I YEAR I SEMESTER – COURSE STRUCTURE (R20)

S.No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A51001	**BSC**	Mathematics–I	3	1	0	4.0
2	A51006	**BSC**	Applied Physics	3	1	0	4.0
3	A51004	ESC	Programming for Problem Solving–I	2	0	0	2.0
4	A51007	ESC	Basic Electrical Engineering	3	0	0	3.0
5	A51237	**BSC**	Applied Physics Lab	0	0	3	1.5
6	A51238	ESC	Programming for Problem Solving–I Lab	0	0	3	1.5
7	A51239	ESC	Basic Electrical Engineering Lab	0	0	2	1.0
8	A51240	ESC	Engineering Workshop	0	0	3	1.5
9	A51241	HSMC	English Communication Skills Lab	0	0	2	1.0
TOTAL				11	2	13	19.5

I YEAR II SEMESTER – COURSE STRUCTURE (R20)

S.No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A52001	**BSC**	Mathematics–II	3	1	0	4.0
2	A52008	HSMC	English	2	0	0	2.0
3	A52009	**BSC**	Engineering Chemistry	3	1	0	4.0
4	A52003	ESC	Programming for Problem Solving–II	2	0	0	2.0
5	A52233	ESC	Engineering Graphics Lab	0	0	5	2.5
6	A52234	HSMC	English Language Skills Lab	0	0	2	1.0
7	A52235	BSC	Engineering Chemistry Lab	0	0	3	1.5
8	A52236	ESC	Programming for Problem Solving–II Lab	0	0	3	1.5
TOTAL				10	2	13	18.5

B.TECH II YEAR I SEMESTER (R20) [5 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A53025	PCC	Data Structures	3	0	0	3.0
2	A53024	ESC	Digital Logic Design	3	0	0	3.0
3	A53027	BSC	Discrete Mathematics	3	0	0	3.0
4	A53037	PCC	Statistical methods for Data Analysis	3	0	0	3.0
5	A53026	PCC	Python Programming	2	0	0	2.0
6	A53225	PCC LAB	Python Programming Lab	0	0	3	1.5
7	A53226	PCC LAB	Data Structures Lab	0	0	3	1.5
8	A53227	PCC LAB	Linux Programming Lab	0	1	2	2.0
9	A53228	ESC LAB	Design Thinking Lab	0	0	2	1.0
10	A53007	MC	Environmental Studies	2	0	0	0
			TOTAL	15	2	8	20

B. TECH II YEAR II SEMESTER [5 T + 3 P + 1 M]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A54023	PCC	Computer Organization and Architecture	3	0	0	3.0
2	A54029	PCC	Fundamentals of Artificial Intelligence	3	0	0	3.0
3	A54025	PCC	Java Programming	2	1	0	3.0
4	A54027	PCC	Database Management Systems	3	0	0	3.0
5	A54026	PCC	Design and Analysis of Algorithms	3	1	0	4.0
6	A54231	PCC LAB	Database Management Systems Lab	0	0	3	1.5
7	A54230	PCC LAB	Java Programming Lab	0	0	3	1.5
8	A54229	HSS & MC LAB	Soft Skills for Success Lab	0	0	2	1.0
9	A54022	MC	Gender Sensitization	2	0	0	0
			TOTAL	16	2	8	20

B.TECH III YEAR I SEM (R20) **[5T+3L +1 MC]**

S.No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1	A55024	PCC	Computer Networks	3	0	0	3
2	A55025	PCC	Operating Systems	3	0	0	3
3	A55030	PCC	Machine Learning	3	0	0	3
4	A55027	PCC	Web Technologies	3	0	0	3
5	A55077 A55078 A55079 A55081	OEC-1	1.English for Professionals 2. Essential English and Employability Skills 3. Intellectual Property Rights 4. Data story Telling	3	0	0	3
6	A55288	ESC-Lab	Quantitative Aptitude and Reasoning	0	1	2	1.5
7	A55210	PCC-Lab	Web Technologies Lab	0	0	4	2
8	A55209	PCC-Lab	Operating Systems & Computer Networks Lab	0	0	3	1.5
9	A55091	MC	NSS and NSO	0	0	2	0
	TOTAL						20

B.TECH III YEAR II SEM **[5 T +3L]**

S.No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1	A56052	PCC	Data Visualization	3	0	0	3
2	A56053	PCC	Predictive Analytics using R Programming	3	1	0	4
3	A56054 A56037 A56038 A56039	PEC–I	1. Mobile Application Development 2. Internet of Things 3. Fundamentals of Digital Image Processing 4. Object Oriented Modeling	2	0	0	2
4	A56035 A56055 A56043 A56042	PEC–II	1. Software Engineering 2. Language Processors 3. Information Storage and Retrieval 4. Principles of Distributed System	3	0	0	3
5	A56080	HSS&MC	Entrepreneurship Development	3	0	0	3
6	A56232	ESC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	A56215	PCC Lab	Data Visualization Lab	0	0	4	2
8	A56216	PCC-Lab	Predictive Analytics using R Programming Lab	0	0	3	1.5
	TOTAL						20

B.TECH IV YEAR I SEM (7th Semester) (R20) 5 T +2 L + Mini project

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57055	PEC-III	i. Cryptography and Information Security	3	1	0	4
	A57066		ii. Big Data Analytics				
	A57058		iii. Software Testing				
4	A57061	PEC - IV	i. Natural Language Processing	3	0	0	3
	A57062		ii. Web Mining				
	A57064		iii. Human Computer Interaction				
	A57067		iv. Data Science and Analytics				
5	A57060	PEC-V	i. Fundamentals of Cloud Computing	3	0	0	3
	A57065		ii. Fundamentals of Blockchain Technology				
	A57063		iii. Cyber Forensics				
6	A57210	PCC	i. Deep Learning Lab	0	0	3	1.5
7	A57209	PEC-III-Lab	i. Cryptography and Information Security Lab	0	0	3	1.5
	A57214		ii. Big Data Analytics Lab				
	A57212		iii. Software Testing Lab				
8	A57230	PROJ	i. Industry Oriented Mini Project	0	0	4	2
Total							22

B.TECH IV YEAR II SEM **2T +3 L/P**

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	i. Technical and Business Communication Skills	2	1	0	3
	A58019		ii. Digital Media Literacy				
	A58010		iii. Value Engineering				
2	A58005	OEC-III	i. Negotiation Skills	2	1	0	3
	A58008		ii. Project Management				
	A58021		iii. Stress Management				
3	A58201	PROJ	i. Seminar	0	0	4	2
4	A58202	PROJ	i. Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project	0	0	20	10
Total							**20**

Program Structure and Syllabus of B. Tech I, II, III & IV Year (I & II Semesters)

Computer Science and Engineering-Data Science

R20 Regulations

Venkatapur (V), Ghatkesar (M), Medchal-Malkajgiri (Dt.), Hyderabad, Telangana, INDIA
info@anurag.edu.in; http://anurag.edu.in

B.TECH I YEAR I SEMESTER [5 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A51001		Mathematics-I				
2	A51006		Applied Physics				
3	A51004		Programming for Problem Solving-I				
4	A51007		Basic Electrical Engineering				
5	A51236		Applied Physics Lab				
6	A51237		Programming for Problem Solving-I Lab				
7	A51238		Basic Electrical Engineering Lab				
8	A51239		Engineering Workshop				
9	A51240		English Communications				
			TOTAL				

B.TECH I YEAR II SEMESTER [5 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A52001		Mathematics-II				
2	A52008		English				
3	A52009		Engineering Chemistry				
4	A52003		Programming for Problem Solving-II				
5	A52010		Engineering Graphics				
6	A52236		English Language Skills Lab				
7	A52237		Engineering Chemistry Lab				
8	A52238		Programming for Problem Solving-II Lab				
9	A52240		Engineering Graphics Lab				
			TOTAL				

B.TECH II YEAR I SEMESTER [5 T + 4 P + 1 M]

S. No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A53025	PCC	Data Structures	3	0	0	3.0
2	A53024	ESC	Digital Logic Design	3	0	0	3.0
3	A53027	BSC	Discrete Mathematics	3	0	0	3.0
4	A53037	PCC	Statistical methods for Data Analysis	3	0	0	3.0
5	A53026	PCC	Python Programming	2	0	0	2.0
6	A53225	PCC LAB	Python Programming Lab	0	0	3	1.5
7	A53226	PCC LAB	Data Structures Lab	0	0	3	1.5
	A53227	PCC LAB	Linux Programming Lab	0	1	2	2.0
8	A53228	ESC LAB	Design Thinking Lab	0	0	2	1.0
9	A53007	MC	Environmental Studies	2	0	0	0
			TOTAL	15	2	8	20

B. TECH II YEAR II SEMESTER [5 T + 3 P + 1 M]

S.No	Course Code	Category	Course	Hours per week			Credits
				L	T	P	
1	A54023	PCC	Computer Organization and Architecture	3	0	0	3.0
2	A54029	PCC	Fundamentals of Artificial Intelligence	3	0	0	3.0
3	A54025	PCC	Java Programming	2	1	0	3.0
4	A54027	PCC	Database Management Systems	3	0	0	3.0
5	A54026	PCC	Design and Analysis of Algorithms	3	1	0	4.0
6	A54231	PCC LAB	Database Management Systems Lab	0	0	3	1.5
7	A54230	PCC LAB	Java Programming Lab	0	0	3	1.5
8	A54229	HSS & MC LAB	Soft Skills for Success Lab	0	0	2	1.0
9	A54022	MC	Gender Sensitization	2	0	0	0
			TOTAL	16	2	8	20

Data Structures

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53025	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

Any Programming Language

Course Objectives

1. Understand various static and dynamic representations of data structures
2. Understand fundamental algorithmic problems of various nonlinear data structures.
3. To be familiar with Graph representations and traversals.
4. Know the basic concepts of Hashing.

Course Outcomes

1. Examine Static and Dynamic data structures in implementing Stack applications (L4)
2. Apply Tree traversal algorithms in solving real time applications (L3)
3. Analyze the concepts of Advanced Trees to generate search efficiently (L4)
4. Interpret the importance of Graphs in solving real time applications (L5)
5. Examine the concepts of hashing, collision and its resolution methods using hash function (L4)

UNIT I

Introduction: What is data structure, Types of data structures, Static and Dynamic representation of data structure and comparison. Stacks-Definition, Operations, Applications of stacks – Representation and evaluation of expressions using Infix, Prefix and Postfix, Algorithms for conversions and evaluations of expressions from infix to prefix and postfix using stack, Towers of Hanoi, Parenthesis checker.

UNIT II

Trees: Basic terminology, Types of trees: Binary Tree: terminology, Complete and Full Binary Tree, Extended Binary Trees, Threaded Binary Trees-Inorder Threading. Representation of Trees using Arrays and Linked lists (advantages and disadvantages). Tree Traversal and Representation of Algebraic expressions; Algorithms for Tree Traversals.
Heaps: Introduction, Types of Heaps – Min binary heap, Max binary heap.

UNIT III

Advanced concepts on Trees: Representation and Creation of Binary Search Trees (BST), Algorithm for inserting, deleting and searching in BST. Representation and advantages of AVL Trees, Algorithms on AVL Trees-Insertion, Rotation and Deletion. Definition and advantages of B-trees, B Tree of Order M, operations- Insertion and Searching, Introduction to Red-Black Trees and Splay Trees.

UNIT IV

Graphs: Basic terminology, Representation of Graphs: sequential representation (Adjacency, Path Matrix) Linked representation.
Graph Traversals-Breadth First Search, Depth First Search with algorithms. Definition and properties of Spanning Tree, Minimum Spanning Tree, Minimum Spanning Tree Algorithms, Dijkstra Algorithms.

UNIT V

Hashing: General Idea, Hash Functions, Collision Resolution- Separate Chaining, Open Addressing-Linear probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing, Implementation of Dictionaries.

Text Book

1. Seymour Lipschutz, Schaum's Outlines, Data Structures, Special Second Edition, Tata McGraw-Hill, 2014.

Reference Books

1. Richard F.Gillberg & Behrouz A. Forouzan, Data Structures, A Pseudo code Approach with C, Second Edition, Cengage Learning, India Edition, 2005.
2. Aaron M. Tanenbaum, Yedidyah Langsam and Moshe J. Augenstein, Data Structures Using C and C++, PHI Learning Private Limited, Delhi India, 2001.
3. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publications Pvt Ltd. Delhi India, 2015.
4. A.K. Sharma, Data Structure Using C, Pearson Education India, 2011

Digital Logic Design

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53024	ESC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

None

Course Objectives

1. Understand various number systems addition and subtractions in binary system, error detection and correction codes
2. Minimize boolean functions using boolean laws & k-maps and realize by using logic gates
3. Design various combinational circuits with practical applications
4. Understand the basic sequential circuits : Latches, Flip-Flops and their usage
5. Design synchronous and asynchronous counters

Course Outcomes

1. Understand various number systems, floating point representations, complements, error detecting and correcting codes (L2)
2. Apply boolean algebraic principles and k-maps for simplification of boolean functions (L3)
3. Design combinational circuits (L3)
4. Analyze various types of flip flops (L4)
5. Design sequential circuits (L3)

UNIT I

Number Systems: Binary, Octal, Hex Decimal, and Conversions; Binary additions and subtractions (using 1c, and 2c), concept of overflow; Representations of negative numbers using 1's and 2's complement and range; BCD numbers: 8421, 2421, Ex-3, Gray and Self Complementary codes; Error Detecting codes: even & odd parity, hamming codes; Error correcting codes: hamming codes, block parity codes; Floating point representation

UNIT II

Boolean Algebra and Digital Logic Gates, Basic Boolean laws and properties; Boolean functions, truth tables; Standard forms (SOP, POS) and Canonical forms, Conversion between Canonical and

Standard forms ; Gate minimization using three and four variable K-Maps with and without don't cares, Logic Circuit Design using Universal Gates

UNIT III

Introduction to combinational circuits and applications**,** Design Procedure, Combinational circuit for Half Adder, Full Adder, Half Subtractor and Full Subtractor, Binary Adder, Binary Adder-Subtractor, Decimal Adder, Code Converters, Decoders, Encoders, Multiplexers, Demultiplexers

UNIT IV

Introduction to Sequential Circuits and its applications, Lathes, Flip flops, Storage Elements, Flip-flops: S-R Flip flop, D Flip Flop, J-K Flip Flop, T Flip flop, master slave J-K flip flop, Analysis of Clocked Sequential Circuits, Flip Flop Conversions

UNIT V

Registers and Counters: Introduction, Registers, Shift Registers, Ripple Counters: Up counter, Up-Down counter, Decade counter, Synchronous Counters: Up Counter, Up-Down counter, Decade Counter, Other Counters: Ring Counter, Johnson Counter

Text Books:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 5th Edition, Pearson Education, 2012
2. Anand Kumar, Switching Theory and Logic Design, 3rd edition, PHI, 2016

Reference Books

1. Roth, Fundamentals of Logic Design, 5th Edition, Thomson, 2004.
2. John F. Wakerly, Digital Design, Principles and Practices, 4th Edition, Pearson / Prentice Hall, 2005.
3. Malvino & Leach, Digital Principles and Applications, Seventh Edition, Tata McGraw-Hill Education, 2010.
4. A.K. Maini, Digital Electronics, Principles and Integrated Circuits, 1st Edition, Wiley India Publications, 2007.

Discrete Mathematics

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A53027	BSC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

Mathematics I and Mathematics II

Course Objectives

1. Interpret the Sets, syntax and semantics of propositional and predicate logic.
2. Solve applications involving Permutations and Combinations.
3. Formulate Recurrence relations to solve problems involving an unknown sequence.
4. Explain the concepts of Relations and Graphs.
5. Illustrate the Algebraic Systems

Course Outcomes

1. Analyze Statement Logic and Predicate Logic.(L4)
2. Apply the principles of Permutations and Combinations with repetition & without repetitions(L3)
3. Solve Recurrence Relations by using generating functions(L3)
4. Apply the knowledge of Relations and Graph Theory in the field of Computer Science.(L3)
5. Analyze the Algebraic Systems with their properties(L4)

UNIT I

Foundations: Basics, Sets and Operations of Sets, Fundamentals of Logic, Logical Inferences, First order logic and other methods of Proof, Rules of Inference for Quantified Propositions. **(Problems Only and Theorems without Proofs)**

UNIT II

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumerating Combinations and Permutations with & without repetitions, constrained repetitions, and Principle of Inclusion and Exclusion. **(Problems Only and Theorems without Proofs)**

UNIT III

Recurrence Relations: Generating Functions, Calculating coefficient of Generating Function, Solving Recurrence relations by substitution method and Generating Functions, The Method of Characteristic Roots, Solutions to inhomogeneous recurrence relations. **(Problems Only and Theorems without Proofs)**

UNIT IV

Relations and Digraphs: Relations and Directed Graphs, Special Properties of Binary Relations, Equivalence Relations, Ordering Relations, Lattices, Operations on Relations, Paths and Closures, Directed Graphs and adjacency matrices. **(Problems Only and Theorems without Proofs)**

Graphs: Basic Concepts, Isomorphism's and Sub-graphs, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs. **(Problems Only and Theorems without Proofs)**

UNIT V

Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, homomorphism, isomorphism, rings. **(Problems Only and Theorems without Proofs)**

Text Books

1. Joe L. Mott, Abraham Kandel, Theodare P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", Second Edition, PHI, 2019.
2. J. P.Tremblay and P. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 2007

Reference Books

1. K. H. Rosen, "Discrete Mathematics and its Applications with Combinatorics and Graph Theory", 7th Edition, Tata McGraw Hill.
2. S. K. Chakraborthy and B.K. Sarkar," Discrete Mathematics ", Oxford, 2011.
3. C. L. Liu and D. P. Mohapatra,"Elements of Discrete Mathematics-A Computer Oriented Approach", 3rd Edition, Tata McGraw Hill.

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Statistical Methods For Data Analysis

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

Mathematics I and Mathematics II

Course Objectives

1. To provide insights about the basic roles of various statistical methods in building computer applications and develop a greater understanding of the importance of Data Visualization techniques
2. To perform various types of averages and dispersion, polynomial curve fitting, general curve fitting and interpolation, various types of Skewness and kurtosis, Correlations.
3. To develop problem-solving skill on basic Probability.
4. Estimation of statistical parameters, testing of hypothesis of few unknown statistical parameters.
5. Estimation of known statistical parameters of small sampls.

Course Outcomes

1. Analyze an extremely large data set and perform exploratory data analysis to extract meaningful insights. Develop various visualizations of the data in hand and communicate results of analysis effectively (visually and verbally).
2. 2.To understand the concept of Average and Dispersions, and interpolate using curve fitting and identify the correlation between variables.
3. 3Identify distribution in certain realistic situation. It is mainly used for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables involved in the probability models. It is quite useful for all branches of engineering.
4. Calculate mean and proportions of large samples and to make important decisions from few samples which are taken out of unmanageably huge populations. It is mainly useful for non-circuit branches of engineering.
5. To understand the concept of small sample tests.

UNIT I

Introduction to Statistics: Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, representative sample. Classification and tabulation of univariate data, graphical representation, Frequency curves.

UNIT II

Measures of Central tendency, Dispersion, Moments, Skewness and Kurtosis.

Curve fitting by the method of least squares- fitting of straight lines, second degree parabola and more general curves. Correlation, Rank correlation andRegression.

UNIT III

Introduction to Probability, Addition theorem, Multiplication theorem (Two events only), Baye's theorem.

Random variables, Discrete and continuous random variable, Definitions of Probability Distribution function, Probability mass function, Probability density function and properties. Definitions of Mathematical expectation, Variance of discrete and continuous random variable.Bivariate distributions and their properties, marginal and conditional distribution.

UNIT IV

Estimation: Concept of Point estimation and its properties (definition only), Concept of Interval estimation with examples.

Testing of Hypothesis: Null & Alternative Hypothesis, Critical region, Type I and Type II errors, level of significance, one tail, two-tail tests.

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means.

UNIT V

Small Sample tests: t-test for single mean, difference of means,paired t-test, F-test.
Chi-square test for goodness of fit and independence of attributes.

Text Books

1. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press.
2. Probability and Statistics for Engineers by Richard A Johnson, Pearson Education.

Reference Books

1. Fundamentals of Mathematical Statistics by S.C Gupta and V.K Kapoor Sultan Chand & Sons.
2. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.
3. Montgomery: Design and Analysis of Experiments, Wiley

Python Programming

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	MC	L	T	P	C	CIE	SEE	Total
		2	0	0	0	--	--	--

Pre requisites

None

Course Objectives

1. Understand the basics and function of Python Programming Language.
2. Understand the string operation and sequences used in Python Programming Languages.
3. Understand the data structures used in Python Programming Languages.
4. Know the classes and objects in Python Programming Language.
5. Use the reusability concepts in Python Programming Language.

Course Outcomes

t the end of this Data Structures course, students will be able to:

1. Apply control structures, functions and packages in Problem Solving. (L3)
2. Analyze various String handling functions and data structures(L4)
3. Model the object-oriented problems with classes and objects (L4)
4. Solve the problems by using Inheritance and polymorphism (L3)
5. Illustrate programs on Exception Handling and various packages(L3)

UNIT I

Introduction to Python:
Features of Python Language, Data Types, Operators, Expressions, Control Statement, Standard I/O Operations.
Functions and Modules:
Declaration and Definition Function Calling, More on Defining Functions, Recursive Functions, Modules, Packages in Python, Doc Strings.

UNIT II

Strings and Regular Expressions:
String Operations, Built-in String Methods and Functions, Comparing Strings, function in Regular Expression.
Sequence: List, Tuples, Dictionaries, Sets.

UNIT III

Introduction to Object Oriented Programming: Features of OOP,Merits and demerits of Object Oriented Programming Languages,Applications of OOP

Implementation of classes and objects in Python:

Classes and Objects, Class Method and Self Argument. The __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Members, Private Methods, Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects).

UNIT IV

Implementation of Inheritance in Python:

Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces, Meta class,

Implementation of Operator Overloading in Python:

Introduction, Implementing Operator Overloading, Overriding Methods

Exception Handling in Python:

Introduction, Exception hierarchy, Handling Exception, Multiple Except Blocks and Multiple Exceptions, Finally Block.

UNIT V

Python NumPy: NumPy ND array, Data Types, Functions of NumPy Array, NumPy Array Indexing, Mathematical Functions on Arrays in NumPy

Python Pandas: Pandas Features, Dataset in Pandas, Data Frames, Manipulating the Datasets, Describing a Dataset, group by Function, Filtering, Missing Values in Pandas, Concatenating Data Frames. Import data from csv file.

Introduction to Matplotlib :, Plot, Scatterplot, Introduction to Tkinter ,Date and Time Packages

Text Books

1.ReemaThareja,Python Programming using Problem Solving Approach, First Edition,Oxford Higher Eduction,2017

2.James Payne, Beginning Python using Python 2.6 and Python 3,1st Edition

Reference Books

1. Charles Dierach, Introduction to Computer Science using Python,2013

2. https://www.programiz.com/python-programming

3. https://www.javatpoint.com/python-tutorial

4.. https://www.geeksforgeeks.org/python-programming-language/

Environmental Studies

Pre requisites

Engineering Chemistry

Course Objectives

1. To introduce the knowledge about Environment.
2. To introduce students to the concepts of pollution, Biodiversity
3. To develop an awareness about global Environmental problems.
4. To learn to protect environment and awareness on legal issues
5. To learn about importance of sustainable development and role of IT in environment.

Course Outcomes

1.Understand fundamental physical and biological principles that govern natural processes.
2.Understand fundamental concepts from the social sciences and humanities underlying environmental thought and governance.
3.Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
4 Communicate integrated perspectives on complex environmental problems in the form of written and oral argument to both professional and lay audiences.
5.Design and conduct independent research that contributes to environmental thought and/or problem solving.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

Ecosystems: Concept of an ecosystem – Classification, structure and function of different ecosystems - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids.

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT II

Natural Resources: Renewable and non-renewable – Natural resources and associated

problems: Forest resources – Use and over – exploitation, deforestation,– Timber extraction, mining, dams and other effects on forest and tribal people: Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources: Equitable use of resources for sustainable lifestyles.

UNIT III

Environmental Pollution: Definition, Cause, effects and control measures of different kinds of pollution (Air, Water, Soil, Marine, Noise, Thermal, Nuclear, e –Waste)

Carbon Capture & Sequestration – different storage sources, major disadvantages, environmental effect**s**

Social Issues and the Environment: From Unsustainable to Sustainable development - Urban problems related to energy -Water conservation, rain water harvesting, and watershed management. -Climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

UNIT IV

Waste management technology: Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

Waste water and sewage treatment technology: primary, secondary and tertiary treatments.

Bioremediation, Phyto-remediation, ZLD (zero liquid discharge), membrane technology.

Application of GIS and GPS system in environmental science.

Environmental policy, Rules and regulations. EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act - Wildlife Protection Act –Forest Conservation Act.-Public awareness. Global environmental problems and global efforts.

UNIT V

Towards sustainable future: concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. Environmental education, Conservation of resources. Urban sprawl, sustainable

cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, Basic principles of Green engineering, clean development mechanism (CDM), Low carbon life cycle, Polluters-pay principle.

Text Books

1.Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha, University Press Private Limited, Reprinted in 2005.

2.Environmental Studies: From Crisis to Cure by R.Rajagopalan, Oxford University Press, 2nd Edition, 2005

Reference Books

1. Environmental Science: Towards a Sustainable Future by Richard T.Wright. PHL Learning Private Ltd .New Delhi, 2008

2.Environmental Engineering and science by Gilbert M.Masters and Wendell P.Ela. PHI Learning Pvt. Ltd. 4th edition, 2008

Python Programming Lab

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Pre requisites

Python Programming

Course Objectives

1. Understand the basics and function of Python Programming Language.
2. Understand the string operation and sequences used in Python Programming Language.
3. Know the Data Structures in Python Programming Language.
4. Use the reusability concepts in Python Programming Language.
5. Use Exception Handling mechanism in Python Programming Language.
6. Know the packages in Python Programming Language

Course Outcomes

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

1. Develop programs on data types, operators and expressions
2. Apply the data structures in real time scenarios
3. Write the programs on strings and functions
4. Implement programs on class and related issues.
5. Use of python exception handling and packages.

Week 1

1. Installation and Environment set up of Python & Programs on Data types

Week 2

2.Programs on Standard I/O, Operators and Expressions

Week 3

Programs on Functions

Week 4

Programs on lists and Tuples

Week 5

Programs on Dictionaries

Week 6

Programs on Strings and string operations

Week 7

Programs on Regular Expressions.

Week 8

Programs on Inheritance and Polymorphism

Week 9

Programs on Exception Handling

Week 10

Demonstration of Numpy Package

Week 11

Demonstration of Pandas Package

Week 12

Demonstration of matplotlib Package and Tkinter Package

Week 13

Demonstration of Date and Time Packages

Week 14 and 15

Review

Data Structures Lab

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Pre requisites

Data structures course

Course Objectives

1. To design and analyze simple linear and non linear data structures.
2. To design and implement various data structure algorithms
3. To identify and apply the suitable data structure for the given real world problem

Course Outcomes

1. Develop the programs on stacks and its applications.
2. Demonstrate the implementation of various advanced trees.
3. Design and implementation of programs on BST and Graph Traversals.
4. Develop the programs on Hashing and Dictionaries

Week 1

1. Review of Stack and Queue Operations using arrays and Linked Lists

Week 2

2. Program to convert infix to postfix notation
3. Program to evaluate postfix notations

Week 3

4. Program to implement towers of Hanoi
5. Program to implement parenthesis checker

Week 4

6. Program to illustrate tree traversals

a) In order b) Preorder c) Post order

Week 5

7. Program to illustrate insertion, deletion and searching in Binary Search Tree

Week 6

8. Program to implement Heaps

a) Min Heap b) Max Heap

Week 7

9. Program to illustrate Insertion on AVL Trees
10. Program to illustrate deletion and Rotation on AVL Trees

Week 8

11. Program to implement B-Trees

a) Insertion b) Search c) Display

Week 9

12. Program to illustrate Graph traversals

a) Breadth First Search
b) Depth First Search

Week 10

13. Program to implement

a) Prim's algorithm b) Kruskal's algorithm

Week 11

14. Program to Implement Dijkstra algorithm

Week 12 & 13

15. Program to implement Hashing and collision resolution techniques

Week 14

16. Program to implement Dictionaries

Week 15

17. Review

Linux Programming Lab

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	1	2	2	40	60	100

Pre requisites

Basic Computer fundamentals

Course Objectives

1. To gain an understanding of important aspects related to the Linux Commands.
2. To understand directory commands.
3. To provide a comprehensive introduction to SHELL programming.
4. To understand file handling utilities
5. To develop ability to use system calls.

Course Outcomes

1. Apply the basic commands in Linux Operating System.
2. Create directories and Shell Script programs.
3. Analyze a given problem and apply requisite facets of Shell programming.
4. Demonstrate UNIX commands for file handling mechanisms.
5. Develop a C Program for UNIX Commands.

Week 1

Practice Vi Commands

Week 2

Open the file created in session 1
Add some text
Change some text
Delete some text
Save the Changes

Week 3

a) Create mytable (name of the table) using cat command for the following data. use tab to separate fields.

1425 Ravi 15.65
4320 Ramu 26.27

6830 Sita 36.15
1450 Raju 21.86

b) Use the cat command to display the file, mytable.

c) Use the vi command to correct any errors in the file, mytable.

Week 4

a) Use the sort command to sort the file mytable according to the first field. Call the sorted file mytable (same name)

b) Print the file mytable

c) Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)

d) Print the new file, mytable

e) Logout of the system.

Week 5

a) Use the appropriate command to determine your login shell

b) Use the /etc/passwd file to verify the result of "step a".

c) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.

d) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

Week 6

a) Write a sed command that deletes the first character in each line in a file.

b) Write a sed command that deletes the character before the last character in each line in a file.

c) Write a sed command that swaps the first and second words in each line in a file.

Week 7

a) Pipe your /etc/passwd file to awk, and print out the home directory of each user.

b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.

Week 8

a)Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.

c) Write a shell script that determines the period for which a specified user is working on the System.

Week 9

a) Write a shell script to perform the following string operations:

i) To extract a sub-string from a given string.

ii) To find the length of a given string.

b) Write a shell script that accepts a file name starting and ending line numbers as arguments and

displays all the lines between the given line numbers.

c) Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Week 10

a) Write a shell script that computes the gross salary of a employee according to the following rules:

i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.

ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic

The basic salary is entered interactively through the key board.

b) Write a shell script that accepts two integers as its arguments and compute the value of first number raised to the power of the second number

Week 11

a) Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, then program ask the user for the necessary information, such as the file name, new name and so on.

Week 12

a) Write shell script that takes a login name as command – line argument and reports when that person logs in

b) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

Week 13

a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.

b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.

Week 14

Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

i) File type

ii) Number of links

iii) Read, write and execute permissions

iv) Time of last access

(Note: Use stat/fstat system calls)

Week 15

Review

Text Books

1. Unix concepts and applications, Fourth Edition, Sumitabha Das, TMH

2. Introduction to UNIX & SHELL programming, M.G. Venkatesh Murthy, Pearson Education

Design Thinking Lab

B. Tech II Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	ESC LAB	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objectives

1. Understand the concepts of design thinking phases.
2. To familiarize the participant with different case studies
3. Apply both critical thinking and design thinking in parallel to solve real time problems.
4. Apply design thinking phases to real time applications.

Course Outcomes

1. Define the phases of design thinking
2. Explore through different real time case studies
3. Experience a hands-on implementation of design thinking to a real time problem
4. Connect design thinking to real time applications.

Week 1

1. Introduction to phases of Design Thinking

Week 2

2. Empathize to identify problem

Week 3

3.Define the Problem

Week 4

4. Ideate the Problem

Week 5

5.Building of Prototype

Week 6

6.Iterations of Prototype

Week 7

7. Iterations of Prototype

Week 8

8.Demonstration of Prototype Model

Week 9

9. Internal Evaluation of Prototype

Week 10

10. Internal Evaluation of Prototype

Week 11

11. Document submission

Week 12 and 13

Review

Reference Books

1.Design & Thinking Documentary, https://nyu.kanopy.com/video/design-and-thinking
2. Stephanie di Russo, Understanding the Behaviour of Design Thinking in Complex Environments,
3.https://www.academia.edu/24919250/Understanding_the_behaviour_of_design_thinking_in_complex_environments

Computer Organization and Architecture

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

Digital Logic Design

Course Objectives

1. Understand the instruction format, life cycle and CPU Architecture and Organization
2. Know the basic architecture of Microprocessor
3. Learn various types of memories
4. Learn the concepts for data transfer between CPU & I/O devices.
5. Understand the concepts of Pipeline, Vector and Multiprocessors.

Course Outcomes

1. Describe the basic organization of computer and different instruction formats and addressing modes.(L2)
2. Analyze the concept of pipelining, segment registers and pin diagram of CPU.(L4)
3. Analyze various issues related to memory hierarchy.(L4)
4. Compare various modes of data transfer between CPU and I/O devices.(L4)
5. Design Pipeline for the execution of instructions (L5)
6. Examine various inter connection structures of multi processors. (L4)

UNIT I

Instruction: Instruction Definition, instruction cycle, flow chart for instruction cycle, instruction storage, types of instruction formats (Zero, one, two and three address). Addressing modes: mode field, implied, immediate register, register direct, register indirect, auto increment, decrement, indexed, relative, base address mode, Numerical examples and problems.

UNIT II

CPU-Organization: 8086 –CPU –Block diagram and pin diagram, minimum and maximum mode, General purpose registers; segment register and generation of 20 bits address, segmentation of main memory, systems bus, Types of flags.

UNIT III

Memory Hierarchy, Main memory, memory address map, memory connection to CPU; Auxiliary memory, Magnetic disks, Magnetic tapes; cache memory, hit and miss ratio, direct, associative and set associative mapping; Micro-programmed control: control memory, address sequencing.

UNIT IV

I/O interface: I/O Bus and Interface modules, I/O versus Memory Bus, isolated vs Memory-mapped I/O. Asynchronous data transfer-strobe control, Hand shaking; Modes of Transfer: Example of programmed I/O, interrupt-initiated I/O. Daisy-Chaining priority. DMA: DMA Controller, DMA Transfer, Intel 8089 IOP.

UNIT V

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessor; Interconnection structures: Time Shared common bus, multiport memory, crossbar switch, multi-stage switching network; Introduction to Flynn's classification: SISD, SIMD, MISD, MIMD (Introduction).

Text BookS

1. M. Morris Mano, Computer System Architecture, Revised Third Edition, Pearson/PHI, 2017.
2. Carl Hamacher, Zvonks Vranesic, Safea Zaky, Computer Organization ,5th Edition, McGraw Hill,2011.
3. Douglas V Hall, Microprocessor and Interfacing, Second Edition, TATA McGraw Hill, 2006.

Reference Books

1. William Stallings, Computer Organization and Architecture, 6thEdition, Pearson/PHI, 2007.
2. Andrew S. Tanenbaum, Structured Computer Organization, 4th Edition, PHI/Pearson.
3. http://nptel.iitm.ac.in.

Fundamentals of Artificial Intelligence

B. Tech II Year I Semester					Dept. of Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A54029	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	50	50	100

Pre requisites

Programming Knowledge, Computer Organization

Course Objectives

1. The main objective of this course is to introduce the basic concepts of artificial intelligence, its foundations
2. To analyze various search strategies in intelligent systems
3. To apply search algorithms in games
4. To learn various representations of logic and knowledge
5. To understand production systems and its components

Course Outcomes

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

1. Understand Strong AI and Weak AI and identify problems applicable to AI
2. Compare and contrast various uninformed and informed search algorithms to find an optimal solution for a given problem
3. Apply appropriate search algorithms for winning games
4. Learn various representations applicable to logic and knowledge useful in reasoning
5. Learn to apply appropriate inference methods in production or expert systems

UNIT I

Overview of Artificial Intelligence: Introduction. The Turing Test, Strong AI versus Weak AI, Heuristics, Identifying Problems Suitable for AI, Applications and Methods, Early History of AI, Recent History of AI to the Present, AI In the New Millennium

UNIT II

Uninformed Search: Introduction: Search in Intelligent Systems, State-Space Graphs, Generate-and-Test Paradigm, Blind Search Algorithms, Implementing and Comparing Blind Search Algorithms **Informed Search:** Introduction, Heuristics, Informed Search Algorithms – Finding Any Solution, The Best-First Search, The Beam Search, Additional Metrics for Search Algorithms, Informed Search – Finding An Optimal Solution,

UNIT III

Search Using Games: Introduction, Game Trees and Minimax Evaluation, Minimax With Alpha-Beta Pruning, Variations and Improvements To Minimax, Games of Chance and the Expectiminimax Algorithm

UNIT IV

Logic in Artificial Intelligence: Introduction, Logic and Representation, Propositional Logic, Predicate Logic – Introduction, Several Other Logics, Uncertainty and Probability **Knowledge Representation:** Introduction, Graphical Sketches and the Human Window, Graphs and the Bridges of Königsberg Problem, Search Trees, Representational Choices, Production Systems, Object Orientation, Frames, Semantic Networks

UNIT V

Production Systems: Introduction, Background, Production Systems and Inference Methods, Production Systems and Cellular Automata, Stochastic Processes and Markov Chains, Basic Features and Examples of Expert Systems

Text Books

1. Stephen Lucci, Danny Kopec. Artificial Intelligence in the 21st Century. A Living Introduction. Mercury Learning and Information. 2nd Edition. 2016

Reference Books

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

JAVA PROGRAMMING

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Pre requisites

Object Oriented Programming

Course Objectives

1. Understand the concept of OOP and learn the basic syntax and semantics of the Java language and programming environment
2. Be familiar with the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
3. Understand Exceptional handling and multithreading concepts
4. Be familiar with GUI applications.

Course Outcomes

1. Understand the Object Oriented Programming concepts(L2)
2. Design programs using package and interfaces.(L6)
3. Apply the concepts of Exceptions and multithreading.(L3)
4. Develop GUI applications and AWT using Frames (L6)
5. Design the programs using Applet and JDBC Concepts(L6)

UNIT I

Java Basics: History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, static keyword,garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, Strings.

UNIT II

Inheritance –Introduction, forms of inheritance- specialization, specification, construction, extension, limitation, combination, Member access rules, super uses, using final with inheritance

Polymorphism- method overriding, abstract classes, Object class Packages and Interfaces : Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, File, Byte Streams, Character Streams.

UNIT III

Exception handling - Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. Package java.util- The Collection Interface, list interface, Queue interface, The Collection class: LinkedListClass, HashSetClass. TreeSetClass, StringTokenizer, Date, Random, Scanner.

Multi threading: Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

AWT: class hierarchy, component, container, panel, window, frame, graphics class, Layout Manager – layout manager types – boarder, grid, flow, card and grib bag.

UNIT V

AWT controls: Labels, button, scrollbars, text components, check box, check box groups, choices, menu bar.

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, create applets, passing parameters to applets.

JDBC Connectivity: JDBC Type 1 to 4 Drivers, connection establishment, QueryExecution

Text Book

1. Java- The Complete Reference, Seventh Edition, Herbert Schildt, Tata McGraw Hill, Year of Publication:2017
2. Database Programming with JDBC&JAVA, Second Edition,GeorgeReese, O'ReillyMedia, Year of Publication:2009

Reference Books

1. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
2. Thinking in Java Fourth Edition, Bruce Eckel
3. Introduction to Java programming, Y. Daniel Liang, Pearson Education

DESIGN AND ANALYSIS OF ALGORITHMS

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Pre requisites

Data structures

Course Objectives

1. Analyze the asymptotic performance of algorithms.
2. Apply the Paradigms and approaches to appreciate the impact of algorithm design in practice.
3. Synthesize efficient algorithms in common engineering design situations.
4. Analyze complex engineering problems using backtracking.
5. Utilize data structures and algorithmic design techniques in solving new problems.

Course Outcomes

1. Formulate the knowledge of algorithm analysis and its notations that are applied on the problems solved by divide and conquer paradigm. (L6)
2. Design the major graph algorithms for model engineering problems and knowledge of the greedy paradigm(L6)
3. Apply the dynamic-programming paradigm and recite algorithms that employ this paradigm. (L3)
4. Illustrate the concept of backtracking, branch and bound paradigm for real time problems. (L4)
5. Analyze the complexity of problems and differentiate that in terms of P and NP problems with examples. (L4)

UNIT I

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Disjoint Sets- disjoint set operations, union and find operations
Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort.

UNIT II

Graphs: breadth first search, depth first search, spanning trees, connected and bi connected components.

Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III

Dynamic Programming: General method, Multi stage graph,applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem.

UNIT IV

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Branch and Bound: General method, applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT V

Lower Bound Theory: Comparison trees ,NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP Complete classes, Clique Decision Problem(CDP), Node cover decision problem

Text Books

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms,Galgotia publications pvt. Ltd, Second Edition, 2007.
2. Thomas H. Cormen,Charles E. Leiserson,Ronald L. Rivert and Clifford Stein, Introdution to Algorithms, Third Edition ,PHI Learning Private Limited , Eastern Economy Edition, 2008.

Reference Books

1. Aho, Ullman and Hopcroft,Design and Analysis of algorithms, Pearson education, Reprint 2002
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai,Introduction to Design and Analysis of Algorithms A strategic approach, Mc Graw Hill,2005.
3. Allen Weiss,Data structures and Algorithm Analysis in C++,Third edition, Pearson education.

DATA BASE MANAGEMENT SYSTEMS

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

Any Programming Language

Course Objectives

1. Discuss Database management systems, databases and its applications
2. Familiarize the students with a good formal foundation on the relational model.
3. Outline the various systematic database design approaches
4. Describe the concepts of transactions and transaction processing and the issues, techniques related to concurrency and recovery manager.
5. Explore the File organizations, indexing and hashing mechanisms.

Course Outcomes

1. Model Entity-Relationship diagrams for enterprise level databases[L3]
2. Formulate Queries using SQL and Relational Formal Query Languages[L3]
3. Apply different normal forms to design the Database[L3]
4. Summarize concurrency control protocols and recovery algorithms[L5]
5. Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data[L3]

UNIT I

Introduction to Database System Concepts: Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

Introduction to the Relation Models and Database Design using ER Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams- Unary, Binary, ternary, Aggregation.

UNIT II

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested Sub queries.

Formal Relational Query Languages: The Relational Algebra, Tuple Relational Calculus.

UNIT III

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Functional Dependencies, Closure set of Functional dependencies, Procedure for Computing $F^{+,}$ Boyce Codd Normal form, BCNF Decomposition Algorithm, Third Normal Form, Third Normal Form Decomposition Algorithm
Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Serializability.

UNIT IV

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.
Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, ARIES, Remote Backup Systems.

UNIT V

File Organization: Fixed and variable length records, Sequential file organization, Data Dictionary, Buffer manager.
Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Extendible Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices

Text Book

1.Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Sixth Edition, Tata McGraw-Hill 2006.

Reference Books

1. Raghu Rama Kirshna, Johannes Gchrke, Database Management System, Third Edition, TATA MC Graw Hill, 2003.
2. C J Date, AKannan, S Swamynathan, An Introduction to Database Systems, Eigth Edition Pearson 2006
3. P Raja Sekhar Reddy, A MallikarjunaReddy, Foundations of Database Management Systems, Lambert Academic Publishing, 2020 (e-Book)
4. https://www.pdfdrive.com/fundamentals-of-database-systems-pdf-e51477130.html

JAVA PROGRAMMING LAB

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

1. Explain Java Environment and use of Java Development Kit for the creation and execution of java programs
2. Develop programs on various concepts like data abstraction & data hiding, encapsulation, inheritance, polymorphism.
3. Develop the programs using interfaces and packages
4. Create and use threads and handle exceptions
5. Develop GUI applications using Applet and JDBC programs.

Week 1

Write a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object

Write a program to implement static and this keyword?

Week 2

Write a program to illustrate types of constructors and constructor overloading

Write a java program to illustrate Method overloading

Week 3

Write a Java program to practice using String class and its methods.
Write a program to illustrate parameter passing Techniques.

Week 4

Write a program to find Minimum and Maximum element using Arrays

Write a java program to illustrate Recursion and nested class

Week 5

Write a program to illustrate types of inheritance.

Write a program to illustrate the use of creation of packages.

Week 6

Write a java program to demonstrate the concept of polymorphism.

Write a java program to illustrate Method Overriding and abstract class?

Week 7

Write a program to illustrate Interfaces

Write a program to illustrate Files

Week 8

Write a program to illustrate try, catch, throw, throws and finally keywords

Write a program to implement the concept of User defined Exceptions.

Week 9

Write a program to illustrate String Tokenizer, Date, Random and Scanner classes?

Write a program to illustrate collection classes and interfaces

Week 10

Write a program to illustrate Multithreading?

Write a program to illustrate thread priorities.

Week 11

Write a program to illustrate Thread Synchronization
Write a program to illustrate Inter Thread Communication

Week 12

Write a program to illustrate applet concept.
Write a program to illustrate passing parameters to applet

Week 13

Write a program to illustrate Event Handling(keyboard,Mouse events)

Week 14

Write a program to illustrate AWT controls.

Write a program to develop a calculator application using AWT

Week 15-16

Write a program to illustrate JDBC.

DATABASE MANAGEMENT SYSTEMS LAB

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

1. Apply different types of SQL commands to create, manipulate and access data from database[L3]
2. Construct database by using various integrity constraints[L3]
3. Develop basic PL/SQL programs[L3]
4. Implement PL/SQL Programs using procedures, functions and cursors[L3]
5. Create trigger for given problem[L3]

Week 1

Data Base user creation, Data definition Language commands, Data Manipulation commands, Data Control Language Commands, Transaction Control Language commands.

Week 2

1. Database Schema for a customer-sale scenario
Customer (Cust id: integer, cust_name: string)
Item (item_id: integer,item_name: string, price: integer)
Sale (bill_no: integer, bill_data: date, cust_id: integer, item_id: integer, qty_sold: integer)

For the above schema, perform the following—
a) Create the tables with the appropriate integrity constraints
b)Insert around 10 records in each of the tables
c)List all the bills for the current date with the customer names and item numbers
d)List the total Bill details with the quantity sold, price of the item and the final amount
e)List the details of the customer who have bought a product which has a price>200
f)Give a count of how many products have been bought by each customer
g)Give a list of products bought by a customer having cust_id as 5
h)List the item details which are sold as of today
i)Create a view which lists out the bill_no, bill_date, cust_id, item_id, price, qty_sold, amount
Create a view which lists the daily sales date wise for the last one week

Week 3

Database Schema for a Student Library scenario
Student (Stud_no : integer,Stud_name: string)

Membership (Mem_no: integer,Stud_no: integer)
Book (book_no: integer, book_name:string, author: string)
Iss_rec(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)

For the above schema, perform the following—
a) Create the tables with the appropriate integrity constraints
b)Insert around 10 records in each of the tables
c)List all the student names with their membership numbers
d)List all the issues for the current date with student and Book names
e)List the details of students who borrowed book whose author is CJDATE
f)Give a count of how many books have been bought by each student
g)Give a list of books taken by student with stud_no as 5
h)List the book details which are issued as of today
i)Create a view which lists out the iss_no, iss _date, stud_name, book name
j)Create a view which lists the daily issues-date wise for the last one week

Week 5:

Database Schema for a Employee-pay scenario
employee (emp_id : integer,emp_name: string)
Department (dept_id: integer,dept_name:string)
Paydetails (emp_id : integer,dept_id: integer, basic: integer, deductions: integer, additions: integer, DOJ: date)
Payroll (emp_id : integer, pay_date: date)

For the above schema, perform the following—
a)Create the tables with the appropriate integrity constraints
b)Insert around 10 records in each of the tables
c)List the employee details department wise
d)List all the employee names who joined after particular date
e)List the details of employees whose basic salary is between 10,000 and 20,000
f)Give a count of how many employees are working in each department
g)Give a names of the employees whose netsalary>10,000
h)List the details for an employee_id=5
i)Create a view which lists out the emp_name, department, basic, deductions, netsalary
j)Create a view which lists the emp_name and his netsalary

Week 5

Database Schema for a Video Library scenario
Customer (cust_no: integer,cust_name: string)
Membership (Mem_no: integer, cust_no: integer)
Cassette (cass_no:integer, cass_name:string, Language: String)
Iss_rec(iss_no: integer, iss_date: date, mem_no: integer, cass_no: integer)

For the above schema, perform the following—

a) Create the tables with the appropriate integrity constraints
b)Insert around 10 records in each of the tables
c)List all the customer names with their membership numbers
d)List all the issues for the current date with the customer names and cassette names
e)List the details of the customer who has borrowed the cassette whose title is " The Legend"
f)Give a count of how many cassettes have been borrowed by each customer
g)Give a list of books which has been taken by the student with mem_no as 5
h)List the cassettes issues for today
i)Create a view which lists outs the iss_no, iss_date, cust_name, cass_name
j)Create a view which lists issues-date wise for the last one week

Week 6

Database Schema for a student-Lab scenario
Class (class_no: string,descrip: string)
Student (stud_no: integer, stud_name: string, class_no: string)
Lab (mach_no: integer, Lab_no: integer, description: String)
Allotment (Stud_no: Integer, mach_no: integer, dayof week: string)

For the above schema, perform the following—
a) Create the tables with the appropriate integrity constraints
b)Insert around 10 records in each of the tables
c)List all the machine allotments with the student names, lab and machine numbers
d)List the total number of lab allotments day wise
e)Give a count of how many machines have been allocated to the 'CSIT' class
f)Give a machine allotment etails of the stud_no 5 with his personal and class details
g)Count for how many machines have been allocatedinLab_no1 for the day of the week as "Monday"
h)How many students class wise have allocated machines in the labs
i)Create a view which lists out the stud_no, stud_name, mach_no, lab_no, dayofweek
j)Create a view which lists the machine allotment details for "Thursday".

Week 7

Write a program to find largest number from the given three numbers.
Simple programs using loop, while and for iterative control statement.
Write a program to check whether the given number is Armstrong or not
Write a program to generate all prime numbers below 100.

Week 8

Write a program to demonstrate the GOTO statement.
Write a program to demonstrate %type and %row type attributes

Week 9

Write a program to demonstrate predefined exceptions
Write a program to demonstrate user defined exceptions
Create a cursor, which displays all employee numbers and names from the EMP table.

Week 10

Create a cursor, which update the salaries of all employees who works in dept no 10.
Create a cursor, which displays names of employees having salary > 50000.

Week 11

Create a procedure to find reverse of a given number
Create a procedure to update the salaries of all employees whose salary is between 25000 to 50000

Week 12

Create a procedure to demonstrate IN, OUT and INOUT parameters
Create a function to check whether given string is palindrome or not.

Week 13

Create a function to find sum of salaries of all employees working in depart number 10.
Create a trigger before/after update on employee table for each row/statement.

Week 14

Create a trigger before/after delete on employee table for each row/statement.
Create a trigger before/after insert on employee table for each row/statement.

Week 15-16

Review:

SOFT SKILLS FOR SUCCESS LAB

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	HSS & MC LAB	L	T	P	C	CIE	SEE	Total
		0	0	2	1	50	50	100

Course Objectives

1.To identify and participate in meaningful conversations

Course Outcomes

1. Exhibit communication skills in various situations
2. Handle the emotions with peers and classmates
3. Demonstrate respect for the opinions, personal space, and beliefs of others
4. Connect and work with others to achieve a set task
5. Assess and identify the requirements and strengths within the team

UNIT I

Soft Skills Development: An Introductory Overview - Self-Discovery & Goal Setting - Johari Window

UNIT II

Personality Development - Body Language - Etiquette & Manners

UNIT III

Presentation Skills (Individual & Team) Oral & Written - Teamwork & Leadership Qualities

UNIT IV

Debates - Group Dynamics - Dos & Don’ts - Techniques to Participate and Conclude

UNIT V

Emotional Intelligence - Conflict Management - Stress Management

Reference Books

1. **Soft Skills for Everyone** by Butterfield, Jeff. New Delhi: Cengage Learning. 2010.
2. **Soft Skills** by Chauhan, G.S. & Sangeeta Sharma. New Delhi: Wiley. 2016.
3. **Working with Emotional Intelligence** by Goleman, Daniel. London: Banton Books. 1998.
4. **Theories of Personality** by Hall, Calvin S. et al. New Delhi: Wiley. 2011.
5. **Corporate Conversations** by Holtz, Shel. New Delhi: PHI. 2007.

GENDER SENSITIZATION

B. Tech II Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
	PCC	L	T	P	C	CIE	SEE	Total
		2	0	0	0	--	--	--

Course Objectives

1. To develop students sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women

Course Outcomes

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Student will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT I

UNDERSTANDING GENDER: Gender: Why Should We Study It? (Towards a World of Equals: Unit-1) Socialization: Making Women Making Men (Towards a World of Equals: Unit-2), Introduction. Preparing for Womanhood. Growing up Male. First lesions in Caste. Different Masculinities. Just Relationships: Being Together as Equals (Towards a World of Equals: Unit-12)Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Others and Fathers. Further Reading: Rosa Parks-The Brave Heart.

UNIT II

GENDER AND BIOLOGY: Missing Women: Sex Selection and Its Consequences, (Towards a World of Equals: Unit-4) Declining Sex Ratio. Demographic, Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit-10)Two or Many? Struggles with Discrimination.Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit-13)

UNIT III

GENDER AND LABOUR: Housework: the Invisible Labour (Towards a World of Equals: Unit-3)"My Mother doesn't Work." "Share the Load."Women's Work: Its Politics and Economics (Towards a World of Equals; Unit-7)Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

UNIT IV

ISSUES OF VIOLENCE: Sexual Harassment: Say No! (Towards a World of Equals: Unit-6) Sexual Harassment not Eve-Teasing- Coping with Everyday Harassment-Further Reading: "Chupulu". Domestic Violence: Speaking Out (Towards a World of Equals: Unit-8)Is Home a Safe Place? –When Women Unite (Film). Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence (Towards a World of Equals: Unit-11)Blaming the Victim-"I Fought for my Life…." – Further Reading: The Caste Face of Violence.

UNIT V

GENDER STUDIES: Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit-5), Point of View. Gender and the Structure of Knowledge. Further Reading: Unaknowledged.Women Artists of Telangana.Whose History? Questions for Historians and Others (Towards a World of EqualsReclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.Essential Reading: All the Units in the Textbook, "Towards a World of Eqals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagarj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

Reference Books

1. Sen, Amartya, "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making Hisoty…' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989

2. Tripti Lahiri. “By the Numbers: Where Indian Women Work.” Women’s Studies Journal (14 November 2012) Available online at:http://blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-Indian-women-work/>
3. K.Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2, Telugu and Kannada http://harpercollings.co.in/BookDetail.asp?Book Code=3732

B.TECH III YEAR I SEM **[5T+3L +1 MC]**

S.No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1	A55024	PCC	Computer Networks	3	0	0	3
2	A55025	PCC	Operating Systems	3	0	0	3
3	A55030	PCC	Machine Learning	3	0	0	3
4	A55027	PCC	Web Technologies	3	0	0	3
5	A55077 A55078 A55079 A55081	OEC-1	1.English for Professionals 2. Essential English and Employability Skills 3. Intellectual Property Rights 4. Data story Telling	3	0	0	3
6	A55288	ESC-Lab	Quantitative Aptitude and Reasoning	0	1	2	1.5
7	A55210	PCC-Lab	Web Technologies Lab	0	0	4	2
8	A55209	PCC-Lab	Operating Systems & Computer Networks Lab	0	0	3	1.5
9	A55091	MC	NSS and NSO	0	0	2	0
	TOTAL						20

B.TECH III YEAR II SEM **[5 T +3L]**

S.No	Course code	Category	Subject Name	Hours per week			Credits
				L	T	P	
1	A56052	PCC	Data Visualization	3	0	0	3
2	A56053	PCC	Predictive Analytics using R Programming	3	1	0	4
3	A56054 A56037 A56038 A56039	PEC–I	1. Mobile Application Development 2. Internet of Things 3. Fundamentals of Digital Image Processing 4. Object Oriented Modeling	2	0	0	2
4	A56035 A56055 A56043 A56042	PEC–II	1. Software Engineering 2. Language Processors 3. Information Storage and Retrieval 4. Principles of Distributed System	3	0	0	3
5	A56080	HSS&MC	Entrepreneurship Development	3	0	0	3
6	A56232	ESC	Verbal Ability and Critical Reasoning	0	0	3	1.5
7	A56215	PCC Lab	Data Visualization Lab	0	0	4	2
8	A56216	PCC-Lab	Predictive Analytics using R Programming Lab	0	0	3	1.5
	TOTAL						20

COMPUTER NETWORKS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55024	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre requisites

C Programming Language and Data Structures.

Course Outcomes:

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

6. Illustrate the functionalities of various network models and Data link Layer.
7. Analyze error and flow control mechanisms in the data link layer
8. Examine various Routing Protocols.
9. Compare various congestion control mechanisms to improve the QoS of networking.
10. Identify the suitable Application layer protocols for specific applications.

UNIT - I:

Network Models: Layered Tasks, OSI model, Layers in the OSI model, TCP/IP protocol Suite, Addressing.

Data Link Control: Error detection and Correction- Introduction, Hamming Distance, CRC, Checksum.

UNIT - II:

Data Link Layer: Responsibilities of Data Link Layer: Framing, Flow and Error Control, Noiseless Channels - Simplest Protocol, Stop-and-Wait protocol Noisy Channels - Stop-and-Wait Automatic Repeat Request, Go-Back-N Automatic Repeat request, Selective Repeat Automatic Repeat Request, High-Level Data link Control.

Multiple Access: Random Access, ALOHA,CSMA, CSMA/CD,CSMA/CA,Controlled Access - Reservation, Polling, Token Passing, Channelization - FDMA,TDMA,CDMA.

UNIT- III:

Network Layer: Responsibilities of Network Layer, Delivery, Direct Versus Indirect Delivery, Forwarding, Forwarding Techniques, Forwarding process, Types of Routing tables **Unicast Routing protocols:** Optimization, Intra- and Interdomain routing ,Distance Vector Routing, Link State Routing, Path Vector Routing,IPV4 Addressing, Address space, Classful Addressing, Classless Addressing, Frame format of IPV4,IPV6.

UNIT- IV:

Transport Layer: Responsibilities of Transport Layer, Process-to-Process delivery, User Datagram Protocol, Transmission Control Protocol, Congestion Control - Open-Loop Congestion,

Closed-Loop Congestion Control, Quality of Service, Techniques to improve QoS - Scheduling, Traffic Shaping, Resource Reservation, Admission Control.

UNIT-V:

Application Layer: Responsibilities of Application Layer Domain Name Space, Distribution of Name Space, DNS in Internet, Generic Domain, Country Domain, Inverse Domain Resolution, Domain Name Space (DNS) Messages, Electronic mail, File Transfer Protocol.

Text books:

5. Behrouz A Forouzan, Data Communications and Networking,4th Edition, McGraw-Hill.

Reference Books:

1. Andrew S. Tanenbaum, Computer Networks, Third Edition.
2. William Stallings, Data Communications, Eight Edition. Pearson Publishers.
3. http://highered.mheducation.com/sites/0072967757/student_view0/index.html

OPERATING SYSTEMS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55025	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites :

Computer Organization, Data Structures

Course Objectives:

1. Introduce basic concepts of operating system and process management
2. Discuss various CPU scheduling algorithms and problems of process synchronization.
3. Demonstrate different methods for handling deadlock.
4. Describe about memory management Techniques.
5. Explore the File system, system security and protection mechanisms.

Course Outcomes:

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

1. Summarize operating system and process management concepts.
2. Apply process scheduling and synchronization related issues.
3. Outline Deadlock Prevention, Avoidance, Detection and recovery mechanisms.
4. Analyze effectively memory management concepts.
5. Illustrate various protection and security measures.

UNIT I

Operating Systems Overview

Introduction -What operating system do, Operating system structure (uni-programmed and multi programmed), Operating system operations, Operating system services, System calls, Types of System calls, Operating system structure.

UNIT II

Process Management and Process Scheduling

Process Management- Process concepts, Process scheduling, Operations on processes, Inter process communication. Multithreading models. Process Scheduling – Basic concepts, scheduling criteria, scheduling algorithms.

UNIT III

Process Synchronization and Deadlocks

Process coordination: Synchronization – Background, The critical section problem, Peterson's solution, Synchronization hardware, Semaphore, Classical problems of synchronization, Monitors. System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Detection and avoidance, Recovery from deadlock.

UNIT IV

Memory Management

Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual memory management - Demand paging, copy-on-write, page-replacement, Thrashing.

UNIT – V

File system, system protection and security

Storage management – File concept, Access methods, Directory and disk structure, File-system mounting. System protection- Goals of protection, principles of protection, Domain of protection, Access matrix. System Security – Security problem, Program threats, System and Network threats.

Text Books

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th edition ,John Wiley, 2016.

Suggested / Reference Books

1. D.M. Dharmdhere, Operating Systems – A Concept based Approach, 2nd Edition. TMH, 2007.
2. Andrew S Tanenbaum, Modern Operating Systems, 3rd Edition, PHI, 2008.
3. Behrouz A. Forouzan, Richard F. Gilberg, Unix and shell programming, cengage Learning 2009.

MACHINE LEARNING

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55030	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Python Programming, Statistics

Course Objectives:

1. To understand the need for machine learning for various problem solving
2. To study the various supervised and unsupervised learning algorithms in machine learning
3. To understand the latest trends in machine learning
4. To design appropriate machine learning algorithms for problem solving

Course Outcomes:

Student will be able to:

1. Understand the Concepts of Machine Learning
2. Develop Simple Regression Models .
3. Build various classification algorithms
4. Analyze the need of ensemble learning and dimension reduction
5. Apply the Clustering algorithms for developing applications

UNIT I:

Introduction to Machine Learning

What is Machine Learning,Types of Machine Learning, Applications of Machine learning, Preparing to Model, Modeling and Evaluation .

UNIT II:

Supervised Learning: Regression

Introduction to Regression,Example of Regression,Simple Linear Regression,Multiple Linear Regression,Assumptions in Regression Analysis,Improving the accuracy of the Linear Regression Model, Ridge Regression, Lasso Regression.

UNIT III:

Supervised Learning: Classification

What is Classification,General Approach to Classification, K-Nearest Neighbor Algorithm, Logistic Regression, Decision Trees: Construction, classification and regression trees, example, Naive Bayesian Classifier, Support Vector Machines: Optimal Separation, Kernels, Algorithm

UNIT IV:

Unsupervised Learning and Dimensionality Reduction

Types of Unsupervised Learning, Challenges in Unsupervised Learning, Clustering Algorithms: K-Means, Agglomerative, DBSCAN, Comparing and Evaluating Clustering

Algorithms.Dimensionality Reduction: Linear Discriminant Analysis (LDA), Principal Component Analysis (PCA), Factor Analysis (FA).

UNIT V:

Ensemble Learning and Reinforcement Learning

Ensemble Methods: Bagging, Boosting & Random Forests, Reinforcement Learning: Overview, Example: Getting Lost, Markov Decision Process, Values, difference between SARSA and Q Learning, Uses of Reinforcement Learning

Text Books:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, Pearson, 2018.
2. Machine Learning: An Algorithmic Perspective by Stephen Marsland, CRC Press, 2009
3. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido, 2016,O'Reilly Media, Inc.

Reference Books:

1. Introduction to Machine Learning (Adaptive Computation and Machine Learning), Ethem Alpaydin, The MIT Press 2004.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition Aurélien Géron, 2019, O'Reilly Media, Inc.
3. Machine Learning, McGraw-Hill Education (India) Private Limited,Tom M. Mitchell, 2013.
4. Pattern Recognition and Machine Learning. First Edition. ,C. M. Bishop. Springer, 2006.

WEB TECHNOLOGIES

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55027	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Basics of Object Oriented programming, Java

Course Objectives:

1. To provide knowledge on web architecture, web services.
2. Client side scripting technologies to focus on the development of web-based information systems and web services.
3. To provide skills to design interactive and dynamic web sites.
4. To provide knowledge for implementing web applications with database connection

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.
2. Prepare Static Web pages With Validations.
3. Develop new tag sets using XML mechanism.
4. Design and develop web applications using JSP and MVC architecture.
5. Understand database connectivity and retrieving data using client/server database.

UNIT I:

INTRODUCTION TO WEB: Understanding Internet and Web, Web Architecture, Web servers, protocols: HTTP, Introduction HTML: History of HTML, WWW, HTML Basics: Elements, Attributes, Tags, Tables, Forms, Frames.div and span tags.HTML5

UNIT II:

CSS: Introduction to cascading style sheet, Types of style sheets, page layout, selectors, pseudo classes and elements.CSS3

JAVA SCRIPT: Introduction to scripting, control structures, conditional statements, Arrays functions, objects. JS framework(ReactJS)

HTML DOM: Predefined object (Window, Location, History, Navigator). Events, DOM Node methods, Navigation, creating nodes, adding nodes, inserting nodes, removing & Replaces Nodes, Form object and Elements, DHTML with Java Script. front end frameworks(bootstrap),

UNIT III:

XML: Basics of XML, Elements, Attributes, validation, Name space.
XML Scheme Languages: Introduction to DTD, internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, Elements, parsing XML: XML DOM, Document node, element node, Text node, Java and DOM, Navigating DOM Tree.

UNIT IV:

AJAX: Introduction, Environment, Asynchronous communication, process steps, sending and Retrieving Information, Ajax with XML.
Servlets : Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications, Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

UNIT V:

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture.

Text Book:

1. Uttam K. Roy, Web Technologies, 8th Impression, Oxford Publication, 2014.

Reference Books:

1. Thomas Powell, “The Complete Reference HTML and CSS”, 5th Edition, Tata McGraw Hill, 2010.
2. Thomas Powell, Fritz Schneider, “The Complete Reference JavaScript 2.0”, 3rd Edition, Tata McGraw Hill, 2012.

ENGLISH FOR PROFESSIONALS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55077	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

The course aims at preparing the students with the tools needed for successful communication at the professional front. It is designed to improve students' academic and professional skills which the employers are currently looking for.

Objective:

To prepare the students to use the language effectively in all professional pursuits

Course Outcomes:

The students will be able to:

1. Analyze the language use in communicative process
2. Describe the process and product
3. Interpret the ideas in group activities
4. Apply different approaches to comprehend the written text
5. Write any technical and official correspondence within the framework

UNIT-I

Essentials of Communication:

Essentials of Grammar - Rudiments of Communications Skills (Listening, Speaking, Reading, and Writing) - Applied Grammar and Usage - Non-Verbal Communication

UNIT-II

Listening Skills:

Art of Listening - Developing Effective Listening Skills - Process of Listening, Intensive & Extensive Listening Podcasts, Vodcasts (ICT enabled) - Five steps to Active Listening - Effective and Ineffective Listening Skills -Listening & Note-Taking

UNIT-III

Speaking Skills:

Dynamics of Effective Speaking - Group Discussion - Simulated Presentations, Process & Product Descriptions - Proxemics, Paralinguistic Features

UNIT-IV

Reading Skills:

The Art of Effective Reading - Basic steps to Effective Reading - Extensive and Intensive Reading -Approaches to Efficient Reading - Reading Comprehension

UNIT-V

Writing Skills:

Art of Condensation - Descriptive Writing Techniques - Writing & Answering Memos, Circulars - Inter & Intra Official Communication - Writing Minutes of Meeting - Netiquette - E-mail & Blog Writing - Note-Making

PRESCRIBED TEXTBOOK:

1. Business Communication (Second Edition) by Meenakshi Raman & Prakash Singh. Oxford University Press. 2012.

REFERENCES:

1. Communicating at Work (Seventh edition) by Adlar, Ronarld.B. McGrawHill. 2004.
2. Cambridge English for Engineering Professionals by Mark Ibbotson. Cambridge University. 2008.
3. Professional Communication by Aruna Koneru. McGrawHill. 2017.
4. The Effective Communicator by Adair John. Jaico Publishing House. 1995.
5. Oxford English for Careers by Oxford University Press.

ESSENTIAL ENGLISH AND EMPLOYABILITY SKILLS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55078	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. To enable students to develop their personality, infuse confidence and increase employability skills in any chosen career.
2. To provide the students hands-on experience to cope with the demands of the world of recruiters.
3. To help the students acquire the job skills essential for employment.

Course Outcomes:

1. Enhancement of employability skills and professional etiquette.
2. Acquisition of productive knowledge, competent learning and innovative thinking skills.
3. Implementation of verbal and non-verbal communication competencies in work place.

UNIT-I

"Six Sigma: Dabbawala" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Personality Development: A Must for Leadership and Career Growth" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -
Introduction, Learning about Personality Development from 3 Cases, Personality Analysis, Freudian analysis of Personality Development, Swami Vivekananda's Concept of Personality Development, Personality Begets Leadership Qualities.

UNIT-II

"Yet I am not defeated!" from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Interpersonal skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -
The Personality Attribute of Taking Bold Decisions, Personality Types and Leadership Qualities, Personality Tests

UNIT-III

"Patricia Narayanan: An Entrepreneur by accident", from **"English for Employability"** by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Soft Skills: Demanded by Every Employer" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications
Introduction to Soft Skills, Lessons from the 3 Case Studies, Change in Today's Work place; Soft Skills as a Competitive Weapon, Antiquity of Soft Skills, Classification of Soft Skills

UNIT-IV

"Satya Nadella: CEO of Microsoft" from "English for Employability" by K Purushotham published by Orient Black Swan, Hyderabad, India.

"Interview Skills" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications.

UNIT-V

"Body Language Reveals Your Inner self and Personality" from **"Personality Development and Soft Skills"** by Barun.K.Mitra, published by Oxford Publications -
Introduction, Emotions Displayed by Body Language , Handshake-The Most Common Body Language, Eyes-A Powerful Reflection of One's Inner Self, Entry to My Space – Personal Zones May Vary, Body Language Exhibited during Different Professional Interactions.

Textbooks:

1. "English for Employability" by K Purushotham published by Orient Black Swan, Hyderabad

2. "Personality Development and Soft Skills" by Barun K.Mitra, published by Oxford University Press

References:

1. Cottrell,Stella.Skills for Success.London:Palgrave Macmillan,2003.
2. Enhancing English and Employability Skills, State Board of Technical Education and Training, Hyderabad: Orient Blackswan Private Limited, 2012.
3. Knight,T.Peter and Mantz Yorke.Assessment, Learning and Employability.U.K:Mac Graw-Hill House,2003.
4. Rao,M.S. Soft Skills Enhancing Employability.New Delhi: I.K.Publishing House,2010.
5. Rao, Nageshwar.Communication Skills. New Delhi: Himalaya Publishing House Pvt.Ltd, 2008.
6. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
7. Sharma,T.K.Enhancing Employability in Education.India:Patridge Publishing House.2015.
8. Sinha, K. K.Business Communication.NewDelhi: Galgotia Publishing Company ,2008.
9. Yadav, Shalini. Communication Techniques, New Delhi: University Science Press,2010.

INTELLECTUAL PROPERTY RIGHTS

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55079	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objective:

The course aims to help the student understand the concept of Intellectual Property Rights and helps the student to appreciate the purpose and function of a trademark and the process involved in getting copyright, patent and related issues. The student is introduced to the importance of trade Secret and Geographical Indications.

Course Outcomes:

At the end of the course student will be able to

1. Explain the concepts of intellectual property rights and related agencies.
2. Describe the purpose and functions of a trademark in a competitive environment.
3. Analyze the process of copyright and procedure.
4. Understand the process of patent and patent issues.
5. Explore the trade secret and geographical indications of its protection from unfair practices.

Unit I:

Introduction to IPR:
Concept of intellectual property rights, importance of intellectual property rights. Types of intellectual property, international agencies, and treaties.

Unit II:

Trademarks:
Concept of trademarks, purpose, and function of trademarks. Acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Unit III:

Law of copyrights:

Concept of copyright right, fundamentals of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration.

Unit IV:

Law of patents:

Introduction to patent, foundation of patent law, patent searching process, ownership rights and transfer.

Unit V:

Trade Secrets & Geographical Indication:

Law pertaining to trade secrets, determination of trade secrets. Trade secret litigation. Unfair competitions. Geographical Indication, concept of geographical indication, importance of geographical indication, new development of intellectual property rights.

Textbooks:

1. Deborah. E. Bouchoux,Intellectual property right, 5/e,2018,cengage learning.
2. Neeraj Pandey, Intellectual property right, PHI, 2019.

Reference Books:

1. Ramakrishna Chintakunta and M. Geethavani, Kindle e 2021

2. Prabuddha Ganguli,Intellectual Property Right:Unleashing the Knowledge Economy, 2/e, 2017 Tata Mc Graw Hill Publishing company Ltd.

Data Storytelling

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55081	OE-I	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Introduction:

This course will cover the fundamentals of effective data-driven storytelling. Story telling can put a human perspective on the increasingly complex and rapidly changing world of the digital era. Students will learn how to interpret and analyse the data and will learn to articulate the stories with data sets and communicate data findings in visual, oral, and written contexts.

Course Objectives:

1. Develop the skills necessary to be effective data storytellers.
2. Locate relevant datasets, extract insights from that data and present their findings in myriad formats.
3. Learn how to interpret data and to present it in different formatsto different audiences.

Course Outcomes:

1. Identify the stories within datasets and extract insights from that data.
2. Explain the importance of communication skills and competencies for individuals who serve as data storytellers.
3. Act as a data-driven visual storyteller for optimal presentation of trends, patterns, and insights.
4. make effective client presentations of their work using infographic visualizations.
5. learn tools and concepts which can be put to immediate use to transform data into stories.

Unit I:

Introduction

We are all storytellers- Stories Bring Data to Life- The Essence of Data Storytelling

Unit II:

Dynamics of Data Storytelling

Getting to the Core- Planning is Everything- The Quick Fix- Application of Story elements

Unit III:

Crafting the Data Story

The Psychology of Storytelling- The narrative Techniques - Making Good stories Great! – Writer to Storyteller

Unit IV:

Data Visualization

Use Visuals to Advantage: Data Presentation Skills- Infographics Visualizations

Unit V:

Anatomy of Data Story

Rudiments of Grammar - Parts of Speech - Concord Rules - Academic and Technical Vocabulary - Data Interpretation - Case Studies

Textbook:

1.Vora , Sejal (2019).The Power of Data Storytelling, Sage Publications India pvt Ltd.

Reference books:

1. Dykes, Brent (2020). *Effective Data Storytelling*: New Jersey, Wiley.
2. Knaflic, Cole Nussbaumer (2015).*Storytelling with Data: A Data Visualization Guide for Business Professionals,*https://www.amazon.com/Storytelling-Data-Visualization-Business-Professionals/dp/1119002257/
3. Morrow, Jordon (2021), *Be Data Literate- The Data Literacy Skills Everyone Needs to Succeed*, UK: Kogan Page Ltd.
4. Taylor, Scott (2021). *Telling your Data Story: Data storytelling for Time Management*, New Jersey: Technics Publications LLC.
5. https://www.amazon.com/Tableau-Your-Data-Analysis-Software/dp/1119001196/

Quantitative Aptitude and Reasoning

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55288	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT I

Number System: Speed Math's, Numbers, Factors, Prime and co primes, LCM & HCF, Divisibility rules, Finding the unit digit and applications, remainder theory.

Ratio and Proportion with Ages: Definition of ratio and Proportion, Finding the resultant ratio. Problems based on Ratios and ages.

Percentages: Introduction to percentages, Percentage Increase /Decrease, Results on Population, Results on Depreciation, Variations, Applications of Percentage.

Profit and Loss: Classification of Profit and Loss, Profit/ Loss Percentages, Successive Discount.

UNIT II

Time and Distance: Difference between the average, Relative and Effective speed, reaching the destination late and early, stoppage time per hour, problems based on Trains and problems based on Boats.

Time and Work: Calculating Efficiency, alternate days concept, work and wages, Chain rule, problems based on Pipes and cisterns.

Simple and Compound Interest: Simple interest, Principle, Rate, Amount, Applications of Simple interest, Compound interest, compounded annually, Compounded Half yearly, Compounded Quarterly, Difference between simple and compound interest.

UNIT III

Permutations and Combinations: Fundamental rules, Problems on Permutations and Combinations.

Probability: Definition, Notations and Problems based on Probability.

Mean, Median and Mode: Introduction and problems on Mean, Median and Mode.

Partnership: Relation between Partners, Period of Investments and Shares.

Averages: Average of different groups, change in average by adding, deleting and replacement of objects

Flow Charts: Introduction of symbols and problems on flow charts.

UNIT IV

Seating Arrangement: Circular, Row, Column, Square and Double row arrangement

Puzzles: Paragraph puzzles, incomplete puzzles and problems on them.

Number Series: Number, Alphabet and Letter Series.
Analogy: Simple, Double, Word and Number Analogy
Coding and Decoding: Classifications and Problems on Coding and Decoding.

UNIT V

Clocks: Relation between minute and hour hand, angle between hands of a clock, exceptional cases in clocks. Gaining and loosing of time.
Calendars: Classification of years, finding the day of any random calendar date, repetition of calendar years.
Direction Sense Test: Sort of directions in puzzle, distance between two points, Problems on shadows.
Blood Relations: Defining the various relations among the members of a family, solving blood relation puzzles by using symbols and notations. Problems on coded relations.

Text Books

1. R.S Agarwal, Verbal and Non-Verbal Reasoning, New Edition, S. Chand.
2. R.S Agarwal, Quantitative Aptitude, New Edition, S. Chand.

Reference Book

1. Abhijeet Guha, Quantitative Aptitude, New Edition, Mc Graw Hill.

WEB TECHNOLOGIES LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55210	PCC	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Course Objectives:

1. Client server architecture and able to develop static web application
2. Client-side data validation using java script
3. To create dynamic web application using server side technologies
4. To create fully functional web application with MVC architecture.

Course Outcomes:

Student will be able to:

1. Design static web pages and provide client side authentication.
2. Develop new tag sets using XML mechanism.
3. Understand database connectivity and retrieving data using client/server database.
4. Design dynamic web pages and develop web applications using MVC architecture.

Week-1:

Design the following static web pages required for an online book store web site.
1) HOME PAGE:
2) LOGIN PAGE:

Week -2:

Design the student REGISTRATION PAGE:

Week- 3:

Apply internal and external CSS (Cascading Style Sheets) for week1&2 pages.

Week -4:

VALIDATION:
Write JavaScript to validate the following fields of the above registration page.

Week -5:

Design the catalogue page.

Week -6:

Write an XML file which will display the Book information which includes the following: Write a Document Type Definition (DTD) to validate the above XML file.

Week -7:

Develop week(1-5) using bootstrap

Week -8:

Write a program to display the HELLO WORLD message using servlet.

Week -10:

Write a program to create cookies and retrieval using servlet.

Week -11:

Write a program to display the HELLO WORLD message using JSP

Week -12:

Convert all above static web pages into the JSP pages.

Week -13:

Using registration form. Authenticate the user when he submits the login form using the user name and password from the database

Week -14

Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 4)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

Week -15

Implement week -10 in MVC architecture.

OPERATING SYSTEM AND COMPUTER NETWORKS LAB

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55209	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Objectives:

1. Analyze system calls that can offer operating system services
2. Demonstrate various operating system concepts
3. Understand and apply concepts of process synchronization
4. Understand the concept of Dead lock and its avoidance
5. Analyzing page replacement algorithms.

Course Outcomes:

1. Understand system calls behavior and implement that can offer operating system services
2. Implement CPU scheduling algorithms multithreading
3. Implement the producer and consumer problem
4. Implement the dead lock avoidance using banker's algorithm
5. Implement page replacement algorithms

PART -A

1. Write a programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write a program to implement multithreading?
3. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for FCFS and SJF. For each of the scheduling policy compute and print the average waiting time and average turnaround time
4. Give the list of processes, their CPU burst times and arrival times, display or print the Gantt chart for Priority and Round Rabin. For each of the scheduling policy compute and print the average waiting time and average turnaround time.
5. Implement producer consumer problem using semaphore?
6. Write a program to implement Banker's algorithm for deadlock avoidance?
7. Write a program to implement page replacement algorithms (FCFS, Optimal, LRU)

PART - B

Course Objectives :

1. Understand data link layer framing methods.
2. Know about the various error detection methods.
3. Explore the knowledge of various routing algorithms.
4. Understand Traffic Analysis and Statistics in network.

Course Outcomes

1. Implement data link layer farming methods
2. Analyze error detection method
3. Analyze routing and congestion issues in network
4. Apply Traffic Analysis and Statistics in network

Programs:

1. Implement the data link layer framing method Bit stuffing.
2. Implement the data link layer framing method Character Stuffing.
3. Write a program to compute CRC 16.
4. Implement Dijkstra‘s algorithm to compute the Shortest path thru a graph.
5. Installation of Wireshark
6. Simulate Packet Capture Using Wire shark
7. Implement Viewing Captured Traffic Using Wire shark
8. Simulate Statistics & Filters Using Wire shark

NATIONAL SPORTS ORGANIZATION (NSO) / NATIONAL SERVICE SCHEME (NSS)

B. Tech III Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A55091	MC	L	T	P	C	CIE	SEE	Total
		0	0	2	0	50		50

UNIT-I

Health and Wellness

Dimensions of Health: Physical, Mental and Social. Objectives of Health Education. Definition and Dimensions of Wellness – Physical, Emotional, Social, Spiritual, Intellectual and Environmental Wellness. Achieving Wellness.

Practical: Basketball, Cricket, Kho-Kho (Any Two) & Badminton (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-II

Fitness and Body Composition

Physical Fitness Components: Body Composition, Muscular Endurance, Strength, Cardiovascular Fitness and Flexibility, Importance of Cardio-Respiratory Endurance. Obesity and Health Risk Factors. Body Composition Indicators and Measurements.

Practical: Football, Kabaddi, Volleyball (Any Two) & Table Tennis (Mandatory)

Layout of Courts / Fields, Skills, Rules & Lead-up Games.

UNIT-III

Introduction and Basic Concepts of NSS: History, Philosophy, Aims & Objectives of NSS. Emblem, Flag, Motto, Song, Badge, Organizational Structure, Roles and Responsibilities of Various NSS functionaries. NSS Programmes and Activities, Volunteerism and Shramdan.

UNIT-IV

Personality Development Through Community Service: Importance and Role of Youth Leadership, Life Competencies, Social Harmony and National Integration, Youth Development Programmes in India, Citizenship, Health, Hygiene and Sanitation, Environment Issues, Disaster Management, Life Skills.

UNIT-V

Vocational And Entrepreneurship Skills Development: Definition and meaning of Entrepreneurship, Qualities of good entrepreneur, Steps /ways in operating an Enterprise and role of financial and support service Institutions. Project Cycle Management, Resource Mobilisation and Documentation and Reporting.

Project work/ Practical: Conducting Surveys on Special Theme, Involving in Shramadan, Swachh Bharat, Blood Donation, Tree Plantation, Awareness Programmes, Identify the Community Problems and List out the all Possible Solutions, Educate the Villagers on Health, Hygiene, Sanitation and Environment Protection. Self-Review of the Students on their Improvements by Participating in the Community Service Programmes.

References

1. Rajiv Parti, The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Select book incorporation, New York.
2. H. & Walter, H., (1976). *Turners School Health Education*. Saint Louis: The C.Y. Mosby Company.
3. Nemir, A. (n.d.). *The School Health Education*. New York: Harber and Brothers.
4. Edward T Howley, *Health Fitness Instructors Handbook*, Human Kinetics, USA.
5. **About NSS:** National Service Scheme Manual by Government of India Ministry of Youth Affairs & Sports, New Delhi.
6. Robert N Lussier, *Management Fundamentals - Concepts, Applications, Skill Development*, Cengage Leaning, First Edition, 2012.
7. Mroczex & Little, *Handbook of Personality Development* –(eds).2006.
8. Richard Blundel, *Exploring Entrepreneurship Practices and Perspectives*, Oxford, 2011.

DATA VISUALIZATION

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56052	PCC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Programming knowledge

Course Objectives:

1. To provide an overview and best practices of data visualization
2. To introduce the data types, relationships, and visualization formats.
3. To provide the basic principles for data visualization.
4. To introduce the storytelling for effective data presentation.
5. To introduce a trends in market research and data visualization dashboards,

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Identify the skill sets needed for best practices of data visualization.
2. Explain the significance of data types, relationships and visualization formats in data visualization.
3. Identify principles of data visualization.
4. Apply the storytelling for effective data presentation
5. Evaluate a trends in business using data visualization dashboards.

UNIT I:

Introduction: What is data visualization? History, The data visualization process, Why is data visualization so important in reports and statements? Explaining, Exploring, Analyzing.

UNIT II:

Data types: Quantitative, Qualitative, relationships: Ranking, Deviation, Nominal comparisons, Correlation, Partial and total relationships, Series over time, Distribution.

Visualization formats: Bar chart, Histograms, Pie charts, Scatter plots, Heat maps, Line charts, Bubble charts, Radar charts, Waterfall charts, Tree maps, Area charts

UNIT III:

Basic principles for data visualization, Graphics with an objective: seeking your mantra,

Layout and design: communicative elements, Prioritize patterns in your visualizations: Gestalt

UNIT IV:

Storytelling for social and market communication, Data storytelling, A basic recipe for storytelling in your presentations and final reports, Trends in market research and data visualization dashboards, Scrollytelling.

UNIT V:

Application of Data Visualization, Visualizing data tools: HTML5 CANVAS: Linear interpolations, A Simple Column Chart, Animations, Google Charts API Basics, D3.js, and Dashboard using Tableau, Future of data visualization.

Text Books:

1. Chun-houh Chen, Wolfgang Härdle, Antony Unwin, "Handbook of Data Visualization", Springer, 2008.
2. Pérez, J. and Vialcanet, G., Visualize It: A Comprehensive Guide to Data Visualization, 2013.

Reference Books:

1. E. Tufte, “The Visual Display of Quantitative Information”, Second Edition, Graphics Press, 2007.
2. Ward, Grinstein Keim, “Interactive Data Visualization: Foundations, Techniques, and
3. Applications”, Natick: A K Peters, Ltd.
4. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
5. A Julie Steele and Noah Iliinsky, “Designing Data Visualizations: Representing Informational Relationships”, O’Relly.
6. Andy Kirk, Data Visualization: A Successful Design Process, PAKT.
7. Scott Murray, “Interactive Data Visualization for Web”, O’Relly.
8. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

Web references:

1. Visualization through Tableau http://www.tableausoftware.com/public
2. Gap Minder and Google Motion Charts (www.gapminder.org).

PREDICTIVE ANALYTICS USING R PROGRAMMING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56053	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. Use R for statistical programming, computation, and graphics.
2. Write User defined functions and use R in an efficient way,
3. Fit some basic types of statistical models
4. Use R in their own research,

Course Outcomes:

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

1. Understand the basics in R programming in terms of vector, matrix and List (L1)
2. Apply various operations on data frames. (L4)
3. Use the apply family of functions to iterate functions across data for real world problems. (L6)
4. Import, Explore data-sets to create testable hypotheses and identify appropriate statistical tests (L6)
5. Able to apply R programming for predictive analysis Formulate linear and multiple regression models using R
6. Understand the fundamentals of Predictive Analytics in R.

UNIT I:

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types, Vectors**:** Creating and Naming Vectors, Vector Arithmetic, Vector Sub setting, R operators
Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays,
Lists: Introduction, Creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors,

UNIT II:

Factors and Data Frames : Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames,
Conditionals and Control Flow: Conditional Statements.
Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

UNIT III:

Functions in R: Introduction, Writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R, Input and Output Operations.
Apply Family in R : Introduction, Using Apply in R, Using Lapply in R, Using Sapply, Using Tapply in R: Split Function, Using Mapply in R.

UNIT IV:

Charts and Graphs : Introduction, Pie Chart: Chart Legend, 3D Pie Chart, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.
Data Interfaces: Introduction, CSV Files: Syntax, Importing a CSV File, Excel Files: Syntax, Importing an Excel file, Binary Files: Syntax, XML Files, Web Data, Databases.

UNIT V:

I**ntroduction to Predictive modeling and Predictive modeling Techniques:** What is predictive modeling, importance of predictive modeling, applications of Predictive Modeling, Hypothesis Testing, Analysis of Variance (One way ANOVA, Two way ANOVA),T-Test, Linear regression in R, Logistic Regression in R ,Clustering with R.

Text Books:

1. K G Srinivas ,G M Siddesh "Statistical programming in R", Oxford Publications.

Reference Books:

1. K Beginning R: The Statistical Programming Language,Mark Gardener, Wrox.
2. Norman Matloff , "The Art of R Programming: A Tour of Statistical Software Design", NoStarch Press, 2011.
3. Y. Anchang Zhao ,R and Data Mining: Examples and Case Studies . Elsevier in December 2012.
4. Avril Coghlan ,A Little Book of R For Time Series, Release 0.2.

MOBILE APPLICATION DEVELOPMENT

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56054	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Course Objectives:

1. Outline the usage of Android development framework.
2. Understand the main components of an Android application and its entire life Cycle.
3. Develop database programming using SQLite.
4. Identify the use of location-based service in android applications.
5. Build SMS and MMS applications using Intents.

Course Outcomes:

At the end of this Mobile Application Development course, students will be able to:

1. Analyze the architecture of android and current trends in mobile operating systems.
2. Apply suitable software tools and APIs for the design of User Interfaces to a particular
3. mobile application.
4. Design applications for mobile devices using SQLite Database.
5. Apply the location-based services in android applications.
6. Summarize the Monitoring changes to the phone, network, data connectivity and SIM states.

UNIT I:

Introduction to Android, Features of Android, The development framework**:** Understanding the Android Software Stack, Android Application Architecture; the Dalvik Virtual Machine, Creating First Android Application, Types of Android Applications, Android Development Tools: The Android Virtual Device Manager, Android Emulator, The Dalvik Debug Monitor Service.

UNIT II:

Creating applications and Activities: Introduction to the application Manifest File, Using the Manifest Editor, Externalizing Resources: Creating Resources - Simple Values, Drawables, Layouts, Menus, Animations.The Android Activity Life cycle. **Building User Interfaces:** Fundamental Android UI design, Introducing Layouts: Defining Layouts, Using Layouts to Create Device Independent User Interfaces, Optimizing Layouts.

UNIT III:

Databases and Content Providers: Introduction to Android Databases, Introducing SQLite, ConValues and Cursors, working with SQLite Databases - Introducing the SQLiteOpenHtent elper, querying a Database, Extracting Values from a Cursor, Adding, Updating, and Removing Rows, Creating Content Providers, Using Content Providers - Introducing the Content Resolver, Querying Content Providers, Adding, Deleting, and Updating Content

UNIT IV:

Maps and Location based services: Using the location-based services, selecting a Location Provider, selecting a Location provider, finding current location; **Creating Map-Based Activities**: Introducing Map View and Map Activity, Creating a Map-Based Activity, Maps and Fragments

UNIT V:

Telephony and SMS: Using telephony - Initiating Phone Calls, Accessing Telephony Properties and Phone State, Monitoring Changes in Phone State Using the Phone State Listener, Introducing SMS and MMS - Using SMS and MMS in Your Application, Sending SMS and MMS from Your Application Using Intents, Sending SMS Messages Using the SMS Manager.

Text Book:

1. Reto Meier, Professional Android 4 Application Development, 1st Edition, Wrox Press, Wiley Publishing, 2014.

Reference Books:

1. Pradeep Kothari, Android Application Development (with Kitkat Support), Black Book, 2014, Dreamtech Press publisher, Kogent Learning Inc., 2014
2. Erik Hellman, Android Programming: Pushing the Limits, 1st Edition, Wiley Publications, 2014.
3. Mike Wolfson, Android Developer Tools Essentials, O'Reilly Edition, 1st Edition, 2013.

INTERNET OF THINGS

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56037	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Pre-requisites:

Computer Networks, Python Programming

Course Objectives:

1. Differentiate Physical and Logical Design of IoT
2. Categorize pin configuration of Arduino Uno Board
3. Demonstrate Code in Node-RED
4. Identify communication between M2M
5. Develop an IoT Applications using Raspberry Pi board

Course Outcomes:

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

1. Identify physical and logical design of IoT
2. Understand Arduino Uno Board
3. Implement code in Node-RED
4. Develop an IoT Application using Arduino Uno board
5. Develop an IoT Applications using Raspberry Pi board

UNIT - I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. (T1, Chapter 1)

Domain specific applications of IoT: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and lifestyle. (T1, Chapter 2)

UNIT – II

Arduino Basics: Hardware Requirements, Software Requirements, Arduino Programming Lanugage References. (T2, Chapter 1)

Internet Connectivity: Arduino Uno Wired Connectivity(Ethrnet), Arduino Uno Wireless Connectivity(Wifi) (T2, Chapter 2)

UNIT - III

Communication Protocols: HTTP, MQTT (T2, Chapter 3)
Complex Flows: Node-RED: Hardware and Software Required, Circuit, Node-RED Flow, code (Arduino) (T2, Chapter 4)

UNIT - IV

Prototypes
IoT Patterns: Real-time Clients, Remote Control, On-Demand Clients, Web Apps, Location Aware, Machine to Human, Machine to Machine. (T2, Chapter 5-11)

UNIT - V

Using IOT for RFID and MQTT and the Raspberry Pi: Introduction to Raspberry Pi, RFID Technology, IoTRFID Hardware and Software, Building an MQTT Server on a Raspberry Pi, the Software on the Raspberry Pi, Building the IOTRFID Project (T3, Chapter 6)

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015
2. Adeel Javed, Building Arduino Projects for the Internet of Things Experiments with Real-World Applications, Apress, 2016
3. John C. Shovic , Raspberry Pi IoT Projects, Prototyping Experiments for Makers, Apress, 2016

REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, (CRC Press)
2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O’Reilly (SPD), 2014
3. R.K.Mittal and I J Nagrath, Robotics and Control, TMH, 2003

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56038	PEC-I	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

Pre requisite:

Basic Mathematics

Course Objectives:

1. Comprehend fundamental aspects of digital image processing
2. Understand the image noise models and enhancement methods
3. Evaluate the image segmentation methodologies
4. Understand the colour image processing techniques
5. Understand image morphological operations

Course Outcomes

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

1. Understand the fundamental concepts of digital image processing system
2. Analyze the image noise models and enhancement techniques
3. Comprehend the different image segmentation and restoration methodologies.
4. Analyze the concepts of colour image processing.
5. Apply morphological operations on binary images.

UNIT-I

Introduction: Definition, Pixel, Digital image representation, Types of images, Fundamental steps in image processing, image processing applications. Digital image processing operations – Basic relationships and distance metrics, Classification of image processing operations- Arithmetic operations, Logical operations.

UNIT – II

Image Enhancement and Restoration – Image quality and Need for image enhancement, image enhancement point operations, Histogram based techniques.
Categories of Image Degradations- Image Restoration in the presence of noise only- Mean filters, order statistics filters.

UNIT-III

Image Segmentation: Introduction, classification of image segmentation algorithms, detection of discontinuities, edge detection- stages in edge detection, types of edge detectors, First-order edge detection operators, second-order derivatives filters, edge operator performance, edge linking algorithms, principle of thresholding.

UNIT –IV

Colour image processing: introduction, devices of colour imaging, colour image storage and processing, colour models-RGB Colour Model, HSI Colour Models, HSV Colour Model, Colour Quantization, Image filters for colour images.

UNIT –V

Image Morphology: Need for morphological processing Morphological operators: Erosion, Dilation, Opening & Closing, Hit-or-Miss transform, Basic morphological algorithms, Gray-scale morphology

Text Books

1. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd edition 2016.
2. D. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Prentice Hall, 2nd Edition, 2015.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2011.
4. Gonzalez R.C., Woods R.E, Digital image processing, Pearson, Prentice-Hall of India Pvt.Ltd. New Delhi, 3rd Edition, 2018
5. Jan Erik Solem, Programming Computer Vision with Python, O'Reilly ,1st Edition, 2012

References

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis and Machine Vision, 4th Edition, Cengage Learning, 2013
2. Fundamentals of Digital Image Processing, by Anil K. Jain, Prentice- Hall of India Pvt. Ltd,NewDelhi,2002
3. Prince, Simon JD. Computer Vision: Models, Learning and Inference, Cambridge UniversityPress,1stEdition,2012.

OBJECT ORIENTED MODELING

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
		L	T	P	C	CIE	SEE	Total
A56039	PEC-I	2	0	0	2	40	60	100

Prerequisites:

Any Programming Language

Course Objectives:

1. Introduce the basic concepts of UML.
2. Understand modelling of a real-word application by UML class diagram.
3. Describe the process of Interaction Diagrams.
4. Identify the importance of events, signal and state machines.
5. Demonstrate the component and deployment diagrams.

Course Outcomes:

Students will be able to:

1. Understand the concepts and principles of object-oriented programming in UML.
2. Compare the purposes, major components and key mechanisms of Class and Object Diagram.
3. Design the sequence and Collaboration Diagram for applications.
4. Construct the Start chart diagram for real world applications
5. Analyze the techniques for Component and Deployment Diagrams.

UNIT – I:

Introduction to UML: Importance of modeling, principles of modeling, object oriented Modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT – II:

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Common modelling techniques.
Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams, Common modelling techniques.

UNIT – III:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams
Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams

UNIT – IV:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

UNIT-V

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams

Text Book:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, 7th Impression, Pearson Education, 2008.

Reference Books:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, *UML2 Toolkit*, 2nd Edition, WILEY-Dreamtech India Pvt. Ltd., 2012.
2. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Illustrated Edition, Pearson Education, 2000.
3. Pascal Roques, Modeling Software Systems Using UML2, 1st edition, WILEY-Dreamtech India Pvt. Ltd., 2011.
4. Atul Kahate, Object Oriented Analysis & Design, 1st Edition, The McGraw-Hill Companies, 2007.
5. Mark Priestley, Practical Object-Oriented Design with UML, 2nd Edition, TATA McGrawHill, 2005.

SOFTWARE ENGINEERING

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
		L	T	P	C	CIE	SEE	Total
A56035	PEC-II	3	0	0	3	40	60	100

Prerequisites:

Any programming language

Course objectives

1. Understand the framework activities for a given project.
2. Choose a process model for given project requirements.
3. Design various system models for a given scenario.
4. Design various testing techniques.
5. Understand metrics for Products.

Course Outcomes:

1. Outline the framework activities for a given project.
2. Apply Right process model for a given project.
3. Design various system models for a given Context.
4. Apply various testing techniques for a given project.
5. Identify various risks in project development.

UNIT -I:

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI),

Process models: The waterfall model, Incremental process models, Evolutionary process model.

[TB-1,Ch-1,2,3]

UNIT -II:

Agile process Model: Agile principles, Extreme programming, Dynamic System Development Methods, Feature Driven Development, Scrum framework, Sprint, Scrum master, Roles of Scrum Master, Implementing Scrum - A case study. [TB-1,Ch-4]

Software Requirements: Functional and non-functional requirements, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. [TB-2,Ch-6,7]

UNIT -III:

System models: Context Models, Behavioral models, Data models, Object models, structured methods. [TB-2,Ch-8]

Design Engineering: Design process and Design quality, Design concepts, the design model.Modeling component level design: design class based components, conducting component level design. Performing User interface design: Golden rules.
[TB-1,Ch-9,11]

UNIT -IV:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.
Product metrics : Software Quality, Metrics for Analysis Model- function based metrics, Metrics for Design Model-object oriented metrics, class oriented metrics, component design metrics, Metrics for source code, Metrics for maintenance. [TB-1,Ch-13,14,15]

UNIT -V:

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: Quality concepts, Metrics for Software Quality, Software Reviews, Formal Technical Reviews, Software Reliability, The ISO 9000 quality standards.
[TB-1,Ch-25,26]

Text Books:

1. Roger S. Pressman, Software Engineering - A practitioner‘s Approach, 6th edition. McGraw Hill International Edition, 2005.
2. Somerville, Software Engineering, 7th edition, Pearson education, 2009.

Reference Books:

1. K.K. Agarwal & Yogesh Singh, Software Engineering, New Age International Publishers,3rd edition, 2008
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, 3rd edition 2005.
3. James F. Peters, Witold Pedrycz, Software Engineering - an Engineering approach, JohnWiely, 2007.
4. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw-Hill Companies, 2013.
5. https://nptel.ac.in/courses/106/105/106105182/
6. https://ff.tu-sofia.bg/~bogi/knigi/SE/Mcgraw%20Hill%20-%20Software%20Engineering%20-%20A%20Practitioner%27s%20Approach%20-%20Pressman%20(5Th%20Ed,2001,Bookmarked,Cover).pdf

LANGUAGE PROCESSORS

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56055	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Formal Languages and Automata Theory, Computer Organization

Course Objectives :

1. Describe the fundamental principles in compiler design.
2. Discuss CFG's and parsing techniques.
3. Predict the performance of different parsers.
4. Summarize the role of runtime environments and memory organization for implementation of typical programming languages.
5. Predict various techniques for code optimization and code generation.

Course Outcomes:

Student will be able to:

1. Analyze the phases of a typical compiler, including the front- and backend.(L3)
2. Apply the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation.(L3)
3. Design and implement a parser using a typical parser generator.(L6)
4. Implement an intermediate code generator based on given code patterns.(L3)
5. Apply the optimization techniques to have a better code for code generation.(L3)

UNIT I:

Introduction to Compilers: Structure of Compiler-Phases of Compiler, Symbol Table Management, Grouping of Phases into Passes, Compiler Vs Interpreter.

Lexical Analysis: Role and need of Lexical Analyzer, Input Buffering, Regular expressions for identifiers, Signed numbers etc.., A Language for specifying Lexical Analyzer, Lexical phase errors.

UNIT II:

Syntactic Specification: Context Free Grammars, Derivations and Parse Trees, Capabilities of Context Free Grammars, Syntactic Phase errors, Semantic errors.

Basic Parsing Techniques: Parsers, Shift-Reduce Parsing, Operator-Precedence parsing, Top-Down parsing, Predictive parsers.

UNIT III:

Construction of efficient Parsers: LR Parsers, Canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing LR parsing tables, Constructing LALR parsing tables, using Ambiguous grammar, Comparison of SLR,LALR and CALR parsers, Comparison of Top down and Bottom up parsers.

UNIT IV:

Syntax Directed Translation: Syntax Directed Translation schemes, Intermediate codes, Postfix notation, Three Address code, Quadruples and triples.
Symbol table: Contents of Symbol table, Data Structures for symbol tables, representing scope information.
Run-Time Environments: Storage Organization, Stack allocation of space, Access to non data.

UNIT V:

Code Optimization: Principal sources of optimization, Loop optimization, Copy Propagation, Dead code elimination, Redundant sub expression elimination.
Code Generation: Object programs, problems in Code generation, A Machine Model, A Simple Code generator, Register allocation and assignment, Peephole optimization.

Text Book:

1. Alfred V Aho, Jeffrey D Ullman, Principles of Compiler Design, Pearson Education, 2001.

Reference Books:

1. J P Trembly and P G Sorenson, The Theory and practice of Compiler Writing, Mc Graw Hill, 2005.
2. Alfred V Aho, Ravi sethi ,Jeffrey D Ullman, Compilers-Principles , Techniques and Tools , Pearson Education, second edition.
3. Dick Grone, Henri E Bal, Ceriel J H Jacobs, Modern Compiler Design, Wiley Dreamtech, 2006.

INFORMATION STORAGE AND RETRIEVAL

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56043	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Database management system

Course Objectives:

1. This course studies the basic principles and practical algorithms used for information retrieval and text mining
2. To understand the functions of Information retrieval
3. To provide exploration of information retrieval systems' evaluation tools
4. To provide hands-on experience in evaluating search engines to solve computational search problems.
5. To understand the complexity of Information Retrieval Systems.

Course Outcomes:

Student will be able to:

1. Acquire the knowledge of information retrieval system and its capabilities
2. Comprehend the knowledge of indexing and Data structure that can used for storing the data
3. Know the concept of indexing and clustering of the information
4. Understand the searching techniques and visualization
5. Have a handle on algorithms for text searching and multimedia retrieval

UNIT -1

Introduction to Information Retrieval Systems: Definition, Objectives, functional overview, Relation to Database Management system.
IRS capabilities: Search capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT –II

Cataloging and Indexing: History of objectives of Indexing, indexing process, automatic indexing
Data Structure: Introduction to Data structure, Stemming Algorithms, Invert file system, N-Gram Data structure, PAT data structure, Hypertext and XML data structure

UNIT- III

Automatic Indexing: Classes of Automatic indexing, Statistical indexing, Natural language, concept Indexing, Hypertext Linkage.
Document and Term Clustering: Introduction to clustering, Thesaurus Generation, Manual clustering, Automatic term clustering

UNIT –IV

User Search Techniques: Searching statement and binding, Similarity Measurement and Ranking, Relevance Feedback, Selective dissemination of information search, weighted searches of Boolean system.
Information Visualization: introduction to information visualization, Cognition and perception

UNIT –V

Text Search Algorithms: Introduction to Text search techniques, Software text search algorithms, hardware text search system
Multimedia information retrieval: Spoken language audio retrieval, Non- speech audio retrieval, Graph Retrieval, Imagery retrieval, video retrieval

Text Book:

1. Gerald J.Kowalski, Mark T. Maybury,Information storage and retrieval systems, theory and implementation, 2nd Edition, Springer publications.

Reference Books:

1. Christopher D. Manning and Prabhakar, Raghavan, Introduction to information Retrieval, Cambridge University Press, 2008.
2. Ricardo baeza-Yates, Modern information retrieval, Pearson Education, 2007.
3. Robert Korthage, Information storage and Retrieval, John wiley& sons.

PRINCIPLES OF DISTRIBUTED SYSTEM

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56042	PEC-II	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-Requisite:

Operating Systems, Computer Networks

Course Objectives:

1. Outline various models for processing and communication in distributed systems
2. Examine the file characteristics and Naming services
3. Explores the concept of clocks and distributed algorithms
4. Describes about transactions and their properties in distributed systems
5. To design and implement sample distributed systems.

Course Outcomes:

After completion of the course the students will be able to:

1. Identify the models for distributed processing and communication
2. Apply the knowledge in naming synchronization, consistency and replication
3. Predict the advantages and challenges in designing distributed Algorithms
4. Analyse distributed transactions and transaction recovery
5. Design Distributed Systems

UNIT I:

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and web, challenges, Architectural model: Client Server model, Proxy Servers and Caches, Peer process model ,Fundamental model :Interaction model, Security model ,Failure model.

UNIT II:

Distributed file system: Characteristics of file systems, Distributed file system requirements, File service architecture. **Name Services:** Name space ,Name resolution , Domain Name System ,DNS name servers ,Directory services, discovery services in Jini

UNIT III:

Time and Global States: Clocks, events and Process states, Synchronizing physical clocks , logical clocks, distributed debugging. Coordination and Agreement: Introduction, Distributed mutual exclusion, Elections, Multicast communication.

UNIT IV:

Transactions and Concurrency control: Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. **Distributed Transactions**: Flat and Nested Distributed

Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT V:

Replication : System model , group communication ,Fault tolerant services ,Passive(primary-backup) replication,Active replication,Transactions with replicated data.**Designing Distributed Systems:Google Case Study** :Introducing the case study Google, physical model ,overall architecture and design philosophy ,Data storage and coordination services , Google file system, Chubby, BigTable ,Distributed computation services.

Text Books:

1. G Coulouris, J Dollimore, T Kindberg, Distributed Systems Concepts and Design, fifth Edition, Pearson Education.

Reference Books:

1. S.Mahajan and S.Shah, Distributed Computing, Oxford University Press.
2. PradeepK.Sinha, Distributed Operating Systems Concepts and Design, PHI.
3. M Singhal, N G Shivarathri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition.
4. K.P.Birman, Reliable Distributed Systems, Springer.
5. A.S. Tanenbaum and M.V. Steen, Distributed Systems: Principles and Paradigms, Pearson Education.
6. R.Chow, T.Johnson, Distributed Operating Systems and Algorithm Analysis, Pearson.
7. A.S.Tanenbaum, Distributed Operating Systems, Pearson Education.

Web Resources:

https://www.cs.usfca.edu/~srollins/courses/cs682-s08/web/notes/models.html

ENTREPRENEURSHIP DEVELOPMENT

B. Tech III Year II Semester						Dept. of Computer Science and Engineering-Data Science		
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56080	HSS&MC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

The objective of this course is to familiarize the student with entrepreneurship, the issues involved in it, the potential of entrepreneurship and intrapreneurship, the legal environment and statutory issues and explore various funding opportunities.

Course Outcomes

1. Interpret the concepts of Entrepreneurship and Intrapreneurship.
2. Apply the opportunity identification techniques
3. Differentiate needs of different segments
4. Develop business model and MVP
5. Recognize organizational forms, IPR concerns and funding opportunities for startups.

Unit – I:

Introduction to Entrepreneurship: Entrepreneurship and Intrapreneurship, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, women entrepreneurs, Role of entrepreneurs in economic development, Types of entrepreneurs. Entrepreneurial mind set and stress, Causes of failure.

Unit – II:

Opportunity identification: Myths and realities of entrepreneurship, Opportunity identification, Problem worth solving, idea generation techniques, Design thinking.

Unit – III:

Customer analysis: Market segmentation, consumer persona, Product market fit, Unique Value proposition.

Unit – IV:

Business model and MVP: Business model canvas, MVP, Risks and assumptions, Importance of financial planning.

Unit – V:

Organizational forms Funding Opportunities: Organizational forms - Partnership, Sole proprietorship, Corporation. Intellectual Property Rights- Copyrights, Trademarks, Patents. Law Vs. Ethics, Informal capital- Friends and Family, Angels, Venture Capitalists, Idea/ Patent, Growth strategies

Text Books:

1. Vasant Desai, YayatiNayak, Entrerpreneurship, Himalaya Publishing House,2018
2. D.F.Kuratko and T.V.Rao Entrepreneurship- Cengage Learning,2012

References:

1. Dhruv Nath, Sushanto Mitra, Funding Your Startup: And Other Nightmares, 2020
2. Rajeev Roy, Entrepreneurship, Oxford University Press, 2/e, 2012
3. V Srinivasa Rao, Lean Digital Thinking: Digitalizing Businesses in a New World Order, Bloomsbury India, 2021
4. S.K.Mohanty, Fundamentals of Entrepreneurship, PHI, 1/e,2005
5. MOOCS by Wadhwani Foundation

VERBAL ABILITY AND CRITICAL REASONING

BTech III Year II Semester					Dept. of Computer Science and Engineering-Data Science ta Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56232	HSS&MC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

UNIT-I

Data Interpretation: Tabular, Pie-charts, Bar and line graphs and Problems on allmodels. **Data Sufficiency:** Introduction and Problems based on all Quant and logical topics. **Allegations and Mixtures:** Allegation rule, mean value of the mixture, Replacement ofequal quantity of

UNIT-II

mixtures.

Geometry: Line, line segment, angle, Triangles and Polygons with their Properties.

Mensuration: Area and perimeter of Triangle, Rectangle, Square, Parallelogram,Trapezium, Surface area & Volume of 3D figures.

Logarithms: Formulas and Problems based on Logarithms.

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions and their relations. General forms of Quadratic equations and finding the roots and their nature.

UNIT-III

Syllogisms: Statements and Conclusions by using vein diagrams.

Odd One Out: Classification and problems based of Odd one out.

Cubes and Dice: Types of cubes and dice with Examples.

Statement and Conclusions: Introduction, Types of conclusions and different cases.

UNIT-IV

Tenses: Types, usage, question solving.

Vocabulary: Types, usage and error spotting.

Inference: conclusion reached on the basis of evidence and reasoning, questionsolving.

Para Jumbles: Arranging the jumbled sentence by using the strategies.

Sentence Completion: Completing a sentence by filling the gaps by understanding &analyzing the meaning of the sentence along with the approaches.

UNIT-V

Subject Verb Agreement: Rules and examples for finding the right subject and verb.

Sentence Correction: Error spotting and correcting the sentence.

Reading Comprehension: Understanding Meaning, Understanding the meaning of a text means figuring out what the passage is trying to tell you. Drawing Connections. Summarizing and Synthesizing.

Direct & Indirect Speeches: What is Direct & Indirect Speech? , reporting the message of the speaker in the exact words as spoken by the speaker and examples.

Active Voice & Passive Voice: Types of active and passive voice, rules and examples

Text Books

R.S Agarwal, *Verbal and Non Verbal Reasoning*, New Edition -2020, S. Chand.

R.S Agarwal, *Quantitative Aptitude*, New Edition- 2020, S. Chand.

References

1. Abhijeet Guha, *Quantitative Aptitude*, New Edition-2020, Mc Graw Hill

DATA VISUALIZATION LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56215	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	4	2	50	50	100

Prerequisites:

Some exposure to programming.

Course Objectives:

- To acquire in-depth understanding of the data visualization techniques.
- To empower students with tools and techniques for handling and analyzing data.
- To empower students with tableau tool for managing and interpreting data.
- To strengthen the analytical and problem solving skill through developing real time applications.

Course outcomes

At the conclusion of the course, students should be able to:

- Understand data visualization concepts related to different applications.
- Apply different techniques for accessing data sources.
- Create different charts, stories using Tableau.
- Create powerful business dashboards using Tableau.

Programming Languages/Tools:

- Tableau Desktop. Tablea
- u's data visualization software is provided through the

Tableau for Teaching program at http://www.tableau.com/data-visualizationsoftware

List of Experiments:

Week 1

Introduction to Tableau interface / Installation of Tableau.

Week 2 – Week 3:

Apply accessing, importing data/connecting to external Sources using Tableau. Graphs and Layouts, Colors, Size, Text and Typography, Shape, Lines.

Week 4 – Week 6:

Charting in Tableau: Colors, Shapes, and Sizes, Dual Line Charts, Tableau Tooltip. Bar Charts, Line Graphs, Pie Charts, Maps, Scatter Plots, Gantt Charts, Bubble Charts, Histograms, Bullet Charts, Heat Maps and Highlight Tables, Tree maps and Box-and-Whisker Plots.

Week 7:

Multivariate visualization on given dataset using Tableau.

Week 8:

Maps and Geographic Data Analysis using Tableau.

Week 9 - Week 12:

Creating dashboards and stories: Hierarchies, Actions, Filters, and Parameters using Tableau. Connecting/publishing data using Tableau Public Server.

Week 13 – Week 16:

Study projects on selected applications using data visualization. Submission of abstract, introduction, related work, and progress, Final report, final presentations and videos.

References:

1. Nandeshwar, A. (2015), Tableau Data Visualization Cookbook, Mumbai: PACKT / Shroff Publishers.
2. https://public.tableau.com/en-us/s/resources

PREDICTIVE ANALYTICS USING R PROGRAMMING LAB

B. Tech III Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A56216	PCC LAB	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites:

Basics of Statistics, Machine Learning and Basic knowledge in any Programming language.

Course Objectives:

1. To acquire in-depth understanding of the predictive analytics.
2. To empower students with tools and techniques for handling, managing, analyzing and interpreting data.
3. To acquire in-depth understanding of charts and graphs.
4. Practice R operations required for predictive analytics.
5. Understand linear regression model.

Course outcomes:

1. Demonstrate and set up of R studio.
2. Apply EDA tools for managing, analyzing and interpreting data.
3. Summarize data insights using charts and graphs.
4. Develop R scripts for predictive analytics.
5. Analyse data with linear regression model.

Week-1:

Installation and Environment set up R and R studio.

Week-2:

Experiments on Vector Arithmetic operations.

Week-3:

Experiments on Matrices operations.

Week-4:

Experiments on Arrays functions.

Week-5:

Experiments on Factors.

Week-6:

Experiments on Data Frames.

Week-7:

Experiments on List operations.

Week-8:

Write R scripts which demonstrate logical operations and Conditional Statements.

Week-9:

Write R scripts which demonstrate Looping over List.

Week-10:

Write R scripts which demonstrate Nested Functions and Function Scoping.

Week-11:

Experiments on Mathematical Functions, Lapply, Sapply and Apply functions in R.

Week13:

Generate different Charts and Graphs using R.

Week-14:

Perform ANOVA Test, Regression, and Clustering on data using R.

Week 15 – Week 16:

Study projects on selected applications on predictive analytics. Submission of abstract, introduction, related work, and progress, Final report, final presentations and videos.

B.TECH IV YEAR I SEM (7th Semester) 5 T +2 L + Mini project

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A57054	HSS&MC	Managerial Economics and Financial Analysis	2	1	0	3
2	A57056	PCC	Deep Learning	3	1	0	4
3	A57055	PEC-III	i. Cryptography and Information Security	3	1	0	4
	A57066		ii. Big Data Analytics				
	A57058		iii. Software Testing				
4	A57061	PEC - IV	i. Natural Language Processing	3	0	0	3
	A57062		ii. Web Mining				
	A57064		iii. Human Computer Interaction				
	A57067		iv. Data Science and Analytics				
5	A57060	PEC-V	i. Fundamentals of Cloud Computing	3	0	0	3
	A57065		ii. Fundamentals of Blockchain Technology				
	A57063		iii. Cyber Forensics				
6	A57210	PCC	i. Deep Learning Lab	0	0	3	1.5
7	A57209	PEC-III-Lab	i. Cryptography and Information Security Lab	0	0	3	1.5
	A57214		ii. Big Data Analytics Lab				
	A57212		iii. Software Testing Lab				
8	A57230	PROJ	i. Industry Oriented Mini Project	0	0	4	2
Total							22

B.TECH IV YEAR II SEM **2T +3 L/P**

Serial No	Course Code	Category	Course Title	Hours per week			Credits
				L	T	P	
1	A58001	OEC-II	i. Technical and Business Communication Skills	2	1	0	3
	A58019		ii. Digital Media Literacy				
	A58010		iii. Value Engineering				
2	A58005	OEC-III	i. Negotiation Skills	2	1	0	3
	A58008		ii. Project Management				
	A58021		iii. Stress Management				
3	A58201	PROJ	i. Seminar	0	0	4	2
4	A58202	PROJ	i. Comprehensive Viva-Voce	0	0	0	2
5	A58203	PROJ	Project	0	0	20	10
Total							**20**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57054	HSS&MC	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

The objective of this course is to familiarize the student with the concepts of managerial economics and financial accounting, demand and cost concepts, market structures, pricing and financial ratios

Course Outcomes:

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

1. Describe the concept of demand and its determinants in managerial decisions
2. Know the cost concepts and breakeven analysis in production
3. Identify various market structures and different pricing strategies
4. Have knowledge of capital budgeting techniques in financial decisions
5. Have knowledge of Ratios in solving of business problems

Unit-I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics, demand analysis- demand determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, types, measurement and significance of elasticity of demand. demand forecasting, methods of demand forecasting.

Unit-II

Theory of Production and Cost Analysis: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs.

Cost Analysis: Cost concepts, Opportunity cost, Breakeven Analysis (BEA) – determination of breakeven point, managerial significance and limitations of BEA.

Unit –III

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition, price - output determination in perfect competition

Objectives and Policies of Pricing: objectives of pricing**,** methods of pricing - cost plus pricing, marginal cost pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, two - part pricing, block pricing, peak load pricing, cross subsidization.

Unit –IV

Capital and Capital Budgeting: Capital and its significance. Types of capital. estimation of fixed and working capital requirements. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method

Unit –V

Introduction to Financial Accounting: Definition of Accounting**,** Double-Entry Book Keeping, Journal, Ledger, and Trial Balance, Final Accounts.

Ratio Analysis: Computation, Analysis and Interpretation of Liquidity Ratios Activity Capital Structure Ratios and Profitability Ratios.

TEXT BOOKS:

1. Arya Sri: Managerial Economics and Financial Analysis, TMH,2009
2. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2014

REFERENCES:

1. R. K. Sharma & Shashi K Gupta, Financial Management, Kalyani Publishers, 2020
2. V. Rajasekaran & R. Lalitha, Financial Accounting, Pearson Education, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 9e, Oxford Univ Press, 2018.
4. S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Financial Accounting, 6/e, Vikas Publications, 2018

DEEP LEARNING

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57056	PCC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisites:

Basic Mathematics, P&S, Python, Machine Learning

Course Objectives:

1. To advance in training techniques for neural networks
2. To understand various CNN Architectures
3. To understand various RNN Methodologies
4. To custom train Autoencoder Models and implement them.
5. To apply Transfer Learning to solve problems

Course outcomes:

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

1. Have a good understanding of the fundamental issues and basics of deep learning
2. Understand the concept of CNN to apply it in the Image classification problems
3. Learning and understanding the working of various RNN methods
4. Learning and understanding the working of various Autoencoders methods
5. Use Transfer Learning to solve problems with high dimensional data including image and speech

UNIT I :

Deep Learning: Fundamentals, Introduction, Building Block of Neural Networks, Layers, MLPs, Forward pass, backward pass, class, trainer and optimizer, The Vanishing and Exploding Gradient Problems, Difficulties in Convergence, Local and Spurious Optima, Preprocessing, Momentum, learning rate Decay, Weight Initialization, Regularization, Dropout, SoftMax, Cross Entropy loss function, Activation Functions

UNIT II:

CNN: Introduction, striding and padding, pooling layers, structure, operations and prediction of CNN with layers, CNN -Case study with MNIST, CNN VS Fully Connected

UNIT III:

RNN: Handling Branches, Layers, Nodes, Essential Elements-Vanilla RNNs, GRUs, LSTM

UNIT IV:

Autoencoders: Denoising Autoencoders, Sparse Autoencoders, Deep Autoencoders, Variational Autoencoders, GANS

UNIT V:

Transfer Learning- Types, Methodologies, Diving into Transfer Learning, Challenges

Text Books:

1. Seth Weidman, “Deep Learning from Scratch”, O'Reilly Media, Inc., 2019
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning” , MIT Press, 2015
3. Dipanjan Sarkar, Raghav Bali, “Transfer Learning in Action”, Manning Publications, 2021

Reference Books:

1. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
2. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

CRYPTOGRAPHY AND INFORMATION SECURITY

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57055	PEC-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Prerequisites:

Fundamentals of Networking, Mathematical Fundamentals

Course Objectives

1. Understand fundamentals of cryptography and classic encryption techniques.
2. Compare and analyze encryption Algorithms
3. Summarize Authentication Functions using MAC and Hash
4. Analyze security importance of various web Applications
5. Categorize various types of Intruders and Viruses

Course Outcomes

1. Assess fundamentals of cryptography and classic encryption techniques.
2. Compare various encryption Algorithms.
3. Summarize authentication functions using MAC and Hash
4. Outline security importance of various web applications.
5. Categorize various types of intruders and viruses.

Unit I:

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques symmetric and asymmetric key cryptography, steganography.

Unit II :

Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

Unit III:

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos.

Unit IV

Security at layers (Network, Transport, Application): IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME.

Unit V

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls.

Text Books:

1. B.Forouzan, Cryptography and Network Security,Tata McGraw-Hill.
2. William Stallings, Cryptography and Network Security, Pearson Education,4th Edition

Reference Books:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security : Wiley India, 1st Edition.
2. Bernard Menezes, Network Security and Cryptography: CENGAGE Learning
3. AtulKahate, Cryptography and Network Security: McGraw Hill, 2nd Edition

Reference Links:

1. http://www.cs.iit.edu/~cs549/cs549s07/lectures.htm
http://williamstallings.com/Extras/Security-Notes/
2. http://williamstallings.com/NetworkSecurity/styled/

BIG DATA ANALYTICS

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57066	PEC-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. Discuss the overview of big data analytics concepts and growth rate
2. Introduce the tools required to manage and analyze big data like Hadoop, NoSQL Data Management.
3. Summarize the fundamental concepts of Hadoop Distributed file systems
4. Describe the techniques involved with Map Reduce Applications.
5. Analyze various recommender systems for applications

Course Outcomes:

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

1. Appraise the concept and application of Big Data
2. Apply scalable algorithms on NO SQL for big data analytics.
3. Elaborate the notion of Hadoop Distributed File System and applications
4. Apply MapReduce for the given problem
5. Implement recommender systems for different application

Unit-I

Introduction To Big Data: Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Applications of big data, Features and benefits of big data, Analysis vs Reporting, CAP theorem, Modern Data Analytic Tools.

I**ntroduction to Hadoop Programming languages:** Pig, Hive.

NOSQL Databases: Cassandra, Mongo, HBase.

Unit-II

NOSQL Data Management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data Models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharing and replication

Unit –III

Introduction To Hadoop: History of Hadoop, Data Storage and Analysis, Hadoop – Setup, Hadoop operation modes, Configurations of Hadoop. Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, concepts of Blocks in HDFS Architecture, Name Nodes and Data Nodes, using command Line Interface with HDFS, HDFS Commands, Features of HDFS.

Unit –IV

MapReduce Applications: MapReduce workflows, unit tests with MR Unit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic MapReduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

Unit –V

Social Media Analytics and Text Mining: Introducing social media; Key elements of social media; Sentiment Analysis, Performing Social Media Analytics.

TEXT BOOKS:

1. BIG DATA- Black Book, Dream Tech Press, 2019.

REFERENCES:

1. Seema Acharya, S. Chellappan," Big Data and Analytics", Wiley,2014
2. Tom White "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Jim Stogdill, "Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley Publications,2013
4. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.

SOFTWARE TESTING

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57058	PEC-III	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

Course Objectives:

1. To gain knowledge on testing in software development life-cycle, software testing process levels and testing terminologies
2. To learn techniques and algorithms for test case design
3. To understand various issues involved with applying test criteria during software development
4. To comprehend how to develop the many testing criteria to be applied with a variety of technologies.

Course Outcomes:

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

1. Understand Software Testing terminology, various activities of Test Engineer and Test coverage criteria
2. Design Test cases from graphs
3. Design Test cases from logical expressions
4. Design Test cases from partitions of the input space and syntax
5. Test Object-Oriented and Web Application Softwares

Unit – I

Activities of a Test Engineer: Testing Levels Based on Software Activity, Beizer's Testing Levels Based on Test Process , Maturity Automation of Test Activities, Software Testing Limitations and Terminology, Coverage Criteria for Testing: Infeasibility and Subsumption, Characteristics of a Good Coverage Criterion, Older Software Testing Terminology

Unit – II

Graph Coverage: Graph Coverage: Graph Coverage Criteria, Graph Coverage for Source Code, Graph Coverage for Design Elements, Graph Coverage for Specifications, Graph Coverage for Use Cases, Representing Graphs Algebraically

Unit – III

Logic Coverage: Logic Predicates and Clauses, Logic Expression Coverage Criteria: Active Clause Coverage, Inactive Clause Coverage, Infeasibility and Subsumption, Making a Clause Determine a Predicate, Finding Satisfying Values. Structural Logic Coverage of Programs, Specification-Based Logic Coverage, Logic Coverage of Finite State Machines, Disjunctive Normal Form Criteria

Unit – IV

Input Space Partitioning: Input Domain Modeling, Combination Strategies Criteria, Constraints among Partitions

Syntax-Based Testing: Syntax-Based Coverage Criteria, Program-Based Grammars, Integration and Object-Oriented Testing, Specification-Based Grammars, Input Space Grammars

Unit – V

Practical Considerations: Regression Testing, Integration and Testing, Test Process, Test Plans, Identifying Correct Outputs

Engineering Criteria for Technologies: Testing Object-Oriented Software, Testing Web Applications and Web Services, Testing Graphical User Interfaces, Real-Time Software and Embedded Software

Text Books

1. Paul Ammann and Jeff Offutt, Introduction to Software Testing, Cambridge University Press, 2008.
2. Software Testing techniques - Boris Beizer, Second Edition, Dreamtech Press
3. Software Testing Tools – Dr.K.V.K.K. Prasad, Dreamtech Press

Reference Books

1. Glenford J. Myers, The Art of Software Testing, Second edition, 2008.
2. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth edition, CRC Press, 2014.
3. Lisa Crispin and Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison-Wesley, 2009.

NATURAL LANGUAGE PROCESSING

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57061	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Artificial Intelligence, Machine Learning, Python Programming

Course Objectives:

1. To learn the fundamentals of Natural Language Processing
2. To understand the semantic aspects and similarity measures
3. To understand the aspects of context-free grammar and perform parsing
4. To understand and identify different word senses and find their relationship
5. To apply the NLP techniques in understanding discourses

Course Outcomes:

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

1. Solve problems involving regular expressions and N grams
2. Evaluate Vector models
3. Perform parsing operations
4. Build and analyze applications with semantic roles involving selectional restrictions
5. Utilize NLP learning algorithms in understanding a discourse

UNIT I:

REGULAR EXPRESSIONS AND N-GRAM MODELS

Regular Expressions - Regular Expressions, Corpora, Text Normalization, Minimum Edit Distance

Ngram Models - Ngrams, Evaluating Language models, Generalization, Smoothing

UNIT II :

Lexical Semantics, Vector semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF, PMI

Visualising Embeddings, Semantic Properties of Embeddings, Bias and Embeddings

UNIT III :

Constituency Grammar - Constituency, Context free grammar, Grammar Rules for English, Treebanks, Grammar Equivalence and Normal Form, Lexicalised Grammar

Parsing - Ambiguity, CKY Parsing

UNIT IV:

WORD SENSES AND SEMANTIC ROLE

Word senses, Relation between senses, WordNet, Word Sense Disambiguation
Semantic Roles, Diathesis alternations, Problems with thematic roles, Proposition Bank, FrameNet, Semantic Role Labelling, Selectional Restrictions

UNIT V :

COREFERENCE RESOLUTION AND DISCOURSE COHERENCE

Coreference Resolution - Coreference Phenomena, coreference Tasks and datasets, Architecture of coreference algorithm, Gender bias in coreference
Discourse Coherence - Coherence Relation, Discourse Structure Parsing, Centering and Entity based Coherence, Representation model for local coherence, Global coherence

Text Books:

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009

Reference Books:

1. James Allen, "Natural Language Understanding", 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Rajesh Arumugam, Rajalingappaa Shanmugamani, "Hands-On Natural Language Processing with Python" , Packt Publishing Ltd., 2018
3. Deepti Chopra, Nisheeth Joshi, Iti Mathur "Mastering Natural Language Processing with Python" First Edition, Packt Publishing, 2016

WEB MINING

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57062	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-requisites:

Probability & Statistics, Basics of Internet Knowledge

Course Objectives:

1. To describe web mining and understand the need for web mining.
2. Differentiate between Web mining and data mining
3. Understand the different methods to introduce structure to web-based data.
4. To understand how information is retrieved from Social media & WWW

Course Outcome:

By the end of the course, Student will be able to:

1. Identify the difference between Web mining & Data Mining.
2. Learn the methods of data extraction and Processing.
3. Learn the social network data mining.
4. Understand the concepts of Information Retrieval System from Web.
5. Do text processing, Language Processing.

Unit-I:

Introduction: A brief history of web and hypertext data, Topic directories, clustering and classification.

Web data extraction and processing: Web crawling and indexing, Hyperlink analysis, resources discovery and vertical portals. Structured and unstructured data mining.

Unit-II:

Infrastructure: Crawling the web: HTML,HTTP Basics, engineering large- scale crawlers. DNS Catching, Perfecting and resolutions.

Multiple current fetches: Multithreading, Link extraction and Normalization.Txt repository.Similarity and clustering

Unit-III:

Mining social network data: Social Network Analysis, Information propagation in social network, Community discovery in social networks, expert finding in social networks, Link

prediction in social networks. **Mining user generated contents:** The Social Web, Mining micro blogging data, Mining social tagging data.

Unit-IV:

Information Retrieval: Basic Concepts of Information Retrieval, Information Retrieval Methods – Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing – Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression – Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing – Singular Value Decomposition.

Unit-V:

Opinion Mining: motivation and problem definition, Research issues on Opinion Mining, Natural Language Processing, Text processing and Opinion Mining resources.
Opinion Mining – Sentiment Classification – Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization – Problem Definition, Object feature extraction.

Text Books:

1. Soumen Chakrabarti,"Mining the Web: Discovering Knowledge from Hypertext Data" Second edition, Morgan Kauffmann.
2. Bing Liu" Web Data Mining: Exploring hyperlinks, contents and usage data " , Springer Second Edition.

Reference Books:

1. "Mining the Social Web" by Mathew A. Russell, Mikhail Klassen" 3rd Edition, O Reilly publication.
2. "Mining the World Wide Web: An Information Search Approach." by Chang, G., Healey, M. J., McHugh, J. A. M., Wang, J. T. L. Kluwer Academic Publishers.
3. "Web mining: Applications & Techniques" by Antony Scime.

HUMAN COMPUTER INTERACTION

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57064	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Web Technologies

Unit – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design.A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit – II

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

Unit – III

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit – IV

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit – V

Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

Text Books

1. The essential guide to user interface design: Wilbert O Galitz,WilelyDreama Tech 2007
2. Designing the user interface design: Ben Shneiderman 3rd Edition, Pearson Education Asia 2001

Suggested / Reference Books

1. Human – Computer Interaction. ALAN DIX, JANET FINCAY, GRE GORYD, ABOWD, RUSSELL BEALG, PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dreamtech,

Other Resources

1. http://courses.iicm.tugraz.at/hci/hci.pdf
2. http://www.prenhall.com/behindthebook/0132240858/pdf
3. http://ebooksfile.com/pdf/Zz2/human-computer-interaction-sample-exam-questions.pdf
4. http://nptel.ac.in/courses.php?disciplineId=106

DATA SCIENCE AND ANALYTICS

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57067	PEC-IV	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Basic Mathematics, Machine Learning and Data Visualization

Course Objectives:

1. To gain a foundational understanding of data science.
2. To understand the data science process and significance of exploratory data analysis (EDA).
3. To develop scoring and ranking Systems.
4. To understand the Handling Large Data on a single computer.
5. To understand the Text mining and text analytics.

Course Outcomes:

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

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Analyze the data science process and significance of exploratory data analysis (EDA)
3. Apply the scoring and ranking systems for datasets.
4. Apply basic algorithms for Handling Large Data.
5. Interprets Text mining and text analytics.

Unit I:

Introduction

Computer Science, Data Science, and Real Science, **Asking Interesting Questions from Data**:The Baseball Encyclopedia the Internet Movie Database (IMDb) Google Ngrams, New York Taxi Records

Properties of Data: Structured vs. Unstructured Data, Quantitative vs. Categorical Data, Big Data vs. Little Data **Classification and Regression**, **Data Science Television**: The Quant Shop, Kaggle Challenges About the War Stories, **War Story**: Answering the Right Question

Unit II:

Data Munging

Languages for Data Science: The Importance of Notebook Environments, Standard Data Formats **Collecting Data**: Hunting, Scraping, Logging

Cleaning Data: Errors vs. Artifacts. Data Compatibility, Dealing with Missing Values, Outlier

War Story: Beating the Market Crowd sourcing: The Penny Demo, when is the Crowd Wise, Mechanisms for Aggregation, Crowd sourcing Services, Gamification

Exploratory data analysis: Build the models

Unit III:

Scores and Rankings

The Body Mass Index (BMI), **Developing Scoring Systems**: Gold Standards and Proxies, Scores vs. Rankings, Recognizing Good Scoring Functions, Z-scores and Normalization

Advanced Ranking Techniques: Elo Rankings, Merging Rankings, Digraph-based Rankings, PageRank

War Story: Clyde's Revenge, Arrow's Impossibility Theorem, War Story: Who's Bigger

Unit IV:

Handling Large Data on a single computer

Problems when handling large data, **General techniques for handling large data:** Choosing the right algorithm, Choosing the right data structure, Selecting the right tools

General programming tips for dealing with large data sets: Don't reinvent the wheel, Get the most of your hardware, reduce your computing needs, **Case study:** Predicting Malicious Urls, Building a recommender system inside a database

Unit V:

Text mining and Analytics

Text mining in the real world, Text mining techniques: Bag of words, Stemming and Lemmatization, Decision tree Classifier.

Case Study- Classifying Reddit Posts: Research Goal, data retrieval, data preparation, data exploration, data analysis, presentation and automation

Text Books:

1. Skiena, Steven S, The Data Science Design Manual, CRC press
2. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.

Reference Books:

1. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, Introduction to Data Mining (Second Edition)
2. V.K. Jain, Data Science and Analytics (with Python, R and SPSS Programming), Khanna Book Publishing Company.
3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning,Second Edition. ISBN 0387952845. 2009.
4. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
5. Data Science from Scratch: First Principles with Python, Joel Grus, O'Reilly, 1st edition, 2015.

FUNDAMENTALS OF CLOUD COMPUTING

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57060	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Prerequisites:

Computer Organization and Computer Networks.

Course Objectives:

1. This course provides an insight into cloud computing

Course Outcomes:

After the end of the course, the students will be able to:
1. Understand different Computing Paradigms and Virtualization
2. Learn the fundamentals of Cloud Computing.
3. Understand various service delivery models of a cloud computing architecture.
4. Demonstrate the ways in which the cloud can be programmed and deployed
5. Identify applications that can deploy on a Cloud environment.

UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing
Virtualization: Introduction to Virtualization, Approaches in Virtualization, Hypervisor and Its Role, Types of Virtualization

UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, Defining Cloud Computing, 5-4-3 Principles of Cloud computing, Cloud Ecosystem, Requirements for Cloud Services.

UNIT-III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-IV

Cloud Deployment Models: Private cloud, Public Cloud, Community Cloud, Hybrid Cloud.
Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service.

UNIT-V

Cloud Service Providers: EMC, Google, Amazon Web Services, Microsoft, Windows Azure, IBM, Cloud Models, IBM, Sales force.
Open-Source Support for Cloud: Open-Source Tools for IaaS, Open-Source Tools for PaaS, Open-Source Tools for SaaS.

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57065	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Pre-Requisites:

Object Oriented Programming Through Java, Basic Knowledge Of Computer Security, Data Structures

Course Objectives:

1. Identify different components and types of Blockchain.
2. Learn Smart Contracts for public Blockchain
3. Apply Ethereum tool for Deploying the Smart Contract
4. Interpret Private Blockchain System
5. Analyse the impact of Blockchain in business

Course Outcomes:

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

1. Summarize types and applications of Blockchain
2. Understand Smart Contracts for Public Blockchain System
3. Illustrate the design and deployment of smart contract through Ethereum
4. Apply Private Blockchain System in different Networks
5. Categorize different Business Applications of Blockchain

UNIT I:

Fundamentals of Blockchain: Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Decentralization and Distribution, Types of Blockchain, Consensus Protocol

UNIT II:

Blockchain, Ethereum Blockchain

Smart Contracts: Smart Contract, Characteristics of a Smart Contract

Ethereum Solidity: Introduction, Datatype, operator, enum, arrays, loops

UNIT III:

Ethereum Solidity: Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Compile and Deploy the Smart Contract. Introduction to Truffle IDE and metamask.

UNIT IV:

Private Blockchain System: Key Characteristics of Private Blockchain, Why We Need

Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

UNIT V:

Application of Blockchain: Blockchain in Banking and Finance, Blockchain in

Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT.

Limitations and Challenges of Blockchain: Blockchain Implementation – Limitations, Blockchain Implementation – Challenges

Text Books:

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017
2. Blockchain Technology:ChandramouliSubramanian,Asha A George,Abhilash K A and MeenaKarthikeyan,Published by University Press

Reference Books

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O'Reilly
2. Philipp Hacker, IoannisLianos (2019). Regulating Blockchain: Techno-Social and Legal Challenges, OUP Oxford. (ISBN-13: 978-0198842187).

Reference Link

1. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

CYBER FORENSICS

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57063	PEC-V	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

Course Objectives:

1. Create a document review, retention, and destruction policy.
2. Write an acceptable use policy and employer privacy statement.
3. List and describe the generally accepted computer forensic procedures.
4. Explain and list the various legislation and regulations that impact technology.
5. Analyze forensic analysis reports

Course Outcomes:

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

1. Perform a forensic investigation by following guidelines to secure the crime or corporate scene.
2. Learn what legal issues are involved and what rights the person of interest has.
3. Perform digitally and court approved images of evidence to be used in a court of law.
4. Learn how to document and store evidence.
5. Learn how to analyze evidence using commercial forensic software and also how to create a report of the said evidence.

UNIT-I

Computer Forensics and Investigations: What is computer Forensics? Use of computer forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceeding, Computer Forensics services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists.
Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of law Enforcement-Computer forensic Technology.

UNIT-II

Computer Forensics Evidence and capture: Data Recovery Defined Data Backup and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution
Evidence Collection and Data Seizure: Why Collection Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, General Procedure, Collection and

Archiving, Methods of Collection, Artifacts, Collection Steps.

UNIT-III

Controlling Communication: The Chain of Custody duplication and Preservation of Digit Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collection and Preserving Computer Forensics Evidence.
Computer Image Verification and Authentication: Special Needs of Evidential Authentication
Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

UNIT-IV

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics using network tools.
Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes,
Preparing for a Search, securing a Computer Incident or Crime Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT-V

E-mail Investigations: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating Email Crimes and Violations, Understanding Email Servers, Using Specialized Email Forensics Tools,
Mobile Device Forensics: Understanding Mobile Device Forensics, Understanding Acquisition Procedure for Cell Phones and Mobile Devices

TEXT BOOKS:

1. John R.Vacca, Computer Forensics, Computer Crime Investigation, firewall Media, New Delhi,2005
2. Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations, Cengage Learning.2009

REFERENCES:

1. Keith J. Jones, Richard Bejthich, Curtis W Rose, Real Digital Forensics, AdditionWesley Pearson Education.2006
2. Tony Sammesand Bairn Jenkinson, Forensic Compiling A Practitioner's Guide, Springer International edition.2013 Christopher L.T.Brown, Computer Evidence Collection & Presentation, Firewall Media.2005

Deep Learning Lab								
B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
A57210	PCC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites:

DM, P&S, Python, AI, ML

List of Programs:

1. Implementation of Linear Regression
2. Deep learning Packages Basics: TensorFlow, Keras and PyTorch
3. Implementation of Neural network
4. Face recognition using CNN
5. Sentiment Analysis using LSTM
6. Language Modeling using RNN
7. Sentiment Analysis using GRU
8. Image Classification with Transfer Learning

CRYPTOGRAPHY AND INFORMATION SECURITY LAB

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57209	PEC-III-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes

By the completion of the course, Students will be able to:

1. Implement port Scanning
2. Investigate Security of Network
3. Analyze Packet Protocols ,IP Spoofing
4. Implement Various Encryption Algorithms
5. Implement Brute Force Algorithm

Week 1

1. Installation of NetCat.

Week2

2. Implement port scanning with NetCat

Week 3

3. Perform the following using NetCat

- Banner Grabbing .
- Chat Interface
- File Transfer

Week 4

4. Installation of Network Miner

Week 5

5. Perform an experiment to sniff packets and IPs using Network

Week 6

6. Perform Sniffing of Web Browser User-Agents.

Week 7

7. Implement Simple Data Encryption Standard (SDES) Algorithm through C program

Week 8, 9

8. Implement Diffie–Hellman key exchange algorithm through C program.

Week 10

9. Installation of cryptool 2

Week 11

10. Implement DES algorithm using cryptool 2

Week 12

11. Implement RSA algorithm using cryptool 2

Week 13

12. Implement HASH algorithm using cryptool 2

Week 14

13. Implement SHA1 algorithm using crpty tool 2

Week 15

14. Implement brute force algorithm in C.

BIG DATA ANALYTICS LAB

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57214	PEC-III-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Course Outcomes:

At the end of this Big Data Analytics Lab course, students will be able to:

1. Develop various programs in Hadoop.
2. Perform file operation in HDFS
3. Perform query operation using pig
4. Practice various commands in HIVE
5. Create applications for Big Data analytics

List of Experiments:

Week 1

Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.

Week2

Implement the following file management tasks in Hadoop:

1. Adding files and directories
2. Retrieving files
3. Deleting files

Week 3

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

1. Find the number of occurrences of each word appearing in the input file(s)
2. Performing a Map Reduce Job for word search count (look for specific keywords in a file)

Week 4

Stop word elimination problem: Input:

1. A large textual file containing one sentence per line
2. A small file containing a set of stop words (One stop word per line) Output: A textual file containing the same sentences of the large input file without the words appearing in the small file.

Week 5

Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volumes of log data, which is a good

candidate for analysis with MapReduce, since it is semi structured and record oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

1. Find average, max and min temperature for each year in the NCDC data set?

2. Filter the readings of a set based on the value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

Week 6

Implement of Matrix Multiplication with Hadoop Map Reduce

Week 7

Command line interface with HDFS

Week 8

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Week 9

PIG Programs:

1. Run the Pig Latin Scripts to find Word Count
2. Run the Pig Latin Scripts to find a max temp for each and every year.

Week 10

Installation of Hive along with practice examples.

Week 11

Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Week 12

Write a Pig script for:

1. DML operations on Cassandra Database.
2. Retrieving data from MongoDB.

Week 13

HBase Shell Commands practice

Week 14

Data analytics on Amazon food dataset, find all the pairs of items frequently reviewed together.

1. Transposes the original Amazon food dataset, obtaining a PairRDD of the type: <user_id> → <list of the product_ids reviewed by user_id>
2. Counts the frequencies of all the pairs of products reviewed together;
3. Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Note: The above experiments are for indicative purposes only. However, the concerned faculty member can add a few more experiments in addition to the existing. In such cases the concerned faculty member should get the syllabus approved by the BoS.

SOFTWARE TESTING LAB

B. Tech IV Year I Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A57212	PEC-III-Lab	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	50	50	100

Prerequisites:

Data Structure, Object Oriented Programming, Web technologies

Course Objectives:

1. Manual testing using functional test
2. White box test case design based on path ,data, and logic
3. Explore Regression and Integration testing
4. Testing of Object-Oriented and Web Applications Softwares

Course Outcomes:

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

1. Performed Manual testing based on test cases
2. Design and execute Test cases of Path and Data coverage Criteria
3. Design and execute Test cases of Data and Logic coverage Criteria
4. Performed Regression and integration Testing
5. Testing Object-Oriented and Web Applications Software

List of Programs:

Week 1

Write functional test cases of ATM and perform manual testing to find faults and failures

Week2

Design and execute Edge and Node coverage Test cases of Student grade Assignment computer program

Week 3

Design and implement a program that will compute all paths (edge and Node) in a graph, it will be to accept a graph as input by reading a list of nodes, initial nodes, final nodes, and edges.

Week 4

Write Program to Reducing Graphs to Path Expressions of give Control Flow graph

Write Program to Find Maximum and Minimum number of test cases of give Control Flow graph

Week 5

Design and execute all du path test cases of Pattern matching of two strings

Week 6

Design and execute complete set of coupling du-pairs of compute the quadratic root for two numbers

Week 7

Design and execute Predicate coverage (PC) and Clause coverage (CC) Test cases of Quadratic program

Week 8

Design and execute Combinatorial coverage (CoC) Correlated active clause coverage Test cases of Quadratic program

Week 9

Design and execute Data partition based test case of Quadratic program

Week 10

Demonstrate Java mutation tool

Week 11

Demonstrate the Regression and Integration testing

Week 12

Demonstrate and execute all Object-Oriented Testing Criteria

Week 13-14

Demonstrate and execute all web application Testing Criteria

TECHNICAL AND BUSINESS COMMUNICATION SKILLS								
B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	Category	Hours / Week			Credits	Marks		
A58001	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is intended to expose the students to learn and practice the five communication skills thinking, listening, speaking reading, and writing in English, the global language of communication. It reflects some of the approaches in English language teaching and learning currently in practice around the world.

Objective

To help the students to develop effective communication skills in all communicative contexts for professional advancement

Course Outcomes

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

1. communicate technical and business correspondence
2. reflect on the themes discussed
3. recognize ethical implications of technical communication in professional contexts
4. identify the contemporary issues in engineering from environmental, societal, economic, and global perspectives
5. demonstrate ethical decisions in complex situations

UNIT-I

E-World & E-Communication:

E-language - E-governance - E-commerce/E-business - E-banking - E-waste

UNIT-II

Business Establishment & Infrastructure Development:

Power Supply - Industrial Park - Business Correspondence: Follow-up letters - Acceptance & Rejections - Persuasive letters - Resignation letters

UNIT-III

Technology and Society:

Robot Soldiers - For a Snapshot of a Web - Placing an order - Proposal Writing - Patents & Rights (National & International) - Intellectual Property – Nanotechnology

UNIT-IV

Ethics in Business Communication:

Ethical issues involved in Business Communication - Ethical dilemmas facing managers - Ethical Code & Communication - Standards in Daily Life - Total Quality Management - World University Ranking

UNIT-V

Management Information System:

Corporate Governance - Business Process Outsourcing - Project Management Communication - Marketing Communication

Textbook:

1. Dhanavel, P. S. English and Communication Skills for Students of Science and Engineering. Orient Black Swan. 2009.

References:

1. Anderson, V. Paul. *Technical Communication.* Cengage. 2014.
2. Kalkar, Anjali. et.al. *Business Communication*. Orient Black Swan. 2010.
3. Knisely, W. Charles. and Knisely, I. Karin. *Engineering Communication.* Cengage. 2015.
4. Kumar, Sanjay. and PushpLata. *Language and Communication skills for Engineers.* Oxford University Press. 2018.
5. Raman, Meenakshi and Singh, Prakash. *Business Communication.* (Second Edition.). Oxford University Press. 2012.

DIGITAL MEDIA LITERACY

B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58019	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Introduction

The course is introduced to build a relationship between media Literacy to traditional forms. It will enable the students understand the media around them and learn to use media literacy effectively. The students can also excel their writing skills through media.

Learning Objectives

The students will be able to

1. prepare the students to use media source and its content
2. train the students become media literate
3. provide practical tips for incorporating media literacy into the traditional curriculum

Course Outcomes

After the completion of the course, the students will

1. Use media as a learning tool
2. Share knowledge in digital media
3. Apply the use of persuasive language
4. Exhibit copy writing skills
5. Contribute their ideas through blogs

Prescribed Textbook:

Jacobs , Hayes Heidi. ***Media Literacy.*** Solution Tree Press: USA.
(E-book is available to download)

UNIT-I

Introduction – Diversity and Media:

Bias in the Media - Peer Driven Social Learning Communities - Social Learning Spaces -

Mirrored Learning Words - Online Events - The Nitty - Gritties

UNIT-II

Digital Literacy in Action:

Internet Safety and Filtering - Establish Proficiency of Tagging

UNIT-III

Blogging:

Basics of Blog Writing - Foundations of Blogging - Blogs as Professional Development Tool - Blogs as a Learning Tool - Creating Knowledge Habitats

UNIT-IV

The Classroom:

A Market place for Learning - Build an Electronic Calendar-Paper less News Paper - Marketing through Social Media - Writing Techniques

UNIT-V

Gaming as a Literacy:

How Video games promote Learning? - Participatory Culture and Engagement - Collaboration and Cooperation - Motivation

References:

1. Hobbs Renee R.Create To Learn: Introduction To Digital Literacy:Wiley-Blackwell Publications.
2. Frank, W. Baker. Media Literacy in the K-12 Classroom. (2nd Edition.). Paperback Publications.
3. Hertz, Mary. Beth. Digital and Media Literacy in the Age of the Internet: Practical Classroom Applications. Rowman & Littlefield Publishers.
4. Hobbs Renee R. Digital and Media Literacy. Sage Publications.
5. Potter, W. James. Introduction to Media Literacy. Sage Publications.

VALUE ENGINEERING

B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58010	OEC-II	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives

The course is designed to help the student understand the concepts of Value engineering, understand different phases of value engineering and decision alternatives, and teams.

Course Outcomes

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

1. Understand the importance of value engineering concepts in productivity
2. Identify the different phases of value engineering projects
3. Know the different decision alternatives and choose the best alternative for optimization
4. Identify the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

Unit-I

Introduction: Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

Unit-II

Value Engineering and Job Plan: Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

Unit-III

Value Engineering Techniques: Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix, Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced technique like Function Analysis System.

Unit–IV

Versatility Of Value Engineering: Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

Unit–V

Value Engineering Level of Effort: Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

TEXT BOOKS:

1. Anil Kumar Mukhopadhyaya, “Value Engineering: Concepts Techniques and applications”, SAGE Publications 2010.
2. Del L. Younker, “Value Engineering analysis and methodology”, Marcel Dekker Inc, New York, 2004

REFERENCES:

1. Alphonse Dell’Isola, “Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations”, R S Means Co., 1997
2. Richard Park, “Value Engineering: A Plan for Invention”, St. Lucie Press, 1999.
3. Anil Kumar Mukhopadhyaya, “Value Engineering Mastermind: From concept to Value Engineering Certification”, SAGE Publications, 2003

NEGOTIATION SKILLS

B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58005	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

1. To familiarize the students with various negotiation approaches and styles.
2. Understand & develop effective strategies for each stage of a negotiation
3. Identify Cross – cultural challenges that arise in negotiations
4. Enhance communication skills, emphasizing effective listening, persuasion & relationship building
5. Strengthen creative ability to expand the option for resolving a dispute.

Course outcomes:

At the end of the course students will be able to

1. Describe negotiation theories, concepts and tactics to manage negotiations
2. Explain the importance of various factors impacting negotiations.
3. Apply effective negotiation strategies and tactics for different scenarios
4. Identify negotiation practices towards building relationships
5. Evaluate various conflict resolution strategies.

Unit- I

Introduction to Negotiation: Introduction, Concept of Negotiation, Characteristics of a Negotiating Situation, Basic Negotiation Skills, Interpersonal Skills in Negotiation, Theories of Negotiation.

Unit- II

Types of Negotiation: Types of Negotiation, Principles of Negotiation, Steps of Negotiation, Win-Win Negotiation, Negotiation Tactics, Factors Affecting Success in Negotiation.

Unit- III

Strategies of Negotiation: Fundamentals of Negotiation, Effective Strategies to develop Negotiation Skills, Anchoring / BATNA, Process of Negotiation and Negotiation Phases.

Unit –IV

Improving Negotiation skills: Enhancing Communication skills for effective Listening, Persuasion & Relationship Building, establishing Trust-Building Relationships.

Unit- V

Managing Negotiation: Managing Different Types of Negotiations**,** Cross –Cultural Challenges in Negotiations, Industrial Negotiation: Collective Bargaining, Arbitration, Origins of Conflict, Dispute Resolution.

TEXT BOOKS:

1. Fredluthans, Organisational Behavior, 9th ed, Prentice Hall.

2. Roger Fischer, Essentials of Negotiations, Harward Business School Press.

REFERENCES:

1. Beverly DeMarr and Suzanne De Janasz, Negotiation and Dispute Resolution, Prentice Hall, 2013.

2. Roy J Lewicki, Bruce Barry, and David M Saunders, Essentials of Negotiation, 5th Edition, McGraw Hill, 2011

3. Malhotra, Deepak, Negotiating the Impossible: How to Break Deadlocks and Resolve ugly Conflicts (without money or muscle). Oakland, CA: Berrett-Koehler Publishers, 2016.

4. Fatima, Shaheed; Kraus, Sarit; Wooldridge, Michael, Principles of Automated Negotiation. Cambridge, UK; New York: Cambridge University Press, 2015.

5. Subramanian, Guhan, Dealmaking: New Dealmaking Strategies for a Competitive Marketplace. New York: W. W. Norton & Company, 2011.

PROJECT MANAGEMENT

B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58008	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

Course Outcomes:

At the end of the course students will be able to

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

Unit-I

Introduction: Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

Unit-II

Project Identification and Planning: Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

Unit-III

Project Execution: Initiating the Project, Controlling and Reporting Project Objectives, Conducting project evaluation, Risk, Risk Management Factors, Project Management, Four Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

Unit-IV

Leading Project Teams: Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

Unit-V

Performance Measurement and Evaluation: Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

TEXT BOOKS:

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

REFERENCES

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam& P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

STRESS MANAGEMENT

B. Tech IV Year II Semester					Dept. of Computer Science and Engineering-Data Science			
Code	**Category**	**Hours / Week**			**Credits**	**Marks**		
A58021	OEC-III	L	T	P	C	CIE	SEE	Total
		2	1	0	3	40	60	100

Course Objectives:

The course is designed to help the student understand the concepts of project management, explain how to identify the projects and planning, analyze how to execute the projects, assess how to lead the team and evaluation of projects and to explain the performance measurement and evaluation of the projects.

Course Outcomes:

By the completion of the course, Students will be able to:

1. Understand the sources of reducing stress among employees.
2. Improve the physiological and physical illness of employees and self.
3. Develop a right attitude among employees and self.
4. Adopt stress management strategies for personal well-being and well-being of team members.
5. Understand the leadership styles in stress and time management techniques

Unit-I

Introduction to Stress Management

Nature of stress, approaches to stress, Good stress Vs. Bad stress, the individual and work. Occupational stress, role stress, source of managerial stress.

Unit-II

Stress & thought process learning Stress & thought process learning. Manifestations of stress - stages of stress, signs of stress at work, personality types and stress.

Unit-III

Various linkages and Assessment of Stress Stress & personality, stress & motivation, verbal & non-verbal indications of stress, assessment of stress, general sources of stress, stress and health, physiological and psychological illness.

Unit-IV

Stress Management Stress management, stress diary, becoming change skilled, adopting a healthy lifestyle, right attitude, thought awareness, imaginary (auto-genic therapy), learning to relax, correct breathing, and goal planning.

Unit-V

Stress and Leadership Styles Stress & management of change, stress & conflict, leadership styles in stressful & non-stressful situations, organization and stress management, recognizing the signs, approaches to the problem, providing assistance. Time management, general advice - ten commandments for effective stress management.

TEXT BOOKS:

1.R. P. Banerjee, Stress Management through Mind Engineering, Sage Spectrum, 2021

2. Alok Chkarawal, Prathibha Goyal, Stress Management, Studera Press, 2018

REFERENCES

1. Wolfgand Linden, Stress Management, Sage Publication, 2005

2. Jonathan C Smith, Stress Management: A Comprehensive Handbook of Techniques and Strategies , 2002

3. K. Hari Gopal, Organizational Stress, University Press.

4. Ann Edworthy, Managing Stress, Open University Press, Buckingham, Phildephia.

5. Dr. Rakesh Chopra Santosh Sharma, The stress Cyclone Suffer or Emerge out: The choice of yours, Institute of corporate Management, Excel Books.