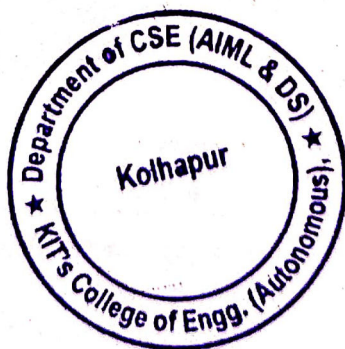KOLHAPUR INSTITUTE
OF TECHNOLOGY'S
**COLLEGE OF
ENGINEERING**
(AUTONOMOUS),
KOLHAPUR

Structure for

B.Tech in

Computer Science & Engineering (DS)

(To be Implemented w.e.f. Academic Year 2022-23)

Department of Computer Science & Engineering (DS)

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur,
Maharashtra, INDIA

Dr. U. P. Gurav
Head, Department of CSE(DS)

Prof Dr. A. S. Patil
Dean Academics

SEM V

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for
Third Year B. Tech. Program in Computer Science & Engineering (DS) Semester-V

Course Code	Course Name	Curriculum Component	L	T	P	Credits	Component	Max	Min for Passing	
UDSC0501	Design and Analysis of Algorithms	PC	3	1	-	4	ISE I	10	20	40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UDSC0502	Database Management System	PC	3	-	-	3	ISE I	10	20	40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UDSC0503	Exploratory Data Analysis	PC	3	-	-	3	ISE I	10	20	40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UDSE05**	Program Elective - I	PE	3		-	3	ISE I	10	20	40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UDSO05**	Open Elective - I	OE	3	-	-	3	ISE I	10	20	40
							MSE	30		
							ISE II	10		
							ESE	50	20	
UDSC0531	Database Management System lab	PC	-	-	2	1	ISE	25	10	30
							ESE(POE)	50	20	
UDSC0532	Exploratory Data Analysis Lab	PC	-	-	2	1	ISE	25	10	20
							ESE (POE)	25	10	
UDSC0533	Web Technology Lab	PC	2	-	2	3	ISE	25	10	30
							ESE (POE)	50	20	
UDSC0551	Mini Project-II	PW	-	-	2	1	ISE-I	25	20	
							ISE-II	25		
UDSA0561	Software System Tools	Audit Course	2	-	-	-	ISE-I	50	40	
							ISE-II	50		
								750		
			19	1	8	22	500 + 250 = 750 + Audit Course			

Total Credits - 22, Total Contact hours – 28

Program Elective – I (PE-I)		Open Elective – I (OE-I)	
UDSE0521	AI for Cyber Security	UDSO0511	Data Science for Everyone
UDSE0522	STQA		
UDSE0523	Internet of Things Analytics		
UDSE0524	Text Analytics		

Course Code:	UDSC0501		L	T	P	Credit
Course Name:	Design and Analysis of Algorithms		3	1		4

Course Prerequsites:	Data Structures

Course Description:	This course introduces fundamental concepts and key techniques for designing and analyzing algorithms along with studying and applying different algorithm design methods namely, greedy method, divide and conquer, dynamic programming and backtracking.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Define basic concepts of algorithms and measure the efficiency of algorithms.
CO2	Apply various algorithmic strategies such as divide and conquer, greedy algorithms, dynamic programming, backtracking to solve real life problems
CO3	Analyze performance efficiency of designed algorithm's time and space complexity .

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	1							1	1	
CO2	2	3	2	2	2							1	1	
CO3	2	3	2	3	2							1	1	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	INTRODUCTION	7 Hours

What is algorithm, Algorithm Specification: Pseudocode Conventions, Recursive Algorithm, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations, Practical Complexities, Performance Measurement Recurrences: The substitution method, recursion tree method, Master Theorem

UNIT 2	ALGORITHM DESIGN AND ANALYSIS TECHNIQUES-I	7 Hours

Divide and Conquer-The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort and analysis of these algorithms. The Greedy method: The general method, Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Huffman codes.

UNIT 3	ALGORITHM DESIGN AND ANALYSIS TECHNIQUES-II	7 Hours

Dynamic Programming: The general method, Multistage graphs, Optimal binary search trees, 0/1 knapsack, Reliability design, Traveling Salesperson problem.

UNIT 4	GRAPH ALGORITHMS: ELEMENTARY GRAPH ALGORITHMS:	7 Hours

Representations of graphs , Breadth-first search, Depth first search, Strongly connected components, Minimum Spanning Trees: Growing a minimum spanning tree, The algorithms of Kruskal and Prim
Single-Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra's algorithm, The Floyd-Warshall algorithm

UNIT 5:	BACKTRACKING	7 Hours

The general method, 8-queen problem, Sum of subsets, Graph Coloring, Knapsack Problem, Branch & Bound Algorithms , Hamiltonian Cycle.

UNIT 6:	COMPLEXITY CLASSES :P & NP - COMPLETE	7 Hours

Polynomial time, Polynomial-time verification, Decidability , NP completeness and reducibility, NP-complete problems ,string matching algorithms, case studies

Text Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI
2. Fundamentals of Computer Algorithms - Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Universities Press, Second Edition.

Reference Books:

1. Fundamentals of Algorithmics – Gilles Brassard, Paul Bratley (Pearson Education).
2. Mastering Algorithms with C – Kyle Loudon (SPD O'Reilly).
3. Computer Algorithms- Introduction to Design and Analysis – Sara Baase, Allen Van Gelder (Pearson Education).

Course Code:	UDSC0502		L	T	P	Credit
Course Name:	Database Management System		3			3

Course Prerequsites:

File Systems

Course Description:

This course presents the fundamental concepts of database design and use. It provides a study of data models, data description languages, relational algebra, SQL, data normalization and transactions.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Explain the fundamental database concepts.
CO2	Apply the normalization techniques and SQL queries on database.
CO3	Interpret various indexing and concurrency control techniques.
CO4	Develop a database application using database design principles.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	2	3											1	
CO3	2	1											2	
CO4			3											2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Database Concepts	8 Hours

Purpose of Database Systems, View of Data, Data Models, Database Architecture, Roles in Database Environment, The Entity-Relationship Model, Entity-Relationship Diagrams, Reduction to Relational Schemas, Introduction to Relational Model, Relational Query Languages- The Relational Algebra.

UNIT 2	Relational Database Design	6 Hours

The purpose of Normalization, Data Redundancies and Update Anomalies, Functional Dependencies, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

UNIT 3	Relational Model and Structured query Language	6 Hours

Structure of Relational Databases, SQL Data Definition Language, Basic Structure of SQLQueries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Integrity Constraints, Accessing SQL from a Programming Language.

UNIT 4	Transactions and Concurrency Control	8 Hours

Simple Transaction Model, Serializability, Concurrency Control- Lock-Based Protocols, Two phase locking protocols, Graph-based protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

UNIT 5	File Structure, Indexing and Hashing	6 Hours

Overview of Physical Storage Media, File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer. Basic Concepts of Indexing and Hashing, Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing.

UNIT 6	Overview of NoSQL	6 Hours

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch.

Text Books:

1. Fundamentals of Database Systems – by Ramez Elmasri and Shamkant Navathe Publisher -Pearson Education, 5th Edition.
2. Database Systems: Design, Implementation and Management.- PeterRof, Carlos Coronel (7th Edition), Cengage Learning.

Reference Books:

1. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Sixth Edition.
2. Database Systems- A practical approach to Design, Implementation and Management by Thomos Connolly, Carolyn Begg, 3rd Edition, Pearson Education

Course Code:	UDSC0503		L	T	P	Credit
Course Name:	Exploratory Data Analysis		3			3

Course Prerequsites:

Statistics and Linear Algebra, Python Programming

Course Description:

This course will cover the exploratory data analytics , data pre-processing and data preparation for machine learning model.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Explain the fundamentals of exploratory data analysis.
CO2	Interpret different EDA techniques to gain insights, identify patterns, detect missing values, outliers, and understand the underlying structure of a real-world datasets.
CO3	Identify appropriate EDA techniques for different data types such as numerical, categorical, or time series data.
CO4	Choose appropriate EDA techniques for feature scalling, feature extraction and data visualization.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1		1		2				1	2	3
CO2	2	2	1	2	2	1		3				1	3	3
CO3	2	2	2	2	2	1		3				1	3	3
CO4	2	2	2	2	3	1		3				1	2	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc. (10
2	Mid Semester Examination (MSE)	30%	50% of course contents. (30 Marks)
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc. (10
4	End Semester Examination (ESE)	50%	100% course contents. (50 Marks)

Course Contents:

UNIT 1	Data Foreseeing	6 Hours

Data engineering, technical requirements of data during machine learning modeling:- identify numerical and categorical variables, missing data, determine cardinality in categorical variables, identify linear relationship, identify normal distribution, highlighting outliers.

UNIT 2	Handling Missing Data and Data Encoding	7 Hours

Impute missing data: - remove missing data, impute missing data by mean, mode or median, replacing missing values with value at the end of the distribution, multivariate imputation.
Data Encoding: - Why encoding? one hot encoding, replace categories with ordinal numbers, encoding with integers, encoding with mean of the target.

UNIT 3	Variable Discretization and Working with Outliers	6 Hours

Variable Discretization:- divide the variables into equal intervals, perform discretization followed by categorical encoding. Working with outliers:- Outliers means?, trimming outliers, capping the variables at arbitrary max and min values, performing zero coding.

UNIT 4	Feature Scaling	7 Hours

Standardizing features, mean normalization, scaling to max and min values, scaling with the median and quantiles, scaling to vector unit length, deriving new features with decision trees, and carrying out PCA.

UNIT 5	Feature Creation with transaction and time series data	6 Hours

Aggregating transaction with mathematical operations, aggregating transaction in a time window, determining the number of local maxima and minima, deriving time elapsed between time-stamped events, creating features from transaction.

UNIT 6	Feature Extraction from text and Case study	6 Hours

Counting characters, words, vocabulary, estimating text complexity by counting sentences, create features with bag-of-words and n-grams.
Case study: - Data preprocessing @given dataset(includes exploratory data analysis(EDA), pipelining)

Text Books:

"Python Feature Engineering Cookbook" by Soledad Galli - Packt Publication.

Reference Books:

"Python for data analysis " by Wes Mckinney - O'Reilly Publication.

Course Code:	UDSE0521		L	T	P	Credit
Course Name:	AI for Cyber Security		3			3

Course Prerequsites:

Knowledge of Information Security, Basics of Machine Learning.

Course Description:

Students will get exposer to various AI based cyber security analysis concepts and its related tools.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the need of AI for Cyber Security.
CO2	Outline the basics of phishing and CAPTCHA in Cyber Security.
CO3	Identify the use of AI in IDS and Mail Server.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		1	1			3						1
CO2	1	2	1	2	2			3					2	1
CO3	1	2	1	2	2			3					2	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	INTRODUCTION TO INFORMATION SECURITY	6 Hours

Overview:

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security

Classical Encryption Techniques:

Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor machines, Steganography

UNIT 2	SYMMETRIC AND ASYMMETRIC KEY CRYPTOGRAPHY	7 Hours

Block Ciphers and the Data Encryption Standard :

Block Cipher Structure, Data Encryption Standard (DES), A DES Example, Strength of DES, Block Cipher Design Principles, AES Structure, Multiple Encryption and Triple-DES.

Public Key Cryptography:

Principles of Public-Key Cryptosystems, RSA Algorithm, Other Public key Cryptosystems - Diffie-Hellman Key Exchange, ElGamal Cryptographic system.

UNIT 3	DETECTION OF MALICIOUS WEB PAGES, URLS.	7 Hours

URL Blacklisting – Drive by download URL- Command and Control URLs – Phishing URLs – Using Heuristics to detect Malicious Pages – Data for the analysis – Feature Extraction – Lexical Features – Web Content based Features – Host based features – site Popularity features.

UNIT 4	CAPTCHA AND SCAN DETECTION	6 Hours

Using AI to crack CAPTCHA – Types of CAPTCHA – ReCAPTCHA – Breaking a CAPTCHA – Solving CAPTCHA with neural network - Machine Learning in Scan Detection - Machine-Learning Applications in Scan Detection

UNIT 5	AI AND IDS	6 Hours

Architecture of IDS based on Neural networks – Intelligent flow based IDS - Multi-Agent IDS – AI based Ensemble IDS – Machine Learning in Hybrid Intrusion Detection Systems - MachineLearning Applications in Hybrid Intrusion Detection: Anomaly - Misuse Sequence Detection System - Parallel Detection System.

UNIT 6	AI AND MAIL SERVER	6 Hours

Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text based emails to numeric values – Logistic regression to spam filters - Anomaly detection techniques for SMTP and HTTP.

Text Books:

1. Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem, Soma Harder, Sinan Ozdemir, Packt Publishing Ltd, 2018.
2. The state of the Art in Intrusion Detection System, Al-Sakib Khan Pathan, CRC Press, Taylor & Francis Group, 2014
3. Data Mining and Machine Learning in Cyber Security, Sumeet Dua and Xian Du, CRC Press, 2011.

Reference Books:

1. Cybersecurity for Dummies, Brian Underdahl, Wiley, 2011
2. Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011

Course Code:	UDSE0522		L	T	P	Credit
Course Name:	Software Testing and Quality Assurance		3			3

Course Prerequsites:

Fundamentals of Software Engineering

Course Description:

Technical and managerial aspects of testing and quality assurance in
software development with emphasis on practical projects. Tools for testing and QA.
Performance evaluation, verification and validation of software. Managing and documenting
software testing and QA activities in local and outsourced projects

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain basic concepts of Software Testing and Software verification models
CO2	Identify Test cases and explain SRS and various technical documents
CO3	Interpret appropriate metrics for evaluation of software projects
CO4	Explain the concepts of web application testing

CO-PO Mapping:

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	2	2	2	1		2		2					1	2
	CO2	2	2	2	1		2		2					1	2
	CO3	2	2	2	2	3	2		2					2	2
	CO4	2	2	2	2	3	2		2					2	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Testing	4 Hours

Types of Software Failures, Testing Process, Some
Terminologies, Limitations of Testing, The V Shaped software life cycle model

UNIT 2	Software Verification	8 Hours

Verification Methods, SRS document verification,
SDD document verification, Source code reviews, User documentation verification,
Software project audit Creating test cases from SRS and Use cases: Use Case
Diagram and Use Cases, Generation of test cases from use cases, Guidelines for
generating validity checks, strategies for data validity, Database testing

UNIT 3	Regression Testing	8 Hours

What is regression testing, Regression Test cases selection, Reducing the number of test cases, Risk analysis, Code coverage prioritization techniques Object oriented testing: What is Object orientation, What is object-oriented testing, Path testing, State based testing, Class testing

UNIT 4	Measurement	7 Hours

Measurement in everyday life, Measurement in software engineering, scope of software Metrics and Models in Software testing: Software Metrics, Categories of Metrics, Object oriented Metrics
used in testing, what should we measure during testing, Software Quality attributes prediction models

UNIT 5	Measuring Internal Product	7 Hours

Attribute Size, Aspects of software size, Length, Reuse, Functionality Measuring External Product Attributes: Modeling software quality, measuring aspects of software quality.

UNIT 6	Testing Web applications:	7 Hours

What is web testing? Functional testing, UI testing, Usability testing, configurations and compatibility testing, security testing, performance testing, database testing, post deployment testing, web metrics. Automated Test data generation: Automated Test Data generation Approaches to test data generation, Test data generation tools.

Test Books:

1. Software testing: Yogesh Singh, Cambridge University Press, First Edition
2. Software Metrics – A Rigorous & Practical approach: Norman Fenton, Shari Lawrence
P fleeger, 2nd Edition Thomson Press
3. Software Quality Engineering, Jeff Tian, Wiley India Ltd.

References Books:

1. Foundations of Software testing: Aditya P. Mathur, Pearson, Second Edition
2. Software Testing: Ron Patton, Pearson (SAMS), Second Edition
3. Software Quality, Mordechai Ben Menachem, Garry S. Marliss, BS Publications

Course Code:	UDSC0523			L	T	P	Credit
Course Name:	Internet Of Things (I.O.T) Analytics			3			3

Course Prerequsites:

Knowledge of Computer Networking, Knowledge of Microprocessor, Knowledge of Python and Assembly

Course Description:

This Course Introduces to necessary fundamentals of IOT, introduction of Raspberry Pi with Python Programming and it aims to develop applications related to Smart Home Application, Electric vehicles and its Networks.

Course Outcomes: After the completion of the course the student will be

CO1	Illustrate Key Concepts and Terminologies related to IOT.
CO2	Outline Raspberry Pi Programs and Arduino Programs.
CO3	Explain IOT Servers and Cloud Services.
CO4	Analyze IOT Solutions for real life Problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	2	1	1		1								1	
CO3	2	1												
CO4	2	2	1		1								1	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	INTRODUCTION TO INTERNET OF THINGS	6 Hours

Introduction, Physical Design of IOT, Logical Design of IOT,Working with IOT Devices, IOT Templates, Application of IOT.

UNIT 2	FUNDAMENTALS OF IOT MECHANISMS AND KEY TECHNOLOGIES	8 Hours

Structural Aspects of IOT: Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy. IOT Technologies: RFID, Sensor, Satellite, Nano, Smart Tech, Cloud Computing. IOT Standards: Bluetooth Smart, ULE, IEEE 802.11ah,Thread, Zigbee, Zwave, 6LoWPAN, IETF IPv6 Routing Protocols for RPL Roll.

UNIT 3	PROGRAMMING RASPBERRY PI WITH PYTHON AND ARDUINO	6 Hours

Introduction, Raspberry Pi Intefaces- Serial ,SPI, I2C . Controlling LED , Interfacing LED and Switch, Interfacing Light Sensor(LDR) with Raspberry Pi. Arduino UNO, Sensors in Arduino Kit, Programming with Arduino.

UNIT 4	IOT PHYSICAL SERVERS AND CLOUD OFFERINGS	8 Hours

Introduction to Cloud Storage Models and Communication API's, WAMP- AutoBahn for IOT, Amazon Web Services for IOT, Xively Cloud Services, Django Model and Architecture, Python Web Application Framework

UNIT 5	IOT AND M2M	6 Hours

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software Defined Networking, Network Function Virtualization

UNIT 6	CASE STUDIES ILLUSTRATING IOT DESIGN	6 Hours

Introduction, Home Automation- Smart Lighting,Home Intrusion Detection, Cities-Smart Parking Environment-Weather Monitoring System, Air Pollution Monitoring,Forest Fire Detection, Agriculture- Smart irrigation, Productivity Applications-IOT Printer

Text Books:

1. IOT- for Automated and Smart Application- Yasser Ismail
2. IOT- Hands on Approach- A Bagha
3. Intelligence in IoT-enabled Smart Cities, Fadi AI,Turjan,CRC Press 2019

Reference Books:

1. IOT- Hands of Approach- Arshdeep Bahga, Vijay Madisetti
2. Arduino Project Handbook- Mark Geddis
3.IOT Technologies in Smart Cities- Fadi AI,Turjan, Muhammad Imran,2020 IET.
4. Selected Journal Papers on FANET's, VANET's,IOV and Smart Cities.

Course Code:	UDSE0524		L	T	P	Credit
Course Name:	Text Analytics		3			3

Course Prerequsites:

Natural Language Processing and Machine Learning

Course Description:

This course facilitates students to understand the concepts related to text classification, summarization and clustering.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Explain the basic concepts of text analysis
CO2	Interpret the steps involved in text processing.
CO3	Demonstrate the text classification and summarization methods
CO4	Apply the knowledge of text analytics to use cases.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	1	2												
CO3	1	3											1	
CO4		3	1										1	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Text Processing and Language Modeling	7 Hours

Natural Language, Linguistics, Language Syntax and Structure, Language Semantics, Text Corpora, Natural Language Processing, Text Analytics.

UNIT 2	Processing and Understanding Text	7 Hours

Text Tokenization, Sentence Tokenization, Word Tokenization, Text Normalization: Cleaning Text, Tokenizing Text, Removing Special Characters, Expanding Contractions, Case Conversions, Removing Stopwords, Correcting Words, Stemming, Lemmatization, Understanding Text Syntax and Structure.

UNIT 3	Text Classification	7 Hours

Text Classification, Automated Text Classification, Text Classification Blueprint, Text Normalization, Feature Extraction, Classification Algorithms, Evaluating Classification Models, Building a Multi-Class Classification System, Applications and Uses.

UNIT 4	Text Summarization	7 Hours

Text Summarization and Information Extraction, Text Normalization, Feature Extraction, Keyphrase Extraction, Topic Modeling, Automated Document Summarization.

UNIT 5	Text Similarity and Clustering	6 Hours

Text Normalization, Feature Extraction, Text Similarity, Analyzing Term Similarity, Analyzing Document Similarity, Document Clustering.

UNIT 6	Semantic and Sentiment Analysis	6 Hours

Semantic Analysis, Exploring WordNet, Word Sense Disambiguation, Named Entity Recognition, Analyzing Semantic Representations, Sentiment Analysis.

Text Books:

1.Text Analytics with Python- A Practical Real-World Approach to Gaining Actionable Insights from Your Data, Dipanjan Sarka,Apress.

Reference Books:

1. John Atkinson-Abutridy, Text Analytics: An Introduction to the Science and Applications of Unstructured Information Analysis, CRC Press, 2022.
2. Srinivasa-Desikan, Bhargav. Natural Language Processing and Computational Linguistics: A practical guide to text analysis with Python, Gensim, spaCy, and Keras. Packt Publishing Ltd, 2018.

Course Code:	UDSCO0511		L	T	P	Credit
Course Name:	Data Science for Everyone		3			3

Course Prerequsites:

Basic Knowledge of Computer Science

Course Description:

This course deals with the principles of data science

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Demonstrate the core concept of data science along with mathematical foundations needed to handle the data.
CO2	Explain Python-based toolkits and machine learning essentials
CO3	Collect, explore, clean and manipulate data

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1							1	3	2
CO2	3	2	2	2	3							1	3	2
CO3	3	2	2	2	3						2	1	3	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	INTRODUCTION TO DATA SCIENCE:	6 Hours

The data science Venn diagram, Terminology, Data science case studies, Summary, Types of Data, Flavors of Data: Structured versus unstructured data, Quantitative and qualitative data, The four levels of data: Nominal level, Ordinal level, Interval level, and Ratio level

UNIT 2	THE 5 STEPS OF DATA SCIENCE:	6 Hours

Introduction to data science, Overview of the five steps, Explore the data, obtain the data, model the data, communicate and visualize the results.

UNIT 3	CONCEPTS OF DATA SCIENCE:	6 Hours

Traits of Big data, Web Scraping, Analysis vs Reporting, Introduction to Programming, Tools for Data Science, Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK

UNIT 4	MACHINE LEARNING:	6 Hours

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforcement learning variables

UNIT 5	VISUALIZING DATA: BAR CHARTS, LINE CHARTS, SCATTERPLOTS:	6 Hours

Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling

UNIT 6	DATA SCIENCE FOR EVERYONE:	6 Hours

CASE STUDIES:

DS in Healthcare, Finance, Bio-Informetics, Robotics, IoT analytics, Weather forecasting, Stockmarket prediction, Object Recognition, Real Time Sentiment Analysis etc.

Text Books:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi

Reference Books:

1. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
2. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
3. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
4. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
5. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

Course Code:	UDSC0531		L	T	P	Credit
Course Name:	Database Management System lab				2	1

Course Prerequsites:

File systems

Course Description:

Upon completion, student should be able to write programs for database design and execute SQL queries.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Design conceptual models of a database using ER modeling.
CO2	Apply normalization techniques for database design.
CO3	Develop relational models for the real time applications and apply SQL queries for the same.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2												2
CO2	1	2												2
CO3			3										2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/ Mini-Project / Presentation/ Group Discussion/ Internal Oral
2	ESE(POE)	100%	Assessment is based on practical-oral examination

Course Contents:

EXPERIMENT NO. 1	**2 Hours**

Draw ER diagram for an organization using any suitable software & convert it into table.

1. Install Dia software
2. Use E-R sheet to draw E-R diagram.
3. Convert each E-R diagram to relational schema.

EXPERIMENT NO. 2	**2 Hours**

Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No-of_Copies)
BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date)
LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to
1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2023 to Jun 2023
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library

EXPERIMENT NO. 3		2 Hours

Consider the following schema for Order Database:
SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER
(Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No,
Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries
to

1. Count the customers with grades above Kolhapur's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

EXPERIMENT NO. 4		2 Hours

Consider the schema for Movie Database:
ACTOR (Act_id, Act_Name, Act_Gender)
DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST (Act_id, Mov_id, Role)
RATING (Mov_id, Rev_Stars)

Write SQL queries to
1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

EXPERIMENT NO. 5		2 Hours

Consider the schema for College Database:
STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, Final_IA)

Write SQL queries to
1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:
If FinalIA = 17 to 20 then CAT = 'Outstanding'
If FinalIA = 12 to 16 then CAT = 'Average'
If FinalIA< 12 then CAT = 'Weak'
Give these details only for 8th semester A, B, and C section students.

EXPERIMENT NO. 6		2 Hours

Consider the schema for Company Database:
EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo,DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

Write SQL queries to
1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator). For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

EXPERIMENT NO. 7		2 Hours

Write a program to implement any concurrency control protocol.

EXPERIMENT NO. 8		2 Hours

Write a PL/SQL program to demonstrate Functions.

EXPERIMENT NO. 9		2 Hours

Design a simple NoSQL database e.g. MongoDB (Installation, Basic CRUD operations, Execution).

EXPERIMENT NO. 10		2 Hours

To Design a simple GPS-Enabled Lab Location Tracking System using NoSQL (To have the pymongo library installed, which is the Python driver for MongoDB.)

Text Books:

1. Fundamentals of Database Systems – by Ramez Elmasri and Shamkant Navathe Publisher -Pearson Education, 5th Edition.
2. Database Systems: Design, Implementation and Management.- PeterRof, Carlos Coronel (7th Edition), Cengage Learning.

Reference Books:

1. DataBase System Concept by Henry F. Korth, Abraham Silberschatz, Sudarshan (McGraw Hill Inc.) Sixth Edition.
2. Database Systems- A practical approach to Design, Implementation and Management by Thomos Connolly, Carolyn Begg, 3rd Edition, Pearson Education

Course Code:	UDSC0532		L	T	P	Credit
Course Name:	Exploratory Data Analysis Lab				2	1

Course Prerequsites:

Python Programming, Statistics and Linear Algebra

Course Description:

This course will cover the exploratory data analytics , data pre-processing and data preparation for machine learning model.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Apply appropriate EDA techniques to real-world datasets to understand its underlying structure and preform imputation and encoding.
CO2	Choose appropriate EDA techniques to perform time series analysis, PCA and data visualization.
CO3	Choose appropriate EDA techniques for text dataset for NLP.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1		1	2		1	1	3	3
CO2	2	1	2	1	2	1		1	2	1	1	1	3	3
CO3	2	1	2	1	2	1		1	2		1	1	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Lab assignments, Quiz, etc. (25 Marks)
2	ESE(POE)	100%	(25 Marks)

Course Contents:

EXPERIMENT NO. 1	2 Hours

Load any dataset from Kaggle and perform the following using pandas:-
1. Read the dataset into Jupyter Notebook or Google Colab.
2. Understand the dataset using - head, tail, loc, iloc, info, describe, shape, dtypes etc.

EXPERIMENT NO. 2	2 Hours

Perform following Exploratory data analysis on a dataset:-
1. Identify Missing Values.
2. Explore About the Numerical Variables.
3. Explore About categorical Variables.
4. Finding Relationship between features.

EXPERIMENT NO. 3	2 Hours

Perform various types of data cleaning operations on the data collected in the previous lab using data exploration, imputation etc.

EXPERIMENT NO. 4		2 Hours

Perform various types of data cleaning operations on the data collected in the previous lab using data exploration, imputation etc.
1. Identify and work with duplicate values.
2. Identify and work with Outliers.

EXPERIMENT NO. 5		2 Hours

Perform different label encoding on categorical variables using Scikit learn library.

EXPERIMENT NO. 6		2 Hours

Perform merging, concatenation and train, test split of dataset as a case study. Perform above all data cleaning and preprocessing on the dataset and make it ready for training and testing on a model. Analyze observations out of it.

EXPERIMENT NO. 7		2 Hours

Perform feature scaling and dimensionality reduction and identify the skewness on a given dataset and create various visualizations like histograms, scatter-plots, etc. to see the difference between the visualization with and without feaure scaling.

EXPERIMENT NO. 8		2 Hours

Perform following with respect to Time Series Data:-
1. Read time series data
2. Understand Date Time Index, Time Resampling, Time Shifts
3. Mean Rolling Expanding
4. Time Series Visualization

EXPERIMENT NO. 9		2 Hours

Perform following with respect to Time Series Data:-
1. Simple Moving Average
2. Cumulative Moving Average
3. Exponential Moving Average
4. Implement ARMA model

EXPERIMENT NO. 10		2 Hours

Perform EDA for NLP (text dataset):-
1. Counting characters, words
2. Word frequency analysis
3. Sentence length analysis
4. Create features with bag-of-words and n-grams length analysis.

Text Books:	

"Python for data analysis ", Oreilly Publications , Wes Mckinney

PBL Implementation

1. A team may include a maximum of 4 members.
2. Concepts studied in the subject to be used.
3. Down to earth application and innovative idea should have been attempted.
4. Report in Digital format with all evaluations and analysis to be submitted.
5. Assessment on a continuous basis with a minimum of 3 reviews.

Sample project domains:
1. Healthcare
2. E-Learning
3. Smart village
4. Smart agriculture Image recognition

Course Code:	UDSC0533		L	T	P	Credit
Course Name:	Web Technology Lab		2	0	2	3

Course Prerequsites:

Fundamentals of Python, Computer Network

Course Description:

Web Technology course is mainly focused on creating web applications for Machine Learning Applications. It covers front end development in HTML, CSS, JavaScript, JSON. Deployment of Machine Learning models in web application structure are covered in Flask and FastAPI framework.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Apply knowledge of client side and Server-side scripting
CO2	Design web applications using HTML, CSS, Java Script
CO3	Deploy RESTful web application using Flask & FastAPI

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2		1	2	2		2	2			2	1	1
CO2			3		3	1		2	2			2	2	1
CO3			3		3	1		2	2			2	2	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to HTML5	4 Hours

Introduction to HTML5, Features of HTML5, New Structure Tags, Section, Nav, Article, Aside, Header, Footer, designing a HTML Structure of Page, New Media Tags, Audio Tag, Video Tag, Introduction to HTML5 Forms, New Attributes, Placeholder Attribute, Require Attribute, Pattern, Attribute, Autofocus Attribute, email, tel, url types, number type, date type, range type

UNIT 2	CSS 3.0	4 Hours

Introduction to CSS 3, New CSS 3 Selectors, Attribute Selectors, First-of-type, Last- of-type, Nth-child, Element: empty, New CSS3 Properties, Custom Fonts, Text- Shadow Property, Text-Stroke Property, Rounded Corners, Box Shadows, CSS Gradients, CSS Multiple backgrounds, Opacity Property, Transition effect

UNIT 3	JavaScript	4 Hours

Introduction to Client-Side Scripting, Introduction to Java Script, Javascript Types, Variables in JS, Operators in JS, Conditions Statements, Java Script Loops, JS Popup Boxes, JS Events, JS Arrays, Working with Arrays, JS Functions, Using Java Script in Realtime, Validation of Forms, Related Examples

UNIT 4	Building Web Applications in Flask	6 Hours

Introduction to Flask - Installation, Creating the Application Directory, Virtual Environments,
Creating a Virtual Environment with Python 3, Installing Python Packages with pip, Basic Application Structure, Initialization, Routes and View Functions, Development Web Server, Templates, Web Forms, Databases, Python Database Frameworks, Database Management with Flask-SQL Alchemy, Database Operations, Integration with the Python Shell

UNIT 5	Introduction to FastAPI framework	5 Hours

Services and APIs, Kinds of APIs, HTTP, REST (ful), JSON and API Data Formats,
JSON: API, GraphQL, FastAPI Installation
A FastAPI Application, HTTP Requests, URL Path, Query Parameters, Body, HTTP Header, Multiple Request Data, Complex Data, FastAPI and Async, FastAPI Path Functions

UNIT 6	Deploy Machine Learning Models	7 Hours

Dataset, Dataset Preprocessing, ML Models, Pipeline Overview of ML Models, HTML Forms.
Deploy ML Model using Flask – Flask Installation, Flask Web Server Configuration, Routes and Views, Input Web Pages, Output Web Pages
Deploy ML Model using FastAPI – FastAPI installation, FastAPI Application, FastAPI end Point, test application using cURL, RESTApi endpoint, Authenticate and Secure FastAPI endpoints

Text Books:

1. HTML & CSS: The Complete Reference, Fifth Edition by ThomasPowell
2. JavaScript: The Definitive Guide, 6th Edition ByDavid Flanagan
3. Flask Web Development, 2nd Edition by Miguel Grinberg Released March 2018 Publisher(s): O'Reilly Media, Inc.
4. FastAPI by Bill Lubanovic Released November 2023 Publisher(s): O'Reilly Media, Inc.

Reference Books:

1. Head First Servlets and JSP: Passing the Sun Certified Web Component Developer Exam -2nd
Edition-Bryan Basham, Kathy Sierra, Bert Bates- O'REILLY

Suggested Experiment List:

EXPERIMENT NO. 1		2 Hours

Design a user registration form and validate using JAVASCRIPT with following fields and validations
 1. User Name (should contain first name and last name only characters
allowed)
2. Gender radio button (Male & Female)
3. Date of Birth
4. List of States (any 5 states Dropdown)
5 Pin Code 6 digits only
7. Email (Should be valid email address)
8. Password (should be minimum 4 characters)
9. Confirm Password (should match to Password Entered)

EXPERIMENT NO. 2		2 Hours

Design a simple college website using CSS
a. Internal CSS [ID Selector, Class Selector, Element Selector and Group Selector]
b. External CSS

EXPERIMENT NO. 3		2 Hours

Develop EMI calculator using JavaScript
a. Input: Amount, Duration [Month] and Interest Rate [Input Type=range]
b. Output: Total Payable amount, Total Interest Amount and EMI

EXPERIMENT NO. 4		2 Hours

Develop a Web application for student login with Student Username and Password and Login Button. Show Welcome
Username as Message

EXPERIMENT NO. 5		2 Hours

Deploy Student login web application in Flask and Test your Web Application.

EXPERIMENT NO. 6		2 Hours

Create Web Application to take input from user and Train your ML Model. Deploy ML model using Flask to show
prediction output to the User

EXPERIMENT NO. 7		2 Hours

Create Machine learning web application in the domain Agriculture to take inputs as text, image from user. Provide
prediction service using your ML Web Application. Deploy ML Web Application on Flask.

EXPERIMENT NO. 8		2 Hours

Set up FastAPI Interactive API Documentation Swagger UI to add endpoints, methods, and schemas and Users

EXPERIMENT NO. 9		2 Hours

Use FastAPI Interactive API Documentation Swagger UI to perform CRUD operation on Database

EXPERIMENT NO. 10		2 Hours

Develop weather prediction ML Web Application. Configure FastAPI end point to send user data in request and get ML
model output as response message

Course Code:	UDSC0551		L	T	P	Credit
Course Name:	MiniProject-II				2	2

Course Prerequsites:

Knowledge of Software Development Tools and Technologies.

Course Description:

Course Description: In this mini project, the students will apply multi-course environment for solving different real-world problems. The students shall use the concepts they have learned in their previous & the courses they are learning in the current semester and students will develop a solution to an identified problem.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Identify real world problems which can be solved using CS concepts and technologies.
CO2	Describe the the proposed solution to the real world problem using technical report
CO3	Implement the proposed solution using Computer Science & Engineering techniques
CO4	Build a detailed project report

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				1		1	3	2	2	3	3	3
CO2	2	2	3		3	1		2	3	3	3	3	3	3
CO3	2	2	3		3	1		2	3	3	3	3	3	3
CO4	2	1	1		3	1		2	3	3	3	3	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	50%	Problem Statement, SRS, Design
2	In Semester Evaluation 2 (ISE2)	50%	Implmentation, Presentation, Demo

Course Contents:

Guidelines for Mini Project -II

1. The primary objective of the mini project-II is to achieve multi course real world problem-based learning.
2. Course Instructor shall form the project team of 3 to 4 students in the batch of students
3. Each team shall use the knowledge they learned in the previous courses to identify the real world problem and solve using learnt technology
4. The solution shall be using the tools & techniques from multiple courses - e.g a solution shall be using data structures, Computer Networks, Data Science and ML modeling to develop mini project.
5. The evaluation shall be done in two phases
a.Phase 1 ISE-1 In ISE 1 the students shall be graded based on the skills demonstrated to identify the problem statement, define the problem statement & Designing its solution. The partial working model is expected to be completed.
b.Phase 2 ISE-2 In ISE 2 the students shall be graded based on the complete project implementation and its working. Followed by the detailed project report which shall cover the technical aspects of the project.
6. It's recommended to share a common project report format to all batches.
7. All course instructors shall coordinate and work towards a common evaluation process.
8. Course instructors shall demonstrate and discuss sample case studies with students to help them understand the mini project deliverables.

Guidleines for the Evaluations:
Below Criteria points can be used for Students Project Evaluation.
Problem Statement
Software Requirement Specification (SRS)
Detailed Design
Implementation
Testing and Team Communication
Checking Projects for Expected Analysis and Result
Project Final Demonstration with detailed Report

Course Code:	UDSA0561		L	T	P	Credit
Course Name:	Software Systems Tools		2			

Course Description:

In Software Systems students will learn necessary tools and techniques required for report writing and project management. This course will empower students with knowledge and practices that will help student in versioning projects, testing authenticity of work, generating reports and developing build for deployment of project.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Apply report writing tools and plagiarism testing tools for checking research work for genuine and authenticity.
CO2	Utilize Smart Tools & Technologies in Industry 4.0 project management tools to track and manage progress of project.
CO3	Describe the processes in product design & development tools like Watson Deep Learning, AI based Chatbot.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2					3	3	2	3	3
CO2	2	2	3	3	3			1		1	3	2	3	3
CO3	3	3	3	3	3			1		1	3	2	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	REPORT WRITING AND PLAGARISM TOOLS	6 Hours

Effective Report Writing: LateX- using document classes. Inserting graphics, tables, references, TikZ- creating diagrams, flowcharts, workflow etc.
Language Checking Tools: Language Checking, Use of tools like grammarly.
Plagiarism Detections: Plagiarism meaning. Testing an article for plagiarism. Use of tools like viper, turnitin, ithenticate etc.

UNIT 2	PROJECT MANAGEMENT TOOLS	6 Hours

Project Management Tools: Maintaining project versions using branching technique. JIRA, ClearQuest ,Use of tools like GITHUB to manage project progress.

UNIT 3	PRODUCT DEVELOPMENT LIFE CYCLE	4 Hours

Product Development Life Cycle tools - Process Models - Prototyping - Agile Models New Product Development Processes – Project tracking techniques such as Agile, SCRUM Master.

UNIT 4	BUIL MANAGEMENT SYSTEM	4 Hours

Build Management Systems: Study of various build management systems such as ,MAVEN , make install, WAF, configure etc. OneNote, Microsoft Project Plane (MPP),

UNIT 5	DATA PLATFORM	4 Hours

Data Platform : Weka, Canva ,figma ,wireframe ,idea boards, GitHub, Build Tool starUML, Rational Rose -UML diagram, 3D printing

UNIT 6	WATSON	4 Hours

WATSON : Watson Deep Learning, AI based Chatbot, Natural Language Classifier, Language Identifications and Translations, Visualization and Rendering

Text Books:

1. LaTeX: A Document Preparation System (2nd Edition)by Leslie Lamport
2. Learning Agile by Andrew Stellman & Jennifer Greene
3. Learning Python: Powerful Object-Oriented Programming 4th Edition by Mark Lutz
4. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition by Hadley Wickham, Garrett Grolemund
5. Smart Product Design, Sendpoints Publications, 2017

Reference Books:

1. Git online documentation. https://git-scm.com/docs/git-help
2. Pyplot online documentation https://matplotlib.org/api/pyplot_api.html
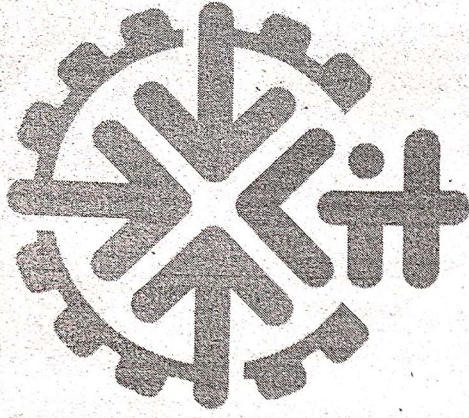
KOLHAPUR INSTITUTE OF TECHNOLOGY'S

COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR

Structure for

B.Tech in

Computer Science & Engineering (DS)

(To be Implemented w.e.f. Academic Year 2022-23)

Department of Computer Science & Engineering (DS)

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur,
Maharashtra, INDIA

Dr. U. P. Gurav
Head, Department of CSE(DS)
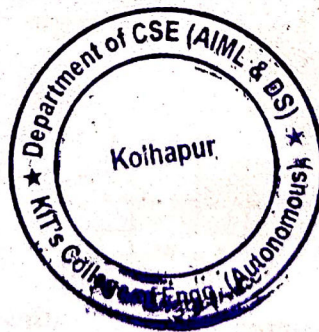
Prof Dr. A. S. Patil
Dean Academics

SEM VI

Kolhapur Institute of Technology's
College of Engineering (Autonomous), Kolhapur
Teaching and Evaluation scheme for

Third Year B. Tech. Program in Computer Science & Engineering (DS)Semester-VI

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Credits	Components	Marks		
								Max	Min for Passing	
UDSC0601	Natural Language Processing	PC	3	-	-	**3**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSC0602	Operating System	PC	3	-	-	**3**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSC0603	Machine Learning	PC	3	-	-	**3**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSC0604	Image Processing & Computer Vision	PC	3	1	-	**4**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSE06**	Program Elective - II	PE	3	-	-	**3**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSO06**	Open Elective - II	OE	3	-	-	**3**	ISE-I	10	20	40
							ISE-II	10		
							MSE	30		
							ESE	50	20	
UDSC0631	Machine Learning Lab	PC	-	-	2	**1**	ISE	25	10	20
							ESE (POE)	25	10	
UDSC0632	Natural Language Processing Lab	PC	-	-	2	**1**	ISE	25	10	20
							ESE (POE)	25	10	
UDSC0651	Mini Project - III	PW	-	-	2	**1**	ISE-I	25	20	
							ISE-II	25		
UDSA0661	Communication and Personality Development	Audit Course	2	-	-	**-**	ESE	100	40	
								750		
			20	**1**	**6**	**22**	**500 + 250 = 750 + Audit Course**			

Total Credits - 22, Total Contact hours – 27

Program Elective – II (PE-II)		Open Elective – II (OE-II)	
UDSE0621	Immersive Technology - ARVR	UDSO0614	Python for Data Science
UDSE0622	Business Intelligence		
UDSE0623	Nature Inspired Computing		
UDSE0624	Information Storage Management		

Course Code:	UDSC0601		L	T	P	Credit
Course Name:	Natural Language Processing		3			3

Course Prerequsites:

Deep Learning Algorithms

Course Description:

This Course helps to understand fundamental concepts for natural language processing and automatic speech recognition as well as technologies involved in developing speech and language applications.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Describe NLP and the tools that are available to efficiently study and analyse large collections of text.
CO2	Analyze and discuss the effects of electronic communication on our language
CO3	Learn natural language processing with manual and automated approaches and its computational frameworks.
CO4	Develop a Statistical Methods for Real World Applications and explore deep learning based NLP

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1									3	3
CO2	2	1	2	3									3	3
CO3	2	2	2	3									3	3
CO4	3	1	2	3								1	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction	5 Hours

A computational framework for natural language, description of English or an Indian language in the frame work, lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP-morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.

UNIT 2	Word level and syntactic analysis	5 Hours

Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine readable dictionaries and lexical databases, RTN, ATN.

UNIT 3	Semantic analysis	8 Hours

Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.

UNIT 4	Natural language generation	8 Hours

Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG. Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

UNIT 5	Information retrieval and lexical resources	8 Hours

Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.

UNIT 6	Case Studies	4 Hours

Case Studies - Bidirectional Encoder Representations from Transformers (BERT). Transformer (machine learning model), Graph Neural Networks.

Reference Books:

Text Books:
1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal,
Prentice Hall, 2016.
3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech
Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
5. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley

Reference Books:

1.Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009

Course Code:	UDCS0602		L	T	P	Credit
Course Name:	Operating Systems		3			3

Course Prerequsites:

Fundamentals of Electronics and Computer

Course Description:

This is one of the core course of Computer Science & Engineering Programme. In this course you will become familiar with the core concepts of OS - how OS work, how a processes & threads are created, inter-process communication & synchronisation, the various scheduling algorithms, memory management & memory allocation strategies, etc. This course will be also helpful for exams like GATE.

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Describe the basic concepts of operating systems.
CO2	Evaluate the performance of various scheduling & page replacement algorithms.
CO3	Distingush techniques of inter process communication and synchronization.
CO4	Identify potential deadlock situations and propose appropriate strategies to handle or avoid deadlocks.
CO5	Interpret internal representation of file and buffer cache management.

CO-PO Mapping:

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	1	2								1		2		
	CO2	2	2			2				1	2				
	CO3	1	1	2	1	3							1		1
	CO4	1			1								1		

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction	5 Hours

Introduction to OS, OS Structure, Types of OS, OS Kernel, OS Services, Users Prespective of OS, System Boot Process, Architecture of UNIX OS.

UNIT 2	Process, Threads & Scheduling	7 Hours

Process: Concept, States and Transitions, Context, Creation (fork), Termination (exit), Signals (signal, kill), Awaiting Process Termination(wait, waitpid), Invoking other programs (exec), Threads (pthreads)
Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT 3	Synchronization and Communication (Process & Thread)	8 Hours
Inter-Process Communication - Pipe, Shared Memory, Message Passing Inter-Process Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization		

UNIT 4	Deadlocks	5 Hours
Deadlock: System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock		

UNIT 5	Buffer Cache and Internal Representation of Files	7 Hours
Buffer Cache: Buffer Headers, Structure of the Buffer Pool, Scenarios for Retrieval of a Buffer, Reading and Writing Disk Blocks, Advantages and Disadvantages of Cache. Internal Representation of Files: I-nodes, Structure of a Regular File, Directories, Conversion of a pathname to i-node		

UNIT 6	Memory Management	8 Hours
Memory background, Hierarchy, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.		

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8th edition, Wiley India, 2009.
2. The Design of Unix Operating System - Maurice J. Bach (PHI)

Reference Books:

1. Operating Systems –Concepts and design –Milan Milenkovic (TMGH)
2. Operating Systems: Internals and Design Principles (8th Edition)- by William Stallings (Pearson Education)
3. Modern Operating Systems by Andrew S. Tanenbaum (Pearson Education International)
4. Unix concepts and administration – 3rd Edition – Sumitabha Das (TMGH).

Course Code:	UDSC0603		L	T	P	Credit
Course Name:	Machine Learning		3			3

Course Prerequsites:

Basics of Computer Science

Course Description:

This course aims at introducing various machine learning techniques and algorithms. Further, it creates scope for the

Course Outcomes: After the completion of the course the student will be able to -

CO1	Outline the basic concepts and statistical foundation methods behind machine learning algorithms
CO2	Apply various machine learning algorithms in a range of real-world applications
CO3	Interpret and Analyze results with reasoning using different ML techniques.
CO4	Design and develop the machine learning models to produce solutions for real-world problems

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1				3			2	3	3
CO2	3	2	2	2	2				1			3	2	2
CO3	3	3	2	2	2				1			2	2	3
CO4	3	3	2	2	2				1			2	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	INTRODUCTION TO MACHINE LEARNING	8 Hours

Machine learning, Types of machine learning, Applications of machine learning; Issues in machine learning .Preparing to model –Basic data types , Exploring structure of data , Data issues ,Exploring relationship between variables , Data pre-processing.

UNIT 2	DATA ENGINEERING, MODELING AND EVALUATION	6 Hours

Selecting a model; Training a model (for supervised learning) , Bootstrap sampling; Model representation and Interpretability – Underfitting, Overfitting, Evaluating and Improving performance of a model.

UNIT 3	FEATURE ENGINEERING	6 Hours

Feature Engineering: Feature transformation, Feature subset selection
Bayesian Concept Learning : Bayes theorem: Prior and Posterior Probability, Likelihood, Concept Learning, Bayesian Belief Network

UNIT 4	SUPERVISED LEARNING-I	6 Hours

Basics of supervised learning , classification model , K Nearest neighbor , Decision tree, Random forest , Support vector machine

UNIT 5	SUPERVISED LEARNING-II	6 Hours

Regression –simple linear regression, multiple linear regression,Assumptions in regression analysis ,other regression techniques ,improving accuracy of the linear regression model ,polynomial regression model,   logistic regression.Support Vector Machines

UNIT 6	UNSUPERVISED LEARNING	8 Hours

Unsupervised vs. Supervised learning , Applications on Unsupervised learning , Clustering basics (Partitioned, Hierarchical and Density based) , K-Means clustering , K-medoids , Hierarchical clustering , Density based methods , DBSCAN , Association rules.
Neural Networks Basics of neural network: Exploring the artificial neuron.
Ensemble Learning :Bagging and Boosting (Random forests)

Text Books:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Dos, "Machine Learning", 1 st edition, Pearson, 2019.
2. Ethem Alpaydin,"Introduction to Machine Learning‖, MIT Press, Prentice Hall of India, Third Edition 2014.
3. Tom Mitchell, —Machine Learning‖, McGraw Hill, 3rd Edition,1997. 4.. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
4.Christopher M. Bishop, —Pattern Recognition and Machine Learning‖, Springer 2011 Edition.

Reference Books:

1. Aurelien Geron , " Hands on Machine Learning with Scikit -learning , Keras & Tensorflow ",Concepts , Tools & Techniques to build Intelligent systems
2. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1st Edition, O'Reilly Media, 2017.
3. Rajiv Chopra, Machine Learning, Khanna Book Publishing 2021
4. Kevin P. Murphy, Machine Learning: a Probabilistic Perspective, The MIT Press, 2012.
5. https://www.coursera.org/learn/bayesian-methods-in-machine-learning?specialization=aml

Course Code:	UDSC0604					L	T	P	Credit
Course Name:	Image Processing and Computer Vision					3	1		4

Course Prerequsites:

Engineering Mathematics

Course Description:

The course aims to give exposure to image analysis and processing and practical aspects of computer vision.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Outline the fundamentals of image processing, process image datasets in tools such as OpenCV and perform key image processing tasks such as transformations, restoration, segment and compression
CO2	Explain the algorithms and techniques used in image processing
CO3	Describe the fundamentals of computer vision such as Cameras and projection models

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3								3	2
CO2	3	1	1	1	2								3	2
CO3	3	1	1	1	2								3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Fundamentals	8 Hours

What is Digital Image Processing? Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels.

UNIT 2	Intensity Transformations and Filtering	8 Hours

Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing and Sharpening Spatial Filters, Filtering in the Frequency Domain, Smoothing and Sharpening Using Frequency Domain Filters, Selective Filtering.

UNIT 3	Image Restoration	7 Hours

Using Spatial Filters, Wiener Filter; Introduction to Color Spaces and Color Image Processing; Morphological Image Processing – Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transform, Thinning and Shape Decomposition

UNIT 4	Image Segmentation	6 Hours

Point, Line, and Edge Detection, Thresholding: Basic Global Thresholding, Optimum Global Thresholding Using Otsu's Method, Multiple Thresholds, Region-Based Segmentation

UNIT 5	Image Compression	6 Hours

Fundamentals, Lossless Coding, Predictive Coding, Transform Coding. Coding Redundancy, Spatial and Temporal Redundancy, Irrelevant Information, Image Compression Models, Some Basic Compression Methods: Huffman Coding, Arithmetic Coding.

UNIT 6	Vision	6 Hours

Cameras and projection models, clustering; shape reconstruction from stereo, object recognition, scene recognition, face detection and human motion categorization.

Text Books:

1. Digital Image Processing, Rafael C. Gonza Lez and Richard E. Woods, Fourth Edition, Pearson, 2018.
2. Richard Szeliski, Computer Vision: Algorithms and Applications, 2nd Edition, The University of Washington, 2022.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Fourth Edition, Cengage Learning

Reference Books:

1.Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Fourth Edition, Cengage Learning

Course Code:	UDSE0621		L	T	P	Credit
Course Name:	Immersive Technology - ARVR		3			3

Course Prerequsites:

Computer Graphics, Basics of Animation

Course Description:

This course is introduced at third year level to get the students familiar with Immersive Technolgies related to AR-VR.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Differentiate between Augmented Reality and Virtual Reality
CO2	Demonstrate the Unity Game Engine
CO3	Create Content for Virtual and Augmented Reality
CO4	Explain the different Use Cases in AR-VR applications

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				1			1					1	
CO2		1	2	1	3	2	1	1			1	1	3	1
CO3	1	2	3	2	3	2	2	2			1	1	3	3
CO4		1	1	2										1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Augmented Reality and Virtual Reality	4 Hours

Introducing Virtual Reality and Augmented Reality,Other Types of Virtual and Augmented Reality-Mixed Reality,Augmented Virtuality,Extended Reality, Quick History tour ofn AR-VR,Evaluating the Technology Hype Cycle

UNIT 2	Exploring Augmented Reality and Virtual Reality	10 Hours

Looking at the Available Form Factors in VR,Focusing on Features-Room-scale versus stationary experience,Inside-out tracking,Haptic feedback,Audio,Considering Controllers-Toggle button,integrated hardware touchpad,Gaze controls,Keyboard and mouse, Standard gamepads,Motion controllers,Hand tracking,Eye tracking,Recognizing the Current Issues with VR-Simulator sickness,The screen-door effect,Movement in VR,Health effects,Looking at the Available Form Factors in VR-Mobile devices, AR headset,AR-glasses, Current Issues with Augmented Reality-Form factors and first impressions,Cost and availability,Perceived usefulness,Tracking,Field of view,Visuals.

UNIT 3	Content Creation in ARVR	8 Hours

Choosing Virtual Reality,Choosing Augmented Reality,Planning Your Virtual Reality Project-Defining Your Virtual Reality Project,Exploring Design Principles in Virtual Reality,Planning Your Augmented Reality Project-Defining Your Augmented Reality Project,Exploring Design Principles in Augmented Reality

UNIT 4	Introduction to Game Engine	6 Hours

Introduction to game engine,Game Engines Today, Introduction to Unity Engine-Install Unity, Configure Unity-on disk, in the cloud,Script Editor-VS Code,Navigating the unity interface,understanding the different window views,Confiure and custmize layout, The transform toolset, handle position control, unity project structure, VR and AR app development in Unity

UNIT 5	ARVR Multimedia Tools	8 Hours

Assessing Design Software-User experience design software,VR/AR-based design tools,Capturing Real Life-Video-capture options,Mass-consumer models,Still-image capture options,Audio options-Voiceover,Sound effects,Background audio,Spatial audio

UNIT 6	Case Studies	8 Hours

Exploring Virtual Reality Use Cases-Art, Education,Entertainment, Healthcare, Gaming,Exploring Augmented Reality Use Cases-Art,Education,Industry and commerce, Entertainment, Utilities

Text Books:

1. Virtual & Augmented Reality For Dummies,Published by: John Wiley & Sons, Inc.
2. Developing 2D games with unity-Independent game prograaming with C#-Jared Halpern

Reference Books:

1.The VR Book-Human Centered Design for Virtual Reality-Jason Jerald
2. Virtual and Augmented Reality, An educational handbook by Zeynep Tacgin, Cambridge scholares publishing
3. Virtual Reality-steven m lavalle, cambridge university press, copyright steven m lavalle 2019

Course Code:	UDSE0622		L	T	P	Credit
Course Name:	Business Intelligence		3			3

Course Prerequsites:

NIL

Course Description:

This course deals with applying Business intelligence related conecpts and methods , and undesrstands effects of busine

Course Outcomes: After the completion of the course the student will be able to -

CO1	Define basic concepts ,Architecture and data warehousing related concepts of Business Intelligence
CO2	To demonstrate the impact of business reporting, information visualization, and dashboards.
CO3	To apply text analytics and web analytics business intelligence methods to various situations

CO-PO Mapping:

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	1	2	2	2	3						1	2	3	2
	CO2	1	2	2	2	2						1	2	3	2
	CO3	1	2	2	2	2						1	2	3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Business Intelligence	8 Hours

A Frame work for Business Intelligence (Bl)- The Architecture of Bl - Benefits of business intelligence- how business intelligence differs from competitive intelligence and knowledge management.

UNIT 2	Data warehousing.	6 Hours

Characteristics of Data Warehousing- Data Marts- Data warehousing process- Data warehousing Architectures – Data Integration and the Extraction, Transformation and Load (ETL) Process- OLAP Versus OLTP- Data warehousing implementation issues – Real time data warehousing.

UNIT 3	Business Reporting, Visual Analytics and Business Performance Management.	6 Hours

Data and Information Visualization – Different types of Charts and Graphs- Emergence of Data visualization and Visual analytics - Performance Dashboard - Balance Score Cards – Dashboards Versus Scorecards - Six Sigma as a performance measurement system.

UNIT 4	Data mining – Supervised and unsupervised learning.	8 Hours

Data mining concepts and applications – Data mining process – Data mining methods – Classification techniques – Decision trees.Cluster Analysis – Partition and Hierarchical methods, Association rule mining –Data mining software Tools - Case studies. OLAP -ETL tools Case studies

UNIT 5	Text Analytics, Text Mining and Sentiment Analysis.	6 Hours

Text analytics and Text mining concepts and definition – Text mining process – Text mining tools – Sentiment analysis overview – Sentiment analysis applications – Sentiment analysis process.

UNIT 6	Web Analytics, Web Mining, and Social Analytics	6 Hours

Web mining overview – Web content and Web structure mining – Search Engines - Search Engine Optimization – Web usage mining – Web analytics maturity model and web analytics tools – Social analytics and social network analysis

Text Books:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics, Pearson 10th edition, 2018 .

Reference Books:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence, Analytics, and Data Science: A Managerial Perspective, 4th Edition, Pearson, 2017
2. "Business Intelligence For Dummies" by Swain Scheps.
3. David Loshin Morgan, Kaufman, —Business Intelligence: The Savvy Manager"s Guide‖, Second Edition, 2012.

Course Code:	UDSE0623		L	T	P	Credit
Course Name:	Nature Inspired Computing		3			3

Course Prerequsites:

Biology and Natural Systems, Artificial Intelligence and Machine Learning, Data Analysis and Statistics

Course Description:

Nature-inspired computing is a field of study that draws inspiration from natural processes and phenomena to develop computational techniques for solving complex problems. This course provides an in-depth exploration of various nature-inspired algorithms and their applications.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the concepts and principles of nature-inspired computing.
CO2	Develop skills in implementing and applying nature-inspired algorithms to solve complex problems.
CO3	Outline the strengths, limitations, and applications of nature-inspired computing techniques.
CO4	Prepare critical thinking and problem-solving skills through the analysis and evaluation of nature-inspired algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3										1		
CO2	2	1	2									1		
CO3	1	3		1								3		
CO4	3	2	2	3		2		3				3	3	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to Nature-Inspired Computing	8 Hours

Overview of Nature-Inspired Computing: Definition, motivations, and historical background, Inspiration from Natural Systems: Introduction to biological and natural systems that serve as inspiration for nature-inspired algorithms. Computational Intelligence: Introduction to computational intelligence techniques, genetic algorithms, particle swarm optimization, ant colony optimization, and evolutionary strategies. Problem-Solving Paradigms: Understanding problem representation and solution evaluation in nature-inspired computing.

UNIT 2	Genetic Algorithms	6 Hours

Fundamentals of Genetic Algorithms: Representation, population initialization, selection mechanisms, crossover, and mutation operators. Genetic Programming, Multi-Objective Optimization: Techniques for handling multiple objectives in genetic algorithms, Hybrid Approaches of genetic algorithms with other optimization methods.

UNIT 3	Swarm Intelligence and Optimization	6 Hours

Particle Swarm Optimization (PSO): Concepts, behavior, and variations of PSO algorithms, Ant Colony Optimization (ACO): Principles of ant colony optimization, pheromone trails, and solution construction, Bee Algorithms: Introduction to bee-inspired optimization algorithms, such as the artificial bee colony algorithm, Firefly Algorithm: Basics of the firefly algorithm and its application in optimization problems

UNIT 4	Artificial Neural Networks	6 Hours

Introduction to neural networks and deep learning, Convolutional neural networks (CNN) and recurrent neural networks (RNN), Applications in classification, regression, and pattern recognition

UNIT 5	Artificial Immune Systems	6 Hours

Overview of artificial immune systems (AIS), Immune memory and antibody representation, Clonal selection and immune response, Negative selection and anomaly detection, Applications in optimization and pattern recognition

UNIT 6	Cellular Automata and DNA Computing	8 Hours

Introduction to Cellular Automata, One and two Dimensional Cellular Automata, DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers , Scope of DNA Computing.

Text Books:

1. Xin-She Yang, "Nature-Inspired Computation and Swarm Intelligence Algorithms, Theory and Applications", Elsevier, Academic Press, 2020.

Reference Books:

1. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007.
2.Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.

Course Code:	UDSE0624		L	T	P	Credit
Course Name:	Information storage management		3			3

Course Prerequsites:

Basics of Operating System

Course Description:

This course focuses on Finding key challenges in information management, Storage system architecture and data protection and to gain knowledge of Storage Area Network- concepts, components and protocols. Also to get familiar with Network -Attached Storage - concepts, components, implementation and protocols

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Define the features of Information management.
CO2	Explain process related concepts such as Storage system architecture and data protection, knowledge of Storage Area Network- concepts, components and protocols.
CO3	Analyze Network -Attached Storage - concepts, Components, Implementation and protocols.
CO4	Identify the Need of Replication, Replication techniques and Storage Security.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					1						1		
CO2	2		1		2			2	1			2	2	1
CO3	2	2		2	1			2				2	2	1
CO4	2	2		2	2			1				2	1	1

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Introduction to information storage	6 Hours

Evolution of storage technology and architecture, Data Center Infrastructure, Key challenges in Managing Information, Information Lifecycle. Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Laws governing disk Performance, Logical Components of Host, Application requirements and disk performance,Intelligent Storage System, Direct Attached Storage and Data Protection: Components of Intelligent Storage System, Intelligent Storage Array. Direct Attached Storage – types, benefits and limitation, Disk drive Interface, Introduction to parallel SCSI, SCSI command model. Data Protection (RAID):- Implementation of RAID, RAID array components, RAID levels, Comparison, RAID ,Impact on disk performance, Hot Spares.

UNIT 2	Storage Area Network	6 Hours

Signal Encoding, FC-1: 8b/10b encoding, ordered sets and link control protocol, FC-2: data Transfer, FC-3: common Services, FC-4 and ULPs, Fibre Channel SAN – point-to- point topology, Fabric topology, Arbitrated loop topology, Hardware components of Fibre channel SAN. IP SAN – iSCSI – components, connectivity, topology, protocol stack, discovery, names, session, PDU

UNIT 3	Network -Attached Storage	8 Hours

Local File Systems, Network File System and File Servers, Benefits of NAS, NAS file I/O, Components of NAS, NAS Implementations, NAS File sharing Protocols, NAS I/O operations, Factors affecting NAS Performance. Case Study: Direct Access File System, Shared Disk File System Comparison: NAS, Fibre Channel SAN and iSCSI SAN

UNIT 4	Storage Virtualization	7 Hours

Introduction, Virtualization in the I/O path, Limitations and requirements, Definition of Storage Virtualization, Implementation considerations, Storage Virtualization on block, level, File level Virtualization, Storage Virtualization on various levels of the storage, network, Symmetric and Asymmetric Storage Virtualization.

UNIT 5	Business Continuity, Backup and Recovery	7 Hours

Introduction, Information Availability, Cause of Information unavailability, Measuring information Availability, Consequences of down time, BC terminology, BC planning life cycle, Failure Analysis, BC Technology Solutions, Backup Purpose, Backup, Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup, Process, Backup and Restore Operations, Backup Topology, Backup in NAS environment, Backup Technologies.

UNIT 6	Replication and Storage Security	6 Hours

Local Replication, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations. Storage Security: Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking.

Text Books:

1. A Information Storage and Management by G. Somasudaram – EMC Education Services (Wiley India Edition).
2. Storage Networks Explained by Ulf Troppen, Rainer Erkens, Wolfgang Müller (Wiley India Edition).

Course Code:	UDSO0614			L	T	P	Credit
Course Name:	Python for Data Science			3			3

Course Prerequsites:

Basic Knowledge of Programming

Course Description:

This course is intended to understand the basic concepts related to python for data science involved by data manipulation, cleaning, preparation, and visualization.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Identify the need for data science and solve basic problems using Python built-in data types and their methods.
CO2	Employ efficient storage and data operations using NumPy arrays
CO3	Apply powerful data manipulations, data pre-processing and visualization using Pandas.
CO4	Design an application with user-defined modules and packages.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	2	2	1		1							1	1	1
CO3	1	2	1	2	2							2	2	3
CO4	1	1	1											

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	Background & Introduction	8 Hours

Python for Data Analysis, essential python libraries, Installation and setup of different operating systems, important development environments (IDEs) and text editors, brief background of python, decision structures and Boolean logic, looping, built-in data types, and functions.

UNIT 2	Files, Input-Output, Errors, and Exceptions	8 Hours

File objects, file built-in functions, file built-in methods, file built-in attributes, standard files, command-line arguments, file system, file execution, exception in python, detecting and handling exceptions, standard exceptions.

UNIT 3	Introduction to Numpy	8 Hours

NumPy basics: arrays and vectorized computation- the NumPy ndarray, creating ndarrays, data types for ndarrays, arithmetic with NumPy arrays, basic indexing and slicing, boolean indexing, transposing arrays and swapping axes, universal functions: fast element-wise array functions, mathematical and statistical methods, Sorting, unique and other set logic

UNIT 4	Data Manipulation with Pandas	8 Hours

Introduction to pandas data structures: series, dataframe, essential functionality- dropping entries, indexing, selection, and filtering, function application and mapping, sorting and ranking, summarizing and computing descriptive statistics, unique values value counts, and membership, reading and writing data in text format.

UNIT 5	Data Cleaning and Preparation	5 Hours

Handling missing data-filtering out missing data, filling in missing data, data transformation-removing duplicates, transforming data using a function or mapping, replacing values, detecting and filtering outliers, string manipulation, vectorized string functions in pandas.

UNIT 6	Plotting and Visualization	5 Hours

Matplotlib and libraries, figures and subplots, colors, markers and line styles, ticks, labels, and legends, Annotations and drawing on a subplot, saving plots to file, plotting with pandas-line plot, bar plot, histogram and density plots, scatter and point plots.

Text Books:

1.Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.
2. WesLey J. Chun, "Core Python Programming", Second Edition, Pearson Education, 2010.

Reference Books:

Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Course Code:	UAMC0631				L	T	P	Credit
Course Name:	Machine Learning Lab						2	1

Course Prerequsites:

Python Programming Language

Course Description:

Study and implement Machine Learning Concepts.

Course Outcomes:	**After the completion of the course the student will be able to -**
CO1	Demonstrate, visualize, analyze and preprocess the dataset from a real-time source.
CO2	Apply appropriate Machine learning algorithms to the data.
CO3	Analyze the results of algorithm and convert to appropriate information required for the real – time application

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1				2			2	2	2
CO2	2	2	2	2	2				2			2	2	2
CO3	2	3	3	3	2				2			2	2	3

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/Assignments/Group Discussions/Internal oral
2	ESE(POE)	100%	Assesment is based on practicle oral performance

Course Contents:

EXPERIMENT NO. 1	2 Hours

Write a program for Linear & Multi-Linear Regression

EXPERIMENT NO. 2	2 Hours

Write a program for Naïve Bayes classifier

EXPERIMENT NO. 3	2 Hours

Write a program to implement Decision trees – ID3

EXPERIMENT NO. 4	2 Hours

Write a program to implement Decision trees- CART

EXPERIMENT NO. 5	2 Hours

Write a program to implement Logistic regression.

EXPERIMENT NO. 6	2 Hours

Write a program to implement Support Vector Machines

EXPERIMENT NO. 7		2 Hours
Write a program to implement Artificial Neural networks		

EXPERIMENT NO. 8		2 Hours
Write a program for K-Means clustering		

EXPERIMENT NO. 9		2 Hours
Write a program for K Nearest neighbor algorithm		

EXPERIMENT NO. 10		2 Hours
Write a program for Random – forest ML algorithm		

PROGRAM BASED LEARNING (PBL)

A team may include to a maximum of 4 members.
1. Concepts studied in the subject to be used.
2. Down to earth application and innovative idea should have been attempted.
3. Report in Digital format with all evaluations and analysis to be submitted.
Assessment on a continuous basis with a minimum of 3 reviews.
Sample project domains:
1. Healthcare
2. E-Learning
3. Smart village
4. Smart agriculture Image recognition

Text Books:

 1. Machine Learning Aurelien Geron , " Hands on Machine Learning with Scikit -learning , Keras & Tensorflow ",Concepts , Tools & Techniques to build Intelligent systems , O'Reilly Media
2. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Dos, "Machine Learning", 1 st edition, Pearson, 2019.
3. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", 1st Edition, O'Reilly Media, 2017

Course Code:	UDSC0632		L	T	P	Credit
Course Name:	Natural Language Processing Lab				2	1

Course Prerequsites:

Python Programming , Machine Learning

Course Description:

Study and implement Deep Learning Concepts.

Course Outcomes: After the completion of the course the student will be able to -

CO1	List the capabilities and limitations of current natural language technologies
CO2	Explain linguistic phenomena with formal grammars
CO3	Explain, implement and test algorithms for NLP problems
CO4	Apply NLP techniques to design real world NLP applications

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	2								2	2
CO2	1	1	1	2	2								2	2
CO3	2	1	1	2	2								2	2
CO4	2	1	2	2	2								2	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	100%	Quiz/Assignments/Group Discussions/Internal oral
2	ESE(POE)	100%	Assesment is based on practicle oral performance

Course Contents:

EXPERIMENT NO. 1	2 Hours

Perform Pre-processing (Tokenization, Scrip validation, Stop Word removal and Stemming) of text.

EXPERIMENT NO. 2	2 Hours

Study and Implementation of Morphological analysis (Stop word removal).

EXPERIMENT NO. 3	2 Hours

Study and implementation of POS Tagging.

EXPERIMENT NO. 4	2 Hours

Implement Chunking to extract Noun Phrases.

EXPERIMENT NO. 5	2 Hours

Study and implement N–Gram Language Model.

EXPERIMENT NO. 6	2 Hours

Study and Implementation of NER (Name Entity Recognition).

EXPERIMENT NO. 7		2 Hours

Identify Semantic Relationships Between the Words from Given Text.

EXPERIMENT NO. 8		2 Hours

Study on Reference Resolution Algorithm

EXPERIMENT NO. 9		2 Hours

Study Wordnet-Lesk Algorithm

EXPERIMENT NO. 10		2 Hours

One real life Natural Language Application to be Implemented (Use Standard Datasets Available on the Web)

Project :

1. A team may include to a maximum of 4 members.
2. Concepts studied in the subject to be used.
3. Down to earth application and innovative idea should have been attempted.
4. Report in Digital format with all evaluations and analysis to be submitted.
5. Assessment on a continuous basis with a minimum of 3 reviews.

Text Books:

1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal,
Prentice Hall, 2016.
3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech
Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
5. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley

Reference Books:

Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson
Education, 2009

Course Code:	UDSC0651			L	T	P	Credit
Course Name:	MiniProject-III					2	2

Course Prerequsites:

Knowledge of Software Development Tools and Technologies.

Course Description:

In this mini project, the students will apply multi-course environment for solving different real-world problems. The students shall use the concepts they have learned in their previous & the courses they are learning in the current semester and students will develop a solution to an identified problem.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Identify real world problems which can be solved using CS concepts and technologies.
CO2	Describe the proposed solution to the real world problem using technical report.
CO3	Implement the proposed solution using Computer Science & Engineering techniques.
CO4	Build a detailed project report.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1		2	1	1			2		1	1
CO2	2	2	2		2	1	1	2	3	2	1	1	2	1
CO3	2	2	2		2	1	1	3	3	2	1	2	2	2
CO4	2	1						1		1	2	1		

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE 1	50%	Problem Statement, SRS, Design
2	ISE2	50%	Implmentation, Presentation, Demo

Course Contents:

Guidelines for Mini Project -I

• The primary objective of the mini project-I is to achieve multi course real world problem-based learning.

• Course Instructor shall form the project team of 3 to 4 students in the batch of students

• Each team shall use the knowledge they learned in the previous courses to identify the real world problem and solve using learnt technology

• The solution shall be using the tools & techniques from multiple courses - e.g a solution shall be using data structures, Computer Networks, Data Science and ML modeling to develop mini project.

Guidelines for Evaluation

The evaluation shall be done in two phases

o Phase 1 ISE-1 In ISE 1 the students shall be graded based on the skills demonstrated to identify the problem statement, define the problem statement & Designing its solution. The partial working model is expected to be completed.

o Phase 2 ISE-2 In ISE 2 the students shall be graded based on the complete project implementation and its working. Followed by the detailed project report which shall cover the technical aspects of the project.

• Its recommended to share a common project report format to all batches.

• All course instructors shall coordinate and work towards common evaluation process.

• Course instructors shall demonstrate and discuss sample case studies with students to help them understand

Course Code:	UDSA0661		L	T	P	Credit
Course Name:	Communication and Personality Development		2	-	-	2

Course Prerequsites:

Communication Skills, Communication Skills-Practice

Course Description:

The present course is the subsequent part of the course Communication Skills studied in FY Sem-I. Assuming that the

Course Outcomes: **After the completion of the course the student will be able to -**

CO1	Comprehend the employment skills to have an effective first impression
CO2	Construct effective technical reports and business proposals
CO3	Illustrate various presentation skills and present oneself professionally
CO4	Use various interpersonal skills as per the need of situation and context

CO-PO Mapping:

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1								2	2	3	1	1		
	CO2					2			2	2	3	1	1		
	CO3					3			2	2	3	1	1		
	CO4								2	2	3	1	1		

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

UNIT 1	**Employment Communication**	**6 Hours**

Covering letter and resume, Group discussion,Interviews

UNIT 2	**Technical report writing**	**4 Hours**

Importance of reports, objectives, characteristics,Types/categories, formats (Manuscript, memo, letter, Structure/elements of manuscript reports

UNIT 3	**Presentation skills**	**4 Hours**

Techniques of effective professional presentations, collaborative/team presentations, Team presentation of a technical report using ICT tools

UNIT 4	Business Meetings	2 Hours

Types of meetings, strategies of conducting meetings effectively,Documentation (notice, agenda, minutes)

UNIT 5	Business proposals	2 Hours

Types, components, format, layout and design,Key elements of winning business proposals

UNIT 6	Interpersonal skills	10 Hours

Human values and professional ethics,Developing personality,Self esteem: Know thyself ,Attitude building, Emotional Intelligence,Teamwork,Leadership,Time management ,Netiquette

Text Books:

1.Communication Skills by Meenakshi Raman and Sangeeta Sharma, Oxford University Press (OUP), 2013.
2.Business Communication by S. Kalia and S. Agarwal, Wiley, 2015.
3.An Introduction to Professional English and Soft Skills by Das et al, Cambridge University Press, 2012.

Reference Books:

1.Business Communication by Urmila Rai and S.M. Rai, Himalaya, 2014.
2.Business Correspondence and Report Writing by R.C. Sharma and Krishna Mohan, Tata McGraw Hill, 2007.
3.Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP, 2013.
4.Business Communication by Raymond Lesikar et. al., McGraw Hill, 2015
5.Soft Skills by K. Alex, S. Chand and Company, 2013
6.Personal Development for Life and Work by Masters and Wallace, Cengage Learning, 2011.
7.Managing Soft Skills for Personality Development by B.N. Ghosh, Tata McGraw Hill, 2012.
8.Soft Skills by K. Alex, S. Chand and Company, 2014.