



JAIDEVEDUCATIONSOCIETY'S
JDCOLLEGE OFENGINEERINGANDMANAGEMENT
An Autonomous Institute, with NAAC "A" Grade At: Khandala,
Post- Valni, Kalmeshwar Road, Nagpur
Department of Computer Science & Engineering (Data Science)
"Progress Beyond Excellence"
Session:2023-27



Course Structure and Syllabus (Autonomous)

For

B. Tech. Computer Science & Engineering (Data Science)



**JAIDEVEDUCATIONSOCIETY'S
JDCOLLEGE OF ENGINEERING AND MANAGEMENT**
An Autonomous Institute, with NAAC "A"
GradeAt: Khandala, Post- Valni, Kalmeshwar Road
Department of CSE (Data Science)



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VISION AND MISSION OF INSTITUTE

VISION

To be a centre of excellence imparting professional education satisfying societal and global needs.

MISSION

Transforming students into life long learners through quality teaching, training and exposure to concurrent technologies. Fostering conducive atmosphere for research and development through well-equipped laboratories and qualified personnel in collaboration with global organizations.

VISION AND MISSION OF DEPARTMENT

VISION

To be recognized as a centre of excellence in the field of Information Technology where inquisitive minds of students are fostered, leading to skilled professionals for satisfying the needs of society

MISSION

1. Apply knowledge of engineering fundamentals and cutting-edge technology to identify and implement innovative solutions for engineering problems and issues in society at large.
2. Build strong interpersonal skills and will engage in life-long learning to enhance their career positions, both as team members and leaders.

PROGRAM EDUCATIONAL OBJECTIVES(PEO's)

PEOs	ATTRIBUTES
PEO1	Pursue successful professional career in IT and IT-enabled industries.
PEO2	Pursue lifelong learning in generating innovative engineering solutions using research and complex problem-solving skills.
PEO3	Demonstrate professionalism, ethics, inter-personal skills and continuous learning to Develop leadership qualities.

PROGRAM OUTCOMES (PO's)

POs	ATTRIBUTES
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOS):

At the end of Electronics and Telecommunication program the student will have following Program specific outcomes.

PSO1: Programming and software Development skills:

Ability to acquire programming efficiency to analyse, design and develop optimal solutions, apply standard practices in software project development to deliver quality software product.

PSO2: Information Technology Specific Skills:

Ability to formulate, simulate and use knowledge in various domains like data engineering, image processing and information and network security, artificial intelligence etc., and provide innovation solutions in the interdisciplinary projects.

PSO3: Application:

Anticipate the changing direction of information technology and evaluate and communicate the likely utility of new technologies to an individual or organization for performing tasks related to E-governance, E-Learning , Research, Training and/or Health Care Management with a cost effective solutions

Recommendations for conducting one theory course of curriculum through online Teaching / Learning

1. Only Swayam/NPTEL platform is allowed.
2. One defined subject per semester in online mode and BOS should declare that one subject for online mode based on availability of NPTEL offering before commencement of the semester.
3. Student will be allowed to appear for NPTEL/Institute level/University Examination as applicable.
4. In order to ensure learning, NPTEL lectures to be telecast in the class by including it in regular timetable if required.
5. 75% assignments submission is mandatory for these online classes as well as regular lecture attendance.
6. One faculty to be allotted for this subject, who will discuss and solve student's doubts. Allot 3hrs/weekload to teacher who is allotted to work as facilitator of online course.
7. For Autonomy Students: For online mode the student should submit all assignment given by NPTEL then his/her score has weightage of 40% for CA & MSE. And if student clear the NPTEL final exam and producing certificate then 60% weightage should be given as ESE, otherwise he/she has to appear for Makeup exam of Institute.

If student cannot enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I, CA-II and End sem exams of the Institute.
8. For DBATU students: For online mode he has to appear for CA-I, CA-II, Mid sem exam of the institute and End sem exam of University.

If student can't enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I, CA-II of the institute and End sem exams of the University.
10. If the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

This system will ensure real learning; avoid any problem arising due to cancellation of NPTEL exam as it happened in this semester. At least for first year and in the unpredictable situation of covid pandemic these provisions will avoid any last moment chaos.

Course Structure and Syllabus

For

B.Tech. CSE (Data Science)

Curriculum for Semester-II [Second Year]

3rd Semester

3rd Semester Computer Science & Engineering (Data Science) 2023-2027

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T/A	P	CA	MSE	ESE	Total	
1	PCC	DS3T001	Object Oriented Programming through Java	3	0	0	20	20	60	100	3
2	PCC	DS3T002	Operating Systems	3	0	0	20	20	60	100	3
3	PCC	DS3T003	Data Structures & Algorithm	3	0	0	20	20	60	100	3
4	PCC	DS3A001	Organization Behaviour	2	0	0	10	15	25	50	Audit
5	MDM	DS3M001	Discrete Mathematics & Statistical Analysis	2	0	0	20	20	60	100	2
6	OEC	DS3O001	OE-1	3	0	0	20	20	60	100	3
7	EEMC	DS3I001	Entrepreneurship Development	2	0	0	20	20	60	100	2
8	VEC	DS3V001	UHV-II	2	0	0	20	20	60	100	2
9	PCC	DS3L005	Object Oriented Programming through Java Lab	0	0	2	60	-	40	100	1
10	PCC	DS3L006	Visualization Tools Lab	0	0	2	60	-	40	100	1
11	PCC	DS3L007	Data Structures & Algorithm Lab	0	0	2	60	-	40	100	1
12	CEP/FP	DS3F001	Comm. Engg. Project	0	0	4	30	-	20	50	2
				20	0	10	360	155	585	1100	23

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS)

Course Code- DS3T001

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3T001	Object Oriented Programming through Java	3	0	0	3

Prerequisites for the course

1.	You must know at least the basics of how to use a computer, and should be able to start a command line shell. If you already know C++ or any other Object-Oriented language, Java should be easy to pick up.
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Prior Reading Material/Useful links

1.	Beginning Programming with Java for Dummies (5th Edition)
2.	https://www.geeksforgeeks.org/best-books-to-learn-java-for-beginners-and-experts/
3.	https://www.javatpoint.com/

Course Outcomes:

Sr. No	Course Outcome	CO statement
1	CO1	Understand and implement advanced Java concepts.
2	CO2	Develop Java based Web applications using Servlets and JSP
3	CO3	Incorporate cutting-edge frameworks in web application development.
4	CO4	Learn the advanced concepts in J2SE
5	CO5	Introduce advanced Java frameworks for improving the web application design

Syllabus:

	Course Contents	Hours
Unit I	Basics of OOP: Abstraction, Inheritance, Encapsulation, Classes, subclasses and super classes, Polymorphism and Overloading, message communication Procedure-Oriented vs. Object-Oriented Programming concept Introduction to Java Programming : Basics of Java, Background/History of Java, Java and the Internet, Advantages of Java , Java Virtual Machine & Byte Code , Java Environment Setup ,Java Program Structure	6
Unit II	Primitive Data Types: Integers, Floating Point type, Characters, Booleans, User Defined Data Type, Identifiers & Literals, Declarations of constants & variables, Type Conversion and Casting, Scope of variables & default values of variables declared, Wrapper classes, Comment Syntax, Garbage Collection Arrays of Primitive Data Types: Types of Arrays, Creation, concatenation and conversion of a string, Decision & Control Statements, Different Operators	6
Unit III	Class: Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword Constructor: Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading	6
Unit IV	Basics of Inheritance: Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, Abstract Class Package : Creating package, importing package, access rules for packages, class hiding rules in a package, Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface	8

Unit V	Exception Handling: Introduction, Built in classes for Exception Handling, Mechanism of Exception Handling in Java, Error Handling Exception Classes Multithreading : Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in threads	8
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Text Books

1.	Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2.	Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3	Complete Reference J2EE by James Keogh mcgraw publication

Reference Books

1.	Black Book “Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath
2.	Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.

Useful Links

1.	https://www.udemy.com/course/introduction-to-java-programming
2.	https://www.coursera.org
3.	https://www.educative.io/unlimited?affiliate_id=5073518643380224
4.	https://www.pluralsight.com/courses/java-fundamentals-language

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS) Course Code- DS3T002

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3T002	Operating Systems	3	0	0	3

Prerequisites for the course

1.	Good knowledge of C, Computer Organization and Architecture, x86 Assembly level programming
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Prior Reading Material/useful links

1.	https://www.tutorialspoint.com/operating_system/index.htm
2.	https://www.geeksforgeeks.org/operating-systems/
3	https://www.javatpoint.com/operating-system

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Identify the significance of operating system in computing devices.
2	CO2	Exemplify the communication between application programs and hardware devices through system calls.
3	CO3	Compare and illustrate various process scheduling algorithms.
4	CO4	Apply appropriate memory and file management schemes.
5	CO5	Illustrate various disk scheduling algorithms

Syllabus:

Course Contents		Hours
Unit I	Evolution of operating systems, Types of operating systems. The process concept, system programmer's view of processes, operating system's views of processes, operating system services for process management	[7 Hrs]
Unit II	Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Inter process Communication, Communication in Client - Server Systems, Multithreading Models, Threading Issues	[7 Hrs]
Unit III	Scheduling concepts, scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling.	[7 Hrs]
Unit IV	Memory Management, Contiguous allocation, static-swapping, overlays, dynamic partitioned memory allocation, demand paging, page replacement, segmentation. Non-contiguous allocation, paging, Hardware support, Virtual Memory.	[8 Hrs]
Unit V	A Simple file system, General model of a file system, Symbolic file system, Access control verification, Logical file system, Physical file system, Allocation strategy module, Device strategy module, I/O initiators, Device handlers, Disk scheduling.	[7 Hrs]

Text Books

1.	J.L. Peterson and A. Silberchatz, "Operating System Concepts", Addison Wesley.
2.	Harvey M. Dietel, "An Introduction to Operating System", Addison Wesley.
3.	C. Crowley, "Operating Systems - A Design Oriented Approach", Irwin Publishing

Reference Books

1.	W. Stallings, "Operating systems", Prentice Hall.
2.	A.S. Tannenbaum, "Modern Operating system", PHI

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc19_cs50/preview
2.	https://www.mygreatlearning.com/academy/learn-for-free/courses/operating-system

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS) Course Code- DS3T003

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3T003	Data Structure Algorithm	3	0	0	3
Prerequisites for the course						
1.	Knowledge of computer programming languages, such as C or Java.					
2.	Knowledge of basic algebra, calculus, and statistics.					
3.	Experience with database systems, such as MySQL or MongoDB. With these prerequisites in place, you're ready to learn about data structures.					

Prior Reading Material/useful links

1.	https://www.brainkart.com/subject/Object-Oriented-Programming-and-Data-Structures_165/
2.	https://www.geeksforgeeks.org/data-structures/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Understand the concept of ADT.
2	CO2	Identify data structures suitable to solve problems.
3	CO3	Develop and analyze algorithms for stacks, queues.
4	CO4	Develop algorithms for binary trees and graphs.
5	CO5	Implement sorting and searching algorithms.

Syllabus:

Course Contents		Hours
Unit I	Complexity Analysis: Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms. Hashing: Implementation of Dictionaries, Hash Function, Collisions in Hashing, Open Addressing, Analysis of Search Operations	[7Hrs]
Unit II	ADT Array-Searching and sorting on arrays: Linear search, binary search on a sorted array. Bubble sort, Insertion sort, merge sort and analysis; Emphasis on the comparison based sorting model, Radix sort, and bucket sort.	[8Hrs]
Unit III	Stacks and Queues: Abstract data types, sequential and linked implementations, representative applications such as parenthesis matching, towers of Hanoi, finding path in a maze, simulation of queuing systems, equivalence problem.	[7Hrs]
Unit IV	Linked Lists: Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, exception and iterator classes for lists, doubly linked lists, circular lists, skip lists applications of lists in bin sort, radix sort, sparse tables	[7Hrs]
Unit V	Trees and Graphs: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heap sort, heaps in Huffman coding, leftist trees. Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST)	[7Hrs]

Text Books

1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 1997
2.	Reema Thareja, Data Structures Using C, Second Edition, Oxford University Press, 2011.

Reference Books

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2.	Aho, Hopcroft and Ullman, Data Structures and Algorithms, Pearson Education, 1983
3.	Stephen G. Kochan, Programming in C, 3rd edition, Pearson Education
4.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008

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Teaching Scheme for 3rd Semester (CSE-DS)

Course Code- DS3T012

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3A001	Organization Behaviour	2	0	0	Audit

Prerequisites for the course

- | | |
|----|---|
| 1. | Passion for learning and positive attitude! |
|----|---|

Prior Reading Material/useful links

- | | |
|----|-------------------------------|
| 1. | No Prior Experience Required. |
| 2 | Learn In-Demand Skills |

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Outline the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.
2	CO2	Categorizing the applicability of analyzing the complexities associated with management of individual behaviour in the organization.
3	CO3	Analyze the complexities associated with management of the group behaviour in the organization
4	CO4	Validate how the organizational behaviour can integrate in understanding the motivation (why) behind behaviour of people in the organization
5	CO5	Gain a foundational understanding of a subject or tool

Syllabus:

Course Contents	Hours
<p>UNIT -I</p> <p>Introduction to Organization Behaviour</p> <p>Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Challenges and Opportunities of OB, Models of OB, Impact of technology on organizational behaviour.</p> <p>Organization Culture: Meaning and dimensions, Role of founders' values and vision in creating and sustaining culture, Types of organizational cultures, Impact of culture on image and performance of the organization.</p>	[6 Hrs]
<p>UNIT -II</p> <p>Organizational Design, Change And Innovation</p> <p>Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control, Dimensions of structure, Organizational design models, Multinational Structure and Design, Virtual Organizations.</p> <p>Communication: The importance of communication, The communication process, Communicating within organizations, Information richness, How technology affects communication, Interpersonal communication, Multicultural communication, Barriers to effective communication, Improving Communication in organizations, Promoting ethical communications</p> <p>Technical Report Writing : Characteristics of Technical Communication, Types of Technical Documents, Establishing Goals in Technical Writing, Technical Writing Process: Prewriting, writing, rewriting, Examples of Industries user manuals.</p>	[8 Hrs]

UNIT -III	<p>Personality Meaning of personality, Nature and Determinants of Personality, Personality Traits - Big Five, Locus of Control, Self-esteem, Type A/ Type B Personality, Risk Taking, Machiavellianism, Self-Monitoring, Personality and OB. Attitude: Attributes of personality- Transactional Analysis - Ego states - Johari window - Nature and dimensions of attitude - Developing the right attitude, ABC model of Attitude, Managerial Implications of Attitude</p>	[6 Hrs]
UNIT -IV	<p>Groups and Organizations Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, five stages of group/team development, Determinants of group behaviour, Typical teams in organizations. Leadership: Leadership as a concept and its essence, Leaders versus managers, Blake and Mouton's managerial grid, Hersey and Blanchard's situational leadership, Transactional versus Transformational leadership, Women as leaders, Leadership in entrepreneurial and family business, organizations.</p>	[6 Hrs]
UNIT -V	<p>Motivation Power and purpose of motivation, Theories of motivation - Locke's goal setting theory, Vroom's expectancy theory, Porter and Lawler's model, Adam's equity theory, McClelland's theory of needs, Motivational Techniques - Job design/enlargement /enrichment / rotation, Managing rewards - Job status based rewards, Competency based rewards, performance based rewards, Empowerment and Self Managed Teams. Power and Politics: The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics, power and politics, using power to manage effectively. Empowerment and Participation: The nature of empowerment and participation, How participation works, Programs for participation, Important considerations in participation.</p>	[6 Hrs]

Text Books

1.	Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2	Govind Daryanani, "Analysis and Synthesis of Filters".
3	Van Valkenberg, "Network Analysis", Pearson Education.

Reference Books

1.	Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.
2	John O' Malley, "Basic Circuit Analysis", Schaum's series.

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc20_mg51/
2.	https://www.coursera.org/learn/organisational-behaviour-know-your-people

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS) Course Code- DS3T007

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3M001	Discrete Mathematics and Statistical Analysis	2	0	0	2

Prerequisites for the course

- | | |
|----|--|
| 1. | Basic math (e.g., knowledge of what is a square or how to add fractions), and curiosity. |
|----|--|

Prior Reading Material/Useful links

- | | |
|----|---|
| 1. | https://www.geeksforgeeks.org/discrete-mathematics-tutorial/ |
| 2. | https://www.investopedia.com/terms/s/statistics.asp |
| 3. | https://www.educationtimes.com/ |

Course Outcomes:

Sr. No	Course Outcome	CO statement
1	CO1	Discuss fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.
2	CO2	Introduce students to ideas and techniques from discrete mathematics that are widely used in computer science
3	CO3	Oriented with well-defined aims, objectives and goals to achieve. Elementary probability theory.
4	CO4	Acquire fundamental principle of statistics Perform Frequency distributions.
5	CO5	Learn how to read, understand, devise and communicate proofs of Estimation and Hypothesis

Syllabus:

Course Contents	Hours
Unit I Fundamental Structures and Basic Logic: Sets, Venn diagram, Cartesian product, Power sets, Cardinality and countability, Propositional logic, Logical connectives, Truth tables, Normal forms, Validity, Predicate logic, Limitations of predicate logic, Universal and existential quantification, First order logic. Principles of Mathematical Induction: Well-Ordering Principle, Recursive definition, Division algorithm: Prime Numbers, Greatest Common Divisor: Euclidean Algorithm, Fundamental Theorem of Arithmetic	[6 Hrs]
Unit II Functions and Relations: Subjective, Injective, Bijective and inverse functions, Composition of function, Reflexivity, Symmetry, Transitivity and equivalence relations. Counting, Recurrence relations, Multi graphs and weighted graphs, Paths and circuits, Shortest path problems, Euler and Hamiltonian paths, Representation of graph, Isomorphic graphs, Planar graphs, Connectivity, Matching Coloring	[6 Hrs]
Unit III COMBINATORICS: Permutation and Combination, Repetition and Constrained Repetition, Binomial Coefficients, Binomial Theorem. Elementary probability theory: Definition, conditional probability, Probability distribution, mathematical expectation, Rule of addition, Rule of multiplication, Bayes Theorem, Binomial, Poisson and Normal distribution, Relation between the binomial.	[6 Hrs]
Unit IV Frequency distributions, Histograms and frequency polygons, Measures of central tendency: Mean, Mode, Median, Dispersion, Mean deviation and standard deviation. Moments, Skewness, kurtosis, Range & IQR Correlation and Regression: Linear Correlation, Measure of Correlation, Least Square Regression lines, Theorems on regression coefficient, Properties of regression coefficient Curve fitting: Method of least square, least square line, least squares Parabola. Chi-square test: definition of chi-square; signification test: contingency test, coefficient of contingency.	[8 Hrs]

Unit V	Estimation and Hypothesis Estimation, Large Sample Estimation of a Population Mean, Small Sample Estimation of a Population Mean, Large Sample Estimation of a Population Proportion, Sample Size Considerations, Testing Hypotheses, The Elements of Hypothesis Testing, Large Sample Tests for a Population Mean, The Observed Significance of a Test, Small Sample Tests for a Population Mean, Large Sample Tests for a Population Proportion.	[7 Hrs]
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Text Books	
1.	Discrete Mathematics and its Applications - Kenneth H. Rosen 7th Edition -Tata McGraw Hill Publishers
2.	Elements of Discrete Mathematics, C. L Liu, McGraw-Hill Inc, Applied Combinatorics, Alan Tucker
3	Advanced Engineering Mathematics: H.K. Dass; Chand & Co., 9 Revised Edition, Discrete Mathematics: S.K. Sarkar; S. Chand & Co., 2000.
4	Numerical Analysis: S.S. Sastry; Prentice Hall of India, 1998
5	Mathematical Statistics: J.N. Kapoor and H.C. Saxena.

Reference Books	
1.	Lipschutz, Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2009
2.	V. K. Balakrishnan, Schaum's Outline of Graph Theory, McGraw-Hill Publication, 1 st Edition, 1997.
3.	Eric Gossett, Discrete Mathematics with Proof, Wiley Publication, 2nd Edition, 2009.

Useful Links	
1.	https://www.geeksforgeeks.org/discrete-mathematics-tutorial/
2.	https://www.investopedia.com/terms/s/statistics.asp
3.	https://www.educationtimes.com/
4.	wikipedia.org/wiki/Discrete_mathematics .

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS) Course Code- DS3T009

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3I001	Entrepreneurship Development	2	0	0	2

Prerequisites for the course	
1.	Passion for learning and positive attitude!

Prior Reading Material/useful links	
1.	https://www.udemy.com/course/introduction-to-entrepreneurship-by-zuhaib/
2	https://www.coursera.org/learn/entrepreneur-guide-beginners

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Identify and validate of ideas.
2	CO2	Remember Patent registration of Innovation.
3	CO3	Understand roles and responsibilities of Entrepreneurship
4	CO4	Introduce various qualities required for entrepreneurship
5	CO5	Organize interaction with successful entrepreneurs

Syllabus:

Course Contents	Hours
UNIT -I Innovation Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents	[6 Hrs]
UNIT -II Entrepreneurship Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship	[6 Hrs]
UNIT -III Role of Entrepreneurial Bodies Theory of achievement, motivation, Medelland's. experiment, Women entrepreneurship, Role of SSI, it's advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.	[6 Hrs]
UNIT -IV Role of Entrepreneurial Support Factors governing project selection, Market survey, Preparation of project report. Financial, technical, market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time	[6 Hrs]

Text Books

1.	Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.
2	Dr. Gupta and Dr. Srinivasan, Entrepreneurship development in India
3	Vasant Desai, Dynamics of Entrepreneurial Development and Management

Reference Books

1.	Creativity Innovation Entrepreneurship, Zechariah James Blanchard, Needle Rat Business Publishers.
2	Venkateshwara Rao and Udai Pareek,(Eds)Developing Entrepreneurship-A Handbook

Useful Links

1.	https://www.mygreatlearning.com/academy/learn-for-free/courses/entrepreneurship
2.	https://onlinecourses.nptel.ac.in/noc21_mg70

Program: B.Tech. in CSE (Data Science)Teaching Scheme for 3rd Semester (CSE-DS)

Course Code- DS3T010

Semester	Course Code	Name of the course	L	T	P	Credits
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III	DS3V001	Universal Human Values II	2	0	0	2
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Prerequisites for the course

- | | |
|----|--------------------------|
| 1. | Basic knowledge of UHV-1 |
|----|--------------------------|

Prior Reading Material/useful links

- | | |
|----|---|
| 1. | https://uhv.org.in/uhv-2 |
| 2. | https://www.youtube.com/playlist?list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz |
| 3 | https://www.scribd.com/document/607159022/Unit-2-Human-Value-Ethics |

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Evaluate the significance of value inputs in formal education and start applying them in their life and profession
2	CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3	CO3	Analyze the value of harmonious relationship based on trust and respect in their life and profession
4	CO4	Examine the role of a human being in ensuring harmony in society and nature.
5	CO5	Examine the role of a human being in ensuring harmony in society and nature.

Syllabus:

Course Contents	Hours
UNIT I Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution, basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution	[6 Hrs]
UNIT II Right Understanding (Knowing)- Knower, Known & the Process The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence - its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	[6 Hrs]
UNIT III Understanding Human Being Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; activities and potentialities of the self; Basis for harmony/contradiction in the self	[6 Hrs]
UNIT IV Understanding Nature and Existence A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony order leading to comprehensive knowledge about the existence).	[6 Hrs]
UNIT V Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All encompassing Resolution covering all four dimensions of human endeavor	[6 Hrs]

Text Books

1.	R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2.	Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022. References 1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA 2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3.	Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
4.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
5.	A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.

Reference Books

1.	P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
2.	E G Seebauer, Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
3.	M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
4.	B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

Program: B.Tech. in CSE (Data Science)**Teaching Scheme for 3rd Semester CSE (Data Science)**

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3L005	Object Oriented Programming through Java Lab	0	0	2	1
Prerequisites for the course						
1.	Basic understanding of programming.					

Prior Reading Material/useful links

1.	https://www.geeksforgeeks.org/best-books-to-learn-java-for-beginners-and-experts/
2.	https://www.javatpoint.com/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Understand basic principles of Java programming language
2	CO2	Implement object oriented concepts
3	CO3	Implement data base and GUI application
4	CO4	Create user defined functions, strings, lists and perform searching & sorting.
5		CO5 write Java programs to implement error handling techniques using exception handling

Syllabus:

List of Experiments

1. Install JDK, write a simple “Hello World” or similar java program, compilation, debugging, executing using java compiler and interpreter
2. Write a Java program that takes a number as input and prints its multiplication table upto 10.
3. Write a program in Java to find second maximum of n numbers without using arrays.
4. Designed a class that demonstrates the use of constructor and destructor.
5. Write a java program to demonstrate the implementation of abstract class.
6. Write a java program to implement single level inheritance.
7. Write a java program to implement method overriding
8. Create a package, Add the necessary classes and import the package in java class.
9. Write a java program to implement thread life cycle.
10. Develop minimum two basic Applets. Display Output with Applet Viewer and Browser

Program: B.Tech. CSE(DS)

Teaching Scheme for IIIrd Semester Course Code - DS3L005

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3L005	Visualization Tools Lab	0	0	2	1

Prerequisites for the course

1.	Readers may consider to know the basics knowledge of Microsoft Excel
2	Recommended to have some basic knowledge of data analytics, SQL, and data visualization concepts.

Prior Reading Material/Useful links

1.	https://www.simplilearn.com/learn-power-bi-basics-free-course-skillup
2.	https://learn.microsoft.com/en-us/training/powerplatform/power-bi
3.	https://www.tutorialspoint.com/power-bi-for-beginner/

Course Outcomes:

Sr. No	Course Outcome	CO statement
1	CO1	Understand the foundational information that need to work effectively in the Power BI service.
2	CO2	Understand basic concepts and terminology of the Power BI service.

3	CO3	Ability to create a data model and Publish new reports
4	CO4	Demonstrate the relationship between dashboards and reports, visualizations, and tiles.
5	CO5	Identify patterns and trends using various features and tools such as AI visuals, reference lines, and forecasting

List of Experiments

1. Preparing Data in Power BI Desktop
2. Loading Data in Power BI Desktop
3. Data Modeling in Power BI Desktop
4. Advanced Data Modeling in Power BI Desktop
5. Create DAX in Power BI Desktop
6. Designing a Report in Power BI Desktop
7. Creating a Power BI Dashboard
8. Data Analysis in Power BI Desktop
9. Publishing and Sharing Power BI Content
10. Creating a Paginated Report
11. Design a dashboard with a basic set of visualizations and DAX queries.
12. Generate a report by Comparing Oscars won by genre and certificate for films using a matrix.

Text Books

1.	Mastering Power BI by Brett Powell
2.	Beginning Power BI by Dan Clark
3	The Absolute Guide to Dashboarding and Reporting with Power BI by Kasper de Jonge
4	Microsoft Power BI Dashboards Step by Step by Errin O'Connor
5	Microsoft Power BI for Dummies by Jack A. Hyman

Reference Books

1.	Power BI: A Complete Step-by-Step Guide for Beginners in Understanding Power BI Morris, Mike:
2.	Power BI Cookbook by Brett Powell
3.	Applied Microsoft Power BI (3rd Edition) by Teo Lachev

Useful Links

1.	https://www.tutorialspoint.com/detailed-microsoft-power-bi-dax-and-dashboard-creation/
2.	https://www.knowledgehut.com/business-intelligence-and-visualization/
3.	https://www.udemy.com/course/powerbi-complete-introduction/
4.	https://github.com/PacktPublishing/Microsoft-Power-BI---A-Complete-Introduction

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 3rd Semester (CSE-DS) Course Code- DS3L006

Semester	Course Code	Name of the course	L	T	P	Credits
III	DS3L006	Data Structure & Algorithm Lab	0	0	2	1

Prior Reading Material/useful links

1.	No prior knowledge needed.
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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Understand the concept of ADT.
2	CO2	Identify data structures suitable to solve problems.
3	CO3	Develop and analyze algorithms for stacks, queues.
4	CO4	Develop algorithms for binary trees and graphs.
5	CO5	Implement sorting and searching algorithms.

Syllabus:

List of Experiments
1. Write a program to implement stack using arrays.
2. Write a program to evaluate a given postfix expression using stacks.
3. Write a program to convert a given infix expression to postfix form using stacks.
4. Write a program to implement circular queue using arrays.
5. Write a program to implement double ended queue (de queue) using arrays.
6. Write a program to implement a stack using two queues such that the push operation runs in constant time and the pop operation runs in linear time.
7. Write a program to implement a stack using two queues such that the push operation runs in linear time and the pop operation runs in constant time.
8. Write a program to implement a queue using two stacks such that the enqueue operation runs in constant time and the dequeue operation runs in linear time.
9. Write a program to implement a queue using two stacks such that the enqueue operation runs in linear time and the dequeue operation runs in constant time.
10. Write programs to implement the following data structures: (a) Single linked list (b) Double linked list

Useful Links

1. <https://uhv.org.in/uhv-2>
2. https://www.youtube.com/playlist?list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz
3. <https://www.scribd.com/document/607159022/Unit-2-Human-Value-Ethics>

4th Semester Computer Science & Engineering(Data Science)

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC	DS4T001	Database Management System	3	0	0	20	20	60	100	3
2	PCC	DS4T002	Automata Theory & Compiler Design	2	0	0	20	20	60	100	2
3	PCC	DS4T003	Design and Analysis of Algorithms	3	0	0	20	20	60	100	3
4	MDM	DS4M002	Linear Algebra and Transform	2	0	0	20	20	60	100	2
5	OEC	DS4O002	OE-2	3	0	0	20	20	60	100	3
6	VSEC	DS4L001	Business Intelligence	0	0	4	60	-	40	100	2
7	AEC	DS4A001	Principle of Corporate Success	2	0	0	20	20	60	100	2
8	EEMC	DS4H001	Engineering Economics	2	0	0	20	20	60	100	2
9	VEC	DS4V002	Intellectual Property Rights	2	0	0	20	20	60	100	2
10	PCC	DS4L004	Database Management System Lab	0	0	2	60	-	40	100	1
11	PCC	DS4L005	Design and Analysis of Algorithms Lab	0	0	2	60	-	40	100	1
12	PCC	DS4L006	Data Science with Python Lab	0	0	2	60	-	40	100	1
				19	0	12	400	160	640	1200	24

Program: B.Tech. in CSE (Data Science)**Teaching Scheme for 4th Semester (CSE-DS) Course Code- DS4T001**

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4T001	Database Management System	3	0	0	3

Prerequisites for the course

1. Most entry-level computer engineers have a bachelor's degree in computer engineering

Prior Reading Material/useful links

1.	https://archive.nptel.ac.in/courses/106/105/106105175/
2.	https://www.javatpoint.com/dbms-tutorial
3	https://www.coursera.org/courses?query=database%20management
4	https://www.scaler.com/topics/course/dbms/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Demonstrate the basic elements of a relational database management system.
2	CO2	Ability to identify the data models for relevant problems
3	CO3	To understand the internal storage structures which will help in physical DB design.
4	CO4	To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
5	CO5	To have an introductory knowledge about the Storage and Query processing techniques

Syllabus:

Course Contents		Hours
Unit I	Database Management System - Concepts and Architectures Database System Applications, Purpose of Database Systems, View of Data , Data Abstraction (Instances and Schemas), data Models , the ER Model , Relational Model, Database Languages (DDL , DML, DCL, and TCL). Data base design and ER diagrams, ER Model , Entities, Attributes, and Entity sets ,Relationships and Relationship sets , ER Design Issues.	[5 Hrs]
Unit II	Relational Query Languages Introduction to the Relational Model , Structure , Database Schema, Keys Schema Diagrams, Overview of the SQL Query Language - Basic Structure of SQL Queries, Set Operations, Aggregate Functions (GROUPBY - HAVING, Nested) Sub queries, joins , Triggers.	[5 Hrs]
Unit III	Normalization Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms - dependency preservation, Boyee/Codd normal form, Higher Normal Forms, Introduction, Multi-valued dependencies and Fourth normal form.	[5 Hrs]
Unit IV	Transaction Concept Introduction What is a Transaction? , Transaction Properties , Transaction Management with SQL , The Transaction Log Concurrency Control , Concurrency control with Locking Methods , Types of Locks , Two-Phase Locking to Ensure Serializability , Deadlocks, , Concurrency Control Methods.	[5 Hrs]
Unit V	File organization : File organization, various kinds of indexes. Query Processing , Measures of query cost , Selection operations, Join operations, join operations, set operation and aggregate operation .	[5 Hrs]

Text Books

1.	Database System Concepts, Seventh Edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2.	Fundamentals of Database Systems, Elmasri Navathe Pearson Education
3.	Database System Concepts" by Abraham Silberschatz and S Sudarshan
4.	Introduction to Database Management Systems" by Kahate

Reference Books

1.	Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2.	An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition for UNIT III.

Useful Links

1.	https://archive.nptel.ac.in/courses/106/105/106105175/
2.	https://www.coursera.org/courses?query=database%20management
3.	https://www.geeksforgeeks.org/dbms/
4.	https://www.scaler.com/topics/course/dbms/

Program: B.Tech. in CSE (Data Science)Teaching Scheme for 4th Semester (CSE-DS) Course Code- DS4T002

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4T002	Automata Theory & Compiler Design	2	0	0	2

Prerequisites for the course

1.	Knowledge of graphs, trees, and logic, as well as basic data structures and algorithms.
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Prior Reading Material/Useful links

1.	https://www.geeksforgeeks.org/lmn-toc/
2.	https://srecwarangal.ac.in/cse/cse-downloads/Theory-of-Computation.pdf
3.	https://www.tutorialsduniya.com/notes/theory-of-computation-notes/

Course Outcomes:

Sr. No	Course Outcome	CO statement
1	CO1	Define the mathematical principles behind theoretical computer science.
2	CO2	Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
3	CO3	Correlate the different types of automata to real world applications
4	CO4	Design appropriate automata for the different requirements outlined by theoretical computer science.
5	CO5	Demonstrate the ability to design a compiler given a set of language features. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.

Syllabus:

Course Contents		Hours
Unit I	Fundamentals : Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers. Finite Automata: Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts of Automata Theory, DFA, NFA, and NFA & epsilon Machine. Conversions and Equivalence: Equivalence between NFA with and without epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.	[6 Hrs]
Unit II	Regular Languages : Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions, Pumping Lemma for Regular Languages, Applications of the Pumping Lemma. Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms, Rightmost and leftmost derivation of strings, Parse Trees.	[6 Hrs]
Unit III	Push-Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of CFL and PDA, interconversion, Introduction to DCFL and DPDA.	[6 Hrs]
Unit IV	Unit 4: Turing Machine Definition of Recursive and Recursively Enumerable , Church's Hypothesis , Computable Functions , Methods for Turing Machine Construction, Chomsky hierarchy of languages, linear bounded automata and context sensitive language, decidability of, problems, Universal Turing Machine, undecidability, Posts Correspondence problem, Definition of P and NP problems	[6 Hrs]
Unit V	Introduction to Compilers Definition of compiler, interpreter and its differences, the phases and working of a compiler, role of lexical analyzer, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators	[6 Hrs]

Text Books

1.	"Introduction to Automata Theory Languages and Computation". Hopcroft H. E. and Ullman J. D. Pearson Education.
2.	Introduction to Theory of Computation - Sipser 2 nd edition Thomson.
3	Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman , Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India.

Reference Books

1.	Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R.
2.	Theory of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley India Pvt. Ltd.
3.	K. L. P Mishra, N. Chandrashekar (2003), Theory of computer science- Automata Languages and computation, 2nd edition, Prentice Hall of India, New Delhi, India
4.	Kenneth C. Loudon (1997). Compiler Construction- Principles and Practice. 1st edition. PWS

Publishing

Useful Links

1. <https://www.geeksforgeeks.org/lmn-toc/>
2. <https://srecwarangal.ac.in/cse/cse-downloads/Theory-of-Computation.pdf>
3. <https://www.tutorialsduniya.com/notes/theory-of-computation-notes/>

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS) Course Code- DS4T003

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4T003	Design & Analysis of Algorithms	3	0	0	3

Prerequisites for the course

1. Basic knowledge of programming and analytics.
2. The readers should know data structure very well.

Prior Reading Material/useful links

1. <https://www.javatpoint.com/daa-tutorial>
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
4. <https://www.udemy.com/course/design-and-analysis-of-algorithm-/>

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Develop efficient algorithms for simple computational tasks.
2	CO2	Gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.
3	CO3	Design standard algorithms such as sorting, searching, and problems involving graphs
4	CO4	Compute complexity measures of algorithms, including recursive algorithms using recurrence relations

Syllabus:

Course Contents		Hours
Unit I	Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space, Order Notation (O, Θ , Ω Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm.	[6 Hrs]
Unit II	Introduction to Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Finding median, Closest Pair, Convex Hulls Problem. Greedy Methods, Fractional Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree - Kruskal's and Prim's Algorithm, Dijkstra's Shortest Path Algorithm.	[6 Hrs]
Unit III	Introduction to Dynamic Programming, Elements of Dynamic Programming, Multistage	[6 Hrs]

	Graphs, Traveling Salesman Problem, Matrix-chain multiplication, Optimal Polygon Triangulation, Longest common subsequence, Floyd-Warshall algorithm	
Unit IV	Introduction to Backtracking, N-Queen Problem, Combinational Search, Backtracking Strategies, Search & Traversal Techniques - BFS, DFS, Sum of Subsets, Graph coloring, Hamiltonian Circuit Problem, Tower of Hanoi Problem, State Space Tree, Branch Bound, Least cost (LC) Search, Control Abstractions for LC search, FIFO Branch Bound..	[6 Hrs]
Unit V	Efficiency of Algorithms: Polynomial Time & Non-Polynomial Time Algorithms, NP-Complete, NP-Hard, Limitation of Algorithm, Worst and Average Case Behavior, Efficiency of Recursion, Complexity Calculation for Various Sorting Algorithms, Approximation of Algorithms, Time-Space Trade off in algorithms research.	[6 Hrs]

Text Books

1.	Thomas H. Cormen, Charles E Leiserson, Introduction to Algorithms, PHI Publication, 3rd Edition.
2.	Parag Dave, Himanshu Dave, Design and Analysis of Algorithm, Pearson Education India, 2nd Edition.
3.	S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, India.

Reference Books

1.	Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition, 1983.
2.	D. Balasubramanian Computer Installation & Servicing Tata McGraw Hill
3.	Michel Goodrich, Roberto Tamassia, Algorithm Design - Foundation, Analysis Internet Examples, Wiley Publication, 2nd Edition, 2006.
4.	George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.

Useful Links

1.	https://www.youtube.com/playlist?list=PLxCzCOWd7aiHcmS4i14bI0VrMbZTUvITa
2.	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3.	https://www.javatpoint.com/daa-tutorial
4.	https://www.udemy.com/course/design-and-analysis-of-algorithm-/

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS) Course Code-

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4M002	Linear Algebra and Transform	2	0	0	2
Prerequisites for the course						
1.	Basic knowledge of simple mathematics model					
Prior Reading Material/useful links						
1.	https://collegedunia.com/exams/math-study-material-articleid-4818					
2.	https://unacademy.com/content/ssc/study-material/mathematics/					
3.	https://www.weareteachers.com/best-math-websites/					

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Describe the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra and Stochastic calculus
2	CO2	Illustrate the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra and Stochastic calculus
3	CO3	Apply the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra and Stochastic calculus.
4	CO4	Analyze the problem by using the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra and Stochastic calculus.
5	CO5	Evaluate the problem base on the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra and Stochastic calculus

Syllabus:

Course Contents		Hours
Unit I	Laplace Transform :Definition - conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit step function	[08Hrs]
Unit II	Inverse Laplace Transform :Introductory remarks ; Inverse transforms of some elementary functions ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of differential equations	[08Hrs]
Unit III	Fourier transform : Definitions - Fourier transforms ; Properties of Fourier transforms ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms; Finite Fourier transform	[6Hrs]
Unit IV	Functions of complex variables : Analytic functions; Harmonic functions in Cartesian form; fundamental theorem of algebra; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem.	[6Hrs]
Unit V	Numerical linear algebra and Stochastic calculus : Introduction to linear algebra; Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilt Theorem, Definition and classification of random processes; Discrete-time Markov chains; Poisson process; Stochastic integration, Itôintegral , Itôformula. Stochastic differential equations.	[6Hrs]

Text Books

1.	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2.	Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3.	A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4.	A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Books

1.	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2.	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3.	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4.	Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy. Knowledge ware, Mumbai.

Useful Links

1.	https://www.khanacademy.org/math
2.	https://engineering-computer-science.wright.edu/research/engineering-mathematics-topics-and-materials
3.	https://www.youtube.com/results?search_query=mathematics+fourier+series

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS) Course Code- DS4T009

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4L001	Business Intelligence	0	0	4	2

Prerequisites for the course

1.	Knowledge of various database software programs is required so be sure to also take computer and computer science classes.
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Prior Reading Material/Useful links

1.	Data Strategy: How To Profit From A World Of Big Data, Analytics And The Internet Of Things" by Bernard Marr
2.	Big Data MBA: Driving Business Strategies with Data Science" by Bill Schmarzo
3.	The Data Detective: Ten Easy Rules to Make Sense of Statistics" by Tim Harford

Course Outcomes:

Sr. No	Course Outcome	CO statement
1	CO1	exposed with the basic rudiments of business intelligence system
2		CO2 derstand the modeling aspects behind Business Intelligence
3		CO3 derstand of the business intelligence life cycle and the techniques used in it

4	CO4	exposed with different data analysis tools and techniques
5	CO5	Apply business intelligence methods to various situations

Syllabus:

Course Contents		Hours
Unit I	Effective and timely decisions - Data, information and knowledge - Role of mathematical models - Business intelligence architectures: Cycle of a business intelligence analysis - Enabling factors in business intelligence projects - Development of a business intelligence system - Ethics and business intelligence	6
Unit II	The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.	6
Unit III	Efficiency measures - The CCR model: Definition of target objectives- Peer groups - Identification of good operating practices; cross efficiency analysis - virtual inputs and outputs - Other models. Pattern matching - cluster analysis, outlier analysis	6

Text Books	
1.	Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley,
2.	Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson

Reference Books	
1.	Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications,
2.	David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition,
3.	Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw-Hill
4.	Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle Toolkit", Wiley Publication Inc.

Useful Links	
1.	https://www.tableau.com/learn/articles/business-intelligence
2.	https://www.techtarget.com/searchbusinessanalytics/definition/business-intelligence-BI
3.	https://www.softwaretestinghelp.com/tools/25-important-business-intelligence-tools/
4.	https://www.investopedia.com/terms/b/business-intelligence-bi.asp

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS) Course Code- DS4L004

Semester	Course Code	Name of the course	L	T	P	Credits
II	DS4L004	Database Management System lab			2	2

Prerequisites for the course	
1.	Basic DBMS , basic knowledge about the computer systems

Prior Reading Material/useful links

1.	SQL tutorial:- https://www.w3schools.com/sql/
2.	PL/SQL tutorial :- http://www.plsqltutorial.com

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	To explain basic database concepts, applications, data models, schemas and instances.
2	CO2	To emphasize the importance of normalization in databases.
3	CO3	Students will be able to demonstrate their skills In converting the entity-relationship diagrams into relational tables.
4	CO4	To analyze the business requirements and producing a viable model for the implementation of the database.
5	CO5	Develop database modeling for a problem.

Syllabus:

List of Experiments

1. Introduction SQL and Oracle Installation.
2. Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college).
3. Perform the following::- Data constraints (Primary key, Foreign key, Not Null) Data insertion into a table.
4. Perform the following: a. Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback).
5. Perform the following: a. Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
6. Implementation of different types of operators in SQL
7. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause).
8. For a given set of relation schemes, create tables and perform the following Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause.
9. Write a PL/SQL program using FOR loop to insert ten rows into a database table
10. Writing SQL and PL/SQL queries to retrieve information from the databases.
11. Study and Implementation of triggers
12. CASESTUDY (Student Progress Monitoring System or any other)

Text Books

1.	Database System Concepts, Seventh Edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
2.	Fundamentals of Database Systems, Elmasri Navathe Pearson Education

Reference Books

1.	Introduction to Database Management Systems" by Kahate
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Useful links

1.	SQL tutorial:- https://www.w3schools.com/sql/
2.	PL/SQL tutorial :- http://www.plsqltutorial.com

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS)

Course Code- DS4L005

Semester	Course Code	Name of the course	L	T	P	Credits
IV	DS4L005	Design & Analysis of Algorithms Lab	0	0	2	1
Prerequisites for the course						
1.	Working Principle of Algorithm					
2.	Basic program design concepts (e.g., pseudocode), combinatorics and probability, proof techniques, familiarity with tree and graph data structures, familiarity with basic algorithms such as those for searching, and sorting.					

Prior Reading Material/useful links

1.	https://www.javatpoint.com/
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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Apply design principles and concepts to algorithm design
2	CO2	Understand different algorithmic design strategies
3	CO3	Analyze the efficiency of algorithms using time and space complexity theory
4	CO4	Design techniques introduced i.e. dynamic programming, greedy algorithm etc. to design algorithms for more complex problems and analyze their performance.
5	CO5	Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them

Program: B.Tech. in CSE (Data Science)

Teaching Scheme for 4th Semester (CSE-DS)

Course Code- DS4L006

Semester	Course Code	Name of the course	L	T	P	Credits
9	DS4L006	Python for Data Science (Lab)	0	0	2	1
Prerequisites for the course						
1.	Basic understanding of python programming.					

Prior Reading Material/useful links

1.	https://www.projectpro.io/article/python-projects-for-data-science/462
2.	https://www.youtube.com/watch?v=I10q6fjPxJ0

3.	https://data-flair.training/blogs/data-science-project-ideas/
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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Understand basic principles of Python with data Science.
2	CO2	Implement object-oriented concepts and handling of data.
3	CO3	Implement data visualization method for effective visualization of data
4	CO4	Create user defined functions, strings, lists and perform searching & sorting.
5	CO5	Implement Oriented programming features of Python and process data sets.

Syllabus:

List of Experiments
1. Write python programs to understand Expressions, Variables, Quotes, Basic Math operations, Strings
2. Perform Basic String Operations & String Methods, List etc.
3. Write python programs to understand typecasting.
4. Python Program to Map Two Lists into a Dictionary
5. Write python programs to understand different Object-oriented features in Python i.e Inheritance & Polymorphism, Exception handling
6. Write a python program to create a data frame for given data set.
7. Write a python program to create the list, change the value of list, create list with different data types.
8. Python Program to Map Two Lists into a Dictionary
9. Develop python program for Correlation coefficient.
10. To draw basic plots in Python program using Matplotlib.