SCHEME & SYLLABUS OF UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering (Data Science) V & VI Semester

Effective for the students admitted in year 2019-20 and onwards.

Approved by 7th AC Meeting held on 1st Nov. 2021 (Agenda 7.5)

Office: Bikaner Technical University, Bikaner
Karni Industrial Area, Pugal Road, Bikaner-334004
Website: https://btu.ac.in

Dean Academics
Bikaner Technical University
Bikaner

B. Tech. CSE (Data Science)
3rd Year – V Semester

S.No.	Category	Course Code	Course Title	Contact hrs/week L	T	P	Marks Exam Hrs.	IA	ETE	Total	Cr
THEORY											
1	ESC	5CSDS3-01	Information Theory & Coding	2	0	0	2	20	80	**100**	**2**
2	PCC/ PEC	5CSDS4-02	Compiler Design	3	0	0	3	30	120	**150**	**3**
3		5CSDS4-03	Operating Systems	3	0	0	3	30	120	**150**	**3**
4		5CSDS4-04	Data Wrangling	3	0	0	3	30	120	**150**	**3**
5		5CSDS4-05	Analysis of Algorithms	3	0	0	3	30	120	**150**	**3**
6		Professional Elective 1: (any one)		2	0	0	2	20	80	**100**	**2**
		5CSDS5-11	Mathematical Foundation for Data Science								
		5CSDS5-12	Human-Computer Interaction								
		5CSDS5-13	Computer Graphics & Multimedia								
		Sub Total		**16**	**0**	**0**		**160**	**640**	**800**	**16**
PRACTICAL & SESSIONAL											
7	PCC	5CSDS4-21	Data Wrangling Lab	0	0	2	2	30	20	**50**	**1**
8		5CSDS4-22	Compiler Design Lab	0	0	2	2	30	20	**50**	**1**
9		5CSDS4-23	Analysis of Algorithms Lab	0	0	2	2	30	20	**50**	**1**
10		5CSDS4-24	Advance Java Lab	0	0	2	2	30	20	**50**	**1**
11	PSIT	5CSDS7-30	Industrial Training	0	0	1		75	50	**125**	**2.5**
12	SODECA	5CSDS8-00	Social Outreach, Discipline & Extra Curricular Activities						25	**25**	**0.5**
		Sub- Total		**0**	**0**	**9**		**195**	**155**	**350**	**7**
		TOTAL OF V SEMESTER		**16**	**0**	**9**		**355**	**795**	**1150**	**23**

L: Lecture, **T**: Tutorial, **P**: Practical, **Cr**: Credits
ETE: End Term Exam, **IA**: Internal Assessment

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B. Tech CSE (Data Science)
3rd Year – VI Semester

S.No.	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exam Hrs.	IA	ETE	Total	
THEORY											
1	ESC	6CSDS3-01	Digital Image Processing	2	0	0	2	20	80	**100**	**2**
2	PCC	6CSDS4-02	Machine Learning	3	0	0	3	30	120	**150**	**3**
3		6CSDS4-03	Computer Architecture and Organization	3	0	0	3	30	120	**150**	**3**
4		6CSDS4-04	Concepts in Artificial Intelligence	3	0	0	3	30	120	**150**	**3**
5		6CSDS4-05	Data Science using R	3	0	0	3	30	120	**150**	**3**
6	PEC	Professional Elective 1 (any one)		3	0	0	3	30	120	**150**	**3**
		6CSDS5-11	Distributed System								
		6CSDS5-12	Data Mining and Business Intelligence								
		6CSDS5-13	Cloud Computing								
		Sub-Total		**17**	**0**	**0**		**170**	**680**	**850**	**17**
PRACTICAL & SESSIONAL											
7	PCC	6CSDS4-21	Digital Image Processing Lab	0	0	3	2	45	**30**	**75**	**1.5**
8		6CSDS4-22	Machine Learning Lab	0	0	3	2	45	**30**	**75**	**1.5**
9		6CSDS4-23	Data Science Lab using R	0	0	3	2	45	**30**	**75**	**1.5**
10		6CSDS4-24	Mobile Application Development Lab	0	0	3	2	45	**30**	**75**	**1.5**
11	SODECA	6CSDS8-00	Social Outreach, Discipline & Extra Curricular Activities						**25**	**25**	**0.5**
		Sub- Total		**0**	**0**	**12**		**180**	**145**	**325**	**6.5**
		TOTAL OF VI SEMESTER		**17**	**0**	**12**		**350**	**825**	**1175**	**23.5**

L: Lecture, **T**: Tutorial, **P**: Practical, **Cr**: Credits
ETE: End Term Exam, **IA**: Internal Assessment

SYLLABUS OF UNDERGRADUATE DEGREE COURSE

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5CSDS3-01: Information Theory & Coding

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to information theory:** Uncertainty, Information and Entropy, Information measures for continuous random variables, source coding theorem. Discrete Memory less channels, Mutual information, Conditional entropy.	05
3	**Source coding schemes for data compaction**: Prefix code, Huffman code, Shanon-Fane code &Hempel-Ziv coding channel capacity. Channel coding theorem. Shannon limit.	05
4	**Linear Block Code:** Introduction to error connecting codes, coding & decoding of linear block code, minimum distance consideration, conversion of non-systematic form of matrices into systematic form.	05
5	**Cyclic Code:** Code Algebra, Basic properties of Galois fields (GF) polynomial operations over Galois fields, generating cyclic code by generating polynomial, parity check polynomial. Encoder & decoder for cyclic codes.	06
6	**Convolutional Code:** Convolutional encoders of different rates. Code Tree, Trllis and state diagram. **Maximum likelihood decoding of convolutional code:** The viterbi Algorithm fee distance of a convolutional code.	06
	Total	28

Suggested Books

- T. M. Cover, J. A. Thomas, Elements of Information Theory, Wiley
- R. Togneri, C.J.S deSilva, Fundamentals of Information Theory and Coding Design, Taylor and Franci
- R. J. McEliece, The Theory of Information and Coding, Cambridge University Press
- R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill
- Digital and Analog Communication Systems Shanmugam, K. Sam, Wiley India

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5CSDS4-02: Compiler Design

Credit: 3	Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P	End Term Exams: 3hr

S.No.	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	**Review of CFG Ambiguity of grammars**: Introduction to parsing. Top-down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	**Syntax directed definitions;** Construction of syntax trees, S- Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	**Storage organization:** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08
6	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

Suggested Books

- A.V. Aho, J. D. Ullman, Monica S. Lam and R. Sethi, Compilers Principles, Techniques and Tools (2 ed.), Pearson Education, 2005. ISBN 978-0321547989.
- John Levine, Tony Mason and Doug Brown, Lex and Yacc (1 ed.), O'Reilly Media, 1992. ISBN 978-1565920002.
- Kenneth C. Louden, Compiler Construction Principles and Practice (1 ed.), Course Technology Inc. 1997. ISBN 978-0534939724.
- Dhamdhere, Compiler Construction (2 ed.), Macmillan Publication, 2003. ISBN 978-0333904060

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5CSDS4-03: Operating Systems

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and History of Operating systems**: Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms Device management: devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

Suggested Books

- Silberschatz, P. B. Galvin and G. Gagne, Operating System Concepts (9 ed.), John Wiley, 2012. ISBI 978-1118063330.
- Tanenbaum, Modern Operating Systems (3 ed.), Prentice Hall India Learning Private Limited, 2019. ISBI 978-8120339040.
- W. Stallings, Operating Systems Internals and Design Principles (7 ed.), Prentice Hall, 2013. ISBN 978 9332518803
- Operating Systems – William Stallings, Pearson Education Asia (2002)
- Operating Systems - Nutt, Pearson Education Asia (2003)

5CSDS4-04: Data Wrangling

Credit: 3	Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P	End Term Exams: 3hr

S.No.	Contents	Hrs
1	**Introduction to data wrangling:** What Is Data Wrangling?- Importance of Data Wrangling -How is Data Wrangling performed?- Tasks of Data Wrangling-Data Wrangling Tools-Introduction to Python-Python Basics-Data Meant to Be Read by Machines-CSV Data-JSON Data-XML Data.	6
2	**Working with excel files and pdfs:** Installing Python Packages-Parsing Excel Files-Parsing Excel Files - Getting Started with Parsing-PDFs and Problem Solving in Python-Programmatic Approaches to PDF Parsing-Converting PDF to Text-Parsing PDFs Using pdf miner-Acquiring and Storing Data-Databases: A Brief Introduction-Relational Databases: MySQL and PostgreSQL-Non-Relational Databases: NoSQL-When to Use a Simple File-Alternative Data Storage.	9
3	**Data cleanup:** Why Clean Data?- Data Cleanup Basics-Identifying Values for Data Cleanup-Formatting Data-Finding Outliers and Bad Data-Finding Duplicates-Fuzzy Matching-RegEx Matching-Normalizing and Standardizing the Data-Saving the Data-Determining suitable Data Cleanup-Scripting the Cleanup Testing with New Data.	9
4	**Data exploration & analysis:** Exploring Data-Importing Data-Exploring Table Functions-Joining Numerous Datasets-Identifying Correlations-Identifying Outliers-Creating Groupings-Analyzing Data-Separating and Focusing the Data Presenting Data-Visualizing the Data-Charts-Time-Related Data-Maps-Interactives-Words-Images, Video, & Illustrations-Presentation Tools-Publishing the Data-Open Source Platforms.	8
5	**Web scraping:** What to Scrape and How-Analyzing a Web Page-Network/Timeline-Interacting with JavaScript-In-Depth Analysis of a Page-Getting Pages-Reading a Web Page-Reading a Web Page with LXML-XPath-Advanced Web Scraping-Browser-Based Parsing-Screen Reading with Selenium-Screen Reading with Ghost .PySpidering the Web-Building a Spider with Scrapy-Crawling Whole Websites with Scrapy.	8
	Total	40

Suggested Books

- Jacqueline Kazil & Katharine Jarmul," Data Wrangling with Python", O'Reilly Media, Inc,2016
- Dr. Tirthajyoti Sarkar, Shubhadeep," Data Wrangling with Python: Creating actionable data from raw sources' Packt Publishing Ltd,2019.
- Stefanie Molin," Hands-On Data Analysis with Pandas", Packt Publishing Ltd,2019
- Allan Visochek," Practical Data Wrangling", Packt Publishing Ltd,2017
- Tye Rattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras," Principles of Dat Wrangling: Practical Techniques for Data Preparation", O'Reilly Media, Inc,2017

MOOC

1. https://www.udemy.com/course/data-wrangling-with-python/
2. http://www.openculture.com/free-online-data-science-courses

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5CSDS4-05: Analysis of Algorithms

Credit: 3	Max. Marks: 150(IA:30, ETE:120)
3L+0T+0P	End Term Exam: 3 Hours

S.No.	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Background**: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. Divide And Conquer Method: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	**Greedy Method:** Knapsack Problem, Job Sequencing, Optimal Merge Patterns, and Minimal Spanning Trees.**Dynamic Programming:** Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem.	10
4	**Branch And Bound:** Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	**Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. Randomized Algorithms- Las Vegas algorithms, Monte Carlo algorithms, a randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	**Problem Classes Np, Np-Hard And Np-Complete**: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP- Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

Suggested Books

- E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galotia Publication
- T .H . Cormen, C .E .Leiserson, R .L .Rivest "Introduction to Algorithms", PHI.
- Sedgewich, Algorithms in C, Galgotia
- Berman. Paul, "Algorithms, Cengage Learning".
- Richard Neopolitan, Kumar SS Naimipour, "Foundations of Algorithms"
- Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006

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5CSDS5-11: Mathematical Foundation for Data Science

Credit: 2	Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P	End Term Exams: 2hr

S.No.	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Data summaries and descriptive statistics,** central tendency, variance, covariance, correlation, Simple and Multiple Regression, Non linear regression, logistic regression	5
3	**Distributions:** t-distribution, Z-distribution, Hypothesis testing for sampling distributions of means, proportions, sum and differences of means and proportions for large and small samples. Chi-square test, ANOVA Test	6
4	**Vector Space;** Subspaces; Linear Dependence/Independence; Basis; Dimension; Linear transformation; Range Space and Rank; Null Space and Nullity; Rank nullity theorem, Matrix Representation of a linear transformation; Linear Operators on Rn and their representation as square matrices.	6
5	**Eigen values and eigen vectors** of a linear operator; Inner Product Spaces, Norm; Orthonormal Sets, Gram Schmidt orthogonalization process; projections, positive definite matrices, and Singular Value Decomposition,	6
6	**Bayesian and Markov Networks fundamentals.** Graph Building. Independence Assumption. Basic of Hidden Markov Models and Conditional Random Field. Basics of Multivariate Calculus. Multivariate Chain Rule.	6
	Total	30

Suggested books

- Hoffman and Kunze : Linear Algebra, Prentice Hall of India, New Delhi
- Gilbert Strang : Linear Algebra And Its Applications (Paperback) , Nelson Engineering (2007)
- M R. Spiegal : Theory and Problems of probability and statistics :,2nded :,Schaum series
- Seymour Lipschutz et al: Linear Algebra, 3rded:Schaum series.
- V. Krishnamoorthy et al : An introduction to linear algebra , Affiliated East West Press, New Delhi P.C Bhattacharya, S.K. Jain and S.R.
- Nagpaul : First course in Linear Algebra, Wiley Eastern Ltd., New Delhi
- K.B.Datta : Matrix and Linear Algebra, Prentice Hall of India, New Delhi
- S.C. Gupta and V. K. Kapoor: Fundamentals of Mathematical Statistics (A Modern Approach), 10t Edition.

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5CSDS5-12: Human-Computer Interaction

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Historical evolution of the field,** Interactive system design, Concept of usability - definition and elaboration, HCI and software Engineering, GUI design and Aesthetics, Prototyping techniques.	02
3	**Model-based Design and evaluation:** Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN- GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies.	03
4	**Guidelines in HCI:** Schneiderman's eight, golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use Heuristic evaluation, Contextual inquiry, Cognitive walkthrough	05
5	**Empirical research methods in HCI:** Introduction (motivation, issues, research question formulation techniques), Experiment design and data analysis (with explanation of one-way ANOVA)	06
6	**Task modeling and analysis:** Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines) State charts and (classical) Petri Nets in dialog design	06
7	**Introduction to CA**, CA types, relevance of CA in IS design Model Human Processor (MHP), OOP- Introduction OOM- Object Oriented Modeling of User Interface Design	05
	Total	28

Suggested Books

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human-Computer Interaction, 3rd Edition, Pearson Education, 2004 Brian Fling, —Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009)
- Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009.

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5CSDS5-13: Computer Graphics & Multimedia

Credit: 2		Max Marks: 100 (IA :20, ETE:80)
2L+ 0T+ 0P		End Term Exams: 2hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Basic of Computer Graphics**: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
3	**Graphics Primitives:** Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan- line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributes. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	**Two Dimensional Graphics:** Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	07
5	**Three Dimensional Graphics:**3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces	03
6	**B-spline curves and surfaces.**3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	04
	Total	28

Suggested Books

- Edward Angel, Interactive Computer Graphics: A Top Down Approach Using OpenGl, Pearson Education
- Donald Hearn and M. Pauline Baker, Computer Graphics with OpenGL, Prentice Hall
- F. S. Hill Jr, Computer Graphics using OpenGL, Pearson Education
- J. D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, Computer Graphics - Principles and Practice, Addison Wesley

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5CSDS4-21: Data Wrangling Lab

Credit: 1	Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P	End Term Exams: 2hr

S.No.	List of Experiments
1	Write a Python script to read each row from a given csv file and print a list of strings
2	Write a Python program to read a given CSV file as a dictionary.
3	Write a Python program to convert Python dictionary object (sort by key) to JSON data. Print the object members with indent level 4
4	Write the python script to Read the XML file
5	Write a Pandas program to import excel data (child labour and child marriage data) into a Pandas data frame and process the following a. Get the data types of the given excel data b. Display the last ten rows. c. Insert a column in the sixth position of the said excel sheet and fill it with NaN values
6	Develop the python script to parse the pdf files using pdfminer.
7	Extract the Table from the child labour and child marriage data using pdfables library
8	Write a Python data wrangling scripts to insert the data into SQLite database
9	Develop the Python Shell Script to do the basic data cleanup on child labour and child marriage data a. Check duplicates and missing data b. Eliminate Mismatches c. Cleans line breaks, spaces, and special characters
10	Import the data into `agate` then explores the table using agate methods and perform statistical correlations
11	Draw the chart between perceived corruption scores compared to the child labour percentages using matplotlib.
12	Write the python script to Map the Child Labour Worldwide using pygal.
13	Write a Python program to download and display the content of robot.txt for en.wikipedia.org

***Data can be any taken from any valid publicity data set sources such as Unicef**

Suggested Books

- Jacqueline Kazil & Katharine Jarmul, "Data Wrangling with Python", O'Reilly Media, Inc,2016
- Dr. Tirthajyoti Sarkar, Shubhadeep, "Data Wrangling with Python: Creating actionable data from raw sources", Packt Publishing Ltd,2019.

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5CSDS4-22: Compiler Design Lab

Credit: 1	Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P	End Term Exams: 2hr

S.No.	List of Experiments
1	Introduction: Objective, scope and outcome of the course.
2	To identify whether a given string is a keyword or not.
3	Count total no. of keywords in a file. [Taking file from user]
4	Count total no of operators in a file. [Taking file from user]
5	Count the total occurrence of each character in a given file. [Taking file from user]
6	Write a C program to insert, delete and display the entries in the Symbol Table.
7	Write a LEX program to identify following: Valid mobile number Valid url Valid identifier Valid date (dd/mm/yyyy) Valid time (hh:mm:ss)
8	Write a lex program to count blank spaces,words,lines in a given file.
9	Write a lex program to count the no. of vowels and consonants in a C file.
10	Write a YACC program to recognize strings aaab,abbb using a^nb^n, where b>=0.
11	Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12	Write a YACC program to check validity of a strings abcd,aabbcd using grammar a^nb^nc^md^m, where n , m>0
13	Write a C program to find first of any grammar.

5CSDS4-23: Analysis of Algorithms Lab

Credit: 1	Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P	End Term Exams: 2hr

S.No.	List of Experiments
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
10	Implement N Queen's problem using Back Tracking.

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5CSDS4-24: Advance Java Lab

Credit: 1	Max Marks: 50 (IA :30, ETE:20)
0L+ 0T+ 2P	End Term Exams: 2hr

S.No.	List of Experiments
1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons
2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers
3	RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization
4	J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers
5	Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application
6	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library

6CSDS3-01: Digital Image Processing

Credit: 2	Max. Marks: 100(IA:20, ETE:80)
2L+0T+0P	End Term Exam: 2 Hours

S.No.	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	**Image Transformation & Filtering:** Intensity transform functions, Histogram processing, Spatial filtering, Fourier transforms and its properties, frequency Domain filters, colour models, Pseudo coloring, colour transforms, Basics of Wavelet Transforms.	06
4	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	**Image Compression:** Coding redundancy, Interpixel redundancy, Psych visual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

Suggested Books

- Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", 4th Edition, Pearson, 2018.
- Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
- Anil K.Jain, "Fundamentals of Digital Image Processing", Pearson Education, 2003.

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6CSDS4-02: Machine Learning

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random Forest algorithm	09
3	**Unsupervised learning algorithm:** Grouping Unlabeled Item using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	**Introduction to Statistical Learning Theory,** Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper, and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	**Semi-supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State- Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	**Recommended system,** Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	08
	Total	42

Suggested Books

- Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
- Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009.
- Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson Education, 2018
- Andreas C. Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly,2016.
- Sebastian Raschka, "Python Machine Learning", Packt Publishing, 2015.

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6CSDS4-03: Computer Architecture and Organization

Credit: 3	Max. Marks: 150(IA:30, ETE:120)
3L+0T+0P	End Term Exam: 3 Hours

S.No.	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift micro-operations, Arithmetic logical shift unit. Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	**Programming The Basic Computer:** Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	7
4	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors.	8
5	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor(IOP), CPU IOP Communication, Serial Communication.	8
6	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

Suggested Books

- William stallings, "Computer Organization and Architecture, PHI" 2. M. Morris Mano,
- M. Morris Mano, "Computer System Architecture" , PHI
- J.D. Carpinelli, "Computer Systems Organization and Architecture," Pearson Education
- Heuring and Jordan, Pearson Education, "Computer Systems Design and Architecture"
- Tor M. Aamodt, Wilson Wai Lun Fung, Timothy G. Rogers General-Purpose Graphics Processor Architecture

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6CSDS4-04: Concepts in Artificial Intelligence

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Meaning and definition of artificial intelligence**, Physical Symbol System Hypothesis, production systems, Characteristics of production systems; Breadth-first search and depth-first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search. Analysis of search methods. A* algorithm, and their analysis. Introduction to Genetic Algorithms.	06
3	**Knowledge Representation**, Problems in representing knowledge, knowledge representation using propositional and predicate logic, logical consequences, syntax, and semantics of an expression, semantic Tableau. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction, theorem proving, in ferencing, monotonic and non monotonic reasoning. Introduction to prolog.	06
4	**Network-based representation and reasoning,** Semantic networks, Conceptual Graphs, frames. Description logic (DL), concept language, reasoning using DL. Conceptual dependencies (CD), scripts, reasoning using CD. Introduction to natural language processing.	09
5	**Adversarial search and Game theory**, classification of games, game playing strategies, prisoner's Dilemma. Game playing techniques, minimax procedure, alpha-beta cut-offs. The complexity of alpha-beta search. Automated planning, classical planning problem, forward planning, partial order planning, planning with proposal logic, hierarchical task planning, multi-agent planning	09
6	**Reasoning in uncertain environments,** Fuzzy logic, fuzzy composition relation, operations on fuzzy sets. Probabilistic reasoning, Bayes theorem, construction of Bayesian networks, belief propagation. Markov processes and Hidden Markov models	09
	Total	40

Suggested Books:

- Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-McGraw-Hill.
- Introduction to AI & Expert System: Dan W.Patterson, PHI.
- Artificial Intelligence by Luger (Pearson Education)
- Russel & Norvig, Artificial Intelligence: A Modern Approach, Pearson Education

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6CSDS4-05: Data Science using R

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**R Basics:** data types and objects - control structures – data frame -Feature Engineering - scaling, Label Encoding and One Hot Encoding, Reduction	8
3	**MODEL FIT USING R:** Regression Models- Linear and Logistic Model, Classification Models – Decision Tree, Naïve Bayes, SVM and Random Forest, Clustering Models – K Means and Hierarchical clustering	6
4	**Data visualization using R**: Box plot, histogram, scatter plot, heat map – Working with Tableau, Tableau Data types; Basic graphs and charts; Sheet, Dashboard and Story Programming using Tableau; Simple linear and forecasting; Setting up a Tableau Server for enterprise and management decision making, Outlier detection, Data Balancing. Plotly and ggplot library, D3.js, Gephi	10
5	**PERFORMANCE EVALUATION in R:** Loss Function and Error: Mean Squared Error, Root Mean Squared Error – Model Selection and Evaluation criteria: Accuracy, Precision, F1 score, Recall Score – Binary Predictive Classification – Sensitivity – Specificity	6
6	**Optimization in R:** Common R Packages for Linear, Quadratic and Non-linear optimization, Built-in Optimization functions, Linear Programming in R: lpsolve, Quadratic Programming: quadpot, Non Linear Optimization: One-Dimensional: Golden Section Search; Multi-dimensional: Gradient-based, Hessian based, Non-gradient based	9
	Total	40

Suggested Books

- Hadley Wickham, Garrett Grolemund, R for data science : Import, Tidy, Transform, Visualize, And Model Data Paperback, 2017
- Software for Data Analysis: Programming with R (Statistics and Computing) 2010 by John Chambers
- R Programming for Data Science by Roger D. Peng
- An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics), G. James, D. Witten, T. Hastie and R. Tibshirani, Springer, 2013. 5

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6CSDS5-11: Distributed System

Credit: 3	Max Marks: 150 (IA :30, ETE:120)	
3L+ 0T+ 0P	End Term Exams: 3hr	
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope, and outcome of the course.	01
2	**Distributed Systems:** Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks, and event precedence, recording the state of distributed systems.	06
3	**Concurrent Processes and Programming:** Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included). Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies	09
4	**Distributed Process Scheduling:** A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems	08
5	**Distributed Shared Memory:** Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	09
6	**Distributed Agreement:** Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	09
	Total	42

Suggested Books

- Andrew S. Tannenbaum and Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson
- George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, Distributed Systems: Concepts and Design, Addison Wesley
- P. K. Sinha, Distributed Operating Systems: Concepts and Design, IEEE press
- M. Singhal and N. G. Shivaratri, Advanced Concepts in Operating Systems,, McGraw-Hill

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6CSDS5-12: Data Mining & Business Intelligence

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope, and outcome of the course.	1
2	**Introduction -** Evolution and importance of Data Mining-Types of Data and Patterns mined Technologies-Applications-Major issues in Data Mining. Knowing about Data-Data Preprocessing: Cleaning–Integration–Reduction–Data transformation and Discretization.	8
3	**BI- Data Mining & Warehousing**: Basic Concepts-Data Warehouse Modeling- OLAP and OLTP systems - Data Cube and OLAP operations–Data Warehouse Design and Usage-Business Analysis Framework for Data Warehouse Design- OLAP to Multidimensional Data Mining. Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods – Mining Association Rules – Association to Correlation Analysis.	9
4	**Classification and Prediction: Issues** - Decision Tree Induction - Bayesian Classification – Rule-Based Classification – k-Nearest mining Classification. Prediction –Accuracy and Error measures.	7
5	**Clustering:** Overview of Clustering – Types of Data in Cluster Analysis – Major Clustering Methods.	7
6	**Introduction to BI** -BI definitions and concepts- BI Framework-Basics of Data integration Introduction to Business Metrics and KPI - Concept of the dashboard and balanced scorecard. Tool for BI: Microsoft SQL server: Introduction to Data Analysis using SSAS tools Introduction to Data Analysis using SSIS tools-Introduction to Reporting Services using SSRS tools- Data Mining Implementation Methods.	8
	Total	40

Suggested Books

- Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
- M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
- Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
- M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
- G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, an Applications in Microsoft Office Excel with XLMiner", Wiley India

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6CSDS5-13: Cloud Computing

Credit: 3		Max Marks: 150 (IA :30, ETE:120)
3L+ 0T+ 0P		End Term Exams: 3hr
S.No.	**Contents**	**Hours**
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks, and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	06
3	**Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App Engine.	10
4	**Virtualization Technology**: Definition, Understanding, and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	10
5	**Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery, Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	08
6	**Cloud Platforms in Industry:** Amazon web services, Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
	Total	42

Suggested Books

- Dan C Marinescu, Cloud Computing, Theory and Practice, MK Elsevier
- Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley
- Barrie Sosinsky, Cloud Computing Bible, Wiley
- Jim Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, MK Elsevi

6CSDS4-21: Digital Image Processing Lab

Credit: 1.5	Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P	End Term Exams: 2hr

S.No.	List of Experiments
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non-Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.

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6CSDS4-22: Machine Learning Lab

Credit: 1.5	Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P	End Term Exams: 2hr

S.No.	List of Experiments
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select the appropriate data set for your experiment and draw graphs.

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6CSDS4-23: Data Science Lab using R

Credit: 1.5	Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P	End Term Exams: 2hr

S.No.	List of Experiments
1	Installation of R, General issues, Package Management.
2	To work on Data types, sub setting, writing data, reading data from CSV files.
3	Experiments with Creating vector, vector operations, combining vectors, data frames and their merging, control structures, redirecting output.
4	Experiments using Bar charts, dotplots, histograms, boxplot, Plotting and coloring.
5	Basic statistics, sample means, testing proportion.
6	Experiments using Loops, Conditional statements.
7	To work with Lists, Data transformation, Outlier detection.
8	Work on various Debugging tools.
9	To write database queries related to R .
10	To implement Logical regression and PCA.
11	Work with RODBC and DBI Package.

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6CSDS4-24: Mobile Application Development Lab

Credit: 1.5	Max Marks: 75 (IA :45, ETE:30)
0L+ 0T+ 3P	End Term Exams: 2hr

S.No.	List of Experiments
1	To study Android Studio and android studio installation. Create a "Hello World" application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.