positive integer
- D. To print Fibonacci Sequence up to given number n
- E.To display prime number from2 to n.
- F. Function that accepts two arguments: a list and a number n. It displays all of the numbers in the list that are greater than n
- G. Functions that accept a string as an argument and return the number of vowels and consonants that the string contains
- 4 Files, Exceptions, Lists, Sets, Random Numbers
  - A. Program to write a series of random numbers in a file from 1 to nanddisplay.
  - B. Program to write the content in a file and display it with a line number followed by a colon
  - C. Program to display a list of all unique words in a textfile
D.Program to analyse the two text files using set operations

- E. Write a program to print each line of a file in reverse order.
- F. Write a program to count frequency of characters in a given file. Can you use character frequency total whether the given file is a Python program file, C program file or a text file?
- G. Write a program combine lists that combines these lists in to a dictionary.
- 5 Object Oriented ProgrammingA .Program to implement the inheritanceB. Program to implement the polymorphism
- 6. Demonstrate data analysis using NumPy
  - a. Create an array of 10 zeros
  - b. Create an array of even integers upto 50
  - c. Create a 3x3 matrix
  - d. Generate an array of 25 random numbers sampled from a standard normal distribution.
  - e. Create an array of 20 linearly spaced points between 0 and 1
  - f. Demonstrate slicing and indexing operations
  - g. Get the sum of all columns in matrix
- 7. Write a Program in Python to create and combine student and subject data frames in Pandas.
- 8. Create a data frame 'Book' that contains three vectors [Name, Price, Author]. Convert this data frame into a matrix and list the object using the operator 'as'.
  - 9. Performing Exploratory data analysis on web scraped data of 2021-22 NBA player stats (<u>http://www.basketball-reference.com/</u>)

Perform data cleaning

Handle missing values by replacing with 0

Write to CSV file

Which player scored the most points per game?

Which player had the highest 3-point field goals per game?

Demonstrate Group By() function

10. Data visualization through Sea born for the above program 9.

Box plot of points scored grouped by position

Compute the correlation matrix

- 11. To determine the mean of a set of numbers. To plot the numbers in a bar plot and have a straight line run through the plot at the mean.
- 12. To determine the median of a set of numbers. To plot the numbers in a barplot and have a straight line run through the plot at the median.
- 13. To determine the standard deviation. To plot the numbers in a bar plot and have a straight line run through the plot at the mean and another straight line run through the plot at mean + standard deviation.

More dataset to perform data analysis

**Source of the Data:** https://www.kaggle.com/chirin/africa-economic-banking-and-systemic-crisis-data/downloads/africa-economic-banking-and-systemic-crisis-data.zip/1

Data set: <a href="https://www.kaggle.com/khalidative/crimeanalysis">https://www.kaggle.com/khalidative/crimeanalysis</a>

LCC253

# Database Management Systems Lab Credits : 2

Instruction 3P hrs per week CIE 25 marks Duration of SEE 3 hours SEE 50 marks

### **Course Objectives**

- 1. Learn SQL queries
- 2. Learn PL/SQL stored procedures
- 3. Learn Triggers
- 4. Learn report generation methods
- 5. Learn database application creation

### **Course Outcomes**

- 1. Write SQL queries
- 2. Write stored procedures
- 3. Write triggers
- 4. Use file locking and table locking facilities
- 5. Create small full-fledged database application

### Creation of database (exercising the commands for creation)

- 1. Simple to Complex condition query creation using SQL Plus.
- 2. Usage of Triggers and Stored Procedures.
- 3. Creation of Forms for Student information, Library information, Pay roll etc.
- 4. Writing PL/SQL procedures for data validation.
- 5. Report generation using SQL reports.
- 6. Creating password and security features for applications.
- 7. Usage of File locking, Table locking facilities in applications.
- 8. Creation of small full- fledged database application spreading over 3 sessions.

**Note:** The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

# SIP321

# Summer Internship/ Mini Project \* Credits : 2

CIE 50 marks

#### **Program Description**

The Internship Program/ Mini Project allows MCA students to gain practical experience in the workplace before receiving their graduate degrees.

The internship is a required academic course. The student identifies companies willing to hire him/her on a full time basis for 6-week period (minimum required), usually in the summer. The Internship Program supervises the students and awards academic credits (2) upon successful completion of all the required assignments.

Those students who wish to do a Mini Project can use Problem statements and Data Sources from good quality sources and implement a solution. The Student will be evaluated based on the working system that is presented in Semester III of this course.

### **Intended Learning Outcomes**

Upon successful completion of the internship, you should be able to

- 1. Communicate a practical understanding of how a technology actually operates
- 2. Demonstrate the ability to integrate and apply theoretical knowledge and skills developed in various courses to real-world situations in a business organization
- 3. Exhibit the ability to effectively work in a professional environment and demonstrate work ethic and commitment in a work-based environment
- 4. Demonstrate the ability to successfully complete internship assignments.
- 5. Reflect on personal and professional development needs and set strategic goals for advancing along an intended career path
- 6. Communicate effectively in a professional environment in both English and regional language, orally and in writing.

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**Osmania University** 

**Faculty of Informatics** 

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Two years MCA Program Master of Computer Applications

# Syllabi for Semesters – III and IV With Effect from Academic Year 2023 – 2024

Osmania University Hyderabad

# With effect from the academic year 2023-2024

# SCHEME OF INSTRUCTION MASTER OF COMPUTER APPLICATIONS (MCA) SEMESTER- III

							Sche	ne of	
SNo	Course	Course	Hours/ Week		Examination			No of	
5110	Code	Title			Max		Duration	Credits	
					Marks		(hrs)		
THEORY			L	Т	Р	CIE	SEE	SEE	Cr
1	PCC301	Software Engineering	4	-	-	30	70	3	4
2	PCC302	Computer Networks	4	-	-	30	70	3	4
3	PCC303	Artificial Intelligence	4	-	-	30	70	3	4
4	PCC304	Web Technologies	4	-	-	30	70	3	4
5	PEC**	Professional Elective–I	3	-	-	30	70	3	3
6	PEC**	Professional Elective–II	3	-	-	30	70	3	3
PRACTICALS									
7	LCC351	Computer Networks Lab	-	-	3	25	50	3	1.5
8	LCC352	Software Engineering Lab	-	-	3	25	50	3	1.5
9	LCC353	Web Technologies Lab	-	-	3	25	50	3	1.5
10	SIP321	Summer Internship	-	-	-	50		-	1.5
			22	-	9	305	570	-	28

	Course Code- PEC**	Profession	al Elective -1					
Professional	Professional PEC311 Software Quality & Testin							
Electives	PEC312	Distributed	l Systems					
	PEC313	Internet of	Things					
	PEC314	Image Proc	cessing					
	Course Code- PEC**	Profession	al Elective – II					
	PEC321	Network S	Network Security					
Professional	PEC322	Cyber Secu	ırity					
Electives	PEC323	Information	n Retrieval System	1				
	PEC324	Natural La	nguage Processing	r,				
Abbreviation	Full Form		Abbreviation	Full Form				
PCC	Professional Core	e Course	CIE	Continuous Internal Evaluation				
PEC	Professional Elec	tive Course	SEE	Semester End Evaluation				
MGC	Management Cou	irse	L	Lecture				
LCC	Laboratory Core	Course	Р	Practical				

# **SCHEME OF INSTRUCTION**

# MASTER OF COMPUTER APPLICATIONS (MCA) SEMESTER- IV

SNo	Course Code	Course Title	Hoı We	ırs/ æk	l M Ma	Scher Exami ax rks	ne of nation Duration (hrs)	No of Credits
THEORY			L	Р	CIE	SEE	SEE	Cr
1	PEC**	Professional Elective –III	3	-	30	70	3	3
2	PEC**	Professional Elective –IV	3	-	30	70	3	3
3	OE**	<b>)pen Elective</b>	2	-	30	70	3	2
PRACTICALS								
4	Proj401	Project Work	-	24	50	100	3	12
		Total	8	24	140	310	-	20

# **Professional Electives**

Course Code- PEC**	Professional Elective – III
PEC411	Block Chain Technologies
PEC412	Big Data Analytics
PEC413	Cloud Computing
PEC413	Deep Learning

Course Code- PEC**	Professional Elective – IV
PEC421	Distributed Database Systems
PEC422	Digital Forensics
PEC423	Optimization Techniques
PEC424	Enterprise Architecture

Course Code- OE**	<b>Open Elective</b>				
OE 431	Professional Ethics				
OE 432	Constitution of India				
OE 433	Disaster Management				
OE 434	Organization Behaviour				
OE 435	Intellectual Property & Cyber Law				
OE 436	Environmental Science				

### **Software Engineering**

#### Credits : 4

Instruction4L hrs per week CIE30 marks Duration of SEE3 hours

SEE70 marks

### **Course Objectives**

- 1. Learn the software problem and addressing it through various software processes
- 2. Study the SRS and software architecture
- 3. Understand planning and designing a software project
- 4. Comprehend the testing strategies and the need for performing testing
- 5. Learn how to carry out reengineering to the system and maintain it

Course Outcomes - Students will learn to

- 1. Apply software processes to solve software problem
- 2. Create SRS document and software architecture
- 3. Perform software planning in terms of staffing and scheduling
- 4. Create test cases and procedures
- 5. Re-engineer the developed software

# Unit I

The software Problem: Cost, Schedule and Quality, Scale and change,

**Software Processes:** Process and project, Component Software Processes, SoftwareDevelopment Process Models, Project management Process.

# Unit II

**Software Requirements Analysis and Specification**: Value of a good SRS, RequirementsProcess, Requirements Specification, Functional Specification with Use Cases, Other approaches for analysis. **Software Architecture**: Role of Software Architecture Views, Component and connector view, Architectural styles for C & C view, Documenting Architecture Design, Evaluating Architectures.

# Unit III

**Planning a Software Project**: Effort Estimation, Project Schedule and staffing, Quality Planning, Risk Management Planning, Project Monitoring Plan, Detailed Scheduling. **Design**: Design concepts, Function oriented Design, Object Oriented Design, Detailed Design, Verification, Metrics.

### Unit IV

**Coding and Unit Testing**: Programming Principles and Guidelines, incrementally developing code, managing evolving code, unit testing, code inspection, Metrics. **Testing**: Testing Concepts, Testing Process, Black Box testing, White box testing, Metrics.

# Unit V

**Maintenance and Re-engineering:** Software Maintenance, supportability, Reengineering,Business process Reengineering, Software reengineering, Reverse engineering; Restructuring, Forward engineering, Economics of Reengineering.

**Software Process Improvement**: Introduction, SPI process, CMMI, PCMM, Other SPIFrameworks, SPI return on investment, SPI Trends.

# **Suggested Reading**

- 1. Pankaj Jalote, "Software Engineering- A Precise Approach", Wiley India, 2010.
- 2. Roger. S.Pressman, "Software Engineering A Practitioner's Approach", 7th Edition, McGraw Hill Higher Education, 2010.
- Deepak Jain, "Software Engineering", Oxford University Press, 2008.
   Rajib Mall, "Fundamentals of Software Engineering", 4<sup>th</sup> Edition, PHI Learning, 2014.
- 5. Ian Sommerville, "Software Engineering", 10<sup>th</sup> Edition, Addison Wesley, 2015.

### **Computer Networks**

#### Credits : 4

Instruction 4L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

# **Course Objectives**

- 1. Comprehend the fundamentals of computer networks
- 2. Learn the aspects relevant to physical and datalink layer
- 3. Understand network layer and its significance and functionality
- 4. Study transport layer and its operations
- 5. Learn the protocols implemented at application layer

Course Outcomes - Upon completion of the course, students will be able to:

- 1. Elaborate the network model
- 2. Explain transmission media and functions of datalink layer
- 3. Create routing tables based on DVR and LSR
- 4. Describe TCP and UDP protocols
- 5. Explain application layer protocols

# Unit I

**Data Communications**: Components - Direction of Data flow - networks - Components and Categories - types of connections - Topologies -Protocols and Standards - ISO/OSI model, TCP/IP. **Transmission Media** - Coaxial Cable - Fiber Optics - Line Coding - Modems - RS232 Interfacing.

# Unit II

Datalink Layer: Error detection and correction, CRC, Hamming code,

Flow Control and Error control, Stop and Wait protocol, Sliding Window protocol -go back-N ARQ - selective repeat ARQ.

MAC Layer: LAN - Pure and Slotted ALOHA, Ethernet IEEE 802.3 LAN Ethernet Efficiency Calculation, Bridges. ARP, RARP

# Unit III

**Network Layer**: - Distance Vector Routing, Link State Routing, IP v4 addressing, Subnetting, CIDR., Introduction to IPv6 ICMP, IGMP,OSPF and BGP.

# Unit IV

**Transport Layer**: Services of transport layer, Multiplexing. Transmission Control Protocol (TCP) Congestion Control, timer management, Quality of services (QOS) and User Datagram Protocol (UDP)

# Unit V

Socket Programming: Primitive and Advance System calls, Iterative and concurrent client server programs

Application Layer: Domain Name Space (DNS) - SMTP - FTP - HTTP

### PCC302

# **Suggested Readings**

- 1. Andrew S. Tanenbaum, "Computer Networks", Pearson Education; Fourth Edition, 2008.
- 2. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2009.
- 3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 2006.
- 4. W Richard Stevents, Unix Network Programming, PHI, 2003

Instruction 4L hrs per week CIE 30 marks Instruction 4L hrs per week CIE 30 marks

### **Course Objectives:**

- To familiarize the principles of Artificial Intelligence
- To study the techniques for knowledge representation and inference
- To learn the techniques involved in the creation of intelligent systems
- To study different applications like Game Playing Expert Systems, machine learning and natural language processing

### **Course outcomes :**

Student will be able to

- Identify problems that are amenable to solution by AI method
- Understand and analyze working of an AI technique
- Formalize a given problem in the language/framework of different AI methods

# UNIT-I

Introduction, History, Intelligent Systems, Foundations of AI, Sub-areas of AI, Applications, Problem Solving. State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening, A\*,Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning

# UNIT – II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Knowledge Representation using Frames

### $\mathbf{UNIT} - \mathbf{III}$

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure-Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

### UNIT – IV

Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees (Suggested Reading 2), Deductive Learning, Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

### UNIT – V

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web.

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge.

### **Suggested Readings:**

- 1. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011
- 2. Russell, Norvig, Artificial Intelligence- A Modern Approach, Pearson Education, 2nd Edition, 2004
- 3. Rich, Knight, Nair, Artificial Intelligence, Tata McGraw Hill, 3rd Edition, 2009

# PCC304

Instruction 4(3L+1T) hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Learn basics of HTML and DHTML
- 2. Understand the workings of event model
- 3. Study the java scripting language
- 4. Learn the VB scripts
- 5. Comprehend the active server pages

# **Course Outcomes**

- 1. Write HTML and DHTML programs
- 2. Create programs on event models
- 3. Implement java script programs
- 4. Write VB script programs
- 5. Create ASP programs

# Unit I

**HTML**: Markup languages, common tags, header, test styling, linking images Formatting text, Unordered lists, nested and ordered list, Tabs-and formatting, Basic forms; Complex forms linking, Meta Tags. **Dynamic HTML**: Cascading style sheets in line styles, style element, External Style sheet, text flow and Box model, user style sheets.

# Unit II

**Object model and collections**: Object referencing, collections all, children frames, navigator object. **Event model**: ONCLICK, ONLOAD, Error Handling, ON ERRORS ONMOUSEMOVE, ONMOUSEOVER, ONMOUSEOUT, ONFOCUS, ONBLUR, ONSUBMIT. **Dynamic HTML**: Filters and transitions, Data binding with Tabular data control binding to IMO, TABLE, Structured graphics, Active controls.

# Unit III

Introduction to scripting, Java Script, Data types, Arithmetic's Equality relational, assignment increment, decrement operators, Java Script Control Structures- if, if-else, while. Java Script Control Structures: For, Switch, Do/while, break.

Programming modules, recursion, recursion vs iteration global functions arrays, using arrays, Reference and reference parameters, passing arrays to functions, multiple subscripted arrays, objects-math, string. Boolean and number.

# Unit IV

Client side scripting with VB Script, operations, Data types and control structures, Functions, Arrays, String manipulations, classes and objects. **Web Servers**: Personal Web server, Internet information server, Apache Web Server, Installation of a Web Server.

# Unit V

Active Sever Pages, Client side Scripting vs Server side Scripting, Server side Active X Component, ADO, file system objects, Session tracking, CGI and PERL5, String Processing and Regular Expressions, Server side includes, Cookies and PERL XML Document Type Definition, XML Parsers, Using XML with HTML.

# **Suggested Readings**

- 1 Deiterl, Deitel& NIETO, "Internet & World Wide Web How to Program", Pearson Education, Third Edition, 2004.
- 2 Steven Holzner, "HTML Black Book Comprehensive Problem Server", Dream Tech Press, 2000.
- 3 B Sosinsky, V Hilley, "Programming the Web An Introduction", MGH, 2004.

### **Software Quality and Testing**

### Credits : 3

Instruction 3L hrs per week CIE 30 marks

Duration of SEE 3 hours

SEE 70 marks

# **Course Objectives**

- 1. Learn the essentials of software quality
- 2. Study methods to integrate software quality activities in the project
- 3. Understand the software quality metrics
- 4. Learn building software testing strategy
- 5. Comprehend testing various artifacts of a software project

# **Course Outcomes**

- 1. Explain the essentials of software quality
- 2. Elaborate the methods to integrate software quality activities in the project
- 3. Describe the software quality metrics
- 4. Discuss building software testing strategy
- 5. Perform testing various artifacts of a software project

# UNIT - I

The Software Quality Challenge, Introduction Software Quality Factors, The Components of the Software Quality Assurance System – Overview, Development and Quality Plans.

# UNIT - II

Integrating Quality Activities in the Project Life Cycle, Assuring the Quality of Software Maintenance Components, CASE Tools and their effect on Software Quality, Procedure and Work Instructions, Supporting Quality Devices, Configuration Management, Documentation Control, Project Progress Control.

# UNIT - III

Software Quality Metrics, Costs of Software Quality, Quality Management Standards - ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma, SQA Project Process Standards – IEEE Software Engineering Standards.

# UNIT - IV

Building a Software Testing Strategy, Establishing a Software Testing Methodology, Determining Your Software Testing Techniques, Eleven – Step Software Testing Process Overview, Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report Test Results, Test Software Changes, Evaluate Test Effectiveness.

# UNIT - V

Testing Client / Server Systems, Testing the Adequacy of System Documentation, Testing Web-based Systems, Testing Off – the – Shelf Software, Testing in a Multiplatform Environment, Testing Security, Testing a Data Warehouse, Creating Test Documentation, Software Testing Tools, Taxonomy of Testing Tools, Methodology to Evaluate Automated Testing Tools, Load Runner, Win Runner and Rational Testing Tools, Java Testing Tools, JMetra, JUNIT and Cactus.

#### **PEC311**

# **Suggested Reading**

- 1. Daniel Galin, Software Quality Assurance From Theory to Implementation, Pearson Education.2004
- 2. Mordechai Ben Menachem / Garry S.Marliss, Software Quality Producing Practical, Consistent Software, BS Publications, 2014
- 3. William E. Perry, Effective Methods for Software Testing, 3 rd Edition, 2006, Wiley .
- 4. Srinivasan Desikan, Gopalaswamy Ramesh, Software Testing, Principles and Practices, 2006. Pearson Education.
- 5. Dr.K.V.K.K. Prasad, Software Testing Tool, Wiley Publishers

### **PEC312**

With effect from academic year 2023-2024 Distributed Systems Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

### CourseObjectives

- 1. Understand the architecture, processes and communication of distributed system
- 2. Learn the naming and synchronization strategies
- 3. Study fault tolerance, and distributed object based system
- 4. Learn distributed file system and distributed web based system
- 5. Comprehend the distributed coordination based system and map reduce

### CourseOutcomes

- 1. Explain the architecture, processes and communication of distributed system
- 2. Elaborate the naming and synchronization strategies
- 3. Describe the fault tolerance and distributed object based system
- 4. Discuss the distributed file system and distributed web based system
- 5. Explain distributed coordination based system and map reduce

### Unit I

Introduction: Goals and Types of Distributed Systems

Architectures: Architectural Styles, System Architectures, Architectures versus Middleware, and Self-Management in Distributed Systems.

Processes: Threads, Virtualization, Clients, Servers, and Code Migration.

**Communication:** Fundamentals, Remote Procedure Call, Message-Oriented Communication, Stream-Oriented Communication, and Multicast Communication.

### Unit II

**Naming:** Names, Identifiers and Addresses, Flat Naming, Structured Naming, and Attribute-Based Naming.

**Synchronization:** Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, and Election Algorithms. **Consistency and Replication:** Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, and Consistency Protocols.

### Unit III

**Fault Tolerance:** Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, and Recovery.

**Distributed Object-Based Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

### Unit IV

**Distributed File Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

**Distributed Web-Based Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

# Unit V

**Distributed Coordination-Based Systems:** Introduction to Coordination Models, Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

**Map-Reduce:** Example, Scaling, programming model, Apache Hadoop, Amazon Elastic Map Reduce, Mapreduce.net, Pig and Hive.

# **Suggested Readings**

- 1. Andrew S. Tanenbaum and Maarten Van Steen, —Distributed Systems<sup>II</sup>, PHI 2nd Edition, 2009.
- 2. R.Hill, L.Hirsch, P.Lake, S.Moshiri, —Guide to Cloud Computing, Principles and Practicell, Springer, 2013.
- 3. R.Buyya, J.Borberg, A.Goscinski, Cloud Computing-Principles and Paradigms, Wiley 2013.

Instruction 3L hrs per week CIE 30 marks

Duration of SEE 3 hours

SEE 70 marks

# **Course Objectives**

- 1. Discuss fundamentals of IoT and its applications and requisite infrastructure
- 2. Describe Internet principles and communication technologies relevant to IoT
- 3. Discuss hardware and software aspects of designing an IoT system
- 4. Describe concepts of cloud computing and Data Analytics
- 5. Discuss business models and manufacturing strategies of IoT products

# **Course Outcomes**

Student will be able to

- 1. Understand the various applications of IoT and other enabling technologies.
- 2. Comprehend various protocols and communication technologies used in IoT
- 3. Design simple IoT systems with requisite hardware and C programming software
- 4. Understand the relevance of cloud computing and data analytics to IoT
- 5. Comprehend the business model of IoT from developing a prototype to launching a product.

# UNIT-I

# **Introduction to Internet of Things**

IOT vision, Strategic research and innnovation directions, Iot Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues.

# UNIT-II

# **Internet Principles and communication technology**

Internet Communications: An Overview – IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addressess, TCP and UDP Ports, Application Layer Protocols HTTP, HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source.

# **UNIT-III**

# **Prototyping and programming for IoT**

Prototyping Embedded Devices - Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping, Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.

Techniques for writing embedded C code: Integer data types in C, Manipulating bits -AND, OR, XOR, NOT, Reading and writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for arduino board.

# **UNIT-IV**

# **Cloud computing and Data analytics**

Introduction to Cloud storage models -SAAS, PAAS, IAAS. Communication APIs, Amazon webservices for IoT, Skynet IoT Messaging Platform.

Introduction to Data Analytics for IoT - Apache hadoop- Map reduce job execution workflow.

# UNIT- V

# IoT Product Manufacturing - From prototype to reality

Business model for IoT product manufacturing, Business models canvas, Funding an IoT Startup, Mass manufacturing - designing kits, designing PCB,3D printing, certification, Scaling up software, Ethical issues in IoT- Privacy, Control, Environment, solutions to ethical issues.

# **Suggested Readings**

- 1. Internet of Things Converging Technologies for smart environments and Integrated ecosystems, River Publishers.
- 2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally. Wiley India Publishers
- 3. Fundamentals of embedded software: where C meets assembly by Daneil W lewies, Pearson.
- 4. Internet of things -A hands on Approach, ArshdeepBahga, Universities press.

# EC323

# Image Processing

#### Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

### **Course Objectives**

- **1.** Understand image processing fundamentals
- 2. Understand image transforms
- 3. Understand image enhancement
- 4. Understand image restoration and feature extraction
- **5.** Understand image reconstruction

### **Course Outcomes**

- 1. Learn image processing fundamentals
- 2. Learn image transforms
- 3. Learn image enhancement
- 4. Learn image restoration and feature extraction
- 5. Learn image reconstruction

### Unit I

**Fundamentals-** Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization.

### Unit II

**Image Transforms** - Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT,Discrete cosine transform and KL transform.-Discrete Short time Fourier Transform-Wavelet Transform- Discrete wavelet Transform- and its application in Compression.

### Unit III

**Image Enhancement - Spatial Domain**: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters. **Frequency Domain**: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering.

### Unit IV

**Image Restoration:**- Overview of Degradation models –Unconstrained and constrained restorations-Inverse Filtering ,WienerFilter.

**Feature Extraction**: - Detection of discontinuities – Edge linking and Boundary detection-Thresholding- -Edge based segmentation-Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.

### Unit V

**Image Reconstruction from Projections**: - Need- Radon Transform – Back projection operator-Projection Theorem- Inverse Radon Transform.

# **Suggested Reading**

- 1. Rafael C.Gonzalez& Richard E.Woods Digital Image Processing Pearson Education- 2/e 2004.
- 2. Anil.K.Jain Fundamentals of Digital Image Processing- Pearson Education-2003.
- 3. B.Chanda&D.DuttaMajumder Digital Image Processing and Analysis Prentice Hall of India 2002
- 4. William K. Pratt Digital Image Processing John Wiley & Sons-2/e, 2004

# **PEC321**

With effect from academic year 2023-2024

**Network Security** 

# Credits : 3

Duration of SEE 3 hours

SEE 70 marks

Instruction 3L hrs per week CIE 30 marks

# CourseObjectives

- 1. Understand the significant aspects of network security
- 2. Comprehend secret and public key cryptography
- 3. Learn hash functions and digital signatures
- 4. Study the digital signatures and smart cards
- 5. Comprehend the applications of network applications

# CourseOutcomes

- 1. Explain the fundamentals of network security
- 2. Elaborate the concepts secret and public key cryptography
- 3. Elucidate the hash functions digital signatures
- 4. Describe the digital signatures and smart cards
- 5. Explain the applications of network security

# UNIT-I

**Introduction:** Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle attacks General Threats to Computer Network, Worms, Viruses, -Trojans

# UNIT-II

**Secret Key Cryptography :**DES, Triple DES, AES, Key distribution, Attacks **Public Key Cryptography:** RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks

# UNIT-III

**Integrity, Authentication and Non-Repudiation :**Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

# **UNIT-IV**

**PKI Interface:** Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's.

**Smart Cards:** Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

# UNIT-V

**Applications:** Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)

# **Suggested Reading**

- 1. William Stallings, Cryptography and Network Security, 4th Edition. Pearson, 2009.
- 2. Behrouz A Forouzan, Cryptography and Network Security, TMH, 2009
- 3. Joseph MiggaKizza, A Guide to Computer Network Security, Springer, 2010
- 4. Dario Cataiano, Contemporary Cryptology, Springer, 2010.

### **PEC421**

With effect from academic year 2023-2024 Cyber Security Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

### **Course Objectives**

- 1. Understand the policies and security evolution
- 2. Learn cyber security objectives and guidance
- 3. Study policy catalog and issues
- 4. Comprehend cyber management and infrastructure issues
- 5. Learn the cyber security case studies

### **Course Outcomes**

- 1. Explain the policies and security evolution
- 2. Describe cyber security objectives and guidance
- 3. Discuss policy catalog and issues
- 4. Elaborate cyber management and infrastructure issues
- 5. Elucidate the case studies on cyber security

### **Unit I: Policies and Security Evolution**

**Introduction -** Cyber Security, Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations

**Cyber Security Evolution -** Enterprise Policy, Technology Operations, Technology Configuration, Strategy Versus, Policy, Cyber Security Evolution, Productivity, Internet, E-Commerce, Counter Measures, Challenges.

### Unit II: Cyber Security Objectives and Guidance

**Security Objectives -** Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives, Guidance for Decision Makers, Tone at the Top, Policy as a Project. **Catalog Approach -** Cyber Security Management, Arriving at Goals, Cyber Security Documentation,

the Catalog Approach, Catalog Format, Cyber Security Policy Taxonomy

### **Unit III: Policy Catalog and Issues**

**Cyber Security Policy Catalog -** Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation.

**Cyber user and conflict Issues -** Appropriate Use, Cyber Crime, Geo location, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

### Unit IV: Cyber Management and Infrastructures Issues

**Cyber Management Issues -** Fiduciary Responsibility – Risk Management – Professional Certification – Supply Chain – Security

**Cyber Infrastructure Issues -** Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

### **Unit V: Case Study**

**Government's Approach to Cyber Security Policy -** Cyber security strategy-Brief history-Public policy development in the U.S Federal Government.

**Espionage -** The rise of cyber crime- Espionage and Nation-state Actions-Policy response to growing Espionage threats-Congressional Action.

# Suggested Readings

- 1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
- 2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
- 3. Richard A. Clarke, Robert Knake"Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010

Dan Shoemaker "Cyber security The Essential Body of Knowledge", 1<sup>st</sup> edition, Cengage Learning 2011.

With effect from academic year 2023-2024 Information Retrieval System

Credits : 3

Instruction 3Lhrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

# **Course Objectives**

- 1. Understand IR strategies
- 2. Study basic retrieval utilities
- 3. Learn cross language IR
- 4. Comprehend efficiency aspects
- 5. Learn distributed IR

# **Course Outcomes**

- 1. Explain IR strategies
- 2. Elucidate basic retrieval utilities
- 3. Discuss cross language IR
- 4. Describe efficiency aspects
- 5. Elaborate distributed IR

# UNIT-I

Introduction to Retrieval. Strategies: Vector Space model, Probabilistic Retrieval. Strategies Language Models: Simple Term Weights, Non Binary Independence Model.

# UNIT-II

Retrieval Utilities: Relevance Feedback, Clustering, N-grams, Regression Analysis, Thesauri.

# **UNIT-III**

Retrieval Utilities: Semantic Networks, Parsing, Cross-Language Information Retrieval: Introduction, Crossing the Language Barrier.

# UNIT-IV

Efficiency: Inverted Index, Query Processing, Signature Files, Duplicate Document Detection.

# UNIT - V

Integrating Structured Data and Text: A Historical Progression, Information Retrieval as a Relational Application, Semi-Structured Search using a Relational Schema. Distributed Information Retrieval: A Theoretical Model of Distributed Retrieval, Web Search.

# **Suggested Reading:**

- 1. David A. Grossman, Ophir Frieder. "Information Retrieval Algorithms and Heuristics", Springer, 2nd Edition (Distributed by Universities Press), 2004.
- 2. Gerald J Kowalski, Mark T Maybury. "Information Storage and Retrieval Systems", Springer, 2000.
- 3. SoumenChakrabarti, "Mining the Web: Discovering Knowledge. from Hypertext Data", Morgan-Kaufmann Publishers, 2002.
- 4. Christopher D. Manning, PrabhakarRaghavan, HinrichSchGtze, "An Introduction to Information Retrieval", Cambridge University Press, Cambridge, England, 2009.

# **PEC324**

Natural Language Processing Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

# **Course Objectives**

- 1. Learn elementary probability and information theory
- 2. Study the linguistic essentials
- 3. Comprehend statistical inference and word sense disambiguation
- 4. Understand evaluation measures and markov models
- 5. Learn probabilistic context free grammars

Course Outcomes - Learners on completion of the course, be able to

- 1. Explain elementary probability and information theory
- 2. Discuss the linguistic essentials
- 3. Describe statistical inference and word sense disambiguation
- 4. Elaborate evaluation measures and markov models
- 5. Elucidate probabilistic context free grammars

# UNIT I

Introduction of Elementary Probability Theory, Essential Information Theory. Linguistic Essentials Corpus-Based Work Collocations.

# UNIT II

**Statistical Inference:** Bins: Forming Equivalence Classes, Reliability vs. Discrimination, n-gram models, Building ngram models, An Information Theoretic Approach.

# UNIT III

**Word Sense Disambiguation:** Methodological Preliminaries, Supervised and unsupervised learning, Pseudo words, Upper and lower bounds on performance, Supervised Disambiguation, Bayesian classification.

# UNIT IV

**Evaluation Measures, Markov Models:** Hidden Markov Models, Use, General form of an HMM Part-of-Speech Tagging

# UNIT-V

**Probabilistic Context Free Grammars:** Introduction of Clustering **Information Retrieval:** Background, The Vector Space Model.

# **Suggested Reading**

1. Christopher D. Manning, HinrichSchutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

2. James Allan, Natural Language Understanding, Pearson Education, 1994.

3. Tanveer Siddiqui, US Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

With effect from academic year 2023-2024

### **Computer Networks Lab**

# LCC351

### Credits : 2

Instruction 3P hrs per week CIE 25 marks Duration of SEE 3 hours

SEE 50 marks

### **Course Objectives**

- 1. Understand basic commands of networks
- 2. Learn socket program implementation
- 3. Understand connection oriented socket programs
- 4. Learn connectionless socket programs
- 5. Understand DNS implementation

Course Outcomes - Upon completion of the course, the students will be able to:

- 1. Execute basic commands of networks
- 2. Implement socket program implementation
- 3. Execute connection oriented socket programs
- 4. Implement connection less socket programs
- 5. Execute DNS implementation

# Programs to be written on the following concepts using any programming language like Python, C, C++, Java.

- 1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois.
- 2. Socket Programming: Implementation of Connection-Oriented Service using standard ports.
- 3. Implementation of Connection-Less Service using standard ports.
- 4. Implementation of Connection-Oriented Iterative Echo-Server, date and time, character generation using user-defined ports.
- 5. Implementation of Connectionless Iterative Echo-server, date and time, character generation using user-defined ports.
- 6. Implementation of Connection-Oriented Concurrent Echo-server, date and time, character generation using user-defined ports.
- 7. Program for connection-oriented Iterative Service in which server reverses the string sent by the client and sends it back.
- 8. Program for connection-oriented Iterative service in which server changes the case of the strings sent by the client and sends back (Case Server).
- Program for Connection-Oriented Iterative service in which server calculates the netsalary of an employee based on the following details sent by the client

   basic ii) hra iii) da iv) pt v) epf vi) net-salary=basic+hra+da-pt-epf).
- 10. Program for file access using sockets.
- 11. Program for Remote Command Execution using sockets .
- 12. Implementation of DNS.

With effect from academic year 2023-2024

# Software Engineering Lab

# Credits : 2

Instruction 3P hrs per week CIE 25 marks

Duration of SEE 3 hours

SEE 50 marks

# **Course Objectives**

- 1. Learn use case diagram
- 2. Learn class and object diagram
- 3. Understand sequence and collaboration diagrams
- 4. Study state-chart and activity diagrams
- 5. Comprehend component and deployment diagrams

# **Course Outcomes**

- 1. Apply use case diagram
- 2. Apply class and object diagram
- 3. Apply sequence and collaboration diagrams
- 4. Apply state-chart and activity diagrams
- 5. Apply component and deployment diagrams
- 1. Phases in software development project, overview, need, coverage of topics
- 2. To assign the requirement engineering tasks
- 3. To perform the system analysis: Requirement analysis, SRS
- 4. To perform the function-oriented diagram: DFD and Structured chart
- 5. To perform the user's view analysis: Use case diagram
- 6. To draw the structural view diagram: Class diagram, object diagram
- 7. To draw the behavioral view diagram: Sequence diagram, Collaboration diagram
- 8. To draw the behavioral view diagram: State-chart diagram, Activity diagram
- 9. To draw the implementation view diagram: Component diagram
- 10. To draw the environmental view diagram: Deployment diagram
- 11. To perform various testing using the testing tool unit testing, integration testing

# Draw UML diagrams for the following system

- 1. ATM application
- 2. Library management system
- 3. Railway reservation
- 4. E-Commerce System
- 5. Banking System

# LCC352

# Perform the following tasks

**Background:** Software has made the world a global village today. The impact of software spans across almost all aspect of human life. All organizations, Institutions and companies are leveraging the potentials of software in automating the critical functions and eliminating manual interventions. Software is also a predominant area for trade and export especially for the countries like India. Domains like health care, Airlines, financial Services, Insurance, retails, Education, and many more have exploited software and still there a lot of the scope for software to create impact and add values in multiple dimensions. **Problem Description:** In the context of this background, identify the areas (or application or systems) how software has been leveraged extensively in the following domains

1. Health Care 2. Airlines 3. Banking Insurance

4. Retail 5. Education

**Background:** In the early years of computers applications, the focus of the development and innovation were on hardware. Software was largely views as an afterthought. Computer programming was an art. Programmers did not follow any disciplined or formalized approaches. This way of doing things was adequate for a while, until the sophisticated of computer applications outgrow. Software soon took over and more functions which were done manually. A software houses begin to develop for widespread distribution. Software development projects produced thousands of source program statement. With the increase in the size and complexity of the software, following situation resulted is collectively termed as software crisis.

- 1. Time Slippage
- 2. Cost Slippage
- 3. Failure at customer Site
- 4. Intractable Error after delivery

**Problem Description:** In the context of this background, for each of the scenario mentioned below, identify the most appropriate problem related to software crisis and mention the same in the table provided.

**Scenario A:** Railways reservation software was delivered to the customer and was installed in one of the metro station at 12.00 AM (mid-night) as per the plan. The system worked quite fine till the next day 12.00 PM (noon). The system crashed at 12.00 PM and the railways authorities could not continue using software for reservation till 02.00 PM. It took two hours to fix the defect in the software in the software.

**Scenario B:** A polar satellite launch vehicle was scheduled for the launch on August 15th. The auto-pilot of the rocket to be delivered for integration of the rocket on May 15th. The design and development of the software for the auto-pilot more effort because of which the auto-pilot was delivered for the integration on June 15th (delayed by a month). The rocket was launched on Sep 15th (delayed by a month).

**Scenario C:** Software for financial systems was delivered to the customer. Customer informed the development team about a mal-function in the system. As the software was huge and complex, the development team could not identify the defect in the software.

# **INTEGRATION TESTING**

**Background**: Integration testing is carried out after the completion of unit testing and before the software is delivered for system testing. In top down integration testing, dummy stubs are required for bottom level modules. Similarly, in bottom up testing, dummy drivers are required for top level modules



**Problem Description:** Consider the scenario of development of software for Travel, Management System (TMS) is in progress. The TMS software has 3 major modules namely Ticket\_Booking\_Module, Hotel\_Booking\_Module and Taxi\_Booking\_Module. The Ticket\_Booking\_Module has 3 sub modules namely Enquiry\_Module, Booking\_Module and Update\_Module. The enquiry module uses Date\_Validation\_Unit, Ticket\_Validation\_Unit and Place\_Validation\_Unit.

In the context of the given scenario, identify the usage of stub or driver for the following situations.

1. Except the Ticket\_validation\_Unit, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is in progress for the TMS software. To carry out the integration testing, which among the following is necessary? 2. The coding and unit testing of all the module, sub modules and units of TMS are completed except the Undete Module (acding and testing for Edit Module Cancel Module

completed except the Update\_Module (coding and testing for Edit\_Module, Cancel\_Module and View\_Module are also completed). The bottom-up integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing?

3. Except the Taxi\_Booking\_Module, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing.

**Background:** Performance testing tests the non-functional requirements of the system. The different types of performance testing are load testing, stress testing, endurance testing and spike testing.

**Problem Description:** Identify the type of performance testing for the following:

1. A space craft is expected to function for nearly 8 years in space. The orbit control system of the spacecraft is a real-time embedded system. Before the launch, the embedded software is to be tested to ensure that it is capable of working for 8 years in the space. Identify the suitable performance testing category to be carried out to ensure that the space craft will be functioning for 8 years in the space as required.

2. Global Education Centre (GEC) at Infosys Mysore provides the training for fresh entrants. GEC uses an automated tool for conducting objective type test for the trainees. At a time, a maximum of 2000 trainees are expected to take the test. Before the tool is deployed, testing of the tool was carried out to ensure that it is capable of supporting 2000 simultaneous users. Indicate the performance testing category?

3. A university uses its web-based portal for publishing the results of the students. When the results of an examination were announced on the website recently on a pre-planned date, the web site crashed. Which type of performance testing should have been done during web-site development to avoid this unpleasant situation?

4. During unexpected terrorist attack, one of the popular websites crashed as many people

logged into the web-site in a short span of time to know the consequences of terrorist attack and for immediate guidelines from the security personnel. After analyzing the situation, the maintenance team of that website came to know that it was the consequences of unexpected load on the system which had never happened previously. Which type of performance testing should have been done during web-site development to avoid this unpleasant situation?

**Background:** Enhancements are introduction of new features to the software and might be released in different versions. Whenever a version is released, regression testing should be done on the system to ensure that the existing features have not been disturbed.

**Problem Description**: Consider the scenario of development of software for Travel Management System (TMS) discussed in previous assignment. TMS has been developed by Infosys and released to its customer Advance Travel Solutions Ltd. (ATSL). Integration testing, system testing and acceptance testing were carried out before releasing the final build to the customer. However, as per the customer feedback during the first month of usage of the software, some minor changes are required in the Enquiry Module of the TMS. The customer has approached Infosys with the minor changes for upgrading the software. The development team of Infosys has incorporated. Those changes, and delivered the software to testing team to test the upgraded software. Which among the following statement is true?

a. Since minor changes are there, integration of the Enquiry Module and quick system testing on Enquiry module should be done.

b. The incorporation of minor changes would have introduced new bugs into other modules, so regression testing should be carried out.

c. Since the acceptance testing is already carried out, it is enough if the team performs sanity testing on the Enquire module.

d. No need of testing any module.

**Background**: There are some metrics which are fundamental and the rest can be derived from these. Examples of basic (fundamental) measures are size, effort, defect, and schedule. If the fundamental measures are known, then we can derive others. For example if size and effort are known, we can get Productivity (=size/effort). If the total numbers of defects are known we can get the Quality (=defect/size) and so on.

**Problem Description:** Online loan system has two modules for the two basic services, namely Car loan service and House loan service.

The two modules have been named as Car\_Loan\_Module and House\_Loan\_Module. Car\_Loan\_Module has 2000 lines of uncommented source code. House\_Loan\_Module has 3000 lines of uncommented source code. Car\_Loan\_Module was completely implemented by Mike. House\_Loan\_Module was completely implemented by John. Mike took 100 person hours to implement Car\_Loan\_Module. John took 200 person hours to implement House\_Loan\_Module. Mike"s module had 5 defects. John's module had 6 defects. With respect to the context given, which among the following is an INCORRECT statement? Choose one:

1. John"s quality is better than Mike.

2. John"s productivity is more than Mike.

3. John introduced more defects than Mike.

4. John"s effort is more than Mike.

# LCC351

# Web Technologies Lab Credits : 2 Duration of

Instruction 3P hrs per week CIE 25 marks Duration of SEE 3 hours SEE 50 marks

- 1. Develop College Website using XHTML and CSS.
- 2. Develop HTML form with client validations using Java Script.
- 3. Publishing XML document using XSLT
- 4. XML document processing using SAX and DOM.
- 5. Text processing using Regular expressions and pattern matching.
- 6. Develop form processing application using CGI.pm
- 7. Develop CGI-Perl Web application with State and Session Tracking.
- 8. Develop a simple Java servlet application.
- 9. Develop Java servlet application with session tracking
- 10. Develop a simple JSP application.
- 11. Creation of an application access database with JDBC
- 12. Develop full fledged web application with database access spreading over to 3 sessions.
## Summer Internship\* Credits : 2

Instruction 6-week CIE 50 marks

# **Program Description**

The Internship Program allows MCA students to gain practical experience in the workplace before receiving their graduate degrees. The internship is a required academic course. The student identifies companies willing to hire him/her on a full time basis for a 6-week period (minimum required), usually in the summer. The Internship Program supervises the students and awards academic credits (2) upon successful completion of all the required assignments.

### **Intended Learning Outcomes**

Upon successful completion of the internship, you should be able to

1. Communicate a practical understanding of how a technology actually operates

2. Demonstrate the ability to integrate and apply theoretical knowledge and skills developed in various courses to real-world situations in a business organization

3. Exhibit the ability to effectively work in a professional environment and demonstrate work ethic and commitment in a work-based environment

4. Demonstrate the ability to successfully complete internship assignments.

5. Reflect on personal and professional development needs and set strategic goals for advancing along an intended career path

6. Communicate effectively in a professional environment in both English and regional language, orally and in writing.

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CNL	Course	Course	Hours/ Week		Scheme of Examination			No of
2110	Code	Title			Max Marks		Duration (hrs)	Credits
THEORY			L	Р	CIE	SEE	SEE	Cr
1	PEC**	Professional Elective –III	3	-	30	70	3	3
2	PEC**	Professional Elective –IV	3	-	30	70	3	3
3	OE**	Open Elective	2	-	30	70	3	2
PRACTICALS								
4	Proj401	Project Work	-	24	50	100	3	12
		Total	8	24	140	310	-	20

### SCHEME OF INSTRUCTION MASTER OF COMPUTER APPLICATIONS (MCA) SEMESTER- IV

# **Professional Electives**

Course Code- PEC**	Professional Elective – III
PEC411	Block Chain Technologies
PEC412	Big Data Analytics
PEC413	Cloud Computing
PEC413	Deep Learning

Course Code- PEC**	Professional Elective – IV
PEC421	Distributed Database Systems
PEC422	Digital Forensics
PEC423	Optimization Techniques
PEC424	Enterprise Architecture

<b>Open Elective</b>		
Constitution of India		
Disaster Management		
Organization Behaviour		
Intellectual Property & Cyber Law		
Environmental Science		

# **PEC411**

#### Block Chain Technologies Credits : 3

Instruction3L hrs per week CIE30 marks Duration of SEE3 hours SEE70 marks

### **Course Objectives**

- 1. Learn the basic concept of Cryptographic Hash Functions, Hash Pointers
- 2. Study Elliptic Curve Digital Signature Algorithm.
- 3. A technical overview of decentralized digital currencies like Bitcoin, as well as their broader economic, legal and financial context.
- 4. To get an insight into the working of the Bitcoin network Wallet
- 5. Comprehend Bitcoin mining and distributed consensus for reliability.

#### **Course Outcomes**

- 1. Learn the basics of hash functions
- 2. Learn the importance of digital signature
- 3. Understand the structure of a blockchain.
- 4. Learn different ways of storing Bitcoin keys, security measures.
- 5. Learn how Bitcoin relies on mining.

# UNIT – I

**Introduction to Cryptography:** Cryptographic Hash Functions, SHA- 256, Hash Pointers and Data Structures, Merkle tree.

# UNIT – II

**Digital Signatures:** Elliptic Curve Digital Signature Algorithm (ECDSA), Public Keys as identities, A Simple Cryptocurrency.

# UNIT – III

Centralization vs Decentralization, Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work.

**Mechanics of Bitcoin**: Bitcoin Transactions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network.

# UNIT – IV

**Storage and Usage of Bitcoins:** Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

#### $\mathbf{UNIT} - \mathbf{V}$

**Bitcoin Mining:** The Task of Bitcoin miners, Mining Hardware, Mining pools, Mining incentives and strategies.

**Bitcoin and Anonymity:** Anonymity Basics, Mixing, Zerocoin and Zerocash. Applications of Block Chain Technologies.

- 1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton Press, 2016.
- 2. Mastering Bitcoin: Programming the Open Blockchain by Andreas M. Antonopoulos Shroff, O'Reilly; 2nd Edition, 2017.

### **PEC412**

# **Big Data Analytics**

# Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

#### **Course Objectives**

- **1.** Understand big data fundamentals
- 2. Understand Learn hadoop ecosystem
- 3. Understand mapreduce and hbase fundamentals
- 4. Understand database concepts related to big data
- 5. Understand NoSQL fundamentals

#### **Course Outcomes**

- 1. Learn how to handle big data
- 2. Learn hadoop ecosystem
- 3. Learn mapreduce and hbase fundamentals
- 4. Learn database concepts related to big data
- 5. Learn NoSQL fundamentals

### UNIT-I

**Getting an overview of Big Data**:Introduction to Big Data, Structuring Big Data, Types of Data,Elementsof BigData,BigData Analytics, AdvantagesofBigData Analytics.

**Introducing Technologies for Handling Big Data:** Distributed and Parallel Computing for Big

Data,CloudComputingandBigData,FeaturesofCloudComputing,CloudDeploymentModels, CloudServicesfor BigData, Cloud Providers in BigDataMarket.

#### UNIT-II

UnderstandingHadoopEcosystem:IntroducingHadoop,HDFSandMapReduce,Hadoopfun ctions,HadoopEcosystem.

#### HadoopDistributedFileSystem-

HDFSArchitecture, ConceptofBlocksinHDFSArchitecture, Namenodes and Datanodes, Features of HDFS. MapReduce.

**Introducing HBase**- HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase andHDFS,Features of HBase,Hive,Pigand PigLatin,Sqoop, ZooKeeper,Flume, Oozie.

# UNIT-III

Understanding MapReduce Fundamentals and HBase: The MapReduceFramework ,Exploring

thefeaturesofMapReduce,WorkingofMapReduce,TechniquestooptimizeMapReduceJobs,H ardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in BigDataProcessing-Characteristics ofHBase.

**Understanding Big Data Technology Foundations:** Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, SecurityLayer, MonitoringLayer, Visualization Layer.

# UNIT-IV

Storing Data in Databases and Data Warehouses: RDBMS and Big Data, Issues with RelationalModel, Non-

RelationalDatabase,IssueswithNonRelationalDatabase,PolyglotPersistence,IntegratingBig DatawithTraditional Data Warehouse, BigDataAnalysis andData Warehouse.

NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, Historyof NoSQL, Types of NoSQL Data Models-Key Value Data Model, Column Oriented DataModel,DocumentDataModel, GraphDatabases, Schema-LessDatabases, Materialized Views, CAPTheorem.

- 1. BIGDATA, BlackBookTM, DreamTechPress, 2016Edition.
- 2. Seema Acharya, SubhasniChellappan, "BIG DATA and ANALYTICS", Wiley publications, 2016
- 3. NathanMarzandJamesWarren, "BIGDATA-PrinciplesandBestPracticesofScalableReal-TimeSystems", 2010

# **Cloud Computing**

#### Credits : 3

Instruction 3L hrs per week CIE 30 marks

Duration of SEE 3 hours

SEE 70 marks

# CourseObjectives

- 1. Learn the cloud computing services including resource virtualization
- 2. Study the scaling, planning and file system and storage
- 3. Understand database technology and security issues
- 4. Comprehend portability issues and programming model case study
- 5. Learn the enterprise architecture and its related information

# CourseOutcomes

- 1. Elaborate the cloud computing services and resource virtualization
- 2. Explain the scaling, planning and file system and storage
- 3. Describe the database technology and security issues
- 4. Elucidate portability issues and programming model case study
- 5. Discuss the enterprise architecture and its related information

# Unit-I

Introduction,Benefitsandchallenges,Cloudcomputingservices,ResourceVirtualization,Resourcepoolingsha ring and provisioning, Case study of Iaas, Paas and Saas

# Unit-II

 $Scaling in the Cloud, Capacity Planning, Load Balancing, File System and Storage, \ Containers and \ Storage, \ Containers and \ Storage, \ Containers and \ Storage, \ Storag$ 

# Unit-III

Multi-

 $ten ant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model \ , Security Issues, Privacy and Compliance Issues$ 

# Unit-IV

Portabilityand InteroperabilityIssues,CloudManagementandaProgrammingModelCaseStudy,Popular Cloud Services

# Unit-V

EnterprisearchitectureandSOA,EnterpriseSoftware,EnterpriseCustomApplications,Workflow and Business Processes, Enterprise Analytics and Search, Enterprise CloudComputingEcosystem.

# SuggestedReading

- 1. CloudComputing-Sandeep Bhowmik, Cambridge UniversityPress, 2017.
- 2. EnterpriseCloudComputing-Technology,Architecture,ApplicationsbyGautamShroff,Cambridge UniversityPress, 2016.
- 3. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, "Distributed and Cloud Computing FromParallelProcessing to theInternet of Things", Elsevier,2012.

#### **PEC413**

#### **PEC414**

# Deep Learning

#### Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

#### **Course Objectives**

- 1. Learn deep learning basics and optimization algorithms
- 2. Understand deep learning computation, CNNs and modersn CNNs
- 3. Study recurrent neural networks and its modern versions
- 4. Learn computer vision
- 5. Comprehend GANs

#### **Course Outcomes**

- 1. Learn deep learning basics and optimization algorithms
- 2. Understand deep learning computation, CNNs and modersn CNNs
- 3. Study recurrent neural networks and its modern versions
- 4. Learn computer vision
- 5. Comprehend GANs

#### Unit I

**Introduction** – A motivating example, the key components – data, models, and algorithms, kinds of machine learning, the road to deep learning, success stories, Linear regression, multilayer perceptrons, model selection, underfitting and overfitting, weight decay, dropout, forward propagation, backward propagation and computational graphs, numerical stability and initialization, considering the environment, predicting house prices on Kaggle

**Optimization algorithms** – optimization and deep learning, convexity, gradient descent, momentum, adagrad, RMSProp, Adadelta, Adam, learning rate scheduling

# Unit II

**Deep learning computation** – layers and blocks, parameter management, deferred initialization, custom layers, file I/O, GPUs

**Convolutional neural networks** – from dense layers to convolutions, convolutions for images, padding and stride, multiple input and output channels, pooling, convolutional neural networks(LeNet)

**Modern Convolutional neural networks** – deep Convolutional neural networks(AlexNet), Networks using blocks(VGG), Networks with parallel concatenations(GoogleNet), batch normalization, residual networks(ResNet), densely connected networks(DenseNet)

#### Unit III

**Recurrent neural networks** – sequence models, text processing, language models and the dataset, recurrent neural networks, back propagation through time

**Modern Recurrent neural networks** – gated recurrent units(GRU), long short term memory(LSTM), deep recurrent neural networks, bidirectional recurrent neural networks, machine translation and the dataset, encoder-decoder architecture, sequence to sequence

Attention mechanisms – attention mechanism, sequence to sequence with attention mechanism, transformer

# Unit IV

**Computer vision** – Image augmentation fine tuning, object detection and bounding boxes, anchor boxes, multiscale object detection, the object detection dataset, single shot multibox detection(SSD), region based CNNs(R-CNNs), semantic segmentation and the dataset, transposed convolution, fully convolutional networks(FCN), neural style transfer, image classification(CIFAR-10) on kaggle, dog breed identification (Imagenet dogs) on kaggle

# Unit V

**Generative adversarial networks** – Generative adversarial networks, deep convolutional generative adversarial networks

**Tools for deep learning** – using jupyter, using amazon sagemaker, using AWS EC2 instances, using google colab, selecting servers and GPUs

#### **Suggested Reading**

1. Ian goodfellow, Yoshuabengio, Aaron courville, "Deep learning" Zhang, Aston, et al. "Dive into deep learning." arXiv preprint arXiv:2106.11342 (2021).

#### DISTRIBUTED DATABASES SYSTEMS (Professional Elective-II)

Instruction: 3L hrs per week CIE: 30 Marks Credits: 3 Duration of SEE: 3 hours SEE: 70 Marks

#### **Course Objectives:**

The aim of the course is to

- Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems;
- Introduce basic principles and implementation techniques of distributed database systems,
- Expose active and emerging research issues in distributed database systems and application development,
- Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

#### **Course Outcomes:**

After the completion of the course, the students are expected to

- 1. Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services;
- 2. Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case;
- 3. Be aware of the current research directions in the field and their possible outcomes;
- 4. Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions
- 5. Be able to apply learned skills to solving practical database related tasks.

#### UNIT- I

**Introduction**: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Object-Based and Semistructured Databases, Data Storage and Querying, Transaction Management, Data Mining and Analysis, Database Architecture, Database Users and Administrators, History of Database Systems.

**Relational Model**: Structure of Relational Databases, Fundamental Relational-Algebra Operations, Additional Relational-Algebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database.

#### UNIT-II

**Query Processing**: Overview, Measures of query cost, Selection operation, sorting, Join operation, other operations, Evaluation of Expressions.

**Query Optimization:** Overview, Transformation of Relational expressions, Estimating statistics of expression results, Choice of evaluation plans, Materialized views.

#### **UNIT-III**

**Parallel Systems**: Speedup and Scaleup, Interconnection Networks, Parallel Database Architectures.

**Parallel Databases**: Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Interoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems.

#### UNIT-IV

Distributed **Databases**: Reference architecture for DDB. Types of Data Fragmentation, Distribution Transparency for Read-only applications, Distribution Transparency for Update applications, Distributed

Database Access Primitives, Integrity Constraints in DDB.

**Distributed Database Design**: A frame work for Distributed Database Design, The design of Database fragmentation, The allocation of fragmentation.

#### UNIT-V

**Translation of Global Queries to Fragment Queries**: Equivalence transformations for queries, Transforming global queries into fragment queries, Distributed grouping and aggregate function evaluation, Parametric queries.

**Optimization of Access Strategies**: Access Control Models, Database Security, A framework for query optimization, Join queries, General queries.

### **Suggested Reading:**

1. Silberschatz A, Korth HF, Sudarshan S, Database System Concepts, McGraw-Hill

International Edition, 5<sup>th</sup> Edition, 2006.

2. Ceri S, Pelagatti G, *Distributed Databases: Principles and Systems*, McGraw-Hill International Edition, 1984.

#### **Digital Forensics**

#### Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

**PEC422** 

- **1.** Understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- 2. Understand how to examine computing investigations
- **3.** Understand data acquisition
- **4.** Understand processing crimes
- **5.** Understand forensics tools

#### **Course Outcomes**

- 1. Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
- 2. To be well-trained as next-generation computer crime investigators.
- 3. Learn data acquisition
- 4. Learn processing crimes
- 5. Learn forensics tools

#### Unit -I

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

#### Unit- II

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

#### Unit-III

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

#### Unit-IV

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

#### Unit-V

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations-investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

- 1. Warren G. Kruse II and Jay G Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002
- 2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
- **3.** Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2<sup>nd</sup> Ed, Charles River Media, 2005, ISBN: 1-58450-389.

# With effect from academic year 2023-2024 **Optimization Techniques**

# **PEC423**

#### Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

- **1.** Understand the optimization basics
- 2. Understand optimization using calculus
- 3. Understand dynamic programming and its applications
- 4. Understand integer programming
- 5. Understand advanced optimization techniques

#### **Course Outcomes**

- **1.** Learn the optimization basics
- 2. Learn optimization using calculus
- 3. Learn dynamic programming and its applications
- 4. Learn integer programming
- 5. Learn advanced optimization techniques

#### Unit I

#### Introduction and Basic Concepts

Historical Development; Engineering applications of Optimization; Art of Modeling Objective function; Constraints and Constraint surface; Formulation of design problems as Optimization techniques –classical and advanced techniques

#### Unit II

#### **Optimization using Calculus**

Stationary points; Functions of single and two variables; Global Optimum Convexity and concavity of functions of one and two variables Optimization of function of one variable and multiple variables; Gradient vectors; Examples Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints; Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Examples

#### Unit III

#### **Dynamic Programming**

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of

Optimality Recursive equations –Forward and backward recursions; Computational procedure in dynamic programming (DP) Discrete versus continuous dynamic programming;

Multiple state variables; curse of dimensionality in DP

#### **Dynamic Programming Applications**

Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss Water allocation as a sequential process Capacity expansion and Reservoir operation

#### **Integer Programming**

Integer linear programming; Concept of cutting plane method Mixed integer programming; Solution algorithms;Examples

#### Unit V

#### **Advanced Topics in Optimization**

Piecewise linear approximation of a nonlinear function Multi objective optimization –Weighted and constrained methods; Multi level optimization Direct and indirect search Methods Evolutionary algorithms for optimization and search Applications in civil engineering

#### **Suggested Reading**

- 1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International P)Ltd., New Delhi, 2000.
- 2. G. Hadley, "Linear programming", Narosa Publishing House, New Delhi, 1990.
- 3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
- 4. K. Deb, "Optimization for Engineering Design-Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.

K. Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management", PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288, 2010.

#### **PEC424**

Enterprise Architecture Credits : 3

Instruction 3L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

- 1. Learn the fundamentals of EA
- 2. Study the business architecture
- 3. Understand the organizational structure of EA
- 4. Comprehend enterprise engineering
- 5. Gain insights into cloud computing opportunities for EA

#### **Course Outcomes**

- 1. Learn the fundamentals of EA
- 2. Study the business architecture
- 3. Understand the organizational structure of EA
- 4. Comprehend enterprise engineering
- 5. Gain insights into cloud computing opportunities for EA

### Unit I

Introduction to EA -System analysis, general system theory, definitions and objectives of considerations, Properties of EA, system approach to EA development, principle definitions

#### Unit II

Business architecture, definition and features, BSC – balanced score card basics and its reflection in EA, Strategic governance, Event Causality effects in EA under scope of BSC

#### Unit III

Organizational structure of EA and basic models, Information and technology architecture basics, Introduction to EA structuring and modeling, Business architecture (inc. business process modeling, IBM Component business model), Information architecture, Technology architecture and integration between the layers model

#### Unit IV

Introduction to enterprise engineering (EE), Enterprise transformations (waterfall and agile), EAP, EA methodologies: PRISM, ARIS Framework, Zachmann Framework, FEAF, DODAF and TOGAF, Introduction to Service orientation in Enterprise Engineering (SOA, SoEA), Technological infrastructure for Big Data handling in EA

# Unit-V

Cloud Computing Opportunities for EA, Flexible (agile) business and information architectures (SoEA). Introduction to Spark, Spark Data Frames, SQL, Datasets through worked examples. Spark's low level APIs, RDDS, execution of SQL & Data Frames. How Spark Runs on a Cluster.

Structured Streaming, Spark's Stream – Processing Engine.

- 1. Designing Enterprise Architecture Frameworks: Integrating Business Processes with IT Infrastructure by N Zarvić, R Wieringa. Apple Academic Press (19 April 2016), 360 p. URL: https://doi.org/10.1201/b16417
- 2. Neubauer M., Stary CH., S-BPM in the Production Industry. Stakeholder approach, Springer Open, 2017. URL: https://www.springer.com/gp/book/9783319484655
- 3. A systematic literature review on Enterprise Architecture Implementation Methodologies by Babak D., Mohd N. Elsevier (June 2015), p. 1-20. URL: https://doi.org/10.1016/j.infsof.2015.01.012
- 5. Spark : The Definite Guide Bill Chambers, MateiZaharia, 2018.

#### **Professional Ethics**

# Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

**OE431** 

- 1. Learn the developments of legal profession in India
- 2. Study the seven lamps of advocacy
- 3. Understand disciplinary proceedings
- 4. Comprehend the accountancy for lawyers
- 5. Gain insights into safety and risk

#### **Course Outcomes**

- 1. Explain the developments of legal profession in India
- 2. Describe the seven lamps of advocacy
- 3. Elaborate disciplinary proceedings
- 4. Elucidate the accountancy for lawyers
- 5. Discuss insights into safety and risk

#### UNIT-I

Development of Legal Profession in India — Advocates Act, 1961 — Right to Practice — a right or privilege? -- Constitutional guarantee under Article 19(1) (g) and its scope — Enrolment and Practice — Regulation governing enrolment and practice — Practice of Law — Solicitors firm — Elements of Advocacy.

#### UNIT-II

Seven lamps of advocacy — Advocates duties towards public, clients, court, and other advocates and legal aid ; Bar Council Code of Ethics.

#### UNIT-III

Disciplinary proceedings --- Professional misconduct — Disqualifications — Functions of Bar Council of India/State Bar Councils in dealing with the disciplinary proceedings — Disciplinary Committees -- Powers and functions - Disqualification and removal from rolls.

#### UNIT-IV

Accountancy for Lawyers - Nature and functions of accounting — Important branches of accounting — Accounting and Law – Bar - Bench Relations.

#### UNIT- V

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

- 1. Myneni S.R, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia
- 2. Gupta S.P, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Asia Law House, Hyderabad.
- 3. Kailash Rai, Professional Ethics, Accountancy for Lawyers and Bench-Bar Relation, Allahabad Law Agency.
- 4. Siroh, Professional Ethics, Central Law Publications, Allahabad.
- 5. Ramachandra Jha, Selected Judgements on Professional Ethics, Bar Council of India Trust.

#### Constitution of India Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours

SEE 70 marks

#### **Course Objectives**

**OE432** 

- 1. Learn the basics of the constitution
- 2. Understand the structure of the union government
- 3. Comprehend the state government structure
- 4. Gain insights into local administration
- 5. Study about the election commission

#### **Course Outcomes**

- 1. Explain the basics of the constitution
- 2. Elucidate the structure of the union government
- 3. Elaborate the state government structure
- 4. Describe the local administration
- 5. Discuss the election commission

#### Unit 1 – The Constitution - Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

#### Unit 2 – Union Government

- Structure of the Indian Union
- President Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

#### Unit 3 – State Government

- Governor Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

#### Unit 4 – Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

#### Unit 5 – Election Commission

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

#### **Suggested Readings**

- 1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
- 2. The Constitution of India B.L. FadiaSahityaBhawan; New edition (2017)
- 3. Introduction to the Constitution of India DD BasuLexis Nexis; Twenty-Third 2018 edition

#### Suggested Software/Learning Websites

- 1. https://www.constitution.org/cons/india/const.html
- 2. http://www.legislative.gov.in/constitution-of-india
- 3. https://www.sci.gov.in/constitution
- 4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

#### Disaster Management

# **OE433**

Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

- 1. To learn about various types of natural and man-made disasters.
- 2. To know pre- and post-disaster management for some of the disasters.
- 3. To know about various information and organisations in disaster management in India.
- 4. To get exposed to technological tools and their role in disaster management.

#### **Course Outcomes**

After competing this course, student will be

- 1. Acquainted with basic information on various types of disasters
- 2. Knowing the precautions and awareness regarding various disasters
- 3. Decide first action to be taken under various disasters
- 4. Familiarised with organisation in India which are dealing with disasters
- 5. Able to select IT tools to help in disaster management

#### **Unit – I: Understanding Disaster**

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity, Disaster and Development, and disaster management.

#### Unit - II: Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

#### **Unit- III: Disaster Management Cycle and Framework**

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Stretegy, Hyogo Framework of Action.

#### Unit– IV: Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter Governmental Agencies

#### Unit- V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

- 1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
- 2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
- 3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- 4. Alexander, David, Natural Disasters, Kluwer Academic London
- 5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
- 6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

#### Organization Behaviour Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

**OE434** 

- 1. Learn management process and functions
- 2. Study decision making and negotiations
- 3. Comprehend psychological contract
- 4. Understand models of organization behaviour
- 5. Gain insights into organization design

#### **Course Outcomes**

- 1. Explain management process and functions
- 2. Discuss decision making and negotiations
- 3. Describe psychological contract
- 4. Elaborate models of organization behaviour
- 5. Elucidate the organization design

### UNIT I

Management Process and Functions, Scientific and Modern Management, 3D Model of Managerial Behavior - MBO - MBWA - Line and Staff - The Peter's Principle - Parkinson's Law - Approaches to Organization Structure-Management - Classical, Human Relations, Systems and Contingency Approaches, Hawthorne's Experiments - Human Engineering.

#### UNIT II

Decision Making and Negotiations: Approaches to Decision making - Rational, Behavioral, Practical, and Personal Approaches - Open and Closed Models of Decision Making, Types and steps in planning, Authority, Responsibility, Centralization, Decentralization and Recentralization, Bureaucracy.

#### UNIT III

Psychological contract - Personality Traits, Big 5 personality traits, MBTI inventory, the Process of Perception - Perceptual distortions and errors, Kelly's personal construct Theory, Motivation-Content Theories: Maslow, Alderfer, Herzberg, McCleland. Process Theories: Vroom, Potter and Lawler, Equity Theory - Goal Theory - Attribution Theory.

#### UNIT IV

Models of Organization Behavior - Autocratic, Custodial, Supportive, Collegial and System Models, Transactional Analysis, Johari Window. Group Dynamics: Typology of Groups - Conflicts in groups - The nature, of conflict - Reactions to conflict - A model of conflict. Trait and Behavioral Approaches to Leadership, Managerial Grid, Path-Goal Theory, Vroom's Decision Tree Approach to Leadership - Hersey and Blanchard Model.

# UNIT V

Organization Design, Organization culture and organization climate, Stress Management and Counseling, Management of change and organization development. Communication - Emerging aspects of OB.

- 1. Harold Koontz and Heinz Weihrich, Essentials of Management, 9<sup>th</sup> Edition, McGraw Hill Education, 2015.
- 2. Curtis W. Cook and Phillip L. Hunsaker, Management and Organizational Behavior, 3<sup>rd</sup> Edition, McGraw-Hill,2010.

**Intellectual Property and Cyber Law** 

#### **OE435**

Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

- 1. Learn the fundamentals of intellectual property
- 2. Study the basics of international instruments of IPR
- 3. Understand the laws concerning copyright in India
- 4. Comprehend the IP in trademarks
- 5. Gain insights into the concept of patent

#### **Course Outcomes**

- 1. Explain the fundamentals of intellectual property
- 2. Elaborate the basics of international instruments of IPR
- 3. Describe the laws concerning copyright in India
- 4. Discuss the IP in trademarks
- 5. Explain the concept of patent

# UNIT-I

Meaning, Nature, Classification and protection of Intellectual Property, The main forms of Intellectual Property, Copyright, Trademarks, Patents, Designs (Industrial and Layout), Geographical Indications Plant Varieties Protection and Biotechnology

# UNIT-II

Introduction to the leading International instruments concerning Intellectual Property Rights, The Berne Convention, Universal Copyright Convention, The Paris Union, Patent Cooperation Treaty, The World Intellectual Property Organization (WIPO) and the UNEESCO, International Trade Agreements concerning IPR, WTO, TRIPS.

# UNIT-III

Select aspects of the Law of Copyright in India The Copy Right Act,1957 Historical evolution, Meaning of copyright, Copyright in literary, dramatic and musical works, computer programmes and cinematograph films, Neighbouring rights, Rights of performers and broadcasters, etc., Ownership and Assignment of copyright, Author's special rights, Notion of infringement, Criteria of infringement Infringement of copyright in films, literary and dramatic works, Authorities under the Act, Remedies for infringement of copyright.

# UNIT-IV

Intellectual Property in Trademarks and the rationale of their protection - The Trade Marks Act. 1999 —Definition of Trademarks — Distinction between Trademark and Property Mark - Registration — Passing off — Infringement of Trademark — Criteria of Infringement — Remedies. The Designs Act, 2000 -- Definition and characteristics of Design — Law in India — Protection and rights of design holders -- Copyright in design — Registration — Remedies for infringement.

# UNIT-V

Patents — Concept of Patent — Historical overview of the Patents Law in India — Patentable Inventions — Kinds of Patents — Procedure for obtaining patent — The Patents Act, 1970 — Rights and obligations of a patentee — Term of patent protection — Use and exercise of rights — Exclusive Marketing Rights — Right to Secrecy — The notion of 'abuse' of patent rights — Infringement of patent rights and remedies available.

- 1. P. Narayanan, Patent Law, Eastern Law House, 1995.
- 2. Roy Chowdhary, S.K. & Other, Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
- 3. Dr. G.B. Reddy, Intellectual Property Rights and the Law ,5<sup>th</sup> Edition, Gogia Law Agency, 2005.

#### **Environmental Science**

#### Credits : 2

Instruction 2L hrs per week CIE 30 marks Duration of SEE 3 hours SEE 70 marks

#### **Course Objectives**

**OE436** 

- 1. Learn the scope and importance of environmental studies
- 2. Study about the environment and natural resources
- 3. Understand the environmental pollution
- 4. Comprehend the regional and sectoral issues concerning environment
- 5. Gain insights into social issues and the environment

#### **Course Outcomes**

- 1. Explain the scope and importance of environmental studies
- 2. Elaborate the environment and natural resources
- 3. Describe the environmental pollution
- 4. Discuss the regional and sectoral issues concerning environment
- 5. Explain the social issues and the environment

# UNIT-I

Environmental Studies: Introduction - Definition, Scope and Importance - Basic principle of ecosystem functioning - Concept of ecosystem, structure and functioning of ecosystem, introduction and characteristic features, structures and functions, different ecosystems.

Biodiversity and its conservation: Introduction - Bio-geographical classification of India. Value of biodiversity - consumptive and predictive use, social, ethical and optional values. Biodiversity - Global, National and local levels. Hot spots of biodiversity - Threats to biodiversity - Endangered and endemic species of India - Conservation of biodiversity - In-situ and Ex-situ conservant.

# UNIT-II

Environmental and Natural Resources: Forest resources - Use and over-exploitation, Deforestation, Timber extraction, Mining and dams - their effects on forests and tribal' people. Water resources - Use and over-utilization of surface and ground water, floods, droughts, conflicts over water, dams - effects of extracting and using mineral resources. Food resources - World food problems - change caused by agricultural and overgrazing, effects of modern agricultural fertilizer pesticide problems, water logging and salinity.

Environmental Valuation: Welfare measure and environmental values, definition and classification of environmental values, valuation methods. Environmental Economics: Economic approach to environmental preservation and conservation, property rights and externalities, management of natural resources.

# UNIT-III

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution.

Environmental Problems in India: Effects of human activities on the quality of life, Water and River, Ground water, Wasteland reclamation.

# UNIT-IV

Regional and Sectoral Issues: Urbanization, Agro-forestry, Dry lands, Goods and services, Mountain development, River basin water resources management. sustainable tourism, and Costal zone management. Environment and Development: The economy and environment interaction, State of the Environment - Economics of development; Preservation and conservation.

Sustainability: Theory and Practice, Equitable use of resources for sustainable life styles - Role of an individual in prevention of pollution.

Human Population and the Environment: Population growth and environment - Human Rights.

# UNIT-V

Social Issues and the Environment: Sustainable Development - Resettlement and rehabilitation of people and its problems and concerns.

Environmental ethics: Issues and possible solutions-Consumerism and waste products - Public awareness. Sustainable resources management. Design of Environmental Policy -- Direct regulation by Government - Command and control instrumentation.

- 1. B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji& K. Purushottam Reddy, An Introduction to Environmental Studies, Maruti Publications.
- 2. C.Manohar Chary and P.Jayaram Reddy, Principles of Environmental Studies, B.S. Publications, Hyderabad.
- 3. Y.Anjaneyulu, Introduction to Environmental Science, B.S. Publications, Hyderabad.

		With effect from academ	With effect from academic year 2023-2024				
Proj401		Project Work	Project Work				
		Credits : 12					
Instruction	24hrs per week	Duration of SEE	3 hours				
CIE	50 marks	SEE	100 marks				

Project hasto be carried out by each student individually in a periodof 15 weeks of duration. Students should submit a synopsis at the end of  $2^{nd}$  week in consultation with theProject Guide. The synopsis should consist of definition of the problem, scope of theproblem and plan of action. After completion of eight weeks students are required topresent a Project Seminar on the topic covering the aspects of analysis, design and implementation of theproject work.

At the end of the semester the students are required to presentthemselves for aUniversityVivavoceexamination.EvaluationguidelinesfortheawardofSEEmarksaremention ed in theRules and Regulationsbook.

A committee consisting of two faculty members of the respective college along withaguidewill evaluate the project and award CIE marks.

Eachstudentwillberequiredto:

- 1. Submitone page of synopsis on the project work for display on notice board.
- 2. Givea20 minutes presentation followedby10 minutes discussion.
- 3. Submitatechnicalwrite-upontheproject.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of CIE marks which will be on the basis of performance in all the 3itemsstated above.

Theprojectseminarpresentationshould include the following components of the project:

- Problemdefinitionandspecification.
- Literaturesurvey, familiarity with research journals.
- Broadknowledgeofavailabletechniques tosolve aparticularproblem.
- Planningofthework, preparation of bar (activity) charts, Presentationboth oralandwritten.

Course Objectives: The aim of the course is to

- Enhance the previous knowledge of database systems by deepening the understanding of thetheoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems; Introduce basic principles and implementation techniques of distributed database systems
- Expose active and emerging research issues in distributed database systems and application
- development, Apply theory to practice by building and delivering a distributed database query engine,
- subject to remote Web service calls. Course Outcomes: After the completion of the course, the students are expected to 1. Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services; 2. Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case; 3. Be aware of the current research directions in the field and their possible outcomes; 4. Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions 5. Be able to apply learned skills to solving practical database related tasks.