



**Nagarjuna College of Engineering &
Technology, Bengaluru**
An Autonomous Institute, Affiliated to VTU Belagavi

**Scheme & Syllabus
of
V Sem**

As per the NEP 2020 Guidelines,
Choice-Based Credit System
&
Outcome-Based Education

CSE (Data Science)

**w.e.f.
Academic Year 2023-2024**

Vision

To prepare the next generation practitioners and researcher for data centric world by bringing together interdisciplinary faculty across the globe.

Mission

M1: To provide Skill Based Education to master the students in problem solving and analytical skills to enhance their niche expertise in the field Data Science

M2: To educate the students with latest technologies to update their knowledge in the field of Data Science

M3: To enable students to experience the Content Based Learning with premier quality data science education, research and industrial collaboration

M4: To enable students to become leaders in the Industry and Academia Nationally as well as internationally

M5: To guide students in research on Data Science, with the aim of having an ethical impact on society by tackling societal grand challenges

PROGRAM OUTCOMES (POs): Graduates of the Computer Science and Engineering – Data Science Program will be able to achieve the following

POs:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science and Engineering principles to the solution of complex problems in Computer Science and Engineering.

PO2: Problem Analysis: Identify, formulate, research literature, and analyses complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex Computer Science and 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 considerations.

PO4: 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 related to Computer Science and Engineering problems.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Computer Science and Engineering activities with an understanding of the limitations.

PO6: 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 Computer Science and Engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional Computer Science and Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science and Engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex Computer Science and 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.

PO11: 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 Computer Science and Engineering projects and in multidisciplinary environments.

PO12: 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 Outcome (PSO)

PSO1: Ability to analyse complex computing issues and apply the principles to achieve related solution.

PSO2: Ability to design, implement and evaluate computing based solutions to meet range of computing requirements based in the data science.

PSO3: Ability to effectively communicate within diverse work group related to professional framework.

Program Educational Objectives (PEOs)

PEO 1: To make students competent for higher studies and employable, to meet industrial requirements.

PEO 2: To develop students having core competence in science, mathematics and fundamentals of Data Science to address ever changing industrial requirements globally.

PEO 3: To create academically conducive environment to learn engineering skills in the domains such as Data Analytics, Data Modelling, Data Visualization and Allied Technologies.

PEO 4: To enrich students with professional ethics, leadership qualities, and entrepreneurial skills.

PEO 5: An ability to engage in lifelong learning for effective adaptation to technological developments.

NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

B.E. in CSE (Data Science)

Scheme of Teaching and Examinations 2021

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2023 - 24)

V SEMESTER

Sl. No	Course and Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination			Credits	
				Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
				L	T	P	S					
1	BSC/PCC 21CDT51	Data Wrangling	Any CS Board Department	3	0	0	0	03	50	50	100	3
2	PCC 21CDT52	Software Engineering & Project Management		3	0	0	0	03	50	50	100	3
3	IPCC 21CDI53	Predictive Modeling Analytics		3	0	2	0	03	50	50	100	4
4	PCC 21CDT54	Data Communication & Computer Networks		3	0	0	0	03	50	50	100	3
5	PCC 21CDL55	Data Wrangling Lab		0	0	2	0	03	50	50	100	1
6	AEC 21CDT56	Research Methodology & Intellectual Property Rights	TD: Any Department PSB: As identified by university	2	0	0	0	02	50	50	100	2
7	HSMC 21ENV57	Environmental Studies	TD: Civil/ Environmental /Chemistry/ Biotech. PSB: Civil Engg	1	0	0	0	1	50	50	100	1
8	AEC 21CD58X/ 21CDL58X	Ability Enhancement Course-V	Concerned Board	If offered as Theory courses				01	50	50	100	1
				1	0	0						
				If offered as lab. courses				02				
				0	0	2						
Total									400	400	800	18

Ability Enhancement Course - IV

21CDL581	Snow flake	21CDL583	Power BI
21CDL582	Jira		

Note: BSC: Basic Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, AEC –Ability Enhancement Course INT – Internship, HSMC: Humanity and Social Science & Management Courses.

L –Lecture, T – Tutorial, P- Practical/ Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Integrated Professional Core Course (IPCC): refers to Professional Theory Core Course Integrated with Practical of the same course. Credit for IPCC can be 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). Theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE. For more details the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech.) 2021-22 may be referred.

DATA WRANGLING			
Course Code	21CDT51	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Prerequisites: Python Programming.			
Course Learning Objectives			
<ul style="list-style-type: none"> • To learn different methods for Data Cleanup • To learn basics of Python. • To learn Data aggregation Techniques. • To learn about packages Numpy and Pandas • To learn concepts of Web scraping. 			
Teaching-Learning Process (General Instructions)			
<p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. 2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class. 4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. 6. Introduce Topics in manifold representations. 7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them. 8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. 			
Module - I			
<p>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.</p>			
08 Hours			
Module - II			
<p>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 Postgre SQL-Non-Relational Databases: No SQL-When to Use a Simple File-Alternative Data Storage.</p>			
08 Hours			
Module - III			
<p>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.</p>			
08 Hours			

Module - IV

DATA EXPLORATION AND 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-Interactive-Words-Images, Video, and Illustrations-Presentation Tools-Publishing the Data-Open Source Platforms.

08 Hours

Module - V

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.Py- Spidering the Web-Building a Spider with Scrapy-Crawling Whole Websites with Scrapy.

08 Hours

Teaching-Learning Process for all modules

Chalk and board, Active Learning, PPT Based presentation, Video

Course Outcomes:

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

- CO 1:** Identify and execute the basic data format.
- CO 2:** Perform the computations with Excel and pdf files.
- CO 3:** Understand the concepts of data cleanup.
- CO 4:** Explore and analyze the Image and video data.
- CO 5:** Understand the concepts web scraping.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks			

Text Books:

1. Jacqueline Kazil & Katharine Jarmul,|| Data Wrangling with Python||, O'Reilly Media, Inc,2016.

References:

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

E-Books:

1. <http://www.gbv.de/dms/ilmenau/toc/827365454.PDF>

MOOC:

1. <https://www.udemy.com/course/data-wrangling-with-python/>
2. <http://www.openculture.com/free-online-data-science-courses>
3. <https://www.classcentral.com/course/dataanalysiswithpython-11177>

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT			
Course Code	21CDT52	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Prerequisites: Software Development Life Cycle (SDLC), Scripting Language, Version Control Tool, Database			
Course Learning Objectives			
<p>CLO 1. Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers.</p> <p>CLO 2. Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.</p> <p>CLO 3. Infer the fundamentals of object oriented concepts, differentiate system models, use UML diagrams and apply design patterns.</p> <p>CLO 4. Explain the role of DevOps in Agile Implementation.</p> <p>CLO 5. Discuss various types of software testing practices and software evolution processes.</p>			
Teaching-Learning Process (General Instructions)			
<p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. 2. Use of Video/Animation to explain functioning of various concepts. 3. Encourage collaborative (Group Learning) Learning in the class. 4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. 6. Introduce Topics in manifold representations. 7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them. 8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. 			
Module - I			
<p>Introduction: The evolving role of software, The changing nature of software, Software engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models, Process Technology, Product and Process.</p> <p>Textbook 1: Chapter 1: 1.1 to 1.3</p> <p>Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, Specialized process models.</p> <p>Textbook 1: Chapter 2: 2.1, 2.2, 2.4 to 2.7</p>			
			08 Hours
Module - II			
<p>Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling, abstraction, The Three models. Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance.</p> <p>Textbook 2: Chapter 1,2,3</p>			

<p>Building the Analysis Models: A sample class model, Navigation of class models, Introduction to RUP(Textbook: 5 Sec 2.4) and UML diagrams Requirement Analysis, Analysis Model Approaches, Data modeling Concepts, Textbook 1: Chapter 8: 8.1 to 8.8</p> <p style="text-align: right;">08 Hours</p>	
Module - III	
<p>Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging. Textbook 1: Chapter 13: 13.1 to 13.7</p> <p>Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development,</p> <p>Self-Learning Section: What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C’s of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation. Textbook 4: Chapter 2: 2.1 to 2.9</p> <p style="text-align: right;">08 Hours</p>	
Module - IV	
<p>Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Textbook 3: Chapter 1: 1.1 to 1.17</p> <p style="text-align: right;">08 Hours</p>	
Module - V	
<p>Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass Textbook 3: Chapter 6: 6.1 to 6.16</p> <p>Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans. Textbook 3: Chapter 13: (13.1 to 13.6 , 13.9, 13.11, 13.14)</p> <p style="text-align: right;">08 Hours</p>	
Teaching-Learning Process	Chalk and board, Active Learning, Demonstration
<p>Course Outcomes At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> CO1. Understand the activities involved in software engineering and analyze the role of various process models CO2. Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques CO3. Describe various software testing methods and to understand the importance of agile methodology and DevOps CO4. Illustrate the role of project planning and quality management in software development. CO5. Understand the importance of activity planning and different planning models 	

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks			

Suggested Learning Resources:**Textbooks**

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, TataMcGraw Hill.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
4. Deepak Gaikwad, Viral Thakkar, DevOps Tools From Practitioner's Viewpoint, Wiley.
5. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Reference:

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Weblinks and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFIJ
3. <http://elearning.vtu.ac.in/econtent/CSE.php>
4. <http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html>
5. <https://nptel.ac.in/courses/128/106/128106012/> (DevOps)

PREDICTIVE MODELING ANALYTICS

Course Code	21CDI53 (IC)	CIE Marks	50
Teaching Hours/Week (L: T: P: S) (3:0:2:0)	Credits (3:0:1:0)	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 13 Lab slots	Total Marks	100
Credits	04	Exam Hours	03

Prerequisites: Data mining, Machine Learning

Course Objectives:

This course will enable students to,

- To learn, how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines and Bayesian network models.
- To know the use of the binary classifier and numeric predictor nodes to automate model selection.
- To advice on when and how to use each model. Also learn how to combine two or more models to improve prediction

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- Lecture method (L) does not mean only traditional lecture method, but a different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing.
- Encourage collaborative (Group) Learning in the class.
- Ask at least three HOTS (Higher Order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation.
- Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
- Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
- Give Programming Assignments.

Module – I

DATA PREPARTION: Introduction – Predictive Analytics in the Wild – Exploring Data types and associated Techniques - Complexities of data - Applying Models: Models and simulation, Categorizing Models, Describing, summarizing data, and decisions – Identify similarities in Data: Data Clustering, converting Raw Data into a Matrix, Identify K-groups in Data.

08 Hours

Module – II

DATA CLASSIFICATION – PART I: Background – Exploring Data classification process - Using Data Classification to predict the future: Decision tree, Algorithm for generating Decision Trees, Support Vector Machine.

08 Hours

Module-III	
DATA CLASSIFICATION – PART II: Ensemble Methods to Boost Prediction Accuracy: Naive Bayes Classification Algorithm, The Markov Model, Linear Regression, Neural Networks – Deep learning.	
08 Hours	
Module-IV	
DATA PREDICTION: Adopt predictive analytics - Processing data: identifying, cleaning, generating, reducing dimensionality of data – Structuring Data – Build predictive model: develop and test the model.	
08 Hours	
Module-V	
DATA VISUALIZATION: Introduction to visualization tool – Evaluate the data – visualize Model’s Analytical Results: hidden grouping, data classification results, outliers, decision trees, prediction – Novel visualization in Predictive Analytics.	
08 Hours	
Teaching-Learning Process for all modules	Chalk and Talk, Power point presentation, flip teaching, YouTubevideos
PRACTICAL COMPONENTS	
Sl. No	Experiments
1	Practical Component: Using Machine learning approach with R Healthcare Analytics Case Study: Cancer survivability predictors
2	Social and Marketing Analytics Case Study: Tweets as predictors for the stock market Step 1- Collecting data Step 2 – Exploring and preparing the Data
3	Practical Component: Using Machine learning approach with R (Case Studies mentioned in Module 1) Apply Decision tree classification model on Healthcare Analytics
4	Apply Support Vector Machine model on Social and Marketing Analytics
5	Practical Component: Using Machine learning approach with R (Case Studies mentioned in Module 1) Apply Naive Bayes Classification Algorithm on Healthcare Analytics
6	Apply Linear Regression Algorithm on Social and Marketing Analytics
7	Practical Component: Using Machine learning approach with R (Case Studies mentioned in Module 1) Develop and test the model for Healthcare Analytics
8	Develop and test the model for Social and Marketing Analytics
9	Practical Component: Using Tableau or Matplotlib Visualize Data Classification results
10	Visualize the decision trees
11	Visualize the prediction
Course Outcomes: On completion of this course, the students will be able to, CO1: Understand the basics of predictive analytics and summarize Data, Categorize Models, and techniques CO2: Apply Decision tree, Support Vector Machine for Data Classification CO3: Apply Methods such as Naive Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification. CO4: Develop predictive models for various Real-Time Applications. CO5: Analyze and Visualize predictive Model’s results using Data Visualization tools.	

Assessment Details (both CIE and SEE)

Component		Weightage (%)		
CIE's	CIE 1 5 th week	20	60	Average of 3 tests for 20 marks
	CIE 2 10 th week	20		
	CIE 3 15 th week	20		
AAT's	AAT-1 10 th week			10
	Lab Test	30	Reduced to 10	
	Lab Record	20	10	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks				
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks				

Text Books:

1. Anasse Bari, Mohamed Chaouchi, Tommy Jung, -Predictive Analytics For Dummies, Wiley Publisher, 2nd Edition, 2016.

References:

1. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
2. Aurelien, Hands-On Machine Learning with Scikit-Learn & TensorFlow, O'Reilly Publisher, 5th Edition, 2017.
3. Max Kuhn, Kjell Johnson, — Applied Predictive Modeling, Springer, 2013.

E-Books:

1. https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-maxkuhn-kjell-johnson_1518.pdf
2. https://www.researchgate.net/publication/329873035_Prediction_Modeling_Methodology
3. <https://www.memsql.com/releases/oreilly-predictive-analytics/>

MOOC:

1. <https://www.coursera.org/learn/predictive-modeling-analytics>
2. <https://www.edx.org/course/predictive-analytics>
3. <https://www.udemy.com/course/machinelearningandlogisticregression/>

DATA COMMUNICATION AND COMPUTER NETWORKS			
Course Code	21CDT54	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Prerequisites: Network designer, Connectivity, Network provider			
Course objectives:			
<ul style="list-style-type: none"> To understand the basic concepts of data communication, layered model, protocols and inter-working between computer networks and switching components in telecommunication systems. Discuss the nature, uses and implications of internet technology. The main goal of the computer network is Resource Sharing. It is to create all the programs, data and hardware accessible to anyone on the network without considering the resource's physical area and the client 			
Teaching-Learning Process (General Instructions)			
<p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> Lecturer method (L) need not to be only a traditional lecture method, but alternative effectiveteaching methods could be adopted to attain the outcomes. Use of Video/Animation to explain functioning of various concepts. Encourage collaborative (Group Learning) Learning in the class. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes criticalthinking. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it. Introduce Topics in manifold representations. Show the different ways to solve the same problem with different circuits/logic and encouragethe students to come up with their own creative ways to solve them. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. 			
Module – I			
<p>Data communications: Introduction, Components, Data Representation, Data Flow, Networks-Network criteria, Physical Structures, Physical Topology, Categories of networks. Network Models-Layered tasks, OSI Model. Physical Layer-Services, Transmission Media, Data Rate Limits, Transmission Impairment.</p>			
			08 Hours
Module – II			
<p>Data Link Layer and Medium : Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple accessprotocols -Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA</p>			
			08 Hours
Module – III			
<p>Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP,BOOTP and DHCP-Delivery, Forwarding and Unicast Routing protocols.</p>			
			08 Hours
Module – IV			

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

08 Hours

Module - V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

08 Hours

Teaching-Learning Process for all modules

Chalk and board, Active Learning, PPT Based presentation, Video

Course Outcomes:

After studying this course, the students will be able to:

- Students will be able to understand different networking protocols, Network models and different transmission media.
- Student will be able to understand different Data link layer mechanisms, standards protocols.
- Students will be able to understand the IPV4, IPV6 and different Routing protocols.
- Students will be able to understand UPP, different transport layer protocols.
- Students will be able to understand various types of transport layer protocols.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks			

Text Books and Reference Books:

1. Forouzan, Data Communications and Networking, 5th Edition.

DATA WRANGLING LAB

Course Code	21CDL55	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	13 Lab Slots	Total Marks	100
Credits	1	Exam Hours	03

Prerequisites: Python Programming.

Course Learning Objectives

- To learn different methods for Data Cleanup
- To learn basics of Python.
- To learn Data aggregation Techniques.
- To learn about packages Numpy and Pandas
- To learn concepts of Web scraping.

Note: two hours tutorial is suggested for each laboratory sessions.

Sl. No.	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.xlsx) 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.xlsx 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.xlsx 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

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

- CO 1: Identify and execute the basic data format.
- CO 2: Perform the computations with Excel and pdf files.
- CO 3: Understand the concepts of data cleanup.
- CO 4: Explore and analyze the Image and video data.
- CO 5: Understand the concepts web scraping.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	Lab Test1 8 th week	15	30
	Lab Test2 14 th week	15	
AAT's	Lab Record	20	
Continuous Internal Evaluation Total Marks: Reduced to 30Marks			
Semester End Examination(SEE) Total Marks: Reduced to 20Marks			

Text Books:

1. Jacqueline Kazil & Katharine Jarmul,|| Data Wrangling with Python||, O'Reilly Media, Inc, 2016.

Reference Books:

1. Dr. Tirthajyoti Sarkar, Shubhadeep,|| Data Wrangling with Python: Creating actionable data from raw sources||, Packt Publishing Ltd,2019.
2. Stefanie Molin,|| Hands-On Data Analysis with Pandas||, Packt Publishing Ltd,2019.
3. Allan Visocek,|| Practical Data Wrangling||, Packt Publishing Ltd,2017.
4. Tye Rattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras,|| Principlesof Data Wrangling: Practical Techniques for Data Preparation||, O'Reilly Media, Inc, 2017.

E-Books:

1. <http://www.gbv.de/dms/ilmenau/toc/827365454.PDF>

MOOC:

1. <https://www.udemy.com/course/data-wrangling-with-python/>
2. <http://www.openculture.com/free-online-data-science-courses>
3. <https://www.classcentral.com/course/dataanalysiswithpython-11177>

RESEARCH METHODOLOGY AND IPR

Course Code	21CDT56	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	02	Exam Hours	03

Prerequisites: Literature survey, Requirement analysis

Course objectives:

1. To give an overview of the research methodology and explain the technique of defining a research problem
2. To explain the functions of the literature review in research.
3. To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review and research reports.
4. To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.
5. To discuss leading International Instruments concerning Intellectual Property Rights.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Syllabus

Module – I

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.

Text Book 1 - Chapter 1, 2

08 Hours

Module – II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.

Text Book 4 - Chapter 3.

<p>Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs. Text Book 1 - Chapter 3.</p>		08 Hours
Module – III		
<p>Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Text Book 1 - Chapter 6. Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. Text Book 2 - Chapter 5.</p>		08 Hours
Module – IV		
<p>Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report writing, Different steps in writing report, Layout of the research report, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports, Conclusion. Text Book 1 - Chapter 19. Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper —The Choice, Writing Strategies, Journal Paper: Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited, or Perish. Text Book 2 - Chapter 6. Communicating Research Work: Presentation Skills - Oral Presentations - Language Choices, Delivery, Poster Presentations, Presentation Preparation Guidelines. Text Book 2 - Chapter 9.</p>		08 Hours
Module – V		
<p>Intellectual property: an introduction - Intellectual property types, More patent basics. Text Book 3 - Module 1 - 1, 2. Patents- Detailed overview of patents-What is a patent, What can be the subject of a patent, Why are patents important. Legal requirements for patentability - Novelty, Inventive step/non obviousness, Industrial application/utility, Patentable subject matter, Disclosure requirement. Text Book 3 - Module 2 - 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5 Patent application preparation - Preparing patent applications - Obtaining invention disclosures from Inventors, Identifying patentable inventions, Understanding the invention (core inventive concept), Inventorship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, Application format. Text Book 3 - Module 3 - 1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6.</p>		08 Hours
Teaching-Learning Process for allmodules	Chalk and board, Active Learning, PPT Based presentation, Video	
Course Outcomes (Course Skill Set)		
<p>At the end of the course the student will be able to: CO1. Explain the meaning of engineering research. CO2. Explore the procedure of Literature Review and Technical Reading. CO3. Explain the various data collection methods, ethics in research. CO4. Know the techniques involved report writing, technical writing, presentation skills. CO5. Explain the fundamentals of patent law & drafting procedure.</p>		

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks			

Textbooks

1	Research Methodology: Methods and Techniques	C. R. Kothari, Gaurav Garg	New Age International	4 th Edition, 2019
2	Engineering Research Methodology: A Practical Insight for Researchers	Dipankar Deb, Rajeeb Dey, Valentina E. Balas	Intelligent Systems Reference Library	1 st Edition, 2019
3	WIPO (2022), WIPO Patent Drafting Manual, 2nd edition. Geneva: WIPO.	DOI: 10.34667/tind.44657 ISBN: 978-92-805-3264-7	World Intellectual Property Organization	Second edition
4	RESEARCH METHODOLOGY a step-by-step guide for beginners.	Ranjit Kumar	SAGE Publications India Pvt Ltd.	3 rd Edition, 2011.

Reference Books

1	"Research Methods for Engineers"	David V. Thiel	Cambridge University Press	2020
---	----------------------------------	----------------	----------------------------	------

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
2. <https://archive.nptel.ac.in/courses/127/106/127106227/>
3. https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
4. <https://archive.nptel.ac.in/courses/110/105/110105139/>
5. www.indiacode.nic.in

ENVIRONMENTAL STUDIES			
Course Code	21ENV57	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	18	Total Marks	100
Credits	01	Exam Hours	01
Course Objectives: To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.			
Syllabus			
Module – I			
Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake. Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. 03 Hours			
Module – II			
Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading. 04 Hours			
Module – III			
Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. 04 Hours			
Module – IV			
Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology. 03 Hours			
Module – V			
Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. Field work: Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation. 04 Hours			
Course outcomes: At the end of the course, students will be able to : <ul style="list-style-type: none"> • CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, . • CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. • CO3: Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components. • CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues. 			

Sl. No	Name of the Textbook/s	Title of the Book Author/s	Name of the Publisher	Edition and Year
1	Environmental Studies	Benny Joseph	Tata Mc Graw – Hill.	2 nd Edition, 2012
2	Environmental Studies	S M Prakash	Pristine Publishing House, Mangalore	3 rd Edition, 2018
3	Environmental Studies – From Crisis to Cure	R Rajagopalan	Oxford Publisher	2005
4.	Environmental Studies	R. Geetha Balakrishna, K. G. Lakshminarayana Bhatta	SM Publications.	2016
Reference Books				
1	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning, Singapur.	2 nd Edition, 2005
2	Environmental Science – working with the Earth	G. Tyler Miller Jr.	Thomson Brooks /Cole,	11 th Edition, 2006
3	Text Book of Environmental and Ecology	Pratiba Sing, Anoop Singh & Piyush Malaviya	Acme Learning Pvt. Ltd. New Delhi.	1 st Edition

Ability Enhancement Course - SNOW FLAKE			
Course Code	21CDL581	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	01	Exam Hours	03
Prerequisites: SQL, Cloud, Data Warehouse and Data Mining			
Course Objectives:			
<ul style="list-style-type: none"> • Snowflake provides an enterprise solution that makes gathering, Processing, using a Huge amount of data easy. • Its serves a wide range of technology areas, including data integration, business intelligence, advanced analytics and security & governance. • It helps organizations to Discover access and share the information. 			
Module – I			
Introduction to Cloud What is Cloud, Different Cloud Vendors, Advantages of Cloud over On-Premise, Data Ware Housing Concepts What is a Data Warehouse, Data Base Vs Data Warehouse , Data Ware House Architecture, Why do we need Data Ware House, OLTP Vs OLAP, What is ETL.			
04 Hours			
Module – II			
Introduction to Snowflake Key Concepts & Architecture, Cloud Platforms, Snowflake Editions, Overview of Key Features, Overview of the Data Lifecycle, Continuous Data Protection, Connecting to Snowflake Overview of the Ecosystem, Snowflake Partner Connect, SnowSQL (CLI Client) - Installation, Configuring and Usage, Lab – Snowsql Lab & Exercises.			
04 Hours			
Module – III			
Loading / Unloading Data into/from Snowflake Overview of Data Loading/Unloading, Data Loading/Unloading Considerations, Preparing to Load/Unload Data, Bulk Loading/Unloading from a Local File System, Bulk Loading/Unloading from Amazon S3, Bulk Loading /Unloading from Microsoft Azure, Loading Continuously Using Snowpipe, Loading Using the Web Interface (Limited), Querying Data in Staged Files, Querying Metadata for Staged Files, Transforming Data During a Load, Troubleshooting Bulk Data Loads, Lab – Data Loading / Unloading Lab & Exercises.			
04 Hours			
Module – IV			
Using Snowflake Web Interface, Virtual Warehouses, Databases, Tables & Views, Queries, Date & Time Data, Semi-structured Data, Binary Data, Snowflake Time Travel & Fail-safe, Lab & Exercises.			
04 Hours			
Module – V			
Snowflake Continuous Data Pipelines Streams, Tasks & Snowpipe, Lab – Streams & Tasks Lab & Exercises Sharing Data in Snowflake Introduction to Data Sharing, Data Providers, Data Consumers, Working with Shares, Using Secure Objects to Control Data Access, Configuring a Reader Account, Managing Reader Accounts, Lab – Streams & Tasks Lab & Exercises.			
04 Hours			
Teaching-Learning Process	Chalk and board, MOOC, Practical based learning, practical's		
Course Outcomes (Course Skill Set):			
<ol style="list-style-type: none"> 1. Knowledge of SQL language and cloud based technologies. 2. Data Warehousing concepts, data modeling, metadata management. 3. Data lakes, multi-dimensional models, data dictionaries. 4. Migration to AWS or Azure Snowflake platform. 5. Performance tuning and setting up resource monitors. 			

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

Each experiment to be evaluated for conduction with observation sheet and record write-up.

Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.

Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.

Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). Weightage to be given for neatness and submission of record/write-up on time.

Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.

In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

The suitable rubrics can be designed to evaluate each student's performance and learning ability.

Rubrics suggested in Annexure-II of Regulation book

The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.

Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

Text Books

1. Snowflake: The Definitive Guide - Architecting, Designing, and Deploying on the Snowflake Data Cloud by Joyce Avila

Ability Enhancement Course – JIRA SOFTWARE

Course Code	21CDL582	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	1	Exam Hours	03

Prerequisites: Software Engineer, Project Management

Course Objectives:

This course will enable students to

1. Learn how to create projects, Tasks, Backlogs, Subtasks, Epics, User stories and Bugs.
2. Understand how to handle live agile projects.
3. Track and handle your issues, set up boards and report on them with JIRA.
4. Build Backlogs.
5. Work as a team member in an agile project.

Note: two hours tutorial is suggested for each laboratory sessions.

Sl. No.	Experiments
1	Navigating the JIRA interface Creating and managing user accounts Setting up projects and workflows Issue Types and Workflows:
2	Understanding different issue types (e.g., task, bug, epic) Customizing workflows to match your team's processes Creating and Managing Issues:
3	Creating new issues and specifying details Assigning, prioritizing, and scheduling issues Using labels, components, and versions for issue organization Advanced Searching and Filters:
4	Creating custom filters for specific views Using JIRA Query Language (JQL) for advanced searches Dashboards and Reports:
5	Creating personalized dashboards Generating and interpreting various reports (e.g., burndown charts, velocity charts) Agile Development with JIRA:
6	Implementing Scrum or Kanban boards Managing sprints, backlogs, and boards Estimating and tracking story points Integration and Automation:
7	Integrating JIRA with other tools (e.g., Confluence, Slack) Setting up automation rules for issue transitions and notifications Permissions and Security:
8	Managing user access and permissions Implementing issue-level security JIRA Add-ons and Plugins:
9	Exploring and installing useful add-ons and plugins from the Atlassian Marketplace Configuring and customizing add-ons for your specific needs Data Migration and Backup:
10	Importing and exporting data in JIRA Setting up regular backups and data recovery procedures

Course Outcomes (Course Skill Set):

1. Jira provides the foundation to help developers focus on building software with the ability to automate and integrate processes with IT teams.
2. Create a Scrum board, managing project roles, Building a backlogs and monitoring work in Kanban Board.
3. Planning a version to release version management and managing epics.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

Each experiment to be evaluated for conduction with observation sheet and record write-up.

Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.

Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.

Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). Weightage to be given for neatness and submission of record/write-up on time.

Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.

In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

The suitable rubrics can be designed to evaluate each student's performance and learning ability.

Rubrics suggested in Annexure-II of Regulation book

The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

Weightage of marks for PART A is 80% and for PART B is 20%. General rubric suggested to be followed for part A and part B.

Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

Text Books:

1. Jira Software Essentials – Second Edition by Li Patrick
2. Mastering Jira 7 - Second Edition: Become an expert at using JIRA 7 through this one-stop guide! by Ravi Sagar

Ability Enhancement Course – POWER BI			
Course Code	21CDL583	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	01	Exam Hours	02
Prerequisites: Visualization, Data base management, Excel.			
Course Objectives:			
<ol style="list-style-type: none"> 1. Find your content in dashboards, reports and apps. 2. View and export data from dashboards and reports. 3. View filters that are used in a report. 4. Explain the relationship between dashboards and reports, visualization and tiles 			
Module – I			
Power BI Introduction Data Visualization, Reporting, Business Intelligence (BI), Traditional BI, Self-Serviced BI, Cloud Based BI, On Premise BI, PowerBI Products, Power BI Desktop (Power Query, Power Pivot, Power View), Flow of Work in Power BI Desktop, Power BI Report Server, Power BI Service, Power BI Mobile Flow, Of Work in Power BI / Power BI Architecture, A Brief History of Power BI.			
04 Hours			
Module – II			
Power Query Data Transformation, Benefits of Data Transformation, Shape or Transform Data using Power Query, Overview of Power Query / Query Editor, Query Editor User Interface The Ribbon (Home, Transform, Add Column, View Tabs), The Queries Pane, The Data View / Results Pane, The Query Settings Pane, FormulaBar, Saving the Work, Datatypes, Changing the Datatype of a Column Filter, in Power Query, Auto Filter / Basic Filtering, Filter a Column using Text Filters, Filter a Column using Number Filters, Filter a Column using Date Filters, Filter Multiple Columns, Remove Columns / Remove Other Columns, Name / Rename a Column, Reorder Columns or Sort Columns, Add Column / Custom Column Split, Columns, Merge Columns, PIVOT, UNPIVOT Columns, Transpose Columns, Header Row or Use First Row as Headers.			
04 Hours			
Module – III			
Power Query Continued Keep Top Rows, Keep Bottom Rows Keep, Range of Rows, Keep Duplicates, Keep Errors, Remove Top Rows, Remove Bottom Rows, Remove Alternative Rows, Remove Duplicates, Remove Blank Rows, Remove Errors, Group Rows / Group By.			
04 Hours			
Module – IV			
M Language IF..ELSE Conditions, Transform Column () Types, Remove Columns (), Split Columns (), Replace Value() Table. Distinct Options and GROUP BY Options Table. Group (), Table. Sort () with Type Conversions PIVOT, Operation and Table. Pivot(). List Functions Using, Parameters with M Language.			
04 Hours			
Module – V			
Data Modeling Data Modeling Introduction, Relationship, Need of Relationship, Relationship Types / Cardinality in General, One-to-One, One-to-Many (or Many-to-One), Many-to-Many, AutoDetect the relationship, Create a new relationship, Edit existing relationships, Make Relationship Active or Inactive, Delete a relationship.			
04 Hours			
Teaching-Learning Process	Chalk and board, MOOC, Practical based learning, practical's		
Course Outcomes (Course Skill Set):			
<ol style="list-style-type: none"> 1. Understand Power BI concepts likes Microsoft Power BI desktop layouts, BI reports, dashboards and Power BI DAX commands and functions. 2. Gain a competitive edge in creating customized visuals and deliver a reliable analysis of vast amount of data using Power BI. 3. Learn how to experiment, fix, prepare and present data quickly and easily. 4. Create a sales analysis report and a project management report. 5. Form relationship in your data model and learn data visualization best practices. 			

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

Each experiment to be evaluated for conduction with observation sheet and record write-up.

Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.

Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.

Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). Weightage to be given for neatness and submission of record/write-up on time.

Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.

In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

The suitable rubrics can be designed to evaluate each student's performance and learning ability.

Rubrics suggested in Annexure-II of Regulation book

The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Backup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.

Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).

The duration of SEE is 03 hours

Rubrics suggested in Annexure-II of Regulation book

Text Books

1. Beginning Microsoft Power Bi by Dan Clark, Apress,
2. Mastering Power BI by Chandraish Sinha