

**Scheme of Instruction and Syllabus**

**For**

**MCA- I&II semester  
Regulation : R-23  
2023-24**

**Two years MCA Program  
Master of Computer Applications**  
With effect from the academic year 2023-24



**Mahatma Gandhi University  
Nalgonda  
Telangana State  
508254**

With effect from the academic year 2023-24

**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**[ Regulation : R-23 ]**  
**SEMESTER- I**

SNo	Course Code	Course Title	Hours/Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			L	T	P	CIE	SEE	SEE	Cr
1	PCC101	Mathematical Foundations of Computer Science	4	-	-	40	60	3	4
2	PCC102	Data Structures using C	4	-	-	40	60	3	4
3	PCC103	Object Oriented Programming using Java	3	-	-	40	60	3	3
4	PCC104	Computer Architecture	3	1	-	40	60	3	3
5	PCC105	Probability & Statistics	3	1	-	40	60	3	3
6	MGC106	Managerial Economics and Accountancy	3	1	-	40	60	3	3
PRACTICALS									
7	LCC151	Data Structures using C Lab	-	-	3	40	60	3	2
8	LCC152	Java Programming Lab	-	-	3	40	60	3	2
9	HSC153	Soft Skills Lab	-	-	3	40	60	3	2
			20	3	9	360	540	-	26

Abbreviation	Full Form	Abbreviation	Full 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	P	Practical

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With effect from the academic year 2023-24

**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**[ Regulation : R-23 ]**  
**SEMESTER – II**

Sno	Course Code	Course Title	Hours/Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			L	T	P	CIE	SEE	SEE	Cr
1	PCC201	Operating Systems	3	1	-	40	60	3	3
2	PCC202	Database Management System	4	-	-	40	60	3	4
3	PCC203	Design and Analysis of Algorithms	3	1	-	40	60	3	3
4	PCC204	Artificial Intelligence	4	-	-	40	60	3	4
5	PCC205	Python Programming	3	-	-	40	60	3	3
6	MGC206	Operations Research	3	1	-	40	60	3	3
PRACTICALS									
7	LCC251	Operating Systems Lab	-	-	3	40	60	3	2
8	LCC252	DBMS Lab	-	-	3	40	60	3	2
9	LCC253	Python Lab	-	-	3	40	60	3	2
			20	3	9	360	540	-	26

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	P	Practical

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**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**

[ Regulation : R-23 ]

**SEMESTER- III**

SNo	Course Code	Course Title	Hours/Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			L	T	P	CIE	SEE	SEE	Cr
1	PCC301	Software Engineering	4		-	40	60	3	4
2	PCC302	Computer Networks	4		-	40	60	3	4
3	PCC303	Data Science	3	1	-	40	60	3	3
4	PCC304	Web Technologies	3	-	-	40	60	3	3
5	PEC**	Professional Elective-I	3	-	-	40	60	3	3
6	PEC**	Professional Elective-II	3	-	-	40	60	3	3
PRACTICALS									
7	LCC351	Computer Networks Lab	-		3	40	60	3	2
8	LCC352	Software Engineering Lab	-		3	40	60	3	2
9	LCC353	Data science Lab	-		3	40	60	3	2
10	PS3541	Project Seminar	-		2	50	-	-	1
			20	1	11	410	540	-	27

**Professional Electives**

Course Code-PEC**	Professional Elective -I
PEC311	Information Security
PEC312	Network Security
PEC313	Cyber Security
PEC314	Soft computing

Course Code-PEC**	Professional Elective - II
PEC321	Distributed Systems
PEC322	Cloud Computing
PEC323	Enterprise Architecture
PEC324	Natural Language Processing

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
PS	Project Seminar	L	Lecture
LCC	Laboratory Core Course	P	Practical

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**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**[ Regulation : R-23 ]**  
**SEMESTER- IV**

SNo	Course Code	Course Title	Hours/ Week		Scheme of Examination			No of Credits
					Max Marks		Duration (hrs)	
THEORY			L	P	CIE	SEE	SEE	Cr
1	PEC**	Professional Elective –III	3	-	40	60	3	3
2	PEC**	Professional Elective –IV	3	-	40	60	3	3
3	OE**	Open Elective	3	-	40	60	3	3
PRACTICALS								
4	Proj401	Project Work	-	24	100	200	3	12
		Total	9	24	220	380	-	21

**Professional Electives**

Course Code-PEC**	Professional Elective – III
PEC411	Big Data Analytics
PEC412	Deep Learning
PEC413	Information Retrieval System
PEC414	Optimization techniques

Course Code-PEC**	Professional Elective – IV
PEC421	Block Chain Technologies
PEC422	Software Testing
PEC423	Internet of Things
PEC424	Digital Forensics

Course Code-OE**	Open Elective
OE 411	Professional Ethics
OE 412	Constitution of India
OE 413	Disaster Management
OE 414	Management Information System
OE 415	Intellectual Property & Cyber Law
OE 416	Environmental Science
OE 417	E-Commerce

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## PCC101 Mathematical Foundations of Computer Science

Credits : 4

Instruction 4L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

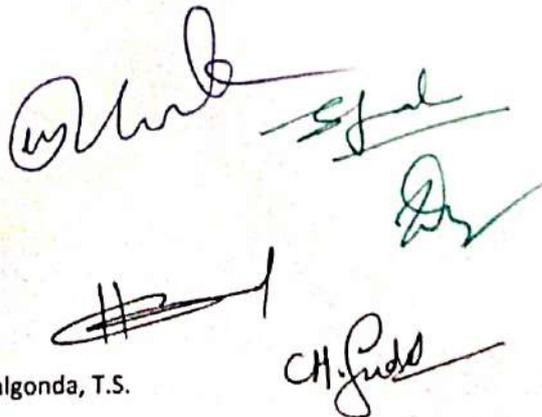
**Relations:** Partial Orders, Equivalence Relations and Partitions.

**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.



  
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#### UNIT-IV

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

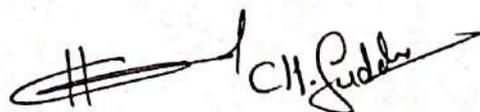
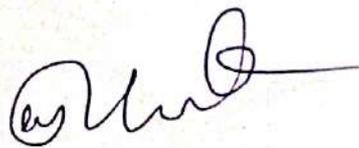
#### UNIT -V

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

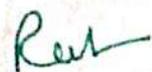
**Trees:** Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

#### Suggested Reading:

1. Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, **Discrete Mathematics for Computer Scientists & Mathematicians**, Prentice Hall NJ, 2nd 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**, 5th Edition, Pearson, 2004.



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**PCC102**

## **Data Structures using C**

**Credits : 4**

Instruction 4L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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**

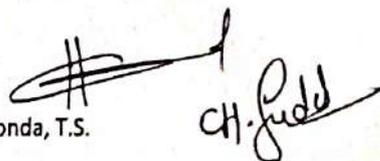
Trees – Binary Trees – Binary tree representation and traversals , – Applications of trees.  
Binary Search Trees , AVL trees.  
Graph and its representations – Graph Traversals.

### **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.

  
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**PCC103**

## **Object Oriented Programming using Java**

**Credits : 3**

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

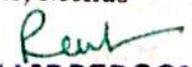
**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces.

**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.



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## 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.

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**PCC104**

## Computer Architecture

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. Learn the basics of data representation
2. Study register transfer microoperations
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

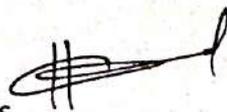
**Register Transfer Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic, Logic and Shift micro operations, Arithmetic Logic Shift Unit. **Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing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

### UNIT-III

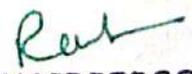
**Micro programmed Control:** Control memory, Address Sequencing, Micro program example, Design of Control Unit.

**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.



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#### 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 McGraw-Hill Education , 5th Edition, 2002

**PCC105**

## **Probability and Statistics**

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### **Course Objectives**

1. Grasping 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, 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 Hypotheses - one sample tests** - Hypotheses 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

#### **References**

1. S lang, Introduction to Linear Algebra
2. Gilbert Strang, Linear Algebra and its Applications
3. Robert V Hogg and Allen T Craig, Introduction to Mathematical statistics. Prentice Hall
4. Fundamentals of Mathematical Statistics, V. K. Kapoor and S. C. Gupta, Sultan Chand & Sons, New Delhi.

  
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**PCC106**

**Managerial Economics and Accountancy**

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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, Equimarginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

**UNIT – II**

**Consumer Behavior:** 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**

**Capital Management:** Significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

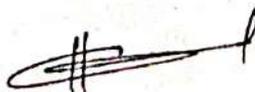
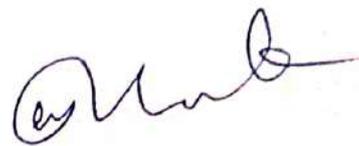
## UNIT – V

**Book-keeping:** Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance, concept and 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 ,Sulthan 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



  
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**LCC151**

**Data Structures using C Lab**

**Credits : 2**

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

**Course Objectives**

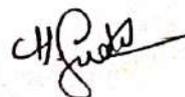
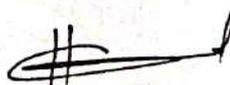
1. To understand and implement basic data structures using C
2. To apply linear and non-linear data structures in problem solving.
3. To learn to implement functions and recursive functions by means of data structures
4. To implement searching and sorting algorithms

**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



With effect from academic year 2023-24

**LCC152**

## **Java Programming Lab**

**Credits : 2**

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

With effect from academic year 2023-24

## HSC153

## Soft Skills Lab

Credits : 3

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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

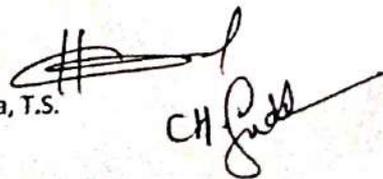
1. Express conversational skills
2. Specify reading strategies
3. Perform time management
4. Perform stress management
5. Explore career planning

### Activities

1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
2. Group discussion
3. Interview skills, Making presentation
4. Listening to Lectures and News Programmes, Listening to Talk show
5. Watching videos on interesting events on Youtube.
6. Reading different genres of texts 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 materials from Trinity College, London.
3. International English Language Testing System Practice Tests, Cambridge University Press.

  
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4. Interactive Multimedia Programs on Managing Time and Stress.
5. Personality Development (CD-ROM), Times Multimedia, Mumbai.
6. Robert M Sherfield and et al. "Developing Soft Skills" 4<sup>th</sup> edition, New Delhi: Pearson Education, 2009.

#### **Web Sources**

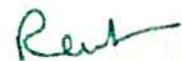
<http://www.slideshare.net/rohitjsh/presentation-on-group-discussion>

[http://www.washington.edu/doit/TeamN/present\\_tips.html](http://www.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](http://www.mindtools.com/pages/article/newCDV_34.htm)

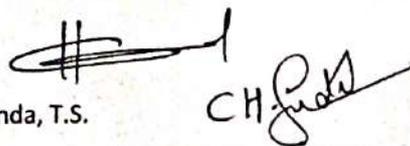


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CH. Pradeep

With effect from academic year 2023-24

**PCC201**

## **Operating Systems**

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### **Course Objectives**

1. To gain the understanding of operating system
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 illustrate the workings of various 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**

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**

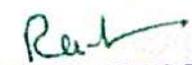
Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process communication. Windows 7 –Design principles, System components, Terminal services and fast user switching File systems, Networking, Programmer interface.



**Suggested Reading:**

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.



  
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## PCC202

## Database Management System

Credits : 4

Instruction 4L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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
5. Explore concurrency concepts

### 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
5. Describe concurrency control concepts

### 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.

#### UNIT – 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, Validation-based 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

#### Suggested Readings

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, Database System Concepts, McGraw-Hill International Edition, 6th Edition, 2010
2. Ramakrishnan, Gehrke, Database Management Systems, McGraw-Hill International Edition, 3rd Edition, 2003
3. Elmasri, Navathe, Somayajulu, Fundamentals of Database Systems, Pearson Education, 4th Edition, 2004

With effect from academic year 2023-24

**PCC203**

## **Design and Analysis of Algorithms**

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.
4. TH Cormen, CE Leiserson, RL Rivert, C Stein, "Introduction to Algorithms", Third Edition, PHI, 2010.

  
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With effect from academic year 2023-24

**PCC204**

## Artificial Intelligence

Credits : 4

Instruction 4L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. Learn problem solving strategies
2. Learn propositional, predicate calculus and knowledge representation
3. Learn probability theory
4. Learn machine learning
5. Learn NLP

### Course Outcomes

1. Solve search problems
2. Apply propositional, predicate calculus and knowledge representation
3. Analyze probability theory
4. Explore machine learning
5. Explain NLP

### Unit - 1

**Introduction:** History Intelligent Systems, Foundations of Artificial Intelligence, 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

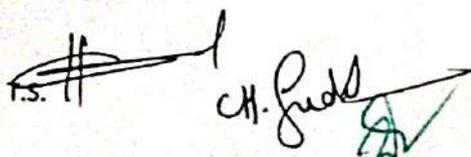
**Logic Concepts and Logic Programming:** Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

**Knowledge Representation:** Introduction, approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

### Unit - 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 System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, 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.

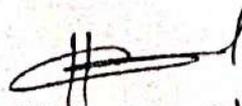
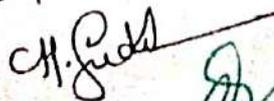
#### Unit - V

**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 India, First Edition, 2011.
2. Russell, Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 2<sup>nd</sup> Edition, 2004.
3. Rich, Knight, Nair , Artificial Intelligence, Tata McGraw Hill, 3<sup>rd</sup> Edition 2009.


With effect from academic year 2023-24

**PCC205**

## **Python Programming**

**Credits : 3**

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### **Course Objectives:**

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

**Course Outcomes:** After learning the contents of this paper the student must be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

### **Unit-I**

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types  
Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules  
Sequences - Strings, Lists, and Tuples, Mapping and Set Types

### **Unit-II**

**Files:** File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

**Exceptions:** Exceptions in Python, Detecting and Handling Exceptions, Context Management,

Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Related Modules , Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

### Unit-III

**Regular Expressions:** Introduction, Special Symbols and Characters, Res and Python  
**Multithreaded Programming:** Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

**GUI Programming:** Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

### Unit-IV

**Web Programming:** Introduction, Web Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web(HTTP) Servers

**Database Programming:** Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules

### Unit-V

**Data Analysis with Pandas:** Introduction, Creating, Reading, and Writing, Creating Data, Reading and Writing Data Files, Indexing, Selecting, and Assigning, Native Approach, Index-Based Selection, Label-Based Selection, Choosing between loc and iloc, Index Manipulation, Conditional Selection, Assigning Values, Summarizing Functions and Maps, Summary Functions, Maps, Grouping and Sorting, Grouping, Multiple Indexes, Sorting, Data Types and Missing Values, Data Types, Dealing with Missing Values, Renaming and Combining, Renaming, Combining.

**Data Visualization with Seaborn:** Introduction, Line Charts, Bar Charts and Heatmaps, Bar Charts, Heatmaps, Scatter Plots, Color-Coded Scatter Plots, Distributions, Histograms, Density Plots, 2D KDE Plots, Color-Coded Plots.

### Suggested Readings:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Think Python, Allen Downey, Green Tea Press.
3. Python for Data Science, Dr. Mohd. Abdul Hameed, WILEY
4. Introduction to Python, Kenneth A. Lambert, Cengage.
5. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
6. Learning Python, Mark Lutz, O'Reilly.

With effect from academic year 2023-24

**PCC206**

## **Operations Research**

**Credits : 3**

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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**

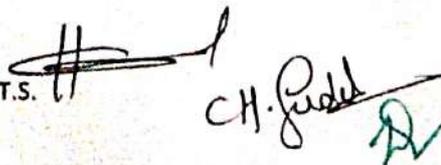
**Assignment Problem:** Introduction, Zero-One Programming Model, Types of Assignment Problem, Hungarian Method, Branch-and-Bound Technique for Assignment Problem.  
**Integer Programming:** Introduction, Integer Programming Formulations, The Cutting-Plane Algorithm, Branch-and-Bound Technique, Zero-One Implicit Enumeration Algorithm.

### **UNIT IV**

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

### **UNIT V**

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

  
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**Suggested Reading:**

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

With effect from academic year 2023-24

**LCC251**

## Operating Systems Lab

Credits : 2

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. Learn CPU scheduling algorithms
2. Learn memory management algorithms
3. Learn synchronization problems
4. Explore file allocation strategies
5. Explore disk scheduling algorithms

### Course Outcomes

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

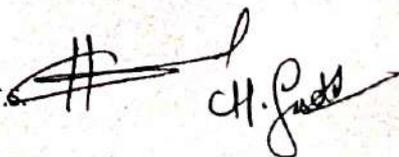
### Programs

1. Simulate the following CPU scheduling algorithms.
  - a. FCFS
  - b. SJF
  - c. Round Robin
  - d. Priority.
2. Write a C program to simulate producer-consumer problem using Semaphores
3. Write a C program to simulate the concept of Dining-philosophers problem.
4. Simulate MVT and MFT.
5. Write a C program to simulate the following contiguous memory allocation techniques
  - a. Worst fit
  - b. Best fit
  - c. First fit.
6. Simulate following page replacement algorithms
  - a. FIFO
  - b. LRU
  - c. OPTIMAL
7. Simulate following File Organization Techniques
  - a. Single level directory
  - b. Two level directory
8. Simulate following file allocation strategies

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- a. Sequential
  - b. Indexed
  - c. Linked.
9. Simulate Bankers Algorithm for Dead Lock Avoidance.
  10. Simulate Bankers Algorithm for Dead Lock Prevention.
  11. Write a C program to simulate disk scheduling algorithms.
    - a. FCFS
    - b. SCAN
    - c. C-SCAN



With effect from academic year 2023-24

**LCC252**

**DBMS Lab**

**Credits : 2**

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

  
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**LCC253**

## **Python Programming Lab**

**Credits : 2**

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### **Course Objectives**

1. To be able to introduce core programming basics and program design with functions using Python programming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise.

### **Course Outcomes:**

1. Student should be able to understand the basic concepts scripting and the contributions of scripting language
2. Ability to explore python especially the object-oriented concepts, and the built-in objects of Python.
3. Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations

### **List of Programs:**

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST2017"
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [ Formula:  $c/5 = f-32/9$  ]

10. Write a Python program to construct the following pattern, using a nested for loop

```
*
**
***
****
*****
*****
****
***
**
*
```

11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two textfiles. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement  $\text{pow}(x, n)$
20. Write a Python class to reverse a string word by word.

With effect from the academic year 2024-25

**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
 [ Regulation : R-23 ]  
**SEMESTER- III**

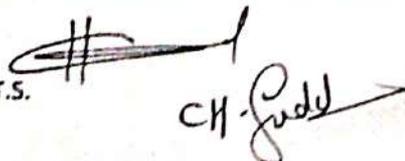
SNo	Course Code	Course Title	Hours/ Week			Scheme of Examination			No of Credits
						Max Marks		Duration (hrs)	
THEORY			L	T	P	CIE	SEE	SEE	Cr
1	PCC301	Software Engineering	4		-	40	60	3	4
2	PCC302	Computer Networks	4		-	40	60	3	4
3	PCC303	Data Science	3	1	-	40	60	3	3
4	PCC304	Web Technologies	3	-	-	40	60	3	3
5	PEC**	Professional Elective-I	3	-	-	40	60	3	3
6	PEC**	Professional Elective-II	3	-	-	40	60	3	3
PRACTICALS									
7	LCC351	Computer Networks Lab	-		3	40	60	3	2
8	LCC352	Software Engineering Lab	-		3	40	60	3	2
9	LCC353	Data science Lab	-		3	40	60	3	2
10	PS3541	Project Seminar	-		2	50	-	-	1
			20	1	11	410	540	-	27

**Professional Electives**

Course Code-PEC**	Professional Elective -I
PEC311	Information Security
PEC312	Network Security
PEC313	Cyber Security
PEC314	Soft computing

Course Code-PEC**	Professional Elective - II
PEC321	Distributed Systems
PEC322	Cloud Computing
PEC323	Enterprise Architecture
PEC324	Natural Language Processing

Abbreviation	Full Form	Abbreviation	Full Form
PCC	Professional Core Course	CIE	Continuous Internal Evaluation
PEC	Professional Elective Course	SEE	Semester End Evaluation
PS	Project Seminar	L	Lecture
LCC	Laboratory Core Course	P	Practical

  
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With effect from the academic year 2024-25

**SCHEME OF INSTRUCTION**  
**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**[ Regulation : R-23 ]**  
**SEMESTER- IV**

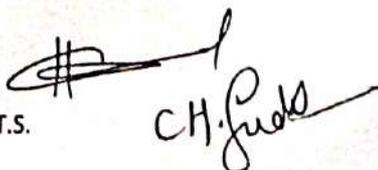
SNo	Course Code	Course Title	Hours/ Week		Scheme of Examination			No of Credits
					Max Marks		Duration (hrs)	
<b>THEORY</b>			L	P	CIE	SEE	SEE	Cr
1	PEC**	Professional Elective –III	3	-	40	60	3	3
2	PEC**	Professional Elective –IV	3	-	40	60	3	3
3	OE**	Open Elective	3	-	40	60	3	3
<b>PRACTICALS</b>								
4	Proj401	Project Work	-	24	100	200	3	12
Total			9	24	220	380	-	21

**Professional Electives**

Course Code-PEC**	Professional Elective – III
PEC411	Big Data Analytics
PEC412	Deep Learning
PEC413	Information Retrieval System
PEC414	Optimization techniques

Course Code-PEC**	Professional Elective – IV
PEC421	Block Chain Technologies
PEC422	Software Testing
PEC423	Internet of Things
PEC424	Digital Forensics

Course Code-OE**	Open Elective
OE 431	Professional Ethics
OE 432	Constitution of India
OE 433	Disaster Management
OE 434	Management Information System
OE 435	Intellectual Property & Cyber Law
OE 436	Environmental Science
OE 437	E-Commerce

  
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With effect from academic year 2024-25

**PCC301**

**Software Engineering**

**Credits : 4**

Instruction 4L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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.

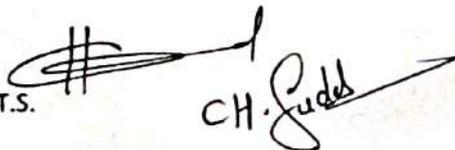
## Unit V

**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 SPI Frameworks, 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", 7<sup>th</sup> Edition, McGraw Hill Higher Education, 2010.
3. Deepak Jain, "Software Engineering", Oxford University Press, 2008.
4. 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.

  
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With effect from academic year 2024-25

PCC302

Computer Networks

Credits : 4

Instruction 4L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

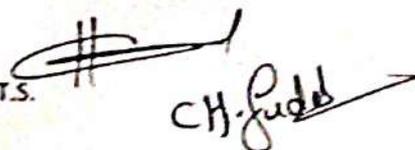
**MAC Layer:** LAN - Pure and Slotted ALOHA, Ethernet IEEE 802.3 LAN Ethernet Efficiency Calculation, Bridges. ARP, RARP

### 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)

  
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## Unit V

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

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

### 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 Stevens, Unix Network Programming, PHI, 2003

  
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PCC303

Data Science

Credits : 3

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. To learn basics of R Programming environment : R language , R- studio and R packages
2. To learn various statistical concepts like linear and logistic regression , cluster analysis , time series forecasting
3. To learn Decision tree induction, association rule mining and text mining

### Course Outcomes

Student will be able to

1. Use various data structures and packages in R for data visualization and summarization
2. Use linear , non-linear regression models, and classification techniques for data analysis
3. Use clustering methods including K-means and CURE algorithm

### UNIT-I

**Introduction To R:** Introduction, Downloading and Installing R, IDE and Text Editors, Handling Packages in R.

**Getting Started With R:** Introduction, Working with Directory, Data Types In R, Few Commands for Data Exploration.

**Loading and Handling Data In R:** Introduction, Challenges of Analytical Data Processing, Expression, Variables, Functions, Missing Values Treatment In R, Using '\_As' Operator To Change The Structure Of The Data, Vectors, Matrices, Factors, List, Few Common Analytical Tasks, Aggregation And Group Processing Of A Variable, Simple Analysis Using R, Methods For Reading Data, Comparison Of R GUI's For Data Input, Using R With Databases And Business Intelligence Systems.

### UNIT-II

**Exploring Data In R:** Introduction, Data Frames, R Functions for Understanding Data in Data Frames, Load Data Frames, Exploring Data, Data Summary, Finding the Missing Values, Invalid Values And Outliers, Descriptive Statistics, Spotting Problems In Data with Visualization.

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### UNIT- III

**Linear Regression Using R:** Introduction, Model Fitting, Linear Regression, Assumptions of Linear Regression, Validating Linear Assumption.

**Logistic Regression:** Introduction, What Is Regression?, Introduction To Generalized Linear Model, Logistic Regression, Binary Logistic Regression, Diagnosing Logistic Regression, Multinomial Logistic Regression Model.

### UNIT IV

**Decision Tree:** Introduction, What Is A Decision Tree?, Decision Tree Representation In R, Appropriate Problems For Decision Tree Learning, Basic Decision Tree Learning Algorithm, Measuring Features, Hypothesis Space Search In Decision Tree Learning, Inductive Bias In Decision Tree Learning, Why Prefer Short Hypotheses, Issues In Decision Tree Learning.

**Time Series In R:** Introduction, What Is Time Series Data, Reading Time Series Data, Decomposing Time Series Data, Forecasts Using Exponential Smoothing, ARIMA Models.

### UNIT-V

**Clustering:** Introduction, What Is Clustering, Basic Concepts in Clustering, Hierarchical Clustering, K-Means Algorithm, CURE Algorithm, Clustering in Non-Euclidean Space, Clustering for Streams and Parallelism.

**Association Rules:** Introduction, Frequent Itemset, Data Structure Overview, Mining Algorithm Interfaces, Auxiliary Functions, Sampling from Transaction, Generating Synthetic Transaction Data, Additional Measures of Interestingness, Distance Based Clustering Transaction and Association.

### Suggested Readings

1. Data Analytics using R by Seema Acharya. McGraw Hill education.
2. Practical Data Science with R, Nina Zumel and John Mount, Manning Shelter Island.
3. The R book, Crawley, Michael J. John Wiley & Sons, Ltd

  
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With effect from academic year 2024-25

PCC304

Web Technologies

Credits : 3

Instruction 4(3L+1T) hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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, text 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 Server 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 Deitel, 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.

With effect from academic year 2024-25

PEC311

Information Security

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. Learn model, SDLC and components of information security
2. Comprehend the legal, ethical and professional issues
3. Understand the risk management
4. Learn planning for security and security technology
5. Study cryptography and implementation of information security

### Course Outcomes

1. Explain the SDLC and security model
2. Describe various issues in information security
3. State the techniques for risk management
4. Elaborate the security technology
5. Specify the cryptography and implementation of information security

### UNIT-I

**Introduction:** History, Critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, Balancing security and access, The SDLC, The security SDLC. Need for Security: Business needs, Threats, Attacks-secure software development.

### UNIT-II

**Legal, Ethical and professional Issues:** Law and ethics in information security, Relevant U.S laws-international laws and legal bodies, Ethics and information security.

**Risk Management:** Overview, Risk identification, Risk assessment, Risk control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, Recommended risk control practices.

### UNIT-III

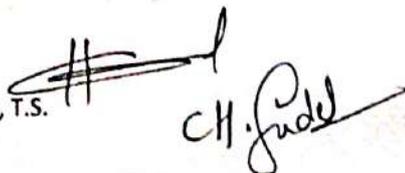
**Planning for Security:** Security policy, Standards and practices, Security blueprint, Security education, Continuity strategies.

**Security Technology:** Firewalls and VPNs, Physical design, Firewalls, Protecting remote connections

### UNIT-IV

**Security Technology:** Intrusion detection, access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

**Cryptography:** Foundations of cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems.



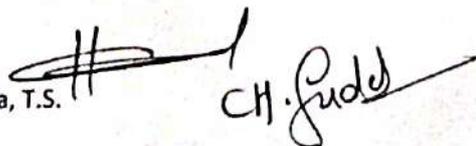
## UNIT- V

**Implementing Information Security:** Information security, project management, Technical topics of implementation, Nontechnical aspects of implementation, Security certification and accreditation.

**Security and Personnel:** Positioning and staffing security function, Employment policies and practices, Internal control strategies. **Information security maintenance:** Security management models, The maintenance model, Digital forensics

### Suggested Reading

1. Michel E Withman and Herbert J Mattord, Principles and Practices of Information Security, Cengage Learning, 2009.
2. Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, Auerbach Publications, 2010.
3. Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes and Practices, PHI, 2008.
4. Mark Merkow and Jim Breithaupt, Information Security Principle and Practices, Pearson Education, 2007.

  
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With effect from academic year 2024-25

PEC312

Network Security

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 marks

**Course Objectives:**

- To impart knowledge on network security issues, services, goals and mechanisms.
- To analyze the security of communication systems, networks and protocols.
- To apply algorithms used for secure transactions in real world applications

**Course Outcomes:** At the end of the course students will be able to

- Demonstrate the knowledge of cryptography and network security concepts and applications.
- Ability to apply security principles in system design.
- Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

**UNIT- I**

**Security Attacks :** Interruption, Interception, Modification and Fabrication, Security Services Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability and Mechanisms, A model for Internetwork security.

**UNIT- II**

**Conventional Encryption:** Principles, Conventional encryption algorithms (DES, AES, RC4, and Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT- III**

**Number Theory:** Modular Arithmetic, Euclid's Algorithm, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**UNIT- IV**

**Email privacy:** Pretty Good Privacy (PGP) and S/MIME.

**IP Security:** Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT- V**

**Web Security:** Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

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**Suggested Readings:**

1. "Cryptography and Network Security" by William Stallings 3rd Edition, Pearson Education, 2017.
2. "Applied Cryptography" by Bruce Schneier, 2007.
3. Cryptography and Network Security by Behrouz A. Forouzan, 2015.



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With effect from academic year 2024-25

PEC313

Cyber Security

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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

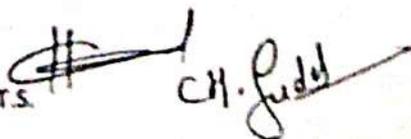
**Security Objectives** - Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives, Guidance for Decision Makers, Tone at the Top, Policy as a Project.

**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 2024-25

PEC314

Soft Computing

Credits : 3

Instruction 3Lhrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 marks

**Course Objectives:**

1. To understand the concepts of Neural Networks
2. To learn about Fuzzy Set theory and Adaptive Resonance Theory
3. Able to analyze various fuzzy sets, membership functions and components
4. To learn about Generic Algorithms and its applications
5. To understand the Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms

**Course Outcomes:**

After completion of the subject, Students will be able to

1. Implementing the use of Generic Algorithms in Machine Learning
2. Apply Neural Networks techniques to solve problems
3. Identify the various operations on fuzzy sets, functions and components of fuzzy expert system
4. Able to combine neural networks and fuzzy logic to build Intelligent model/system

**UNIT-I**

Fundamentals of Neural Networks: Basic Concepts of Neural Networks, Human Brain, Model of an Artificial Neuron, Neural Network Architectures, Characteristics of Neural Networks, Learning Methods, Taxonomy of Neural Network Architectures, History of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Back Propagation Networks: Architecture of a Back Propagation Network, Back Propagation Learning, Illustration, Applications.

**UNIT-II**

Associative Memory: Autocorrelators, Heterocorrelators, Wang Et Al's Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real-Coded Pattern Pairs, Applications, Recent Trends.

Adaptive Resonance Theory: Introduction, ART1, ART2, Applications, Sensitives of Ordering of Data.

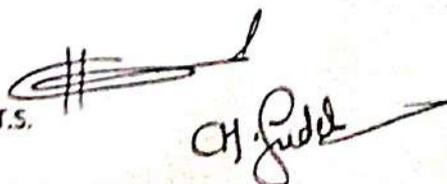
**UNIT-III**

Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations.

Fuzzy Systems: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based Systems, Defuzzification Methods, Applications.

**UNIT-IV**

Fundamentals of Genetic Algorithms: Genetic Algorithms: History, Basic Concepts, Creation of Off springs, Working Principle, Encoding, Fitness Function, Reproduction.



Genetic Modeling: Inheritance Operators, Cross Over, Inversion, And Deletion, Mutation Operator, Bit-Wise Operators, Bit-Wise Operators used in GA, Generational Cycle, Convergence of Genetic Algorithms, Applications, Multi- Level Optimization, Real Life Problem, Differences and Similarities Between GA and Other Traditional Methods, Advances in GA.

#### UNIT-V

Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms: Hybrid Systems, Neural Networks, Fuzzy Logic, and Genetic Algorithms Hybrids, Preview of Hybrid Systems

Genetic Algorithms Based Back propagation Networks: Ga Based Weight Determination, Applications.

Fuzzy Logic Controlled Controlled Genetic Algorithms: Soft Computing Tools, Problem Description of Optimum Design, Fuzzy Constraints, Illustrations, GA in Fuzzy Logic Controller Design, Fuzzy Logic Controller, FLC-GA Based Structural Optimization, Applications.

#### Suggested Readings

1. S.Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, fuzzy logic, and genetic algorithms - Genetic Algorithm, PHI Learning Private Limited-2010
2. S.N.Sivanandam, S.N.Deepa Wiley India , Principles of SOFT COMPUTING, Second Edition 2011.

With effect from academic year 2024-25

PEC321

Distributed Systems

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

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. Learn the Distributed Multimedia Management Strategies

### Course Outcomes

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. Discuss the Distributed Multimedia QoS Principles

### Unit I

**Introduction:** Goals , Connecting Users and Resources , Transparency, Openness, Scalability.

**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.

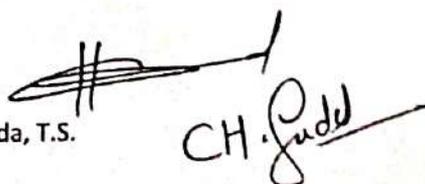
**Distributed Web-Based Systems:** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, and Security.

#### Unit V

**Distributed Multimedia Systems:** Introduction characteristics of Multimedia Data, Quality of Service Management: Quality of Service negotiation, Admission Control , Resource Management and Resource Scheduling.

#### Suggested Readings

1. Andrew S. Tanenbaum and Maarten Van Steen, —Distributed SystemsI, PHI 2nd Edition, 2009.
2. Colouris G, Dollimore Jean, Kindberg Tim, Distributed Systems Concepts and Design, 5<sup>th</sup> Edition Pearson Education 2011

  
CH. Judd

With effect from academic year 2024-25

PEC322

Cloud Computing

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 marks

### Course Objectives

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

### Course Outcomes

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, Benefits and challenges, Cloud computing services, Resource Virtualization, Resource pooling sharing and provisioning, Case study of IaaS, PaaS and SaaS

### Unit-II

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

### Unit-III

Multi-tenant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model, Security Issues, Privacy and Compliance Issues

### Unit-IV

Portability and Interoperability Issues, Cloud Management and a Programming Model Case Study, Popular Cloud Services

### Unit-V

Enterprise architecture and SOA, Enterprise Software, Enterprise Custom Applications, Workflow and Business Processes, Enterprise Analytics and Search, Enterprise Cloud Computing Ecosystem.

### Suggested Reading

1. Cloud Computing - Sandeep Bhowmik, Cambridge University Press, 2017.
2. Enterprise Cloud Computing - Technology, Architecture, Applications by Gautam Shroff, Cambridge University Press, 2016.
3. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.



With effect from academic year 2024-25

PEC323

Enterprise Architecture

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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. Know the fundamentals of EA
2. Understand the business architecture
3. Know 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

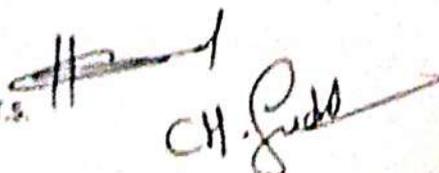
Cloud Computing Opportunities for EA, Flexible (agile) business and information architectures (SoEA).

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.

  
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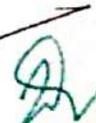
## Suggested Reading

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., Sary 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>
1. Spark : The Definite Guide – Bill Chambers, MateiZaharia, 2018.



Mahatma Gandhi university, Nalgonda, T.S.

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CHAIRPERSON  
Board of Studies In  
Computer Science & Engineering  
Mahatma Gandhi University Nalgonda T.S.

With effect from academic year 2024-25

PEC324

Natural Language Processing

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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, Hinrich Schutze, 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.

  
H. Gudde

With effect from academic year 2024-25

LCC351

Computer Networks Lab

Credits : 2

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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, trace route, 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).
9. Program for Connection-Oriented Iterative service in which server calculates the net-salary of an employee based on the following details sent by the client  
i) 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.

  
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With effect from academic year 2024-25

**LCC352**

**Software Engineering Lab**

**Credits : 2**

Instruction 3P hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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

**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

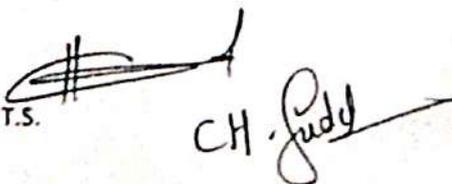
**Background:** In the early years of computers applications, the focus of the development and innovation were on hardware. Software was largely views as an afterthought. Computer programming was an art. Programmers did not follow any disciplined or formalized approaches. This way of doing things was 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

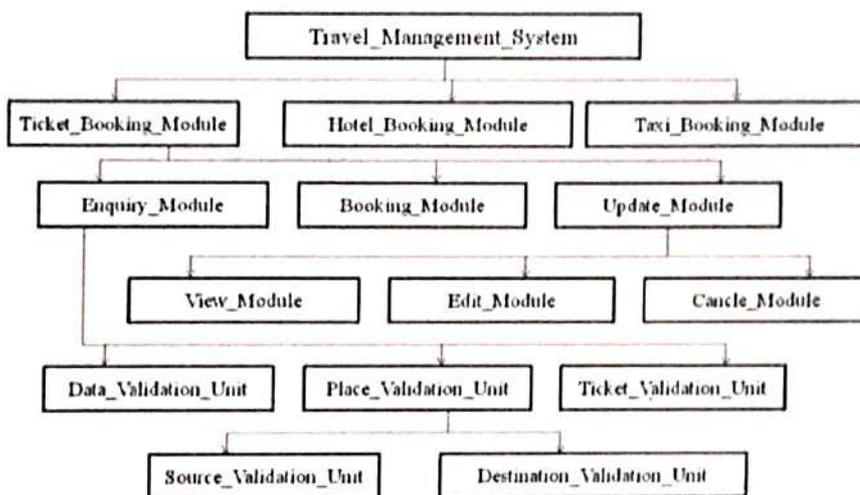
  
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auto-pilot was delivered for the integration on June 15th (delayed by a month). The rocket was launched on Sep 15th (delayed by a month).

**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 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 ( $=\text{size}/\text{effort}$ ). If the total numbers of defects are known we can get the Quality ( $=\text{defect}/\text{size}$ ) 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.

With effect from academic year 2024-25

LCC353

Data Science Lab

Credits : 3

Instruction 3P hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

1. Learn R programming basics
2. Study descriptive statistics
3. Understand reading and writing datasets
4. Learn correlation, covariance and regression model
5. Comprehend multiple regression model and its use for prediction

### Course Outcomes

1. Execute R programming basics
2. Implement descriptive statistics
3. Execute reading and writing datasets
4. Implement correlation, covariance and regression model
5. Execute multiple regression model and its use for predictionE

### SNo Programs

- 1 **R AS CALCULATOR APPLICATION** a. Using with and without R objects on console b. Using mathematical functions on console c. Write an R script, to create R objects for calculator application and save in a specified location in disk.
- 2 **DESCRIPTIVE STATISTICS IN R**  
a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.  
b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
- 3 **READING AND WRITING DIFFERENT TYPES OF DATASETS**  
a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R. c. Reading XML dataset in R.
- 4 **VISUALIZATIONS** a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data.
- 5 **CORRELATION AND COVARIANCE**  
a. Find the correlation matrix.  
b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.  
c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.
- 6 **REGRESSION MODEL** Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and



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rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

7 **MULTIPLE REGRESSION MODEL**

Apply multiple regressions, if data have a continuous Independent variable. Apply on above dataset.

8 **REGRESSION MODEL FOR PREDICTION** Apply regression Model techniques to predict the data on above dataset.

9 **CLASSIFICATION MODEL**

- a. Install relevant package for classification.
- b. Choose classifier for classification problem.
- c. Evaluate the performance of classifier.

10 **CLUSTERING MODEL**

- a. Clustering algorithms for unsupervised classification.
- b. Plot the cluster data using R visualizations.

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With effect from academic year 2024-25

**PS 354**

**PROJECT SEMINAR**

Instruction (2P) hrs per week  
CIE 50 marks

Oral presentation is an important aspect of technical education. The objective of the Seminar Course is to motivate a student to do a systematic and independent study of state-of-topics in a broad area of his/her interest.

Students are to be exposed to following aspects of seminar presentations.

- Literature survey
- Organization of material to be presented
- Preparation of power point Presentation
- Technical writing

Seminar topics may be chosen by the student with the suggestions from the faculty members.

**Each student is required to**

- Submit one page synopsis of the seminar talk two days before for display on notice board of the department.
- Give a 20 minutes presentation with the aid of a PC, followed by a 10 minutes discussion.
- Submit the report on the seminar topic presented along with list of reference and slides used.

Seminar is to be scheduled from the third week to the last week of the semester and any change in schedule should be discouraged.

CIE marks will be awarded jointly or independently by at least two faculty members. The award will be on the basis of the oral presentation made, written materials submitted, active participation of the student in the presentation as well as involvement in the discussions.

  
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With effect from academic year 2024-25

PEC411

Big Data Analytics

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics.

**Introducing Technologies for Handling Big Data:** Distributed and Parallel Computing for Big Data, Cloud Computing and BigData, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for BigData, Cloud Providers in BigData Market.

### UNIT- II

**Understanding Hadoop Ecosystem:** Introducing Hadoop, HDFS and MapReduce, Hadoop functions, Hadoop Ecosystem.

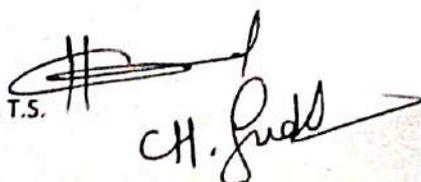
**Hadoop Distributed File System-HDFS Architecture,** Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS, MapReduce.

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

### UNIT-III

**Understanding MapReduce Fundamentals and HBase:** The MapReduce Framework, Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize Map Reduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in BigData Processing- Characteristics of HBase.

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

  
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#### UNIT- IV

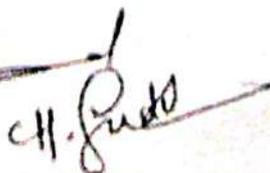
**Storing Data in Databases and Data Warehouses:** RDBMS and Big Data, Issues with Relational Model, Non-Relational Database, Issues with Non-Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouse, Big Data Analysis and Data Warehouse.

#### UNIT-V

**NoSQL Data Management:** Introduction to NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models-Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, CAP Theorem.

#### Suggested Reading

1. BIGDATA, Black Book TM, DreamTech Press, 2016 Edition.
2. Seema Acharya, Subhasni Chellappan , "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIGDATA-Principles and Best Practices of Scalable Real-Time Systems", 2010



With effect from academic year 2024-25

PEC412

Deep Learning

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 marks

### Course Objectives

1. Learn deep learning basics and optimization algorithms
2. Understand deep learning computation, CNNs and modern 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 modern 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)

  
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### 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, Yoshua Bengio, Aaron Courville, "Deep learning"  
Zhang, Aston, et al. "Dive into deep learning." arXiv preprint  
arXiv:2106.11342 (2021).

  
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With effect from academic year 2024-25

PEC413

## Information Retrieval System

Credits : 3

Instruction 3Lhrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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

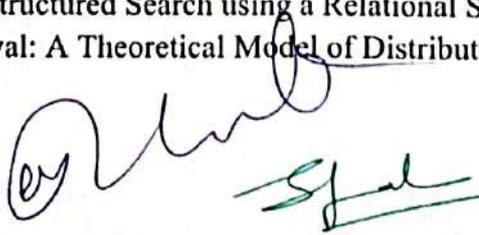
Retrieval Utilities: Semantic Networks, Parsing, Cross-Language Information Retrieval:  
Introduction, Crossing the Language Barrier.

### 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.



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### 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. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge. from Hypertext Data", Morgan-Kaufmann Publishers, 2002.
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich SchGtze, "An Introduction to Information Retrieval", Cambridge University Press, Cambridge, England,-2009.



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With effect from academic year 2024-25

## Optimization Techniques

PEC414

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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



#### Unit IV

##### 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 Pvt.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.
5. 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.

  
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PEC421

Block Chain Technologies

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

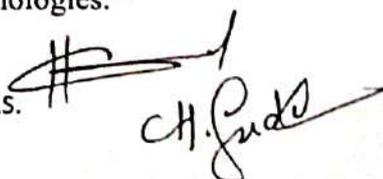
### UNIT – IV

**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.

### UNIT – V

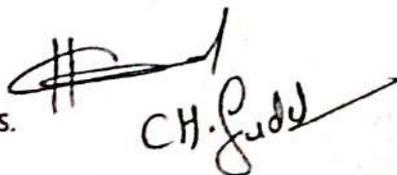
**Bitcoin Mining:** The Task of Bitcoin miners, Mining Hardware, Mining pools, Mining incentives and strategies.

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



### Suggested Reading

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.

  
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**PEC422**

**Software Testing**

**Credits : 3**

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 30 marks

SEE 60 marks

### Course Objectives

1. Learn Functional Testing
2. Learn Structural Testing
3. Discuss Integration and System Testing
4. Learn Object-Oriented Testing
5. Discuss to do software testing

### Course Outcomes

1. Understand the Functional Testing
2. Understand the Structural Testing
3. Comprehend the Integration and System Testing
4. Understand the object-Oriented Testing
5. Comprehend to do software testing

### Unit-I

A Mathematical Context: A Perspective on Testing, Examples

Functional Testing: Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing, Retrospective on Functional Testing.

### Unit-II

Structural Testing: Path Testing, Dataflow Testing, Retrospective on Structural Testing.

### Unit-III

Integration and System Testing: Levels of Testing, Integration Testing, System Testing, Interaction Testing.

### Unit-IV

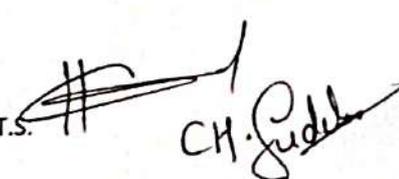
Object-Oriented Testing: Issues in Object-Oriented Testing, Class Testing, Object-Oriented Integration Testing, GUI Testing, Object-Oriented System Testing.

### Unit-V

Millennium Testing: Exploratory Testing, Model-Based Testing, Test-Driven Development, All Pairs Testing, Software Testing Excellence.

### Suggested Reading:

1. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, 3<sup>rd</sup> Edition, CRC Press, 2007.
2. Boris Beizer, Software Testing Techniques, Dreamtech, 2009.



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PEC423

Internet of Things

Credits : 3

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 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 innovation 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.

  
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## 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 Dancil W Iewies, Pearson.
4. Internet of things -A hands on Approach, ArshideepBahga, Universities press.

  
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PEC424

**Digital Forensics**

**Credits : 3**

Instruction 3L hrs per week  
CIE 31 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

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.

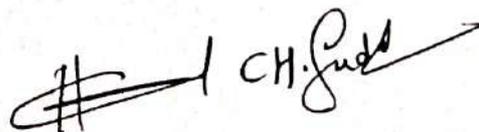
### Unit-V

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.

### Suggested Readings

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.

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OE431

Professional Ethics

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

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.

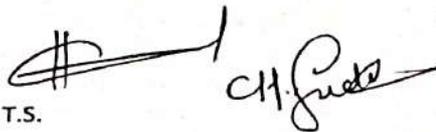
### UNIT- V

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.

  
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### Suggested Readings

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.



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**OE432**

**Constitution of India**

**Credits : 3**

Instruction 3L hrs per week

Duration of SEE 3 hours

CIE 40 marks

SEE 60 marks

**Course Objectives**

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. Fadia Sahitya Bhawan; New edition (2017)
3. Introduction to the Constitution of India DD Basu Lexis 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/>



  
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OE433

Disaster Management

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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 Strategy, 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

#### **Suggested Readings**

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.

  
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OE434

**Management Information System**

**Credits : 3**

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

**Course Objectives :** The students will be able to

1. To understand the basic principles and working of information technology
2. Describe the role of Information technology in business
3. To understand knowledge representation methods to make business more competitive.

**Course Outcomes:** After completing the course, the students will be able to

1. Understand and apply the fundamental concepts of information systems.
2. Develop the knowledge about management of information systems.
3. Recommend the use of information technology to solve business problems.

**UNIT-I**

An Introduction to concepts of System and Organizations. Strategic uses of Information Technology, Business Process in Engineering and Information Technology.

**UNIT-II**

Applications of Operational Information Systems to Business, Tactical and Strategic Information System to Business.

**UNIT-III**

Information Systems Planning, approach to System Building Alternative Application Development.

**UNIT-IV**

Managing Knowledge, Knowledge Management in the Organization, Enhancing Management Decision-Making, DSS, GDSS, and ESS.

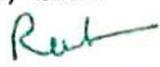
**UNIT-V**

Management of Information Systems, Information System security and control, Ethical issue, managing firm infrastructure and Enterprise system.

**Suggested Reading:**

1. Robert Schultheis, Mary Summer, " Management Information Systems – The Manager's view", Tata McGraw Hill, Fourth Edition, 2006.
2. Kenneth C. Loudon, Jane P Loudon, "Management Information System", Prentice Hall, 2008.
3. Ralph Stair, George Reynolds "Principles of Information Systems", Cengage Learning 2008.
4. James A, O'Brien, "Management Information Systems", Tata McGraw Hill, Sixth Edition, 2004.



  
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OE435

**Intellectual Property and Cyber Law**

**Credits : 3**

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 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.

#### Suggested Readings

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.



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OE436

Environmental Science

Credits : 3

Instruction 3L hrs per week  
CIE 40 marks

Duration of SEE 3 hours  
SEE 60 marks

### Course Objectives

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

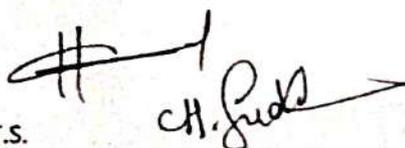
Environmental Studies: Introduction - Definition, Scope and Importance - Basic principle of ecosystem functioning - Concept of ecosystem, structure and functioning of ecosystem, introduction and characteristic features, structures and functions, different ecosystems.

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.

  
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### 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.

### Suggested Readings

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.

  
H. Judd

  
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#### UNIT – IV

Corporate Digital Library – Dimensions of Internal electronic Commerce Systems, Types of Digital Documents, Issues behind Document Infrastructure, Corporate Data Warehouse  
Advertising and Marketing on the Internet – Information based marketing, advertising on Internet, on-line marketing process, market research.

#### UNIT –V

Consumer Search and Resource Discovery – Search and Resource Discovery paradigms, Information search and Retrieval, Electronic Commerce catalogues or Directories, information filtering, Consumer-Data Interface3:Emerging Tools.  
Multimedia and Digital Video- key multimedia concepts, Digital Video and Electronic Commerce, Desktop video processing, Desktop video conferencing.

#### Suggested Readings

1. Ravi Kalakota & A . B. Whinstong – “ *Frontiers of Electronic Commerce*”, Pearson Education, India, 2006
2. Daniel Minoli, Emma Minoli: “ *Web Commerce Technology Handbook*” Tata McGraw Hill 2007
3. J Christopher W, Theodore HKC, Global Electronic Commerce: Theory and Case Studies. Universities Press, 2001



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With effect from academic year 2024-25

**Proj401**

**Project Work**

**Credits : 12**

Instruction 24 hrs per week

Duration of SEE 3 hours

CIE 60 marks

SEE 100 marks

Project has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2<sup>nd</sup> week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of eight weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work.

At the end of the semester the students are required to present themselves for a University Viva-voce examination. Evaluation guidelines for the award of SEE marks are mentioned in the Rules and Regulations book.

A committee consisting of two faculty members of the respective college along with a guide will evaluate the project and award CIE marks.

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**Minutes of the BOS Meeting conducted on 13-10-2023 (ONLINE MODE)**

BOS Meeting for the Department of Computer science and Informatics , University college of Engineering and Technology ,Mahatma Gandhi University, Nalgonda was conducted on 13-10-2023 Online Mode at 12:00PM to Revise the Scheme for MCA with 40-Internal and 60-External pattern for the Academic year 2023-2024, Regulations R-23.

It is Resolved to approve the revised scheme for MCA program in the department of Computer science and Informatics ,UCET, MGU, Nalgonda to 40-Internal and 60-External.

The Following members were presented for the meeting

1. Prof.R.Rekha - Chairperson *Rekha 13/10/2023*
2. Prof.M.Chandra Mohan - Member *M. Chandra Mohan 13/10/2023*
3. <sup>DV</sup> Mr.M.Venkat Das - Member *M. Venkat Das*
4. Dr.K.Shyamala - Member *S. Shyamala 13/10/2023*
5. Mr.M.A.Hameed - Member *M. A. Hameed*
6. The Principal,UCET,MGU- Member *Rekha*
7. Mrs.Ch.Sudha Rani - Member & Convener *Ch. Sudha Rani 13/10/2023*

*Rekha*

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