JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

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Master of Computer Applications

Ist Year Semester - 1 (Theory - 6, Lab - 3)						
S.No	**Course No**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20F00101	Mathematical Foundations of Computer Science	3	0	0	3
2.	20F00102	Foundations of Data Science	3	0	0	3
3.	20F00103	Computer Organization & Architecture	3	0	0	3
4.	20F00104	Python Programming	2	0	0	2
5.	20F00105	Data Structures	4	0	0	4
6.	20F00106	Database Management Systems	3	0	0	3
7.	20F00107	Data Science and Python Laboratory	0	0	4	2
8.	20F00108	Data Structures using C Laboratory	0	0	4	2
9.	20F00109	Database Management Systems Laboratory	0	0	4	2
Total						24

Ist Year Semester - II (Theory - 6, Lab – 3, M-1)						
S.No	**Course No**	**Course Name**	L	T	P	**Credits**
1.	20F00201	Operating Systems	3	0	0	3
2.	20F00202	Software Engineering	3	0	0	3
3.	20F00203	Artificial Intelligence	3	0	0	3
4.	20F00204	**Computer Networks**	3	0	0	3
5.	20F00205a 20F00205b 20F00205c 20F00205d 20F00205e	Elective – I (MOOCs) 1. E-Commerce 2. Operations Research 3. Digital Marketing 4. Data Mining and Business Intelligence 5. Internet of Things	3	0	0	3
6	20F00206a 20F00206b 20F00206c 20F00206d 20F00206e	Elective-II 1. Cloud Computing 2. Formal Languages and Automata Theory 3. Computer Graphics 4. Design and Analysis of Algorithms	3	0	0	3
7.	20F00207	Operating Systems & Computer Networks Laboratory	0	0	4	2
8.	20F00208	Software Engineering Laboratory	0	0	4	2
9.	20F00209	Artificial Intelligence using R Laboratory	0	0	4	2
10..	20F00210	Communication Skills *Mandatory Audit Course-1	3	0	0	0
	Total					24

II year Semester - 1 (Theory - 6, , Lab – 3, M-1)						
S.No	**Course No**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20F00301	Web & OOA Design	3	0	0	3
2.	20F00302	Big Data Analytics	3	0	0	3
3.	20F00303	Dev Ops & Agile Programming	3	0	0	3
4.	20F00304a 20F00304b 20F00304c 20F00304d 20F00304e	Elective – III 1. Software Architecture & Design Patterns 2. Cyber Security 3. Multimedia Systems & Tools 4. Machine Learning 5. Compiler Design	3	0	0	3
5.	20F00305a 20F00305b 20F00305c 20F00305d 20F00305e	**Elective-IV** 1. Software Project Management 2. Wireless Sensor Networks 3. Service Oriented Architecture 4. Deep Learning 5. Android Programming	3	0	0	3
6.	20F00306a 20F00306b 20F00306c 20F00306d 20F00306e	**Elective-V** 1. Software Quality Assurance & Testing 2. Block Chain Technologies 3. Augmented Reality/Virtual Reality 4. Natural Language Processing 5. Mobile Application Development	3	0	0	3
7.	20F00307	Web & OOA Design using Java Laboratory	0	0	4	2
8.	20F00308	Big Data Analytics Laboratory	0	0	4	2
9.	20F00309	Dev Ops & Agile Programming Laboratory	0	0	4	2
10	20F00310	Universal Human Values *Mandatory Audit Course-2	3	0	0	0
Total						24

	II year Semester - I1 (Project & Comprehensive Viva))		
S.No	**Course No**	**Course Name**	C
1.	20F00401	Project work	16
2.	20F00402	Comprehensive Viva-Voce	2
			18

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MCA– I Sem

L	T	P	C
3	0	0	3

(20F00101) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Course Objectives

- To explain about the Boolean Algebra, Graph theory and Recurrence relations.
- To demonstrate the application of basic methods of discrete mathematics in Computer Science problem solving.
- To elucidate solving mathematical problems from algorithmic perspective.
- To introduce the mathematical concepts which will be useful to study advanced courses Design and Analysis of Algorithms, Theory of Computation, Cryptography and Software Engineering etc.

UNIT- I

Statements and Notation, **Connectives**- Negation, Conjunction, Disjunction, Conditional and Bi-conditional, Statement formulas and Truth Tables. Well-formed formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications.

Normal Forms: Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms (PDNF), Principal Conjunctive Normal Forms (PCNF), Ordering and Uniqueness of Normal Forms.

The Theory of Inference for the Statement Calculus: Rules of Inference, Consistency of Premises and Indirect Method of Proof.

The predicate Calculus, **Inference theory of the Predicate Calculus**.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe logical sentences in terms of predicates, quantifiers, and logical connectives (L1)
- Evaluate basic logic statements using truth tables and the properties of logic (L5).
- Apply rules of inference to test the consistency of premises and validity of arguments (L3).
- Verify the equivalence of two formulas and their duals (L4).
- Find the Principal Conjunctive and Principal Disjunctive Normal Forms of a statement formula (L1).

UNIT-II

Set Theory: Basic concepts of Set Theory, Representation of Discrete structures, Relations and Ordering, Functions, Recursion.

Lattices and Boolean Algebra: Lattices as Partially Ordered Sets, Partial order relation, poset - Lattices, Hasse diagram, Boolean Functions, Representation and Minimization of Boolean Functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe equivalence, partial order and compatible relations (L1).
- Compute Maximal Compatibility Blocks (L3).
- Identify the properties of Lattices (L2).

- Evaluate Boolean functions and simplify expression using the properties of Boolean algebra (L5).

UNIT-III

Algebraic Structures: Semi group - Monoid – Groups, Cyclic group - Permutation group(Sn and Dn) - Substructures - Homomorphism of semi group, monoid and groups - Cosets and Lagrange Theorem – Normal Subgroups - Rings and Fields (Definition and examples only)

Learning Outcomes:

At the end of this unit, the student will be able to

- Infer Homomorphism and Isomorphism (L4).
- Describe the properties of Semi groups, Monoids and Groups (L1).
- Describe the properties Normal subgroups.
- Describe the properties Rings and Fields.

UNIT-IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutations and Combinations with constrained Representations, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion and Exclusion.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain fundamental principle of counting (L2).
- Examine the relation between permutation and combination (L4).
- Solve counting problems by applying elementary counting techniques using the product and sum rules (L3).
- Apply permutations, combinations, the pigeon-hole principle, and binomial expansion to solve counting problems (L3).

UNIT-V:

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find the generating functions for a sequence (L1).
- Design recurrence relations using the divide-and-conquer algorithm (L6).

- Solve linear recurrence relations using method of Characteristic Roots (L3).
- Outline the general solution of homogeneous or Inhomogeneous Recurrence Relations using substitution and method of generating functions (L2).
- Solve problems using recurrence relations and recursion to analyze complexity of algorithms (L3).

After completion of this course the student would be able to

- Evaluate elementary mathematical arguments and identify fallacious reasoning (L5).
- Understand the properties of Compatibility, Equivalence and Partial Ordering relations, Lattices and Has see Diagrams (L1).
- Understand the general properties of Algebric Systems, Semi Groups, Monoids,Groups (L1) ,Normal subgroups,Rings and Fields
- Design solutions for problems using breadth first and depth first search techniques (L6)
- Solve the homogeneous and non-homogeneous recurrence relations (L3).

Text Books:

1. Joe L. Mott. Abraham Kandel and Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, Pearson, 2008. (for Units III to V).
2. J P Trembly and R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", 1st Edition, McGraw Hill, 2017(For Unit I&II).

Reference Books:

1. Ralph P. Grimaldi and B.V. Ramana, "Discrete and Combinatorial Mathematics, an Applied Introduction", 5th Edition, Pearson, 2016.
2. Narsingh Deo, "Graph Theory with Applications to Engineering", Prentice Hall, 1979.
3. D.S. Malik and M.K. Sen, "Discrete Mathematics theory and Applications", Ist Edition, Cenegage Learning, 2012.
4. C L Liu and D P Mohapatra, "Elements of Discrete Mathematics, A computer Oriented approach", 4th edition, MCGRAW-HILL, 2018.

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MCA– I Sem

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3	0	0	3

(20F00102) FOUNDATIONS OF DATA SCIENCE

Course Objectives

Ideally for a student to understand Data Science, he/she should have exposure to the following. This will give a basic feel about Data Science. In the following, the topics highlighted in light blue is minimum needed and those highlighted in yellow will help to get a feel about the subject.

Overall it covers the following:

- Basics of probability
- Basics of statistics
- Pattern Recognition
- Machine Learning
- Introduction on Deep Neural Networks.

UNIT-I

Introduction to Probability and Statistics:

Descriptive Statistics: Measures of central tendency—mean, median, mode, harmonic mean and geometric mean; Measures of dispersion – mean deviation from mean, standard deviation and variance. Central moments.Linear and rank correlation. Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations Definition of random variable and probability, (problems depending on counting –taught in MFCS), discrete probability distributions: Bernoulli, Binomial, Poisson; Continuous probability distributions: Gaussian, Exponential, Chisquare. Definition of Bayesian probability.

Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Expectations and moments;; Confidence (statistical) intervals; Correlation functions; White-noise process. Probability, Hypothesis and Inference, Gradient Descent.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand how to summarise data through measures of central tendency, dispersion, moments and correlation.
- Understand random variable and associated probability distributions
- It lays foundations for further UNITs.

UNITT-II

Exploratory Data Analysis (EDA), Data Science life cycle, Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA.

Data Visualization: Scatter plot, bar chart, histogram, boxplot, heat maps etc.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn to analyse the data through plotting: from raw-scatter plot to summarized visualization.
- Understand the functionality of various phases of data Science.
- Analyze the characteristics of data

UNIT-III

Introduction to Pattern Recognition and Machine Learning

Patterns, features, patter representation, curse of dimensionality, dimensionality reduction. Supervised and Unsupervised learning.Classification—linear and non-linear. Bayesian, Perceptron, Nearest neighbor classifier, Support vector machine, use of kernels, Logistic regression, Naïve-bayes, decision trees and random forests; boosting and bagging.Clustering---partitional and hierarchical; k-means clustering.

Regression.Least squares. Evaluation metrics: RMSE, MAE and Coefficient of Determination (R-square)

Cost functions, training and testing a classifier. Cross-validation.Class-imbalance – ways of handling, Exploratory data analysis (EDA), evaluation metrics— Precision, Recall, RoC, AUC; Confusion matrix, Classification accuracy

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the meaning of pattern, feature, importance of pattern representation.
- Classification methods, their working and evaluation.Minimising cost function
- Regression and evaluation.
- Exploratory data analysis (outcome of Unit-I; can be tried out in the associated lab)

UNIT-IV

Introduction to Deep Learning

Multilayer perceptron.Back propagation. Loss functions. Epochs and Batch sizes.Hyper parameter tuning.Applications to classification, regression and unsupervised learning.Overview(introduction to the terms) of RNN, CNN and LSTM.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understanding of deep neural networks as extension of multi-layer perceptron
- Unsupervised and supervised learning in deep neural networks
- Understand what is deep learning
- Minimizing loss functions

- How a deep learning models are trained
- Familiarity of popular deep learning models

UNIT-V

Overview of Data Science Models.

Applications to text, images, videos: recommender systems, image classification, Social network graphs

Learning Outcomes:

At the end of this unit, the student will be able to

- Applications of data science/machine learning
- Familiarity of applications

Textbooks:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
5. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons,2011.

References:

1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
3. [UNIT-1] Robert V Hogg, Allen Craig and J.W. McKean. Introduction to Mathematical Statistics. Pearson. (Indian Edition)
4. [UNIT-II] EMC2: 4) Data Science and Big Data Analytics, EMC Education Services, EMC 2 , Wiley Publication, 2015.
5. [UNIT-III] V. Susheela Devi and M. NarasimhaMurty. Pattern Recognition – An Introduction. Universities Press (Indian Edition; there is an expensive Springer version of the same)
6. [UNIT-II] Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer (Indian Edition)
7. [UNIT-III]Ian Goodfellow and YoshuaBengio and Aaron Courville. Deep Learning. MIT Press. Book available online at https://www.deeplearningbook.org/.
8. [UNIT-IV] J. Leskovec, A. Rajaraman, J.D. Ullman. Mining of Massive Datasets. Cambridge University Press. (Indian Edition; Online pdf is available for download)

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MCA– I Sem

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3	0	0	3

(20F00103) COMPUTER ORGANIZATION & ARCHITECTURE

Course Objectives:

- Learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- Understand the structure and behavior of various functional modules of a computer.
- Discuss the techniques that computers use to communicate with I/O devices
- Study the concepts of pipelining and the way it can speed up processing.
- Describe the basic characteristics of multiprocessors

UNIT - I

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.
Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations
INTEL-8086: CPU architecture, Addressing modes - generation of physical address- code segment registers, Zero, one, two, and three address instructions. INTEL 8086 ASSEMBLY LANGUAGE INSTRUCTIONS-Data transfer instructions, input- output instructions, arithmetic, logical, shift, and rotate instructions, Conditional and unconditional transfer.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic functional units and the ways they are interconnected to form a computer system
- Illustrate various addressing modes for accessing register and memory operands
- Describe the instruction sequencing and various types of instructions

UNIT - II

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Multiprogrammed Control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the arithmetic operations on signed numbers
- Represent the floating-point numbers and describe the operations performed on them

- Distinguish between hardwired and microprogrammed control units

UNIT - III

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various types of memories
- Analyze the performance of cache memory
- Apply effective memory management strategies

UNIT - IV

Input/output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of I/O data transfer synchronization
- Analyze the interrupt handling mechanisms of various processors
- Describe various techniques for I/O data transfer methods.

UNIT - V

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.

Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the use of pipelining and multiple functional units in the design of high-performance processors
- Design and analyze a high performance processor
- Describe the interconnection networks for multiprocessors.

Course Outcomes:

At the end of this unit, the student will be able to

- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os
- Able to explore the hardware requirements for cache memory and virtual memory
- Ability to design algorithms to exploit pipelining and multiprocessors
- Ability to use memory and I/O devices effectively
- Detect pipeline hazards and identify possible solutions to those hazards

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, McGraw Hill Education, 5th Edition, 2013.
2. Microprocessors and Interfacing, Douglas Hall, Tata McGraw-Hill.

REFERENCE BOOKS:

1. Computer System Architecture, M.Morris Mano, Pearson Education, 3rd Edition.
2. Computer Organization and Architecture, Themes and Variations, Alan Clements, CENGAGE Learning.
3. Computer Organization and Architecture, Smruti Ranjan Sarangi, McGraw Hill Education.
4. Computer Architecture and Organization, John P.Hayes, McGraw Hill Education

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MCA– I Sem

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(20F00104) PYTHON PROGRAMMING

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.
Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.
Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.
Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

Unit – III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.
Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.
Case Study: Reading word lists, Search, Looping with indices.
Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use the data structure list.
- Design programs for manipulating strings.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.
Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.
Classes and Functions:

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation
Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.
The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Learning Outcomes:

At the end of this unit, the student will be able to

- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Course Outcomes:

At the end of this unit, the student will be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

Text books:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019

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MCA– I Sem

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(20F00105) DATA STRUCTURES

Course Objectives:

- To illustrate the basic concepts of C programming language.
- To discuss the concepts of Functions, Arrays, Pointers and Structures.
- To familiarize with Stack, Queue and Linked lists data structures.
- To explain the concepts of non-linear data structures like graphs and trees.
- To learn the different types of searching and sorting techniques.

Unit-1

Introduction to C Language - C Language Elements, Variable Declarations and Data Types, Operators and Expressions, Decision Statements - If and Switch Statements, Loop Control Statements - while, for, do-while Statements.

Introduction to Functions, Storage classes, Arrays, Structures, Unions, Pointers, Strings and Command line arguments.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use Cbasic concepts to write simple C programs. (L3)
- Design and develop C programs using functions and arrays. (L6)
- Apply String handling functions and pointers. (L3)

Unit – 2

Data Structures, Stacks and Queues- Overview of Data Structure, Representation of a Stack, Stack Related Terms, Operations on a Stack, Implementation of a Stack, Evaluation of Arithmetic Expressions, Infix, Prefix, and Postfix Notations, Evaluation of Postfix Expression, Conversion of Expression from Infix to Postfix, Recursion, Queues - Various Positions of Queue, Representation of Queue, Insertion, Deletion, Searching Operations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the operations of Stack. (L2)
- Explain the different notations of arithmetic expression. (L5)
- Develop various operations on Queues. (L6)

Unit – 3

Linked Lists–Pointers, Singly Linked List, Dynamically Linked Stacks and Queues, Polynomials Using Singly Linked Lists, Using Circularly Linked Lists, Insertion, Deletion and Searching Operations, Doubly linked lists and its operations, Circular linked lists and its operations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze various operations on singly linked list. (L4)
- Interpret the operations of doubly linked lists. (L2)
- Apply various operations on Circular linked lists. (L6)

Unit-4

Trees- Tree terminology, representation, Binary tress, representation, Binary tree traversals. Binary Tree Operations, **Graphs**- Graph terminology, Graph representation, Elementary Graph Operations, Breadth first search (BFS) and Depth first search (DFS), Connected Components, Spanning Trees.

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop the representation of Tress. (L3)
- Identify the various Binary tree traversals. (L3)
- Illustrate different Graph traversals like BFS and DFS. (L2)

Unit-5

Searching and Sorting–Sequential, Binary, Exchange (Bubble) Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort. Searching- Linear and Binary Search Methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design the different sorting techniques (L6)
- Apply linear search and Binary search methods. (L3)

Course Outcomes:

At the end of this unit, the student will be able to

- Analyse the basic concepts of C Programming language. (L4)
- Design applications in C, using functions, arrays, pointers and structures. (L6)
- Apply various operations of Stacks and Queues in solving the problems. (L3)
- Explain operations on Linked lists. (L5)
- Demonstrate various tree traversals and graph traversal techniques. (L2)
- Design searching and sorting methods (L3)

Text Books:

1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
4. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

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MCA– I Sem

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(20F00106) DATABASE MANAGEMENT SYSTEMS

Course objectives:

At the end of this unit, the student will be able to

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.
- Enable students to model ER diagram for any customized application
- Inducting appropriate strategies for optimization of queries.
- Provide knowledge on concurrency techniques
- Demonstrate the organization of Databases

UNIT-I:

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators.

Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Algebra

Learning Outcomes:

At the end of this unit, the student will be able to

- Distinguish between Database and File System
- Categorize different kinds of data models
- Define functional components of DBMS

UNIT-II:

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL**:** Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Defination in SQL, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.

Learning Outcomes:

At the end of this unit, the student will be able to

- Outline the elements of the relational model such as domain, attribute , tuple, relation and entity
- Distinguish between various kinds of constraints like domain, key and integrity
- Define relational schema
- Develop queries using Relational Algebra and SQL
- Perform DML operations on databases

UNIT-III:

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features, Entity-Relationship Design Issues, Alternative Notations for Modeling Data, Other Aspects of Database Design.

Relational Database Design:
Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition using Functional Dependencies, Decomposition Using Multivalued Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database–Design Process, Modeling Temporal Data, Indexing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop E-R model for the given problem
- Derive tables from E-R diagrams
- Differentiate between various normal forms based on functional dependency
- Apply normalization techniques to eliminate redundancy

UNIT-IV:

Query Processing: Overview, Measures of Query cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Processing in Memory.
Query optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify variety of methods for effective processing of given queries.
- Obtain knowledge related to optimization techniques.

UNIT V:

Transaction Management:
Transactions: Transaction Concept, A Simple Transactional Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.
Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Insert Operations. Delete Operations and Predicate Reads, Timestamp-Based Protocols, Validation- Based Protocols, Multiversion Shemes, Snapshot Isolation, Weak Levels of Consistency in Practice, Advanced Topics in Concurrency.
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-Volatile Storage, High Availability Using Remote Backup Systems, Early Lock Release and Logical Undo Operations, ARIES, Recovery in Main-Memory Databases.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various properties of transaction.
- Design atomic transactions for an application.
- Gain the knowledge about log mechanism and check pointing techniques for system recovery.

Course Outcomes

At the end of this unit, the student will be able to

- Design a database for a real world information system
- Define transactions which preserve the integrity of the database
- Generate tables for a database
- Organize the data to prevent redundancy
- Pose queries to retrieve the information from database

TEXT BOOKS:

1. A.Silberschatz, H.F.Korth, S.Sudarshan, “Database System Concepts”, 7/e, TMH 2020

REFERENCE BOOKS:

1. Shamkant B. Navathe, “Database Management System” 6/e RamezElmasri PEA
2. “Database Principles Fundamentals of Design Implementation and Management”, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Raghurama Krishnan, Johannes Gehrke, “Database Management Systems”, 3/e, TMH

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(20F00107) DATA SCIENCE AND PYTHON LABORATORY

Course Objectives:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Pythonprogramming concepts and itsapplications.
- Practical understanding of building different types of models and their evaluation

List of Topics

1. Write a program to demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python.
2. Write a program to create, append, and remove lists in Python.
3. Write a program to demonstrate working with tuples in Python.
4. Write a program to demonstrate working with dictionaries in Python.
5. Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.
6. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data.
7. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.
8. Write a program to demonstrateRegression analysis with residual plots on a given data set.
9. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
10. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
11. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions using Java/Python ML library classes.
12. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file. Compare the results of various "k" values for the quality of clustering.
13. Write a program to build Artificial Neural Network and test the same using appropriate data sets.

Textbooks:

1. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
2. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016
4. DainelY.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

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(20F00108) DATA STRUCTURES USING C LABORATORY

Course Objectives:

- To get familiar with the basic concepts of C programming.
- To design programs using arrays, strings, pointers and structures.
- To illustrate the use of Stacks and Queues
- To apply different operations on linked lists.
- To demonstrate the Binary tree traversal techniques.
- To design searching and sorting techniques.

Week l

Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.
iii) To solve Towers of Hanoi problem.

Week 2

a) Write a C program to find both the largest and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
i) Addition of Two Matrices ii) Multiplication of Two Matrices

Week 3

a) Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to a given main string from a given position.
ii) To delete n Characters from a given position in a given string.

Week 4

a) Write a C program that displays the position or index in the string S where the string T begins, or –1 if S doesn‘t contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 5

a) Write a C Program to perform various arithmetic operations on pointer variables.

b) Write a C Program to demonstrate the following parameter passing mechanisms:

i) call-by-value ii) call-by-reference

Week 6

Write a C program that uses functions to perform the following operations:

i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 7

Write C programs that implement stack (its operations) using

i) Arrays
ii) Pointers

Week 8

Write C programs that implement Queue (its operations) using

i) Arrays
ii) Pointers

Week 9

Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression
ii) Evaluating the postfix expression

Week 10

Write a C program that uses functions to perform the following operations on singly linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 11

Write a C program that uses functions to perform the following operations on Doubly linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 12

Write a C program that uses functions to perform the following operations on Circular linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 13

Write a C program that uses functions to perform the following:

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers:

i) Linear search
ii) Binary search

Week 15

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

i) Bubble sort
ii) Selection sort

Week 16

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

i) Insertion sort
ii) Merge sort
iii) Quick sort

Text Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
2. B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
3. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. Pradip Dey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

Course Outcomes

At the end of this unit, the student will be able to

- Demonstrate basic concepts of C programming language. (L2)
- Develop C programs using functions, arrays, structures and pointers. (L6)
- Illustrate the concepts Stacks and Queues. (L2)
- Design operations on Linked lists. (L6)
- Apply various Binary tree traversal techniques. (L3)
- Develop searching and sorting methods. (L6)

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(20F00109) DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Objectives:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors using PL/SQL.
- To design and implementation of a database for an organization

Week-1: CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

a. Add a column commission with domain to the Employee table.
b. Insert any five records into the table.
c. Update the column details of job
d. Rename the column of Employ table using alter command.
e. Delete the employee whose empno is19.

2. Create department table with the following structure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into the table.

c. List the records of emp table grouped by dept no.
d. Update the record where dept no is9.
e. Delete any column data from the table

3. Create a table called Customer table

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose ust_city is ‘hyd’.
f. Create a table called branch table.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.
   a. Add and drop a column to the branch table.
   b. Insert values to the table.
   c. Update the branch name column
   d. Delete any two columns from the table

5. Create a table called sailor table

Name	Type
Sid	Number
Snam e	Varchar2(20)
rating	Varchar2(20)

   a. Add column age to the sailortable.
   b. Insert values into the sailortable.

c. Delete the row with rating>8.
d. Update the column details ofsailor.
e. Insert null values into thetable.

6. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

a. Insert values into the reserves table.
b. Add column time to the reserves table.
c. Alter the column day data type to date.
d. Drop the column time in the table.`
e. Delete the row of the table with some condition.

Week-2: QUERIES USING DDL AND DML

1. a. Create a user and grant all permissions to the user.
   b. Insert the any three records in the employee table and use rollback. Check the result.
   c. Add primary key constraint and not null constraint to the employee table.
   d. Insert null values to the employee table and verify the result.
2. a. Create a user and grant all permissions to the user.
   b. Insert values in the department table and use commit.
   c. Add constraints like unique and not null to the department table.
   d. Insert repeated values and null values into the table.
3. a. Create a user and grant all permissions to the user.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to the table.
4. a. Create a user and grant all permissions to the user.
   b. Insert records in the sailor table and use commit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailor table.
5. a. Create a user and grant all permissions to the user.
   b. Use revoke command to remove user permissions.
   c. Change password of the user created.
   d. Add constraint foreign key and no tnull.
6. a. Create a user and grant all permissions to the user.
   b. Update the table reserves and use save point and rollback.
   c. Add constraint primary key , foreign key and not null to the reserves table
   d. Delete constraint not null to the table column

Week-3:QUERIES USING AGGREGATE FUNCTIONS

1. a. By using the group by clause, display the names who belongs to dept no 10 along with average salary.
   b. Display lowest paid employee details under each department.
   c. Display number of employees working in each department and their department number.
   d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert dept name to dept table and insert dept name for each row, do the required thing specified above.
   e. List all employees which start with either B or C.
   f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2. a. Calculate the average salary for each different job.
   b. Show the average salary of each job excluding manager.
   c. Show the average salary for all departments employing more than three people.
   d. Display employees who earn more than thelo west salary in department 30
   e. Show that value returned by sign (n)function.
   f. How many days between day of birth to current date
3. a. Show that two substring as single string.
   b. List all employee names, salary and 15% rise in salary.
   c. Display lowest paid emp details under each manager
   d. Display the average monthly salary bill for each deptno.
   e. Show the average salary for all departments employing more than two people.
   f. By using the group by clause, display the eid who belongs to dept no 05 along with a verage salary.
4. a. Count the number of employees in department20
   b. Find the minimum salary earned by clerk.
   c. Find minimum, maximum, average salary of all employees.
   d. List the minimum and maximum salaries for each job type.
   e. List the employee names in descending order.
   f. List the employee id, names in ascending order by empid.
5. a. Find the sids ,names of sailors who have reserved all boats called “INTERLAKE
   Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
   b. Find the sname , bid and reservation date for each reservation.
   c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
   d. List in alphabetic order all sailors who have reserved red boat.
   e. Find the age of youngest sailor for each rating level.
6. a. List the Vendors who have delivered products within 6 months from or derdate.
   b. Display the Vendor details who have supplied both Assembled and Subparts.
   c. Display the Sub parts by grouping the Vendor type (Local or Non Local).

d. Display the Vendor details in ascending order.

e. Display the Sub part which costs more than any of the Assembled parts.

f. Display the second maximum cost Assembled part

Week-4: PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swaptwonumbers.
   b. Write a PL/SQL program to find the largest of three numbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display thegrade.
   b. Write a PL/SQL program to find the sum of digits in a given umber.
3. a. Write a PL/SQL program to display the number in reverse order.
   b. Writea PL/SQLprogramto checkwhetherthegiven numberisprimeornot.
4. a. Write a PL/SQL program to find the factorial of a givennumber.
   b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius andarea.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the worldHello).
   b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainderin words.

Week-5: PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a givenyear.
3. Create a function to find the factorial of a given number and hence find NCR.
4. Write a PL/SQL block o pint prime Fibonacci series using local functions.
5. Create a procedure to find the lucky number of a given birth date.
6. Create function to the reverse of given number

Week-6: TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:

   CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000

4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellur	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.
   Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
   a. Write a Insert Trigger to check the Passport_id is exactly six digits ornot.
   b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passengerrespectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETEoccurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert orupdate.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time ofdelete.
6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated

Week-7: PROCEDURES

1. Create the procedure for palindrome of given number.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD isfound.
3. Write the PL/SQL programs to create the procedure for factorial of givennumber.
4. Write the PL/SQL programs to create the procedure to find sum of N naturalnumber.
5. Write the PL/SQL programs to create the procedure to find Fibonacciseries.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect ornot

Week-8: CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paid employees**.**
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table.
3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and dept no.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we geta message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

Week-9: CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.

A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-10: **CASE STUDY GENERAL HOSPITAL**

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-11: **CASE STUDY: CAR RENTAL COMPANY**

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

Week-12: **CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM**

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about studentsincludingtheirnumbers,names,addresses,degreestheyreadfor,andtheirpastperformance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the datarequired.
2. Normalize theattributes.
3. Create the logical data model i.e., ERdiagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys whereverrequired.
5. Insert values into the tables created (Be vigilant about Master- Slavetables).
6. Display the Students who have taken M.Sccourse

7. Display the Module code and Number of Modules taught by eachLecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English'module.
10. Retrieve the Prerequisite Courses offered by every Department (with Departmentnames).
11. Present the Lecturer ID and Name who teaches'Mathematics'.
12. Discover the number of years a Module istaught.
13. List out all the Faculties who work for 'Statistics'Department.
14. List out the number of Modules taught by each ModuleLeader.
15. List out the number of Modules taught by a particularLecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and itsname).
17. Update the credits of all the prerequisite courses to 5. Delete the Module 'History' from the Moduletable.

Reference Books:

1. Ramez Elmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 7th Edition, 2020.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

Web References:

http://www.scoopworld.in

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 24 STUDENTS:

HARDWARE: Desktop Computer Systems: 24 nos

SOFTWARE: Oracle 11g.

Course Outcomes

At the end of this unit, the student will be able to

- Design database for any real world problem
- Implement PL/SQL programs
- Define SQL queries
- Decide the constraints
- Investigate for data inconsistency

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(20F00201) OPERATING SYSTEMS

Course Objectives:

The course is designed to

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Explore the concept of file-system and its implementation issues
- Familiarize with the basics of Linux operating system
- Implement various schemes for achieving system protection and security

UNIT I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify major components of operating systems
- Understand the types of computing environments
- Explore several open source operating systems
- Recognize operating system services to users, processes and other systems

UNIT II

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.
Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the importance, features of a process and methods of communication between processes.
- Improving CPU utilization through multi programming and multithreaded programming
- Examine several classical synchronization problems

UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.
Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Examine the various techniques of allocating memory to processes
- Summarize how paging works in contemporary computer systems
- Understanding the benefits of virtual memory systems.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.
File Systems: Files, Directories, File system implementation, management and optimization.
Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Investigate methods for preventing/avoiding deadlocks
- Examine file systems and its interface in various operating systems
- Analyze different disk scheduling algorithms

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.
System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows.

Learning Outcomes:

At the end of this unit, the student will be able to

- Infer various schemes available for achieving system protection.
- Acquiring knowledge about various countermeasures to security attacks
- Outline protection and security in Linux and Microsoft Windows.

Course Outcomes

By the end of this course students will be able to:

- Realize how applications interact with the operating system
- Analyze the functioning of a kernel in an Operating system.
- Summarize resource management in operating systems
- Analyze various scheduling algorithms
- Examine concurrency mechanism in Operating Systems
- Apply memory management techniques in design of operating systems
- Understand the functionality of file system
- Compare and contrast memory management techniques.
- Understand the deadlock prevention and avoidance.
- Perform administrative tasks on Linux based systems.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.
   (Topics: Inter-process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
   Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

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(20F00202) SOFTWARE ENGINEERING

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

Unit – I: Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

1. **Learning Outcomes:**

At the end of this unit, the student will be able to

- Recognize the basic issues in commercial software development.
- Summarize software lifecycle models.
- Infer Workout project cost estimates using COCOMO and schedules using PERT and GANTT charts.

Unit – II: Requirements analysis and specification

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques. axiomatic specification, algebraic specification.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify basic issues in software requirements analysis and specification.
- Develop SRS document for sample problems using IEEE 830 format.
- Develop algebraic and axiomatic specifications for simple problems.

Unit – III : Software Design

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based Vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the basic issues in software design.
- Apply the structured, object oriented analysis and design (SA/SD) technique.
- Recognize the basic issues in user interface design.

Unit – IV : Coding and Testing

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the basic issues in coding practice.
- Recognize the basic issues in software testing.
- Design test cases for black box and white box testing.

Unit – V: Software quality, reliability, and other issues

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize various methods of software quality management.
- Instruct the quality management standards ISO 9001, SEI CMM, PSP, and Six Sigma.
- Outline software quality assurance, quality measures, and quality control.
- Identify the basic issues in software maintenance, CASE support, and software reuse.

Course Outcomes:

By the end of this course students will be able to:

- Obtain basic software life cycle activity skills.
- Design software requirements specification for given problems.
- Implement structure, object oriented analysis and design for given problems.
- Design test cases for given problems.
- Apply quality management concepts at the application level.

Text Book:

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.

Reference Books:

1. Somerville, “Software Engineering”, Pearson 2.
2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
3. Jalote Pankaj, “An integrated approach to Software Engineering”, Narosa

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(20F00203) ARTIFICIAL INTELLIGENCE

Course Objectives:

- To introduce Artificial Intelligence
- To Teach about the machine learning environment
- To Present the searching Techniques for Problem Solving
- To Introduce Natural Language Processing and Perception

Unit – I: **Introduction**: What is AI, Foundations of AI, History of AI, The State of Art.

Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Philosophicalfoundations: WeakAI,StrongAI,Ethics andRisks ofAI,Agent Components,Agent Architectures, Are we going in the right direction, What if AI doessucceed.

(Chapter 1,2 and Chapter 26,27 of Text book 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Define the concept of Artificial Intelligence (L1)
- Select appropriately from a range of techniques when implementing intelligent systems. (L2)
- Apply AI techniques to real-world problems to develop intelligent systems (L3)

Unit – II: **Solving Problems by searching**: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, **Beyond Classical Search:** Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

Adversarial Search: Games, Optimal decisions in games, Alpha-Beta Pruning, Imperfect Real Time decisions, Stochastic games, Partially Observable games, State-of-the-art game programs

(Chapters 3-5 of Text book 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve basic AI based problems (L3)
- Solve strategic games between two and more agents in non-cooperative scenario (L3)
- Learn different methods to solve games. (L1)

Unit – III: Knowledge Representation and Reasoning: Propositional Logic, WumpusWorld, First Order Logic (FOL), Using FOL, Knowledge Engineering in FOL, Inference in FOL: Forward and Backward Chaining, Resolution, Ontological Engineering

Planning: Classical Planning, Planning as State-space-search, Planning graphs; Planning and Acting in Real World: Time, Schedules and Resources, Hierarchical Planning, Planning and acting in Non-deterministic domains, Multi-agent planning

(Chapters 7-12 of Text book 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply AI techniques to real-world problems (L3)
- Exhibit strong familiarity with a number of important AI techniques, including in particular search, knowledge representation, and planning and constraint management. (L1)
- Understand Ontological Engineering (L2)

Unit – IV: **Machine Learning:** ML – Definition, Supervised and Unsupervised Learning, Regression, Naive Bayes Classification, Neural Networks Data, types of data, training, development and test sets, Generalization, bias and variance, over fitting and under fitting, methods to avoid over fitting Unsupervised learning: K-means clustering

(Chapter18 in Text book 1, Chapter 4 and 6 in Text book 2)

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop an understanding what is involved in learning models from data. (L6)
- Understand a wide variety of learning algorithms (L2)
- Apply principles and algorithms to evaluate models generated from data. (L3)
- Apply the algorithms to a real-world problem. (L3)

Unit – V: Communication, Perceiving and Acting

Natural Language Processing: Introdution to NLP, Ngram Language Modelling – maximum likelihood estimation, smoothing (add-1, add-alpha, kneserney smoothing), linear interpolationText Categorization – Decision trees, Maximum entropy modelling, Perceptrons, KNN Machine Translation – Word Alignment, Statistical Machine Translation

(Chapter 22 and 23 in Text book 1, Chapter 16 in Reference book 3)

Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing 3D world, Object recognition from structural information, using vision

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, application domains

(Chapter 24 and 25 in Text book1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of natural language processing. (L2)
- Apply various tools and techniques in natural language processing. (L3)
- Understand machine translation system. (L2)
- Build their own translation model using existing tools for machine translation. (L6)

Course outcomes:

- Apply searching techniques for solving a problem (L3)
- Design Intelligent Agents (L6)
- Understanding, analysing and interpreting machine learning algorithms (L2)
- Ability to implement machine learning algorithms for problem solving (L3)
- Develop Natural Language Interface for Machines (L3)
- Summarize past, present and future of Artificial Intelligence (L2)

Text book:

1. Stuart J.Russell, Peter Norvig, " Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education,2019.
2. Thomas M. Mitchell. 1997. *Machine Learning* (1st. ed.). McGraw-Hill,Inc., USA. http://www.cs.cmu.edu/~tom/mlbook.html

References:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann,1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009):30-39.
3. Christopher D. Manning and HinrichSchütze. 1999. Foundations of statistical natural language processing. MIT Press, Cambridge, MA,USA.
4. Daniel Jurafsky and James H. Martin. 2000. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (1st. ed.). Prentice Hall PTR, USA.
5. A Course in Machine Learning by Hal Daumé III,http://ciml.info/

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(20F00204) COMPUTER NETWORKS

Course Objectives:

This course is designed to:

- Introduce the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Unit – 1: Computer Networks and the Internet

What is the Internet?, The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and their Service Models, Networks under attack, History of Computer Networking and the Internet

Learning Outcomes:

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

- Enumerate the hardware components of a computer network (L1)
- List the layers of a Computer Network (L1)
- Identify the performance metrics of a computer network (L2)

Unit – 2: Application Layer

Principles of Network Applications, The web and HTTP, File transfer: FTP, Electronic mail in the internet, DNS-The Internet's Directory Service, Peer-to-Peer Applications

Learning Outcomes:

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

- Design new applications of a computer network (L6)
- Analyze the application protocols (L4)
- Extend the existing applications (L3)

Unit – 3 :Transport Layer

Introduction and Transport-Layer Services, Multiplexing and De-multiplexing, Connectionless Transport: UDP, Principles of Reliable Data transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control

Learning Outcomes:

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

- Design Congestion control algorithms (L6)
- Select the appropriate transport protocol for an application (L2)
- Identify the transport layer services (L1)

Unit – 4 :The Network Layer

Introduction, Virtual Circuit and Datagram Networks, The Internet Protocol(IP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing

Learning Outcomes:

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

- Compare routing algorithms (L4)
- Design routing algorithms (L6)
- Extend the existing routing protocols (L3)

Unit – 5 :The Layer: Links, Access Networks, and LANs

Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request

Learning Outcomes:

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

- Compare medium access protocols (L4)
- Classify the computer networks (L3)
- Design a Data Centre for an organization (L6)

Course Outcomes:

Students will be able to :

- Identify the software and hardware components of a Computer network (L1)
- Design software for a Computer network (L6)
- Develop new routing, and congestion control algorithms (L3)
- Critique the existing routing protocols (L5)
- Explain the functionality of each layer of a computer network (L2)
- Employ the appropriate transport protocol based on the application requirements (L3)

Text Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

References:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
3. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

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(20F00205a) E – COMMERCE
(Elective-I)

Course Objectives:

- Have a general understanding of the Internet and related technologies
- Understanding of policy issues related to privacy, content selection, intellectual property rights, and establishing identity that are germane to electronic commerce.
- Capability to analyze the impact that electronic commerce is having and will likely have on key sectors of the economy and assess the strategic implications this analysis holds for an organization.
- Be able to analyze the organizational fit between strategy and technology
- Recognize and understand ways of using electronic commerce technologies to improve intra and inter-organizational processes.
- Be able to specify the development of electronic commerce capabilities in a company

UNIT - I

Electronic Commerce:-Frame work, Anatomy of E-Commerce applications, E-Commerce Consumer Applications, E-Commerce Organization Applications, Consumer Oriented Electronic Commerce: - Consumer Oriented Applications, Mercantile Process models.

Learning Outcomes:

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

- Understand the basic concepts and technologies used in the field of management information systems. (L2)
- Demonstrate an understanding of the foundations and importance of E-commerce (L1)
- Analyse the impact of E-commerce on business models and strategy (L4)

UNIT - II

Electronic Payment Systems: - Types of Electronic Payment System, Digital Token-Based, Smart Cards, Credit Cards, Risks and Electronic Payment Systems.

Learning Outcomes:

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

- Understand various approaches and methods of Payment systems (L2)
- Distinguish various issues raised in dealing the payment systems (L2)
- Assess electronic payment systems (L5)

UNIT - III

Inter Organizational Commerce and EDI:- Electronic Data Interchange, EDI in Application Business, EDI: Legal, Security and Privacy Issues, EDI and Electronic Commerce.

EDI Implementation, MIME and Value Added Networks:- Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value added networks, Internet Based EDI.

Learning Outcomes:

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

- Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other. (L1)
- Recognize and discuss global E-commerce issues (L1)
- Understand various legal security and privacy issues.(L2)

UNIT - IV

Corporate Digital Library – Dimensions of Internal EC Systems, Making a Business Case for a Document Library, Types of Digital Document, Issues behind Document Infrastructure, Corporate Data Warehouses. Advertising and Marketing - Information Based Marketing, Advertising on Internet, On-line Marketing Process, Market Research.

Learning Outcomes:

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

- Analysing branding and pricing strategies, (L4)
- Determining the effectiveness of market research (L1)
- Assessing the effects of disintermediation. (L5)

UNIT - V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.

Multimedia - Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing's, Desktop Video Conferencing.

Learning Outcomes:

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

- Understand basic concepts of Information Retrieval Systems for E-Commerce (L2)
- Demonstrate various Multimedia concepts (L1)
- Analysing the Multimedia approaches for E-Commerce concepts. (L4)

Course Outcomes:
Students will be able to :

- Identify the organizational requirements of eCommerce systems on data protection;
- Demonstrate knowledge of the factors which have impacts upon the security of eCommerce systems;
- Make realistic assessment on the security of eCommerce systems;
- Design and analyze security measures to protect organizational data against various attacks;
- Describe relevant regulations governing electronic transactions, data privacy protection, and web access.

Text Book:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson, 1996.

References:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.

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(20A00205b) OPERATION RESEARCH

(Elective – I)

Course Objectives:

To help the students in getting thorough understanding of the fundamentals of operations research and usage of linear programming problems, transportation problems, assignment models, game theory & queuing theory for various applications.

Unit - I

Introduction: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR, Linear Programming Problem (LPP), Generalized LPP- Formulation of problems as L.P.P. Solutions to LPP by graphical method (Two Variables).

Learning Outcomes:

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

- Understand the objectives of Operation Research (L2)
- Formulate the concepts of L.P.P (L3)
- Apply the solutions to various problems like L.P.P (L3)

Unit - II

LPP: Simplex method, Canonical and Standard form of LP problem, slack, surplus and artificial variables, Solutions to LPP by Simplex method, Big-M Method and Two Phase Simplex Method, Degeneracy in LPP. Concept of Duality, writing Dual of given LPP. Solutions to L.P.P by Dual Simplex Method

Learning Outcomes:

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

- Understand the concepts of various methods such as Simplex method, Canonical method, etc. (L2)
- Apply various possible solutions to the problems such as canonical and standard form of LP problem, etc.(L3)
- Analyse various approaches of the methods discussed in this Unit. (L4)

Unit - III

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel’s Approximation method. Optimality in Transportation problem

by Modified Distribution (MODI) method. Unbalanced T.P. Maximization T.P. Degeneracy in transportation problems, application of transportation problem.

Learning Outcomes:

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

- Understand the concepts of transportation problem and its related topics (L2)
- Apply various methodologies to the problems like transportation and etc. (L3)
- Evaluate the approaches of various solutions to the problems discussed in this unit.(L5)

Unit - IV

Network analysis: Introduction, Construction of networks, Fulkerson's rule for numbering the nodes, AON and AOA diagrams; Critical path method to find the expected completion time of a project, determination of floats in networks, PERT networks, determining the probability of completing a project, predicting the completion time of project; Cost analysis in networks.

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), Kendall & Lee's notation of Queuing, empirical queuing models – Numerical on M/M/1 and M/M/C Queuing models.

Learning Outcomes:

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

- Understand the way of improving customer service using Queuing theory (L2)
- Analyse how to balance the cost of providing a level of service capacity with the cost of customers waiting for services. (L4)
- Demonstrate the graphical view of a project (L1)

Unit - V

Game Theory: Definition, Pure Strategy problems, Saddle point, Max-Min and Min-Max criteria, Principle of Dominance, Solution of games with Saddle point. Mixed Strategy problems. Solution of 2X2 games by Arithmetic method, Solution of 2Xn m and mX2 games by graphical method. Formulation of games.

Sequencing: Basic assumptions, Johnson's algorithm, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing of 2 jobs on 'm' machines using graphical method.

Learning Outcomes:

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

- Understanding the significance of Game Theory. (L2)
- Analyse various ways to use game theory in everyday life for various activities like to earn or save money. (L4)
- Describe various methods to find an optimal sequence of jobs to reduce makespan.(L1)

Course Outcomes

Students will be able to :

- Identify and develop operational research models from the verbal description of the real system. (L1)
- Understand the mathematical tools that are needed to solve optimisation problems. (L2)
- Use mathematical software to solve the proposed models. (L3)
- Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering. (L1)

TEXT BOOKS:

1. Operations Research, P K Gupta and D S Hira, S. Chand and Company LTD. Publications, New Delhi – 2007

2. Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private Limited, 2006.

REFERENCE BOOKS:

1. Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi Publications Pvt. Ltd. 2016.

2. Operations Research, Paneerselvan, PHI

3. Operations Research, A M Natarajan, P Balasubramani, Pearson Education, 2005

4. Introduction to Operations Research, Hillier and Lieberman, 8th Ed., McGraw Hill

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(20F00205c) DIGITAL MARKETING

(Elective – I)

Course Objectives:

- The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilised by organisations and how its effectiveness can measured.

Unit I

Online Market space- Digital Marketing Strategy- Components -Opportunities for building Brand- Website - Planning and Creation- Content Marketing.

Learning Outcomes:

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

- Understand the objective of Digital Marketing. (L2)
- Demonstrate various components of Digital Marketing (L1)
- Explore the purpose of building website (L5)

Unit II

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors - On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement

Learning Outcomes:

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

- Understand the purpose of optimization (L2)
- Describe the search engine purpose (L1)
- Demonstrate the search engine marketing (L3)
- Analyse the search engine for the purpose of marketing (L4)

Unit III

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximising email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.

Learning Outcomes:

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

- Understand the purpose of E-Mail marketing (L2)
- Explore various benefits of mobile marketing (L5)
- Analyse the outcomes of Mobile Commerce (L4)

Unit IV

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing-Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

Learning Outcomes:

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

- Explore the opportunities for social media marketing (L5)
- Analyse the engagement marketing-building customer relationships (L4)
- Demonstrate the benefits of social media channels for social media marketing (L1)

Unit V

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

Learning Outcomes:

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

- Understand the recent trends in digital marketing (L2)
- Extract web analytics (L2)
- Determine the advantages of digital transformation (L1)

Course Outcomes:

Students will be able to :

- To examine and explore the role and importance of digital marketing in today's rapidly changing business environment. (L5)
- To focuses on how digital marketing can be utilised by organisations and how its effectiveness can measured. (L4)
- To know the key elements of a digital marketing strategy (L1)
- To study how the effectiveness of a digital marketing campaign can be measured (L2)
- To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs. (L1)

Text Books:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by VandanaAhuja ;Publisher: Oxford University Press (April 2015) ISBN-10: 0199455449;ISBN-13: 978-0199455447

References

1. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN13: 9788126566938;ASIN: 8126566930
2. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
3. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education.
4. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.

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MCA– II Sem

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(20F00205d) DATA MINING AND BUSINESS INTELLIGENCE
(Elective – I)

Course Objectives

- To be familiar with mathematical foundations of data mining tools.
- To define the importance of business intelligence.
- To Understand and implement classical models and algorithms in data warehouses and data mining
- To identify how various business intelligence systems can contribute to organizational success.
- To apply common methods used in business intelligence.
- To describe key business intelligence terms.
- To determine the relevance of data to business

Unit-I

Overview and concepts Data Warehousing and Business Intelligence: Why reporting and Analysing data, Raw data to valuable information, Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing.

Learning Outcomes:

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

- Understand the basic concepts of Data, Data Warehouse and its life cycle.(L2)
- Analyze various components of Data Warehouse (L4)
- Understand the basic concepts of Business Intelligence (L2)

Unit-II

The Architecture of BI and DW:BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP - defining schemas: Stars, snowflakes and fact constellations.

Learning Outcomes:

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

- Analyze about the operational database management and data warehouse (L4)
- Create the architecture of Data warehouse (L6)
- Applying different types of OLAP operations (L3)
- Creating the different types of schemas (L6)

Unit-III

Introduction to data mining (DM): Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process.Data Pre-processing:Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.

Learning Outcomes:

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

- Understanding and remembering the definition of data Mining and KDD task.(L2)
- Analyzing the different data mining Task (L4)
- Understanding the process of Data preprocessing and Data Cleaning (L2)

Unit-IV

Concept Description and Association Rule Mining: What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining.

Learning Outcomes:

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

- Understanding Association Rules (L2)
- Analyzing Frequent Item set Generation (L4)
- Understanding APRIORI principal, support and confidence Measures (L2)

Unit-V

Classification and Prediction:What is classification and prediction? – Issues regarding Classification and prediction:Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network. Prediction methods: Linear and nonlinear regression, Logistic-Regression. Data Mining for Business Intelligence Applications :Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc.,

Learning Outcomes:

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

- Understanding and Evaluating the Classification problem (L2)
- Evaluating the classifiers and classification Techniques (L5)
- Evaluating for selecting the best split (L5)
- Applying and evaluating the data mining approaches for various business applications. (L3)

Course Outcomes:

After completion of the course students will be able to

- Understand the theoretical underpinnings of BI and DM methodologies, architectures, techniques and algorithms. (L2)
- Conduct an audit and analysis of the BI requirements of an organisation and contribute to the planning of a BI project as part of a Knowledge Management. (L4)
- Critically evaluate and select appropriate DM facilities, algorithms/models and apply them and interpret and report the output. (L5)
- Critically appraise the design and implementation of a DM application/technology using test/sample but realistic data sets and modern tools. (L3)
- Integrate intelligent and DM elements into a BI systems development project.(L3)

Text Books:

1. Data Mining Concepts and Techniques, J. Han, M. Kamber, Morgan Kaufmann, 3rd Edition
2. Data Mining for Business Intelligence:Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", G. Shmueli, N.R. Patel, P.C. Bruce, 2nd EditionWiley India

Reference Books:

1. Data mining: Concepts, models, methods and algorithms, Mehmed Kantardzic, 3rd Edition, John Wiley &Sons Inc.
2. Data Mining: Introductory and Advanced Topics, M. Dunham, Pearson Education, 2006.

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(20F00205e) INTERNET OF THINGS

(Elective – I)

Course Objectives:

- Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.
- Familiarize the student with application program interfaces for IoT.
- Enable students to create simple IoT applications.

UNIT I

Overview of IoT:

The Internet of Things: An Overview, The Flavor of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?

Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.

Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain IoT architecture. [L2]
- Interpret the design principles that govern connected devices [L2]
- Summarize the roles of various organizations for IoT [L2]
- Understand the significance of Prototyping [L2]

UNIT II

Embedded Devices:

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the basics of microcontrollers [L2]
- Outline the architecture of Arduino [L2]
- Develop simple applications using Arduino [L3]
- Outline the architecture of Raspberry Pi [L2]
- Develop simple applications using Raspberry Pi [L3]
- Select a platform for a particular embedded computing application [L3]

UNIT III

Communication in the IoT:

Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols

Prototyping Online Components:

Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

Learning Outcomes:

After completing this Unit, students will be able to

- Interpret different protocols and compare them [L2]
- Select which protocol can be used for a specific application [L3]
- Utilize the Internet communication protocols for IoT applications [L3]
- Select IoT APIs for an application [L3]
- Design and develop a solution for a given application using APIs [L6]
- Test for errors in the application [L4]

UNIT IV

Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups.

Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.

Learning Outcomes:

After completing this Unit, students will be able to

- Plan the business model [L6]
- Predict the market value [L5]
- Assemble the product [L6]

UNIT V

Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software.

Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Learning Outcomes:

After completing this Unit, students will be able to

- Employ the manufacturing techniques [L4]
- Adapt the Ethics [L6]

Course outcomes:

At the end of the course, students will be able to

- Choose the sensors and actuators for an IoT application (L1)
- Select protocols for a specific IoT application (L2)
- Utilize the cloud platform and APIs for IoT applications (L3)
- Experiment with embedded boards for creating IoT prototypes (L3)
- Design a solution for a given IoT application (L6)
- Establish a startup [L4]

Text Book:

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
2. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Reference sites:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/

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(20F00206a) CLOUD COMPUTING
(Elective – II)

Course Objectives:

- To understand the need of Cloud Computing.
- To develop cloud applications.
- To demonstrate design the architecture for new cloud application.
- To teach how to re-architect the existing application for the cloud.

Unit-1

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Platforms : Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity & and Access Management services, Open Source Private Cloud software.

Learning Outcomes:

After completing this Unit, students will be able to

- Understand the Cloud, characteristics and models.(L2)
- Classify different models, different technologies in cloud.(L2)
- Summarize the Services and Platform of cloud.(L2)

Unit-2

Hadoop&MapReduce: Apache Hadoop, HadoopMapReduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics : Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

Learning Outcomes:

After completing this Unit, students will be able to

- Validate Hadoop and MapReduce. (L6)
- Design and build the application of the cloud.(L6)
- Understand the basics of Python Programming and its concepts. (L2)

Unit-3

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP,Document Storage App, MapReduce App, Social Media Analytics App.

Learning Outcomes:

After completing this Unit, students will be able to

- Understand how the python concepts and its packages can apply for Cloud Computing (L2)
- Select different cloud services from different vendors (L2)
- Employ Python language to access cloud services (L3)

Unit-4

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data, Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

Learning Outcomes:

After completing this Unit, students will be able to

- Identify the characteristics of datasets (L1)
- Compare trivial data and big data for various applications related to Multimedia Cloud. (L4).
- Recognize and implement various ways of selecting suitable model parameters for cloud applications.(L3)

Unit-5

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity & Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven –step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age : Introduction, Basic concepts of Organizational Readiness, Drivers for changes : A frame work to comprehend the competitive environment , common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing : Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations , Special Topics

Learning Outcomes:

After completing this Unit, students will be able to**:**

- Understand various security services for cloud computing applications (L2)
- Apply cloud computing concepts for providing solutions to real time problems (L4)
- Explore various legal issues in Cloud Computing for privacy and security (L3)

Course Outcomes:

At the end of the course, students will be able to

- Outline the procedure for Cloud deployment (L4)
- Investigate different cloud service models and deployment models (L4)
- Compare different cloud services. (L4)
- Design applications for an organization which use cloud environment. (L6)
- Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data. (L2)

Text Books:

1. Cloud computing A hands-on Approach‖ By ArshdeepBahga, Vijay Madisetti, Universities Press, 2016

2.Cloud Computing Principles and Paradigms: By Raj kumarBuyya, James Broberg, AndrzejGoscinski, wiley, 2016

References:

1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola,SThamaraiSelvi, TMH

2. Cloud computing A hands-On Approach by ArshdeepBahga and Vijay Madisetti.

3. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, TataMcGraw Hill, rp2011.

4. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 2010.

5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.

6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press

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(20F00206b) FORMAL LANGUAGES AND AUTOMATA THEORY
(Elective – II)

Course Objectives:

This course is designed to:

- Introduce languages, grammars, and computational models
- Explain the Context Free Grammars
- Enable the students to use Turing machines
- Demonstrate decidability and un-decidability for NP Hard problems

UNIT – I: Finite Automata

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

Learning Outcomes:

After completing this Unit, students will be able to**:**

- Distinguish DFA and NFA.
- Construct DFA for an input string.
- Perform minimization of Automata.
- Compare Moore and Mealy Machines.

UNIT – II: Regular Expressions

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

Learning Outcomes:

After completing this Unit, students will be able to**:**

- Construct regular expression for the given Finite Automata.
- Construct finite automata for the given regular expression.
- Apply closure properties on regular expressions.

UNIT – III: Context Free Grammars

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

Learning Outcomes:

After completing this Unit, students will be able to**:**

- Define Context Free Grammar.
- Distinguish Chomsky Normal Form and Greibach Normal form.
- Apply Pumping Lemma theorem on Context Free Grammar.

UNIT – IV: Pushdown Automata

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

Learning Outcomes:

After completing this Unit, students will be able to**:**

- List the applications of Pushdown Automata.
- Construct Pushdown Automata for context free grammar.

UNIT – V: Turing Machine

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine.

Decidable and Undecidable Problems: NP, NP-Hard and NP-Complete Problems.

Learning Outcomes:

After completing this Unit, students will be able to**:**

- List types of Turing Machines.
- Design Turing Machine.
- Formulate decidability and undesirability problems.

Course Outcomes:

Students will be able to:

- Explain formal machines, languages and computations (L2)
- Design finite state machines for acceptance of strings (L6)
- Develop context free grammars for formal languages (L3)
- Build pushdown automata for context free grammars (L3)
- Apply Turing machine for solving problems (L3)
- Validate decidability and undecidability (L6)

TEXT BOOKS:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P. Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007.

REFERENCE BOOKS:

1. Formal Language and Automata Theory, K.V.N. Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.
3. Theory of Computation, V. Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.

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(20f00206d) COMPUTER GRAPHICS
(Elective – II)

Course Objectives:

- To familiarize with the use of the components of a graphics system.
- To learn how to draw the line, circle etc., from preliminary element (pixel).
- To learn the basic principles of 3-dimensional computer graphics.
- To provide an understanding of how to scan convert the basic geometrical primitives and how to transform the shapes to fit them as per the picture definition.
- To provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
- To be able to apply computer graphics concepts in the development of computer games, information visualization, and in business applications.

UNIT I: OVERVIEW OF COMPUTER GRAPHICS SYSTEM

Over View of Computer Graphics System – Video display devices – Raster Scan and random scan system – Input devices – Hard copy devices.

Learning Outcomes:

At end of the chapter, the student will be able to

- Understand the overview of computer graphics.
- Classify the Input devices.
- Distinguish the difference between raster scan and random scan system.

UNIT II: OUTPUT PRIMITIVES AND ATTRIBUTES

Drawing line, circle and ellipse generating algorithms – Scan line algorithm – Character Generation – attributes of lines, curves and characters – Antialiasing.

Learning Outcomes:

At end of the chapter, the student will be able to

- Analyse output primitives and attributes.
- Design algorithms based on output.

UNIT III: TWO DIMENSIONAL GRAPHICS TRANSFORMATIONS AND VIEWING:
Two-dimensional Geometric Transformations – Windowing and Clipping – Clipping of lines and clipping of polygons.

Learning Outcomes:

At end of the chapter, the student will be able to

- Draw a two dimensional graphics.
- Examine the clipping of polygon.

UNIT IV: THREE DIMENSIONAL GRAPHICS AND VIEWING

Three-dimensional concepts – Object representations- Polygon table, Quadric surfaces, Splines, Bezier curves and surfaces – Geometric and Modelling transformations – Viewing - Parallel and perspective projections.

Learning Outcomes:

At end of the chapter, the student will be able to

- Draw a three dimensional graphics.
- Understand the Quadric surfaces and polygon table.
- Learn how to view surfaces.

UNIT V: REMOVAL OF HIDDEN SURFACES
Visible Surface Detection Methods – Computer Animation.

Learning Outcomes:

At end of the chapter, the student will be able to

- Understand different types of detection methods.
- Compare various computer animation techniques.

Course Outcomes:

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

- List the basic concepts used in computer graphics.
- Implement various algorithms to draw, scan, fill, transform and clipping.
- Identify the importance of viewing and projections.
- Explore the fundamentals of animation, virtual reality and its related technologies.
- Extend geometric transformations from 2D to 3D and object modelling methods.

TEXT BOOK

1. Hearn, D. and Pauline Baker, M., Computer Graphics (C-Version), 2nd Edition, Pearson Education.

REFERENCES

1. Neuman, W.M., and Sproull, R.F., Principles of Interactive Computer Graphics, McGraw Hill., 1979.
2. Roger, D.F., Procedural elements for Computer Graphics, Mc Graw Hill, 1985.
3. Asthana, R.G.S and Sinha, N.K., Computer Graphics, New Age Int. Pub., 1996.
4. Floey, J.D., Van Dam, A, Feiner, S.K. and Hughes, J.F, Computer Graphics, PearsonEducation, 2001.

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(20F00206e) DESIGN AND ANALYSIS OF ALGORITHMS
(Elective – II)

Course Objectives:

- To demonstrate the importance of algorithms in computing.
- To explain the analysis of algorithms
- To illustrate the method of finding the complexity of algorithms
- To explain the advanced algorithm design and analysis techniques.
- To introduce special classes of algorithms NP – completeness and the classes P and NP.

UNIT I

Introduction: Algorithm, Algorithm specification, Performance analysis.

Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Understand growth functions and Asymptotic notations
- Derive the recurrence equation for running time of a given algorithm and solve.
- Understand the general principle of Divide and Conquer and identify suitable problems to apply Divide and Conquer paradigm
- Analyze the time complexities of Binary Search, Finding the maximum and minimum, and Strassen's matrix multiplication algorithms.
- Compare complexities of Merge sort, Quick sort and Selection sort techniques

UNIT II

Greedy Method: General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths.

Dynamic programming: General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, the traveling salesperson problem.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Understand optimization problems and the general principles of Greedy and Dynamic Programming paradigms to solve them.

- Apply subset and ordering paradigms of greedy strategy for Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, and finding Single-source shortest paths.
- Define Principle of optimality with examples.
- Differentiate Greedy and Dynamic programming paradigms.
- Apply dynamic programming strategy for Optimal binary search trees, Multistage graphs, All-pairs shortest paths, 0/1 knapsack, the traveling salesperson problem.

UNIT III

Basic Traversal and Search Techniques: Techniques for binary trees, Techniques for Graphs, Connected components and Spanning trees, Bi-connected components and DFS

Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Define solution space tree.
- Illustrate graph search strategies : BFS, DFS and D-Search .
- Determine articulation points and bi-connected components in a given graph using Depth First Spanning Trees.
- Demonstrate the recursive and iterative backtracking algorithms.
- Apply backtracking strategy to solve N – queens problem, Sum of subsets problem and Knapsack problem.
- Apply backtracking to solve m-colorability optimization problem.
- Determine all possible Hamiltonian Cycles in a graph using backtracking algorithm.

UNIT IV

Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations.

Lower Bound Theory: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Illustrate the state space search techniques; FIFO, LIFO and LC.
- Analyze the advantage of bounding functions in Branch and Bound technique to solve the Travelling Salesperson problem.
- Compare the LC and FIFO branch and bound solutions for 0/1 knapsack problem.
- Understand lower bound theory concept in solving algebraic problems.

UNIT V

NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being in P, Cook‘s Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

At the end of the unit, students will be able to:

- Differentiate deterministic and Non-deterministic algorithms.
- Define P, NP, NP –hard and NP-complete classes of problems.
- Understand the satisfiability problem.
- State Cook’s Theorem.
- Understand the reduction techniques.

Course Outcomes

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

- Determine the time complexity of an algorithm by solving the corresponding recurrence equation
- Apply the Divide and Conquer strategy to solve searching, sorting and matrix multiplication problems.
- Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.
- Apply Backtracking technique for solving constraint satisfaction problems.
- Analyze the LC and FIFO branch and bound solutions for optimization problems, and compare the time complexities with Dynamic Programming techniques.
- Define and Classify deterministic and Non-deterministic algorithms; P, NP, NP –hard and NP-complete classes of problems.

Text Books

1. Ellis Horowitz, SartajSahni and Rajasekaran, “Fundamentals of Computer Algorithms”, 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and HimanshuBhalchandra Dave, “Design and Analysis of Algorithms”, Second Edition, Pearson Education.

References

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
4. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

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(20F00207) OPERATING SYSTEMS & COMPUTER NETWORKS LABORATORY

Course Objectives:

- To familiarize students with the UNIX environment
- To enhance the knowledge with concept of Sockets for doing network programing
- To elucidate the process management and scheduling and memory management.
- To explain the working of an OS as a resource manager, file system manager, process manager, memory manager, and page replacement tool.
- To provide insights into system calls, file systems and deadlock handling.

List of Experiments

1. Practicing of Basic UNIX Commands.
2. Write programs using following UNIX operating system calls
   Fork, exec, getpid, exit, wait, close, stst, opendir and readdir
3. Implementation of a socket program for Echo/Ping/Talk commands
4. Creation of a Socket between two Computers and Enable File Transfer between them.
   a. TCP b. UDP
5. Implementation of TELNET. (Remote Login)
6. Assume that there are five jobs with different weights ranging from 1 to 5. Implement round robin algorithm with time slice equivalent to weight.
7. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
8. Simulate how parent and child processes use shared memory and address space.
9. Simulate producer and consumer problem using threads.
10. Simulate Paging Technique of memory management
11. Simulate Bankers Algorithm for Dead Lock avoidance and prevention
12. Simulate all File Organization Techniques
    a) Single level directory b) Two level c) Hierarchical d) DAG

Course Outcomes:

- Implement Socket programming (L3).
- Implement Bankers Algorithms to Avoid and prevent the Dead Lock (L3).
- Evaluate Page replacement algorithms (L5).
- Illustrate the file organization techniques (L4).
- Illustrate shared memory process (L4).
- Design new scheduling algorithms (L6)

Reference Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", EighthEdition, John Wiley.
2. "UNIX Network Programming", Richard Stevens, Printice hall, 3rd Edition.
3. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009,Pearson Education
4. Andrew S Tanenbaum "Modern Operating Systems", Second Edition, PHI.
5. S. Haldar, A.A. Aravind, "Operating Systems", Pearson Education.
6. B.L.Stuart, "Principles of Operating Systems", Cengage learning, India Edition.2013-2014
7. A.S.Godbole "Operating Systems", Second Edition, TMH.
8. P.C.P. Bhatt, "An Introduction to Operating Systems", PHI.

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(20F00208) SOFTWARE ENGINEERING LABORATORY

Course Objectives:

- To Learn and implement the fundamental concepts of software Engineering.
- To explore functional and non functional requirements through SRS.
- To practice the various design diagrams through appropriate tool.
- To learn to implement various software testing strategies.

List of Experiments:

1 Draw the Work Breakdown Structure for the system to be automated

2 Schedule all the activities and sub-activities Using the PERT/CPM charts

3 Define use cases and represent them in use-case document for all the stakeholders of the system to be automated

4 Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated

5 Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause & Effect Diagram)

6 Define Complete Project plan for the system to be automated using Microsoft Project Tool

7 Define the Features, Vision, Bussiness objectives, Bussiness rules and stakeholders in the vision document

8 Define the functional and non-functional requirements of the system to be automated by using Usecases and document in SRS document

9 Define the following tracebility matrices :
   1. Usecase Vs. Features
   2. Functional requirements Vs.Usecases

10 Estimate the effort using the following methods for the system to be automated:
   1. Function point metric
   2. Usecase point metric

11 Develop a tool which can be used for quantification of all the non-functional requirements

12 Write C/C++/Java/Python program for classifying the various types of coupling.

13 Write a C/C++/Java/Python program for classifying the various types of cohesion.

14 Write a C/C++/Java/Python program for object oriented metrics for design proposed Chidamber and kremer . (Popularly called as CK metrics)

15 Convert the DFD into appropriate architecture styles.

16 Draw complete class diagram and object diagrams using Rational tools

17 Define the design activities along with necessary artifacts using Design Document.

18 Reverse Engineer any object-oriented code to an appropriate class and object diagrams.

19 Test a piece of code which executes a specific functionality in the code to be tested and asserts a certain behavior or state using Junit.

20 Test the percentage of code to be tested by unit test using any code coverage tools

21 Define an appropriate metrics for at least 3 quality attributes for any software application of your interest.

22 Define a complete call graph for any C/C++ code. (Note: The student may use any tool that generate call graph for source code)

Unit Outcomes

Student is able to

- Acquaint with historical and modern software methodologies
- Understand the phases of software projects and practice the activities of each phase
- Practice clean coding
- Take part in project management
- Adopt skills such as distributed version control, unit testing, integration testing, build management, and deployment

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(20F00209) ARTIFICIAL INTELLIGENCE LABORATORY

Course Objectives:

- To teach the methods of implementing algorithms using artificial intelligence techniques.
- To illustrate search algorithms.
- To demonstrate building of intelligent agents.

List of Experiments:

1. The missionaries and cannibals problem is usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place. This problem is famous in AI because it was the subject of the first paper that approached problem formulation from an analytical viewpoint (Amarel, 1968).
   a. Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space.
   b. Implement and solve the problem optimally using an appropriate search algorithm.

2. Write a Program to find the solution for travelling salesman Problem.

3. Write a program to solve 8 Puzzle problem (with manhattan distance) using A* search.

4. Write a program to solve 8 puzzle problem using RBFS. Generate random puzzles and compare the performance of RBFS with A* search. What do you observe?

5. Generate a large number of 8-puzzle and 8-queens instances and solve them (where possible) by hill climbing (steepest-ascent and first-choice variants), hill climbing with random restart, and simulated annealing. Measure the search cost and percentage of solved problems and graph these against the optimal solution cost. Comment on your results.

6. Solve Tic-tac toe problem using Min-max algorithm.
7. Solve Tic-tac toe problem using alpha-beta pruning. Compare with min-max algorithm and give your comments.

8. Assume that you are organising a party for N people and have been given a list L of people who, for social reasons, should not sit at the same table. Furthermore, assume that you have C tables (that are infinitly large).

Write a function layout(N,C,L) that can give a table placement (ie. a number from 0 : : :C -1) for each guest such that there will be no social mishaps.

For simplicity we assume that you have a unique number 0 .....N-1 for each guest and that the list of restrictions is of the form [(X,Y), ...] denoting guests X, Y that are not allowed to sit together. Answer with a dictionary mapping each guest into a table assignment, if there are no possible layouts of the guests you should answer False.

9. Implement Linear Regresion and Logistic Regression from scratch, without using any libraries. Use any simple open data sets available for this experiment. For eg, Fish market dataset available in www.kaggle.com.

10. Take Large Movie Review Dataset v1.0 (http://ai.stanford.edu/~amaas/data/sentiment/) released by stanford. It is sentiment dataset labelled positive/negative for movie reviews, with a training set of 25000 reviews and test set of another 25000 datasets. On this dataset, train the following algorithms. Present the results using precision, recall and F-measures.

1. Logistic Regression
2. K Nearest Neighbor
3. Naive Bayes Classifier
4. SVM
5. 1 Basic Feedforward Network
5. 2 Using Recursive Neural Network (subject to the availability of GPU machines)

Implement above algorithms using Sci-kit learn or Pytorch based on requirement.

First, report the results without development (tuning) set. Later, report the results by taking a portion (10k records) of test-data set randomly as development set. Use this for setting hyper parameters of your algorithms. What difference do you observe with/without tuning?

11. Build a bot which provides all the information related to your college. You may use Amazon Lex or Pandora bots for the same.

Course Outcomes:

- Implement search algorithms (L3)
- Solve Artificial intelligence problems (L3)
- Design chatbot and virtual assistant (L6)

References:

1. Pytorch:
   https://pytorch.org/
   https://github.com/pytorch

2. Scikit-learn:https://scikit-learn.org/stable/
   https://github.com/scikit-learn/scikit-learn
3. Stuart J.Russell, Peter Norvig, " Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

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(20F00210) COMMUNICATION SKILLS

(Mandatory Audit Course – 1)

Semester - II

Course Objectives:

- To learn the four language skills – Listening, Speaking, Reading and Writing; critical thinking skills to students.
- To enable students comprehend the concept of communication.
- To help students cultivate the habit of Reading and develop their critical reading skills.

UNIT I: Listening: Barriers of Listening skill-Approaches to Listening –How to improve Listening exercises. Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills – Public speaking- Expressing Techniques.

Learning Outcomes:

At the end of the Unit, students should be able to:

- Understand the importance of listening skills (L2)
- Evaluate the listening exercises (L5)
- Know the importance of presentation skills (L1)

UNIT II: Reading: Kinds of Reading – Causes of reading difficulties – Reading strategies – exercises. Writing: Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

Learning Outcomes:

At the end of the Unit, students should be able to:

- Understand the importance of reading skills (L2)
- Evaluate the writing of essay, reports, letters, articles (L5)
- Apply reading strategies for better reading (L3)

UNIT III: Communication: Modes of Communication- Barriers – Interpersonal skills – Negotiation skills – Non- Verbal communication - Etiquettes.

Learning Outcomes:

At the end of the Unit, students should be able to:

- Understand various modes of communication (L2)
- Understand interpersonal skills (L2)
- Understand negotiation skills (L2)

UNIT IV: Group Dynamic skills: Group Discussion – Team building & Team work – Be a manager or leader – Decision making – creativity – Time & Stress management skills.

Learning Outcomes:

At the end of the Unit, students should be able to:

- Understand time and stress management skills (L2)
- Explain how to build team and team work (L6)
- Analyse the responsibilities of manager or leader (L4)

UNIT V: Interview sills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview _ Mock Interview _ Quick Tips.

Learning Outcomes:

At the end of the Unit, students should be able to:

- Understand how to prepare CV. (L2)
- Understand Interview tips (L2)
- Use Mock interview results for the further improvement.(L3)

Course Outcomes: at the end of the course, students will be able to -

- Understand and apply knowledge of human communication and language processes as they occur across various contexts. (L2)
- Evaluate key theoretical approaches used in the interdisciplinary field of communication (L5)
- Apply research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication. (L3)
- Use, find and evaluate primary academic writing associated with the communication discipline. (L3)
- Communicate effectively orally and in writing.(L6)

Text Books & Reference Books:

1. Sanghi, Seema, Improve your communication skills. 2nd edition.
2. Burnard, Philip. Interpersonal skills Training: A source book of activities. 2005.
3. Ashley, Roderic. How to enhance your employability. 1998.
4. Dr. Alex, K. Soft sill: know yourself &Know the world. 2010.
5. Cornerstone. Developing softskills.4th edition 2005.
6. Jones, Daniel. An outline of English phonetics.
7. Aggarwal, Rohini. Business communication and Organization & Management.
8. Grath. E.H. Basic Managerial skills for all.
9. Maxwell, John C. Developing the leader within you.

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(20F00301) WEB &OOA DESIGN

Course Objectives:

- To illustrate the basic concepts of object-oriented programming and java.
- To explain different client side and server side technologies.
- To familiarize the tags of HTML.
- To connect XHTML, JavaScript, Servlet Programming, and Java Server Pages.
- To explain object-oriented software design.
- To constructmodeling using UML diagrams.

Unit-I

Introduction to OOP and Java Fundamentals: Object Oriented Programming, Abstraction, objects and classes, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, Compilation. Fundamental Programming Structures in Java, Defining classes in Java, constructors, methods, access specifiers, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Use Java variables, data, expressions and arrays. (L3)
- Build simple Java applications.(L3)

Unit – II

Web clients, web servers, an introduction to HTML, HTML's History and versions, Basic XHTML syntax and semantics, some fundamental HTML elements, relative URLs, Lists, Tables, frames, forms, defining XHTML's abstract syntax: XML, creating HTML documents.

Introduction to cascading style sheets, cascading style sheet features, CSS core syntax, style sheets and HTML, style rule cascading and inheritance, text properties.

Learning Outcomes:

At end of the chapter, the student will be able to:

- List HTML tags. (L1)
- Explain the syntax and semantics of HTML Document. (L2)
- Apply style sheets to web pages.(L3)
- Select the type of style sheet.(L1)

Unit – III

History and version of JavaScript, introduction to JavaScript, JavaScript in prospective, Basic syntax, variables and Data types, statements Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers.

Servlet architecture Overview, A "Hello World" servlet, servlets generating Dynamic content, servlet life cycle, parameter data, sessions, cookies, URL rewriting.

Introduction to JavaServer Pages, JSP and servlets, running JSP applications, basic JSP, java Beans classes and JSP, Tag Libraries and files.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Describe the functionality of a JavaScript. (L2)
- Practice Servlet Programming.(L3)
- Design Java Server Pages.(L6)
- Integrate Client and Server side programming.(L6)

Unit-IV

Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Recognize basic issues of object-orientation. (L2)
- Identify class relations from problem statements. (L4)
- Construct basic principles of object-orientation. (L6)

Unit-IV

UML and Structure diagrams:
The Unified Modeling Language, Class diagrams, Object diagrams, Package diagrams, Component diagrams, Deployment diagrams, Composite Structure diagrams.

Behavior and Interaction diagrams:

Use case diagrams, Activity diagrams, State Machine diagrams, Sequence diagrams, Communication diagrams, Interaction overview diagrams, Timing diagrams.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Describe the basic syntax and semantics of UML. (L2)
- Design class diagram and object-diagrams. (L6)
- Design Usecase and activity diagrams. (L6)
- Develop sequence diagram for any given use case. (L3)

Course Outcomes:

- Find the purpose of different HTML tags.(L1)
- Apply CSS to HTML web pages.(L3)
- Develop JavaScript to validate the fields in he given page. (L3)
- Design HTML Documents, Java Server pages and Servlets.(L6)
- Analyse the problem from object oriented perspective. (L4)
- Outline the requirements of the problem. (L4)
- Develop UML diagrams. (L3)

Text Books:

1. Herbert Schildt, ―Java The complete reference, 11th Edition, McGraw Hill Education, 2019.
2. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, 2007.
3. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, Pearson Education, 2007.

References:

1."The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12th Impression, 2012.
2. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
3. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, 3rd Edition, Pearson, 2009
4. Ralph Moseley and M. T. Savaliya, "Developing Web Applications" Wiley-India,2011.
5. Joel Sklar," Web Design Principles", 5th Edition, Cengage Learning, 2012.
6. P.J. Deitel& H.M. Deitel, "Internet and World Wide Web How to program", 4th Edition, Pearson, 2008.

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(20F00302) BIG DATA ANALYTICS

Course Objectives:

- To introduce the concept and challenges of big data
- To teach students skills and tools to manage and analyze the big data.
- To illustrate the process of data gathering from a range of data sources.

UNIT- I

Introduction to Big Data. What is Big Data? Why Big Data is Important. Meet Hadoop Data, Data Storage and Analysis, Comparison with Other Systems, Grid Computing. A brief history of Hadoop. Apache Hadoop and the Hadoop Ecosystem. Linux refresher, VMWare Installation of Hadoop.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Identify the characteristics of datasets (L1)
- Compare trivial data and big data for various applications. (L4).
- Recognize and implement various ways of selecting suitable model parameters.(L3)

UNIT-II

The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model. Parallel copying with distcp, keeping an HDFS cluster balanced.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Understand and apply scaling up Hadoop techniques and associated computing techniques and technologies.(L3)
- Find suitable data models. (L1)

UNIT-III

Introduction. Analyzing data with Unix tools. Analyzing data with Hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MRUnit. Running a job in local job runner. Running on a cluster, Launching a job. The MapReduce WebUl.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.(L3)
- Integrate machine learning libraries and mathematical and statistical tools with modern technologies like Hadoop and mapreduce.(L6)

UNIT-IV

Classic MapReduce. Job submission. Job Initialization. Task Assignment. Task execution, Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. Map Reduce Types. Input formats. Output formats. Sorting. Map side and Reduce side joins.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Understand and demonstrate advanced knowledge of statistical data analytics as applied to large data sets (L3)
- Employ advanced statistical analytical skills to test assumptions, and to generate and present new information and insights from large datasets (L3)

UNIT-V

The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. Hive QI. Hbasics. Concepts. Implementation. Java and Map reduce clients. Loading data, web queries.

Learning Outcomes:

At end of the chapter, the student will be able to:

- Learn Hive Services (L1)
- Implement Map Reduce (L3)

Course Outcomes:

- Understand the concept and challenge of big data and why existing technology is inadequate to analyze the big data. (L2)
- Collect, manage, store, query, and analyze various form of big data. (L4)
- Apply large-scale analytics tools to solve some open big data problems. (L3)
- Understand the impact of big data for business decisions and strategy.(L2)
- Design Big data applications (L6)

Text Books:

1. Tom White, Hadoop, "The Definitive Guide", 3rd Edition, O'Reilly Publications, 2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Thomas Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH,2012.

References:

1. Bart baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley publications.
2. Howard Wen, "Big Ethics for Big Data", O'Reilly Media

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(20F00303) DEV OPS & AGILE PROGRAMMING

Course Objectives:

- To give strong knowledge of Agile practices
- To give strong foundation of applications of DevOps
- To give strong foundation of development and its operations
- To give strong foundation of the source code management

Unit -I

Why Agile? , How to be Agile, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value.

Practicing XP-Thinking, Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

Learning Outcomes:

At the end of the unit, students will be able to:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.

Unit- II

Releasing-Done Done, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

Planning-Vision, Release Planning, Risk Management, Iteration Planning, Stories, Estimating.

Learning Outcomes:

At the end of the unit, students will be able to:

- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Able to demonstration of agile practices.

Unit- III

Developing-Incremental Requirements, Customer Tests, Test- Driven Development, Refactoring, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

Learning Outcomes:

At the end of the unit, students will be able to:

- Show how agile approaches can be scaled up to the enterprise level.
- Able to develop real time applications
- Able to design and apply the test cases.

Unit -IV

DEIFINITION & PURPOSE OF DEVOPS: Introduction to DevOps - DevOps and Agile, Minimum Viable Product - Application Deployment - Continuous Integration - Continuous Delivery

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand the basics of Dev Ops
- Able to develop an application and its deployment
- Know the purpose of continuous integration and continuous delivery

Unit -V

CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING): CAMS – Culture - CAMS – Automation - CAMS – Measurement - CAMS – Sharing - Test-Driven Development - Configuration Management - Infrastructure Automation - Root Cause Analysis – Blamelessness - Organizational Learning.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand the basics and need of Culture, Automation, Measurement and Sharing
- Understand the test-driven development
- Know the purpose of configuration management
- Know the purpose of organizational learning.

Course Outcomes:

On completion of this course, the students will be able to

- Understand the traditional software development.
- Learn the rise of agile methodologies.
- Define and design purpose of DevOps
- Understand applied DevOps.
- Learn real world applications of DevOps.
- Understand its practical examples.

Text Books:

1. James Shore and Shane Warden, " The Art of Agile Development", O'REILLY, 2007.
2. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices" , PHI, 2002.
3. The DevOps Handbook - by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
4. What is DevOps? - by Mike Loukides
5. The DevOps Handbook - by John Willis, Patrick Debois, Jez Humble, Gene Kim.
6. DevOps: A Software Architect's Perspective - by Len Bass, Ingo Weber, Liming Zhu.

References:

1. Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012.
2. Bhuvan Unhelkar, "The Art of Agile Practice: A Composite Approach for Projects and Organizations", CRC Press.
3. Jim Highsmith, "Agile Project Management", Pearson education, 2004.

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(20F00304a) SOFTWARE ARCHITECTURE & DESIGN PATTERNS
Elective - III

Course Objectives:

The main objective is to introduce the student to architecture of software and design Patterns. Upon completion of this course the student will get an idea on envisioning architecture, creating architecture, analysing architecture.

- Understand the creational and structural patterns.
- Be capable of applying his knowledge to create an architecture for given application.
- Be able to explain the role of analyzing architectures.
- Be able to identify different structural patterns.

UNIT- I Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Learning Outcomes:

At the end of the unit, students will be able to:

- Define software architecture (L1).
- Demonstrate architecture business cycle (L2).
- Adapt the knowledge of various architectural styles (L1).

UNIT -II Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Learning Outcomes:

At the end of the unit, students will be able to:

- Illustrate various phases of ATAM (L4).
- Experiment with different case studies (L3).
- Illustrate various phases of CBAM (L4).

UNIT-III Patterns: Pattern Description, Organizing catalogs, role in solving design problems ,Selection and usage. Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight, Proxy.

Learning Outcomes:

At the end of the unit, students will be able to:

- Identify design patterns (L3).
- Understand the purpose of design patterns (L2).
- Examine the pattern for spelling and hyphenation (L4).

UNIT- IV Behavioral patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

Learning Outcomes:

At the end of the unit, students will be able to:

- Define behavioural patterns (L1).
- Demonstrate object scope behavioural patterns (L2).
- Justify description for different types of behavioural patterns (L5).

UNIT -V Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

Learning Outcomes:

At the end of the unit, students will be able to:

- Identify behavioural patterns (L6).
- Justify different types of behavioural patterns (L5).
- Determine community for patterns (L4).

Course Outcomes:

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

- Understand the architecture, creating it and moving from one to any, different structural patterns.
- Analyze the architecture and build the system from the components.
- Design creational and structural patterns.
- Learn about behavioral patterns.
- Do a case study in utilizing architectural structures.

Text Books:

1. Len Bass,PaulClements&RickKazman, Software Architecture in Practice, 2nd Edition, Pearson Education, 2003.
2. Erich Gamma, Design Patterns, 1st Edition, Pearson Education,1995.

References:

1. Luke Hohmann , Beyond Software architecture, Addison wesley, 2003.
2. David M. Dikel, David Kane and James R. Wilson, Software architecture, 1st Edition, Prentice Hall,2001
3. F.Buschmann , Pattern Oriented Software Architecture, Wiley&Sons,1st Edition,2001
4. Webreferences :http://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Architecture/Design_Patterns.

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(20F00304b) CYBER SECURITY

Elective - III

Course Objectives:

- Learn fundamentals of cryptography and its application to networksecurity.
- Understand network security threats, security services, andcountermeasures.
- Acquire background Knowledge on well-known network security protocols such as Kerberos, IPSec and SSL.
- Understand software vulnerability and Access control in theOS
- Acquire background on hash functions, authentication, firewalls, intrusion detection techniques.
- Obtain background for original research in network security, especially wireless network and cell phonesecurity.

UNIT-I

Introduction: Cyber attacks, Defense Strategies and Techniques
Mathematical background for Cryptography: Modulo arithmetic, Thegreatest common divisor, Useful Algebraic Structures, Chinese RemainderTheorem
Basics of Cryptography: Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties

Secrete Key Cryptography: Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

Learning Outcomes:

At the end of the unit, students will be able to:

- Identify different types of cyber-Attacks (L1)
- Discover cryptography techniques (L2)
- Differentiate symmetric and asymmetric cryptography (L4)

UNIT-II

Public Key Cryptography: RSA Operations, Performance, Applications, Practical Issues
Cryptographic Hash: Properties, Construction, Applications and Performance
Discrete Logarithm and its applications: Diffie-Hellman Parameters, Other applications
Elliptic Curve Cryptography and Advanced Encryption Standard: Elliptic Curve Cryptography, Applications, Practical Considerations, Advanced Encryption Standard(AES).

Learning Outcomes:

At the end of the unit, students will be able to:

- Discover Public-key cryptography principles (L1)

- Understand the applications of Hash functions (L2)
- Identify the basic mathematics that helps to understand the applications towards Cryptography. (L4)

UNIT-III

Key Management: Digital Certificates, Public key Infrastructure, Identity based Encryption, **Authentication-I**: One-way Authentication, Mutual Authentication, Dictionary attacks, **Authentication-II**: Centralized Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics

Security at the Network Layer: Security at Different Layers: Pros and Cons, IP Sec, Internet Key Exchange(IKE) protocol, Security policy and IPSec, Virtual Private Networks

Security at the Transport Layer: Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, Open SSL.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand key management related to authentication functions(L2)
- Differentiate One-way and Mutual Authentication(L2)
- Discover the security approaches for the Network Layer (L4)

UNIT-IV

Software Vulnerabilities: Phishing, Buffer Overflow, Format string attacks, Cross-site Scripting(XSS), SQL Injection, Virus and Worm Features, Internet scanning Worms, Topological Worms,Botnets,

Access Control in the Operating System: Preliminaries, Mandatory Access Control, Role- based Access control

Firewalls: Basics, Practical issues

Intrusion Prevention and Detection: Prevention Versus Detection, Types of Intrusion detection systems, DDoS attack prevention/detection, Malware Defense.

Learning Outcomes:

At the end of the unit, students will be able to:

- Differentiate various viruses and worms (L1)
- Understand the Firewall design principles.(L2)
- Explore various approaches for Intrusion Detection.(L4)

UNIT-V

WLAN Security: IEEE 802.11 WirelessLAN Security:Background, Authentication, Confidentiality andIntegrity

Cell phone Security: Preliminaries, GSM (2G) Security, Security in UMTS (3G)

RFIDs and E-Passports: RFID basics, Applications, Security issues, Addressing RFID Privacy Concerns, Electronic Passports

Electronic Payment: Introduction, Enabling Technologies, Cardholder Present E-Transactions, Payment over the Internet, Mobile Payments, Electronic cash

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand applications of Security (L2)
- Design secure electronic transactions (L6)
- Explore various security issues in RFIDs and E-Passports(L2)

Course Outcomes

Students should be able to

- Identify various type of vulnerabilities of a Cyber attacks (L2)
- Outline various security algorithms (L4)
- Design secure systems (L6)
- Investigate the threats and identify the solutions for threats (L4)

TEXT BOOKS:

1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.

REFERENCES:

1. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
2. Jonathan Katz, Yehuda Lindell, "Introduction to Modern Cryptography", Chapman & Hall/CRC, New York,2007.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons, New York,2004.
4. Charlie Kafuman, Radia Perlman, Mike Spenciner, Network Security Private Communication in Private world, Second Edition, Prentice Hall India 2002,ISBN:81-203-2213-4

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(20F00304c) MULTIMEDIA SYSTEMS & TOOLS
ELECTIVE –III

Course Objectives

- Formulate a working definition of interactive multimedia
- Demonstrate competence in using the authoring program HyperStudio
- Outline the use of animation, digitized sound, video control, and scanned images
- Illustrate the use of Netscape to access the Course Home Page and Tips and Tricks;

Unit-I: Multimedia Overview, Definition Applications and Design, Authoring (HyperStudio), Introduction to HyperStudio, The Metaphor, The Basics (Cards, Buttons, Text), HyperStudio, Resources.

Multimedia Authoring- Multimedia Authoring Metaphors, Multimedia Production, Multimedia Presentation, Automatic Authoring, Some Useful Editing and Authoring Tools, Adobe Premiere, Macromedia Director, Macromedia Flash, Dreamweaver.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Summarize the importance of Multimedia Application(L3)
- Explain the basics of multimedia and Animation.(L2)
- Understand various tools for multi-media (L2)

Unit-II: Instructional Design, Objectives, Content (print, graphics, sounds, etc.), Interaction, Assessment, Closure, Screen Design: Metaphors and Themes, Colors and Backgrounds, Text (size, color, placement), Navigation, Consistency.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Design Interactive multimedia applications(L6)
- Correlate colors, backgrounds and text (L4)

Unit-III: Transitions and Links, Use of Sound, HyperStudio Sounds, Recording Your Own, Internet Resources, Graphics, Integrating Web documents, HyperStudio Tips and Tricks, Animation, Launching other applications and documents.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Integrate sound into the Multimedia Applications(L6)
- Select the sound suitable for application(L5)

Unit-IV: Multimedia Portfolios, Designing a template, Adding elements, Choosing materials,Advanced Button Features, Hyperlinks,Drag-n-Drop, Advanced NBA's, Using Actions with other Objects.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Choose material for a multimedia Application(L3)
- Design appropriate actions (L6)

Unit-V: Incorporating Digital Media, QuickTime Movies, Laserdisc and CD-ROM control, scanning.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Select Digital media (L5)
- Understand various softwares for Multi-media (L2)

Course outcomes:

- Develop animations for real world scenarios (L3)
- Identify the resources required for animations (L1)
- Integrate graphics, and sound in creating applications (L6)

Textbook:

1. Marcia Kuperberg, A Guide to Computer Animation: for TV, games, multimedia and web,Focal Press (Taylor and Francis Group), 2002.
2. Z. N. Li and M. S. Drew, "Fundamentals of Multimedia", Pearson Prentice Hall

References:

1. Tony White, Animation from Pencils to Pixels: Classical Techniques for Digital Animators, Focal Press (Taylor and Francis Group), 2006.
2. ED Catmull, Creativity, INC: Overcoming the unseen forces that stand in the way of True Inspiration, TransWorld Publishers, 2014.

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(20F00304d) MACHINE LEARNING
(Elective-III)

Course Objectives:

With the increased availability of data from varied sources there has been increasing attention paid to the various data driven disciplines such as analytics and machine learning. This course aims to provide students with the knowledge of key concepts of machine learning from a mathematically well motivated perspective. The course aims to familiarize the students with the two broad categories of machine learning algorithms - supervised and unsupervised:

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To appreciate the concepts and algorithms of learning.

Unit -I: Introduction: Definition-Examples of machine learning applications –Well posed learning problems- Designing a learning system- Perspectives and issues Concept learning and general to specific ordering: Inductive learning hypothesis- Concept learning as search – candidate elimination algorithm-inductive bias.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the fundamental issues and challenges of machine learning. (L2)
- Differentiate the strengths and weaknesses of many popular machine learning approaches.(L2)
- Gain knowledge about basic concepts of Machine Learning (L3)

Unit - II: Regression and classification - Regression: Linear Regression-Simple-Multiple Decision Tree-Pruning: Introduction –Representation-Algorithm issues Classification: Support Vector machine – Naïve Bayes-Applications.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Describe the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised learning. (L2)
- Differentiate classification and regression approaches to solve the real-world problems. (L2)
- Understand the given data sets and apply the suitable classification algorithms (L2)

Unit - III: Clustering and Learning - Clustering: k-Means clustering– adaptive Hierarchical clustering –Applications- Neural network : Perceptron, multilayer network- back propagation- introduction to deep neural network Instance based learning :k-NN– Radial basis functions Case based reasoning-Reinforcement learning -Applications.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of un-supervised learning concepts (L3)
- Differentiate various clustering algorithms. (L2)
- Understand the given data sets and apply the suitable clustering algorithms (L2)

Unit - IV: Probabilistic graphical models- Graphical Models: Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning Generalization - Hidden Markov Models - Conditional random fields(CRFs).

Learning Outcomes:

At the end of the Unit, student should be able to:

- Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.(L1)
- Understand to frame the suitable mathematical model for the problem/application.(L2)
- Integrate machine learning libraries and mathematical and statistical tools to solve the real-world problems (L6)

Unit - V: Machine learning experiments - Design-Cross validation - Measuring Performance - Hypothesis testing- Assessing Performance -Comparison of algorithms, Datasets-Case study.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Design and implement various machine learning algorithms in a range of real-world applications.(L6)
- Identify machine learning techniques suitable for a given problem (L1)
- Apply the cross validation for the efficient results of the machine learning algorithms. (L3)

Course Outcomes:

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

- Identify potential applications of machine learning in practice(L1)
- Describe the differences in approaches and applicability of regression, classification, and clustering (L2)
- Select the suitable machine learning task for a given application (L1)
- Implement feature extraction and selection to represent data as features to serve as input to machine learning models build an application that is based on machine learning (L4)
- Explore the logic for solving various AI problems.(L2)

Text Books:

1. Tom M. Mitchell, Machine learning, McGraw-Hill,1997.
2. EthemAlpaydin, Introduction to Machine Learning, MIT Press, 3rd Edition, 2014.
3. E. Alpaydinm, Introduction to Machine Learning, MIT Press, 2nd Edition, 2009.

References:

1. P. Harrington, Machine learning in action, Manning Publications Co, 2012.
2. C. M. BishopPattern recognition and Machine Learning, Springer, 2007.
3. J.Bell, Machine Learning for Big Data, Wiley, 2014.

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(20F00304e) COMPILER DESIGN
Elective - III

Course Objective:

The course should enable the student

- Realize that computing science theory can be used as the basis for realapplications
- Introduce the major concept areas of language translation and compilerdesign.
- Learn how a compilerworks
- Know about the powerful compiler generation tools and techniques, which are useful tothe other non-compilerapplications
- Know the importance of optimization and learn how to write programs that executefaster

Unit- I:**Introduction:** Language processors, Phases of a compiler, Pass and phase, Bootstrapping, Compiler construction tools, Applications of compiler technology.
Lexical Analysis: Role and Responsibility, Input buffering, Specification of tokens, Recognition of tokens, LEX tool, Design of a Lexical Analyzer generator.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the functionalities of a Compiler (L2)
- Determine various phases of a compiler (L3)
- Apply the lex program for its purpose (L3)

Unit – II: **Syntax Analysis**: Role of the parser, Context Free Grammars- Definition, Derivations, Parse trees, Ambiguity, Eliminating ambiguity, Left recursion, Left factoring.
TOP Down Parsing: Recursive descent parsing, Non-recursive predictive parsing, LL(1) grammars, Error recovery in predictive parsing.
Bottom Up Parsing: Handle pruning, Shift-Reduce parsing, Conflicts during shifts- reduce parsing, SLR Parsing, Canonical LR(1) parsers, LALR parsers, Using ambiguous grammars, YACC tool.

Learning Outcomes:

At the end of the Unit, student should be able to :

- Use the YACC tool for its purpose (L3)
- Understand the Syntax analysis phase about its role and purpose(L2)
- Differentiate various parsing methods (L2)

Unit – III: Syntax Directed Translation: Syntax Directed Definitions, Evaluation orders for SDD‘s, Application of SDT, SDT schemes, Implementing L-attributeSDD‘s.
Intermediate Code Generation: Need for intermediate code, Types of intermediate code, Three address code, Quadruples, Triples, Type expressions, Type equivalence, Type checking, Translation of expressions, control flow statements, switch statement, procedures, back patching

Learning Outcomes:

At the end of the Unit, student should be able to :

- Understand the definitions of Syntax Directed Definitions (L2)
- Differentiate Synthesized and Inherited attributes (L2)
- Discover various forms of Intermediate Representations (L3)

Unit – IV: Run Time Storage Organization: Storage Organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Introduction to Garbage Collection
Machine-Independent Optimizations: Basic Blocks and Flow Graphs, Optimization of Basic Blocks, The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Learning Outcomes:

At the end of the Unit, student should be able to :

- Understand various Storage Allocation Strategies (L2)
- Build flow graphs for the given three address instructions (L3)
- Apply the related concepts for code optimization (L3)

Unit – V : Code Generation : Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand various issues in Code Generation (L2)
- Apply code generator concepts on the given expressions or the input (L3)
- Differentiate register allocation and register assignment (L3)

Course Outcomes

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

- Able to design a compiler for a simple programminglanguage (L4)
- Able to use the tools related to compiler design effectively andefficiently(L3)
- Analyze & implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.(L4)
- Use modern tools and technologies for designing new compiler.(L3)

Text Books:

1. CompilersPrinciples,TechniquesandTools‖,SecondEdition,AlfredV.Aho,MonicaS.Lam, Ravi Sethi, Jeffrey D. Ullman.,Pearson.
2. CompilerDesign|, K.Muneeswaran., Oxford UniversityPress, 2012

Reference Books:

1. CompilerConstruction‖, K.V.N Sunitha,Pearson, 2013
2. Engineering ACompiler|, Second Edition, Keith D. Cooper &Linda Torczon., MK(Morgan Kaufmann)(ELSEVIER)
3. CompilersPrinciplesandPractice|, ParagH.Dave, HimanshuB. Dave.,PEARSON
4. CompilerDesign|, SandeepSaxena, RajkumarSingh Rathore., S.Chandpublication
5. CompilerDesign|, SantanuChattopadhyay., PHI
6. Principals of Compiler Design‖, NadhniPrasad, Elsevier

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(20F00305a) SOFTWARE PROJECT MANAGEMENT
(Elective-IV)

Course Objectives:

The course should enable the student

- Teach the specific roles within a software organization as related to project and process management.
- Describe the principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management).
- Introduce the basic infrastructure competences (e.g., process modelling and measurement).
- Explain the basic steps of project planning, project management, quality assurance, and process management and their relationships.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand basic steps to build a software. (L2).
- Estimate the cost of software by using cost estimation models (L5).
- Compute the size of software by using SLOC and function points (L3).

UNIT II

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

The old way and the new: The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Analyze software estimation and to reduce the size of software (L4).
- Illustrate the principles for improving the team effectiveness (L2).
- Estimate costs and schedules, and overall productivity using a smaller team (L5).
- Choosethe practices for conventional software engineering(L1).
- Understand Principles of modern software management (L2).

UNIT III

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Select life cycle model based on requirements, users (L3).
- Can organizedistinct sets of artifacts (L3).
- Develop and justify the artifacts for the product(L6).

UNIT IV

Work Flows of the process: Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Interaction planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building Blocks, the Project Environment

Learning Outcomes:

At the end of the Unit, student should be able to:

- Organize the hierarchy for work breakdown structures (L3).
- Select general guidelines for iterations in planning process (L3).
- Discuss default roles in software line of business organization (L6).
- Identify discrete states for project environment artifacts (L3).

UNIT V

Project Control and Process instrumentation: The server care Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates, Example.

Future Software Project Management: Modern Project Profiles Next generation Software economics, modern Process transitions.

Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Learning Outcomes:

At the end of the Unit, student should be able to:

- Determine quality of software products using software metrics (L4).
- Measure change traffic over time (L5).
- Apply software economics for modern projects (L3).
- Analyze the command center processing (L4).

Course Outcomes:

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

- Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project. (L1)
- Compare and differentiate organization structures and project structures. (L4)
- Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools. (L3)
- Design software projects (L6)

Text Books:

1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,TataMc-Graw Hill**.**

Reference Books:

1. Applied Software Project Management, Andrew Stellman& Jennifer Greene, O‟Reilly, 2006.
2. Head First PMP, Jennifer Greene & Andrew Stellman, O‟Reilly,2007.
3. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, second edition,Wiley India, 2004.
4. Agile Project Management, Jim Highsmith, Pearson education, 2004**.**
5. The art of Project management, Scott Berkun, O‟Reilly, 2005.
6. Software Project Management in Practice, PankajJalote, Pearson Education,2002.

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(20F00305b) WIRELESS SENSOR NETWORKS
(Elective-IV)

Course Objectives:

The course should enable the student

- Introduce the concepts of Adhoc and Sensor Networks.
- Explain Routing algorithms suitable for Adhoc Networks.
- Modify the transport protocols to make them suitable for Adhoc networks
- Familiarize with the security issues of adhoc and sensor networks

Unit I: IEEE 802 Networking Standard. Fundamentals of WLANs, IEEE 802.11 standard. What is Wireless Internet?, Mobile IP, Cellular and Adhoc Wireless Networks, Applications of AdhocNetworks, Issues in Ad Hoc Wireless Networks,Ad Hoc Wireless Internet.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand different wireless networks. (L2)
- Examine wireless LAN Standard IEEE 802.11.(L4)
- Explore various applications of Adhoc Networks (L4)

Unit II: Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that used Directional Antennas, Other MAC Protocols.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Identify the limitations of existing MAC protocols when applied to adhoc networks. (L4)
- Modify the existing MAC Protocols to make them suitable for Adhoc networks.(L3)
- Understand the classification of MAC protocols (L2)

Unit III: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table-Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols, Power-Aware Routing Protocols.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Compare different routing protocols.(L2)

- Choose the routing protocol based on network characteristics.(L5)
- Explore the issues in designing a routing protocol (L4)

Unit – IV Multicast Routing in Ad hoc Wireless Networks- Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An architecture reference model for multicast routing protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols, Mesh-Based Multicast Routing Protocols, Summary of Tree and Mesh-Based Protocols.Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions. TCP over Ad Hoc Wireless Networks, Other Transport Layer Protocols for Ad Hoc Wireless Networks.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Propose new Transport protocols for adhoc networks(L6)
- Classify the routing protocols.(L3)
- Understand the operation of multi-cast routing protocol (L2)

Unit V: Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Wireless Sensor Networks- Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other issues.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Familiarize with the sensor networks.(L5)
- Identify the need for security in Adhoc and Sensor networks.(L2)
- Explore the various network security attacks.(L4)

Course Outcomes:

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

- List the design issues for Adhoc and sensor networks(L1)
- Analyze the use of TCP in Wireless networks.(L4)
- Justify the need for new MAC Protocols for Adhoc networks.(L4)
- Extend the existing protocols to make them suitable for Adhoc Networks.(L3)
- Evaluate the performance of Protocols in Adhoc and sensor networks.(L5)
- Design new Protocols for Adhoc and Sensor networks.(L3)

Text Book:

1. Murthy, C. Siva Ram, and B. S. Manoj. *Ad hoc wireless networks: Architectures and protocols*. Pearson Education India, 2004.

References:

1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”,Wiley, 2005

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(20F00305c) SERVICE ORIENTED ARCHITECTURE
(Elective –IV)

Course Objectives:

The course should enable the student

- Understand SOA and evolution of SOA.
- Understand web services and primitive, contemporary SOA.
- Understand various service layers.
- Understand service-oriented analysis and design based on guidelines.

UNIT I: Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA.
The Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the fundamentals of SOA (L2).
- Demonstrate the characteristics of Contemporary SOA (L3).
- Explore of Evolution of SOA (L4).

UNIT II : Web Services and Primitive SOA: **The Web Services Frame Work, Services, Service Descriptions, Messaging.**
Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration,and Choreography.

Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the framework of Web services (L2).
- Manage various activities in web services and contemporary SOA (L1).
- Analyze various security issues and policies in web services and Contemporary SOA (L4).

UNIT III : Principles of Service-Orientation: **Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service-Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Orientation.**
Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the Anatomy of SOA (L2).
- Demonstrate the interrelation between principles of service orientation (L3).
- Explore the service layer configuration scenarios (L4).

UNIT IV: SOA Delivery Strategies: SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy.
Service Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services.

Service Oriented Analysis (Part-II-Service Modelling): Service Modeling, Service Modelling Guidelines, Classifying Service Model Logic, Contrasting Service Modeling Approaches.

Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WSDL Language Basics, Service Interface Design Tools.

Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Analyze SOA delivery Lifecycle phases (L4).
- Explore the benefits of Business Centric SOA (L4).
- Understand the service interface design tools (L2).

UNIT V :Service Oriented Design (Part III- Service Design): Service Design Overview, Entity-Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines.
Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS-Coordination Overview, Service Oriented Business Process Design.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Differentiate the various business service designs (L2).

- Understand the WS-BPEL Language basics (L2).
- Explore the service oriented business process design (L4).

Course Outcomes:

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

- Comprehend the need for SOA and its systematic evolution (L4).
- Apply SOA technologies to enterprise domain (L3)
- Design and analyse various SOA patterns and techniques (L6).
- Compare and evaluate best strategies and practices of SOA (L2).

TEXT BOOKS:

1. Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education, 2006.
2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education, 2005.

REFERENCE BOOKS:

1. The Definitive guide to SOA, Jeff Davies & others, Apress,Dreamtech.
2. Java SOA Cook book, E.Hewitt,SPD.
3. SOA in Practice, N.M.Josuttis,SPD.
4. Applied SOA, M.Rosen and others, Wiley India pvt.Ltd.
5. Java Web Services Architecture, J.Mc Govern, and others, Morgan Kaufmann Publishers,Elsevier.
6. SOA for Enterprise Applications, Shankar.K, Wiley IndiaEdition.
7. SOA-Based Enterprise Integration, W.Roshen,TMH.
8. SOA Security, K.RamaRao, C.Prasad, dreamtech press.

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(20F00305d) DEEP LEARNING

(Elective –IV)

Course Objectives:

- To present the mathematical, statistical and computational challenges of building neural networks.
- To teach the concepts of deep learning.
- To introduce dimensionality reduction techniques.
- To enable the students to know deep learning techniques to support real-time applications.
- To explain the case studies of deep learning techniques.

UNIT I

Introduction: Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the basics of deep learning. (L2)
- Justify various deep learning models. (L5)
- Understand Neural Nets. (L2)

UNIT II

Deep Networks: History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning .

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand the history of Deep Learning. (L2)
- Online the differences of VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolution Networks. (L2)
- Define Semi-supervised Learning. (L1, L3)

UNIT III

Dimensionality Reduction: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand manifolds, metric learning. (L2)
- Apply dimensionality reduction process (L3)
- Explore various architectures (L3)

UNIT IV

Optimization and Generalization: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Understand about the optimization in deep learning. (L2)
- Categorize generalization in deep learning. (L4)
- Illustrate Recurrent Neural Network Language Models. (L2)

UNIT V

Case Study and Applications: Image net- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

Learning Outcomes:

At the end of the Unit, student should be able to:

- Investigate deep learning with the help of different case studies (L4)
- Differentiate various methods or architectures for solving real-world problems (L2)
- Understanding the real-world problems and apply suitable algorithm (L2)

Course Outcomes:

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

- Understand Joint Detection Bioinformatics- Face Recognition. (L2)
- Test applications for image net- natural language processing. (L4)
- Explain the basics of deep learning (L2).
- Implement various deep learning models (L3).
- Apply high dimensional data using reduction techniques (L3).
- Critique deep learning applications (L5).

TEXT BOOKS:

1. “Deep Learning”, Ian Goodfellow, YoshuaBengio , Aaron Courville, MIT Press 2016.
2. “Neural Networks and Deep Learning A Text Book”, Charu C Aggarwal, Springer International Publishing AG, Part of Springer Nature 2018.

REFERENCE BOOKS:

1. “Deep Learning: Methods and Applications (Foundations and Trends (R) in Signal Processing)”,Li Deng and Dong Yu, New Publishers, 2013.
2. “Advanced Data Analysis from an Elementary Point of View”,CosmaRohillaShalizi, Cambridge University Press, 2015.

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(20F00305e) ANDROID PROGRAMMING

(Elective –IV)

Course Objectives:

- To demonstrate fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop and deploy software with reasonable complexity on mobile platform
- To demonstrate their ability to debug programs running on mobile devices

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android developmentframework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Typesof Android applications, Best practices in Android programming. **Android toolsAndroid application components** – Android Manifest file, Externalizing resources like values, themes,layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes.

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

Learning Outcomes:

At the end of the module, students will be able to:

- Install and run applications on Android studio (L3)
- Use the resources in Android applications (L3)
- Understand the Android application Lifestyle(L2)

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring units.

Layouts – Linear, Relative, Grid and Table Layouts.

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and ToggleButtons, Checkboxes, Spinners, Dialog and pickers.

Event Handling – Handling clicks or changes of various UI components.

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity,adding, removing and replacing fragments with fragment transactions, interfacing between fragmentsand Activities, Multi-screen Activities.

Learning Outcomes:

At the end of the module, students will be able to:

- Demonstrate the various layouts in Android applications (L3)
- Use various User interface components. (L3).
- Demonstrate event handling of various UI components. (L3)
- Create the fragments and perform interfacing between fragments. (L6)

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, ImplicitIntents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial anumber or to send SMS.

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding andusing Intents received within an Activity.

Notifications – Creating and Displaying notifications, Displaying Toasts.

Learning Outcomes:

At the end of the module, students will be able to:

- Use Intents to launch activities (L3)
- Demonstrate the Intent filters (L3)
- Create and display the notifications and Toasts. (L6)

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data fromfiles, listing contents of a directory Shared Preferences – Creating shared preferences, saving andretrieving data using Shared Preference.

Learning Outcomes:

At the end of the module, students will be able to:

- Create files and shared preferences (L6)
- Use application specific folders and files (L3)
- Demonstrate various operations using shared preference (L3)

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, insertingretrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete,retrieve and update).

Learning Outcomes:

At the end of the module, students will be able to:

- Create and opening a SQLite database. (L6)
- Demonstrate various operations on database.(L3)
- Understand the Use of content providers (L2)

Course Outcomes:

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

- Understands the working of Android OS Practically(L2).
- Design and develop Android user interfaces (L6)
- Develop and deploy and maintain the Android Applications (L6)
- Apply various operations on Databases (L3)
- Create and apply operations on files for storage purpose (L6)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2. J.F. DiMarzio. Beginning Android Programming with Android Studio, Fourth Edition – 2016 – Wiley Publications.

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(20F00306a) SOFTWARE QUALITY ASSURANCE AND TESTING

(Elective – V)

Course Objectives:

- Introduce basic concepts of Software Testing.
- Understand white box, black box, object oriented, web based and cloud testing.
- Know in details of automation testing and tools used for automation testing.
- Understand the importance of software quality and assurance of software systems development.

UNIT I: Software Quality Assurance Framework and Standards SQA Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance – Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan – Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, MalcomBalridge, 3 Sigma, 6 Sigma.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand the various components of software quality assurance (L2)
- Develop software quality assurance plan (L6)
- Demonstrate various quality standards (L4)

UNIT II: Software Quality Assurance Metrics and Measurement Software Quality Metrics: Product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs

Software Quality metrics methodology: Establish quality requirements, Identify Software quality metrics, Implement the software quality metrics, analyze software metrics results, validate the software quality metrics – Software quality indicators – Fundamentals in Measurement theory.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand various software Quality assurance metrics (L2).
- Develop software quality metrics (L6)
- Demonstrate Software quality indicators (L3)

UNIT III: Software Testing Strategy and Environment: Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing

Software Testing Methodology Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand the testing strategy (L2)
- Demonstrate verification and validation (L3)
- Perform functional and structural testing (L4)
- Understand eight considerations in developing testing methodologies (L2)

UNIT IV: Software Testing Techniques Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured Walkthroughs, Thread Testing, Performance Testing, White-Box Testing.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand statement coverage and branch coverage (L2)
- Apply various testing techniques (L3)
- Perform inspections and structured walkthroughs (L4)

UNIT V: Software Testing Tools Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMeter, JUnit and Cactus.

Testing Process Eleven Step Testing Process: Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report test results, testing software installation, Test software changes, Evaluate Test Effectiveness.

Testing Specialized Systems and Applications Testing Client/Server – Web applications, Testing off the Shelf Components, Testing Security, Testing a Data Warehouse.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand the functionality of various testing tools (L2).
- Apply Java testing tools for java applications (L3)
- Demonstrate the eleven step testing process (L3)

Course Outcomes:

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

- Describe fundamental concepts of Software Quality assurance (L2)
- Explore test planning and its management (L4).
- Understand fundamental concepts of software automation (L2).
- Explore various automation tools for testing real-world applications (L4).
- Demonstrate the quality management, assurance, and quality standard to software system (L3)
- Demonstrate Software Quality Tools and analyse their effectiveness (L3).

Text Books:

1. Effective Methods for Software Testing, 2nd Edition, William E. Perry , Second Edition, Wiley India, 2006.

2. Software Quality, Mordechai Ben-Menachem/Garry S. Marliss, Thomson Learning publication,1997.

References:

1.Testing and Quality Assurance for Component-based Software, by Gao, Tsao and Wu, Artech House Publishers

2. Software Testing Techniques, by BoriesBeizer, Second Edition, Dreamtech Press

3. Managing the Testing Process, by Rex Black, Wiley

4. Handbook of Software Quality Assurance, by G. Gordon Schulmeyer, James I.McManus, Second Edition, International Thomson Computer Press

5.Software Testing and continuous Quality Improvement, by William E.Lewis, GunasekaranVeerapillai, Second Edition, Auerbach Publications

6. Metrics and Models for Software Quality Engineering, by Stephen H. Kan, by Pearson Education Publication

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(20F00306b) BLOCK CHAIN TECHNOLOGIES

(Elective – V)

Course Objectives:

- Explain blockchain technology.
- Introduce key vocabulary and concepts related to blockchain and Bitcoin in business situations.
- Discuss the current state of the Blockchain landscape

UNIT-I

Blockchain : Distributed systems, the history of blockchain, introduction to blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.

Decentralization: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for decentralization.

Learning Outcomes:

At the end of the module, students will be able to:

- Decentralize currency using block chain technology. (L6)
- Identify the advantages and limitations of Blockchain technology. (L2)

UNIT-II

Cryptography and Technical Foundations: Introduction, Cryptography, Confidentiality, Integrity, Authentication, Cryptographic primitives, Cryptographic primitives, Public and private keys, Financial markets and trading.

Learning Outcomes:

At the end of the module, students will be able to:

- Apply Cryptography for Block chain technology (L3)
- Analyze financial markets and trading. (L4)

UNIT-III

Bitcoin: Bitcoin, Transactions, Blockchain, Bitcoin payments, Bitcoin programming and the command-line interface, Bitcoin improvement proposals (BIPs).

Alternative Coins: Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin

Learning Outcomes:

At the end of the module, students will be able to:

- Explain Bitcoin crypto currency. (L2)
- Find an alternate to bitcoin technology. (L1)

UNIT-IV

Smart Contracts: History, Definition, Ricardian contracts

Ethereum : Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts, Accounts, Block.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand the power that Smart Contracts add to blockchain technology. (L2)
- Explain the protocols and algorithms of Blockchain technology. (L2)
- Investigate the challenges and security issues of Ethereum (L4)

UNIT-V

Hyperledger: Projects, Hyperledger as a protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda

Learning Outcomes:

At the end of the module, students will be able to:

- Summarize the Hyperledger project. (L2)
- Design open source ledger framework. (L6)

Course Outcomes:

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

- Critique the pros and cons of Block chain technology (L5)
- Use blockchain technology (L3)
- Design software for crypto currency (L6)

Text Book:

1. Imran Bashir, “Mastering Blockchain” Packt Publishing Ltd, March 2017.

Reference Books

1. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.
2. Melanie swan, “Blokchain blueprint for a new economy”, O’REILLY .
3. Andreas Antonopoulos, The internet of money, 2016
4. Paul Vigna & Michael J. Casey, The age of cryptocurrency, 2015

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(20F00306c) AUGMENTED REALITY/VIRTUAL REALITY
(Elective-V)

Course Objectives:

1. Teach the tools and technologies used by professionals working in VR and AR
2. Train with the skills to quickly and confidently create your own applications using the industry's leading tools
3. Guide the student to strategically move into a career in the VR/AR field

UNIT-I

Computer generated worlds: what is augmented reality?, what is virtual reality?,
Understanding virtual space: defining visual space and content, defining position and orientation in three dimensions, navigation
The Mechanics of Sight: the visual path way, spatial vision, and Depth Cues.
Component Technologies of Head mounted Displays: Display fundamentals, related terminology and concepts, optical Architectures.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand and define virtual space. (L2)
- Understand the mechanics of sight like path way, depth, etc.,(L2)

UNIT-II

Augmented Displays: Binocular augmenting displays, Monocular augmenting displays.
Fully immersive Displays: PC-Console driven displays, smartphone based displays, CAVES and Walls, Hemispheres and Domes.
The Mechanics of hearing: Defining sound, the auditory pathway, sound cues and localization, the vestibular system.
Audio displays: Conventional audio

Learning Outcomes:

At the end of the module, students will be able to:

- Design Augmented displays (L6)
- Understand the mechanics of Sound(L2)

UNIT-III

The Mechanics of Feeling: The Science of feeling, Anatomy and Composition of the skin.
Tactile and force feedback Devices: Haptic illusions, tactile feedback devices, Force feedback devices.
Sensors for tracking Position, and orientation and motion: introduction to sensor technologies, optical trackers, beacon trackers, electromagnetic trackers, inertial sensors, acoustic sensors.
Devices to enable navigation and interaction: 2D vs 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with your mind.

Learning Outcomes:

At the end of the module, students will be able to:

- Understand the mechanics of Feeling.(L2)
- Use sensors for tracking, orientation and motion.(L3)

UNIT-IV

Gaming and Entertainment: Virtual reality and the arts, gaming, immersive video/ cinematic virtual reality.

Architecture and Construction: Artificial spaces, architectural design: Manage group architectures, Construction management, real estate sales applications, and architectural acoustics.

Science and engineering: Simulate and innovate, naval architecture and marine engineering, automotive engineering, aerospace engineering, nuclear engineering and manufacturing.

Health and medicine: advancing the field of medicine, training applications, treatment applications.

Learning Outcomes:

At the end of the module, students will be able to:

- Design and implementation of an immersive user experience (L6)
- Apply for Science and engineering and health applications.(L3)

UNIT-V

Aerospace and Defence: Flight simulation and training, mission planning and rehearsal, dismounted soldier situational awareness, advanced cockpit avionics, space operations.

Education: Tangible skills education, theory, knowledge acquisition and concept formation.

Information control and big data visualization: What is big data?, big data analytics and human vision.

Telerobotics and Telepresence: Defining Telerobotics and Telepresence, space applications and robonaut, undersea applications, Terrestrial and airborne applications.

Learning Outcomes:

At the end of the module, students will be able to:

- Design flight simulation models(L6)
- Use for Big Data Visualization.(L3)

Course Outcomes:

- Recognize how to make your competition irrelevant (L2)
- Create your own blue ocean with Augmented Reality (L6)
- Construct your own new business or integrate AR with your current business with step by step process and projects (L6)
- Extend your sales with strategic marketing plan (L3)
- Build more brand value(L6)

Text book:

1. Steve Aukstakalnis, “Practical Augmented Reality”, Pearson Education, 2017.

References

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, “Creating Augmented& Virtual Realities”, O’REILLY.

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(20F00306d) NATURAL LANGUAGE PROCESSING

(Elective – V)

Course Objectives:

- Explain and apply fundamental algorithms and techniques in the area of naturallanguage processing (NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approaches to machine translation.
- Teachmachine learning techniques used in NLP.

UNIT I:

Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

Learning Outcomes:

At the end of the module, students will be able to:

- Classify various NLP Applications (L2)
- Apply the logic by using Python Programming(L3)
- List the AI Languages (L1)
- Outline the Linguistic Background (L2)

Unit II: Grammars and Parsing

Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsingwith Features, Augmented Transition Networks,Bayees Rule, Shannon game, Entropy and Cross Entropy.

Learning Outcomes:

At the end of the module, students will be able to:

- Demonstrate the Top- Down and Bottom-Up Parsing techniques (L2)
- Apply Bayees Rule, Shannon game, Entropy and Cross Entropy. (L3).
- Develop game playing strategies using Shannon game. (L3)

UNIT III: Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions inContext Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences inParsing, Shift Reduce Parsers, Deterministic Parsers.

Learning Outcomes:

At the end of the module, students will be able to:

- Classify Grammars for Natural Language (L2)
- Explain Hold Mechanisms in ATNs. (L2)
- Explain Human Preferences in Parsing, Shift Reduce Parsers. (L2)

UNIT IV:

Semantic Interpretation

Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encodingambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modeling

Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling.

Learning Outcomes:

At the end of the module, students will be able to:

- Distinguish Language model Evaluation (L2)
- Develop Types of Language Models (L3)

UNIT V:

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, BriefHistory, Possible Approaches, Current Status.Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem,Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement inAnusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Preprocessing, Monolingual Information Retrieval, CLIR, MLIR,Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer,Competitions and Datasets.

Learning Outcomes:

At the end of the module, students will be able to:

- Apply Machine Translation techniques . (L3)
- Apply Multilingual Information Retrievaland Multilingual Automatic Summarization. (L3)

Course Outcomes:

- Understand the various NLP Applications and Organization ofNatural language, able to learn and implement realistic applications using Python. (L2)
- Apply the various Parsing techniques, Bayees Rule, Shannon game, Entropy and Cross Entropy. (L3)
- Understand the fundamentals of CFG and parsers and mechanisms in ATN's. (L2)
- ApplySemantic Interpretation and Language Modeling..(L3)
- Apply a concepts of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.(L3)

TEXT BOOKS:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications : From Theory To Practice-DanielM.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, AksharBharathi,Vineetchaitanya,Prentice–Hall of India.

REFERENCES BOOKS:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, PrenticeHall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural LanguageProcessing, MIT Press, 1999.

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(20F00306e) MOBILE APPLICATION DEVELOPMENT

(Elective –V)

Course Objectives:

- To teach the steps in developing application for a mobile
- To introduce the basics of android programming
- To illustrate mobile applications

Unit- I

Fundamentals of java for android application development: introduction to java, working with java tokens, knowledge check-1, explaining data types, declaring variables, declaring classes, declaring methods, creating objects, interfaces, inheritance, implementing flow control statements.

Getting an overview of android: Introducing android, discussing about android applications, the manifest file, downloading and installing android, exploring the development environment, developing and executing the first android application.

Learning Outcomes:

At the end of the module, students will be able to:

- Recognize java tokens and Restate the variables and data types of java.(L2)
- Summarize the fundamental programming elements of JAVA (L2)
- Illustrate sample android application (L3)

Unit- II

Using Activities, Fragments, and Intents in Android: Working with activities, using intents, fragments, using the intent objects to invoke built-in Application.

Working with the user interface using views and ViewGroup: Working with view groups, binding data with the AdapterView class, designing the AutoTextCompleteView, implementing screen orientation, designing the views programmatically, handling UI events, specialized fragments, creating menus.

Learning Outcomes:

At the end of the module, students will be able to:

- Develop user interfaces (L3)
- Interpret user Events. (L2)

Unit- III

Handling pictures and menus with views: Working with image views, designing context menu for image view, using the AnalogClock and digitalclock, embedding web browser in an activity, notifying the user.

Storing the data persistently: introducing the data storage options, using the internal storage, using the external storage, using the SQLite database, working with content providers.

Emailing and Networking with android: building an application to send email, networking in android, checking network availability, consuming JSON services, socket programming.

Learning Outcomes:

At the end of the module, students will be able to:

- Create Graphical user interfaces (L6)
- Organize the data and exchange of data between mobile applications .(L6)

Unit- IV

Working with location services and maps: working with google maps, working with geocoding and reverse geocoding.

Working with graphics and animation: Working with graphics, using the drawable object, using the ShapeDrawable object, working with the NinePatchDrawable graphics, understanding the concept of hardware acceleration, working with animation.

Learning Outcomes:

At the end of the module, students will be able to:

- Incorporate Location Services into an application (L6)
- Integrate Graphics and Animation with an Android Application. (L6)

Unit- V

Audio, Video, and Camera: Role of media playback, using media player, recording and playing sound, creating a sound pool, using camera for taking pictures, recording video.

Bluetooth, NFC, and Wi-Fi: Working with Bluetooth creating an application using Bluetooth functionality, connecting the devices using Bluetooth for data transfer, working with Bluetooth low energy, working with NFC, working with Wi-Fi.

Telephony and SMS:handling telephony, handling SMS, sending SMS Using SmsManager.

Learning Outcomes:

At the end of the module, students will be able to:

- Design image and video capturing applications.(L6)
- Plan networking services (L3)

Course Outcomes:

At the end of the Course, student should be able to:

- Compare different mobile application models/architectures and patterns.(L2)
- Apply mobile application models/architectures and patterns for the development of a mobile software application.(L3)
- Describe the components and structure of a mobile development framework (L1)
- Illustrate advanced Java programming competency by developing a maintainable and efficient mobile applications.(L4)
- Integrate text, audio and video (L6)

Text Book:

1. Pradeep Kothari, “Android Application Development(with KitKat Support)”, dreamtech press.

Reference Book:

1. Reto Meier, “Professional Android 4 Application Development”, John Wiley & Sons, Inc.
2. Wei-Meng Lee, “Beginning Android 4 Application Development”, Wiley India.

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(20F00307) WEB & OOA DESIGN USING JAVA LABORATORY

Course Objectives:

- To design web pages using HTML and CSS.
- To validate various fields in the given page using JavaScript
- To design JSP and Servlets
- Getting familiar with UML CASE tools
- To design various UML diagrams for given problem / application
- To generate the skeletalcode for the given problem / application

Week-1:

Write a Java program to illustrate method overloading

Week-2:

Write a Java program to sort a list of names in ascending order.

Week-3:

Write a Java program to implement the matrix ADT using a class. The operationssupported by this ADT are:

a) Reading a matrix. c) Addition of matrices.
b) Printing a matrix. d) Subtraction of matrices.
e) Multiplication of matrices.

Week-4:

Implement the complex number ADT in Java using a class. The complex ADT is used torepresent complex numbers of the form c=a+ib, where a and b are real numbers. Theoperations supported by this ADT are:

a) Reading a complex number. d) Subtraction of complex numbers.
b) Writing a complex number. e) Multiplication of complex numbers.
c) Addition of Complex numbers. f) Division of complex numbers.

Week-5:

Design the following static web pages required for an online book store web site.

a) HOME PAGE:

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link **"CSE"** the catalogue for **CSE** Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

b) LOGIN PAGE:

This page looks like below:

c)

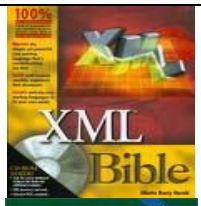
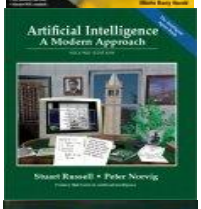
Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: Submit Reset			

CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table.

The details should contain the following:

1. Snap shot of Cover Page
2. Author Name
3. Publisher
4. Price
5. Add to cart button

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL		Book : XML Bible Author : Winston Publication : Wiley	$ 40.5	Add to cart
		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

Week-6:

a) CART PAGE:

The cart page contains the details about the books which are added to the cart.

The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Book name Java 2 XML bible Total amount - $130.5	Price $35.5 $40.5	Quantity 2 1	Amount $70 $40.5

b) REGISTRATION PAGE:

Create a "*registration form* "with the following fields

1) Name (Text field) 2) Password (password field)

3) E-mail ID (text field)

4) Phone number (text field)

5) Sex (radio button)

6) Date of birth (3 select boxes)

7) Languages known (check boxes – English, Telugu, Hindi, Tamil)

8) Address (text area)

Week-7:

VALIDATION:

Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contain alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).
3. E-mail ID (should not contain any invalid ID and must follow the standard pattern (name@domain.com)

4. Phone number (Phone number should contain 10 digits only).

Week-8:

Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following:

a) Use different font, styles:

In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

For example:

```
<HTML>
<HEAD>
<style type="text/css">
B.headline {color:red; font-size:22px; font-family:arial; text-
decoration:underline}
</style>

</HEAD>

<BODY>
```

```
<b>This is normal bold</b><br>
Selector {cursor:value}

For example:

<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>

<b class="headline">This is headline style bold</b>
</BODY>

</HTML>
```

b) Set a background image for both the page and single elements on the page.

You can define the background image for the page like this:

```
BODY {background-image:url(myimage.gif);}
```

c) Define styles for links as

A:link

A:visited

A:active

A:hover

Example:

```
<style type="text/css">
        A:link {text-decoration: none}
        A:visited {text-decoration: none}
        A:active {text-decoration: none}
        A:hover {text-decoration: underline; color: red;}
</style>
```

Week-9:

a) Install TOMCAT web server and APACHE.

While installation, assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.

b) Access the above developed static web pages for online book store web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.

Access the pages by using the urls:

http://localhost:4040/rama/books.html (for Tomcat)

http://localhost:8080/books.html (for Apache)

Week-10:

User Authentication: Write a Servlet which does the following job: Insert the details of 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he/she submits the login form using the user name and password from the database

Week-11:

Write a JSP which does the following job: Insert the details of 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he/she submits the login form using the user name and password from the database

Consider the following case studies

- Library management system
- ATM(Automated Teller Machine)
- Airline/Railway reservation system
- Hospital Management system
- Passport automation system
- Exam registration
- Stock maintenance system
- Credit card processing
- Foreign trading system
- Student information system

Week-12:

Initial Familiarization to a UML CASE tool such as the free tool Argo UML.

Week-13:

Draw a Class diagram for the simple problems given below in Argo UML and generateskeletal code in Java.

- A country has a capital city
- A dining philosopher uses a fork
- A file is an ordinary file or a directory file
- Files contain records
- A class can have several attributes
- A relation can be association or generalization
- A polygon is composed of an ordered set of points
- A person uses a computer language on a project

Week-14:

a) Use UML tool (such as Argo UML) for Use Case modeling for any of the given case studies.

b) Use UML tool (such as Argo UML) for development of Activity Diagram for any of the given case studies.

Week-15:

a) Use UML tool (such as Argo UML) to develop Sequence and Collaboration diagrams for any of the given case studies.

b) Use UML tool (such as Argo UML) to develop State Machine diagramsfor any of the given case studies.

Week-16:

a) Use UML tool (such as Argo UML) to develop Interaction overview diagramsfor any of the given case studies.

b) Generate Java skeletal code for the design solution developed for any of the given case studies.

Course Outcomes

1. Design static pages for the given websites. (L6)
2. DevelopJavaScriptto validate the fields in the given page. (L3)
3. Apply CSS to HTML web pages.(L3)
4. Design Java Server pages and Servlets.(L6)
5. Analyze the problem from object oriented perspective. (L4)
6. Develop UML diagrams. (L3)
7. Generate skeletal code for the given problems.(L6)

Text Books:

1. Herbert Schildt, ―Java The complete reference, 11th Edition, McGraw Hill Education, 2019.
2. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, 2007.
3."Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, Pearson Education, 2007.

References:

1."The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson 12th Impression, 2012.
2. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018.
3. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, 3rd Edition, Pearson, 2009
4. Ralph Moseley and M. T. Savaliya, "Developing Web Applications" Wiley-India,2011.
5. Joel Sklar," Web Design Principles", 5th Edition, Cengage Learning, 2012.
6. P.J. Deitel& H.M. Deitel, "Internet and World Wide Web How to program", 4th Edition, Pearson, 2008.

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MCA– III Sem

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(20F00308) BIG DATA ANALYTICS LABORATORY

Week 1: Hadoop Installation on a)Single Node and SPARK Installation, Launch a cloud instance for AWS instance on Centos 7

Week 2: Design a distributed application using MapReduce which processes a log file of a system. List out the users who have logged for maximum period on the system. Use simple log file from the Internet and process it using a pseudo distribution mode on Hadoop platform.

Design and develop a distributed application to find the coolest/hottest year from the available weather data. Use weather data from the Internet and process it using MapReduce.

Week 4: Write an application using HBase and HiveQL for flight information system which will include 1) Creating, Dropping, and altering Database tables, 2) Creating an external Hive table to connect to the HBase for Customer Information Table, 3) Load table with data, insert new values and field in the table, Join tables with Hive, 4) Create index on Flight information Table, and 5) Find the average departure delay per day in 2008.

Week 5: Display the hierarchical structure of your data by generating Trees, graphs and network visualization. Install and Run Pig then write Pig Latin scripts to sort, group, join, project and filter the data. Install and Run Hive then use Hive to Create, alter and drop databases, tables, views, functions and Indexes.

Week 6: Input file contains a series of tweets made by few people. Do a word count on the text object value Hint: Json Parsing in python – this sample snippet can be used within Map to read the JSON

Week 7: Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location. And Reading Excel,XML data sheets in R. Using with and without R objects on console, mathematical functions on console create R objects for calculator application and save in a specified location in disk.

Write an R script to find basic descriptive statistics using summary,str, quartile unction on mtcars& cars datasets and to find subset of dataset by using subset (),aggregate () functions on dataset.

Week 8:

Implementing data visualization using R : Find the data distributions using box and scatter plot, Find the outliers using plot and Plot the histogram, bar chart and pie chart on sample data.

Text Book(s):

[1] Cole Nussbaumer Knaflic, Storytelling With Data: A Data Visualization

Guide for Business Professionals,Wiley Publications,2015

[2] Tom Soukup and Ian Davidson, “Visual Data Mining: Techniques and

Tools for Data Visualization and Mining”, 1st Edition, John Wiley & Sons,

2002

Reference Books:

[1] Andy Kirk, Data Visualisation,C & M Digitals Pvt Ltd.,2016

[2] Chun-houh ChenWolfgang Härdle Antony Unwin, ,"Handbook of Data Visualization",Springer-Verlag Berlin Heidelberg,2008.

E-resources and other digital material

[1] Data Visualization in R Basic graphics,Prof.Shankar Narasimhan,Ragunathan Rengasamy,IIT Madras, https://nptel.ac.in/courses/106106179/11,2011

[2] Statistics and Visualization for Data Analysis and Inference, Dr. Ed Vul,
Dr. Mike Frank,Massachusetts Institute of Technology, https://ocw.mit.edu/resources/res-9-0002-statistics-and-visualization-for-data-analysis-and-inference-january-iap-2009/.2009

[3] Python for Data Analysis - Python for Data Visualisation, https://www.youtube.com/watch?v=nXr2Xt52MfA,2017

[4] Python Data Visualization, https://www.coursera.org/learn/python-visualization

[5] Data Visualization with Python and Matplotlib, https://www.udemy.com/data-visualization-with-python-and-matplotlib/,2018

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MCA– III Sem

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(20F00309) DEV OPS & AGILE PROGRAMMING LABORATORY

Lab Objectives:

Students will try:

- To understand the concept of DevOps with associated technologies and methodologies.
- To be familiarized with Jenkins, which is used to build & test software Applications & Continuous integration in Devops environment. To understand different Version Control tools like GIT, CVS or Mercurial
- To understand Docker to build, ship and run containerized images
- To use Docker to deploy and manage Software applications running on Container.
- To be familiarized with concept of Software Configuration Management & provisioning using toolslike Puppet,Chef, Ansible or Saltstack.

Agile Laboratory Programs:

1. Understand the background and driving forces fortaking an Agile Approach to Software Development.
2. Understand the business value of adopting agileapproach.
3. Understand agile development practices
4. Drive Development with Unit Test using Test Driven development.
5. Apply Design principle and Refactoring to achieveagility
6. To study automated build tool.
7. To study version control tool.
8. To study Continuous Integration tool.
9. Perform Testing activities within an agile project.

Dev Ops Laboratory Programs:

1. Build & TestApplicationswithContinuousIntegration - To Install and Configure Jenkins to test, anddeploy Java or Web Applications usingNetbeans or eclipse.
2. VersionControl - To Perform Version Control on websites/Softwares using different Version control toolslike RCS/ CVS/GIT/Mercurial (Any two)
3. Virtualization&Containerization - To Install and Configure Docker for creatingContainers of different Operating SystemImages
4. Virtualization&Containerization - To Build, deploy and manage web orJava application on Docker
5. SoftwareConfigurationManagement - To install and configure Software ConfigurationManagement using Chef/Puppet/Ansible orSaltstack.
6. Provisioning - To Perform Software ConfigurationManagement and provisioning usingChef/Puppet/Ansible or Saltstack.

Lab Outcomes:

Students will be able to:

- Remember the importance of Dev Ops tools used in software development life cycle
- Understand the importance of Jenkins to Build, Deploy and Test Software Applications
- Examine the different Version Control strategies
- Analyze& Illustrate the Containerization of OS images and deployment of applications over Docker
- Summarize the importance of Software Configuration Management in DevOps
- Synthesize the provisioning using Chef/Puppet/Ansible or Saltstack.

Text Books:

1. Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication.
2. Len Bass,IngoWeber,Liming Zhu,"DevOps, A Software Architects Perspective", Addison-Wesley-Pearson Publication.
3. John Ferguson Smart,"Jenkins, The Definitive Guide", O'Reilly Publication.
4. Learn to Master DevOps by Star EduSolutions.

References:

1. Sanjeev Sharma and Bernie Coyne,"DevOps for Dummies", Wiley Publication
2. Httermann, Michael, "DevOps for Developers",Apress Publication.
3. Joakim Verona, "Practical DevOps",Pack publication

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MCA– III Sem

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(20F00310) UNIVERSAL HUMAN VALUES

(Mandatory Audit Course – 2)

Introduction:

This course discusses the role of human values in one's family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course names as"H-102 Universal Human Values 2 : "Understanding Harmony" is designed which may be covered in their III or IV Semester.

In the Induction Program, students would get an initial exposure to human valuesthroughUniversalHumanValues–I.Thisexposureistobeaugmentedby this compulsory full semester foundation course.

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Unit 1:

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

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Unit 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3:

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

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature

- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

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

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"

6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

OUTCOME OF THECOURSE:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.