

**B.E CSE - (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
CURRICULUM**

Semester IV										
Course Code	Course Title	Category	Periods / Week				C	Maximum Marks		
			L	T	P	S		CIA	ES E	Total
Theory										
AGB1221	Computer Networks	PC	3	1	0	4	3	40	60	100
CGA1221	Probability and Statistics	BS	3	1	0	4	4	40	60	100
Theory Cum Practical/Practical Cum Theory										
ADB1221 /AGI1252	Fundamentals of Data Science (MKCE,KRCE) / Fundamentals of Data Science using R(KRCT)	PC	2	0	4	2	4	50	50	100
AMI1211/ AMB1221 / AGI1251	Machine Learning Fundamentals (MKCE)/Machine Learning Fundamentals (KRCE) / Data Visualization using Power BI(KRCT)	PC	2	0	4	2	4	50	50	100
CGB1221	Database Management Systems(TCPR)	PC	2	0	4	2	4	50	50	100
Practical										
GEA1211	Business Communication	HS	0	0	4	0	2	60	40	100
Mandatory/Employability Enhancement										
GEA1221	Career Skill Development III	HS	1	0	0	1	1	40	60	100
ADC13XX	Emerging Elective - I	EM	2	1	0	3	3	40	60	100

	Total Credits	25	
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Course Code	Course Title	Sem	Category	Periods / Week				C
				L	T	P	S	
AGB1221	COMPUTER NETWORKS	IV	PC	3	1	0	4	4
Pre-requisite	Data Structures	Course Type	Theory	QP TYPE				QP2
Course Objectives: This Course will gain the knowledge over performance analyzation of different physical layer technologies, enabling them to explore switching techniques, virtual LANs, and link layer addressing schemes. Examine multipath transport protocols and Network Function Virtualization in the transport layer.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								Max BTL
CO1	Explicate a deeper understanding of the interplay between OSI layers and their impact on overall system performance and reliability.							4
CO2	Implement switching techniques, and addressing schemes in networking devices and gain proficiency in configuring and managing VLANs.							4
CO3	Explicate the insights into QoS mechanisms, traffic shaping and admission control through network performance optimization techniques.							4/5
CO4	Explore multipath transport protocols and their applications in load balancing and fault tolerance.							5/6
CO5	Apply threat detection techniques and response mechanisms in networked environments.							4/5
								Max BTL
Syllabus								
Module I	FUNDAMENTALS OF COMPUTER NETWORKS AND PHYSICAL LAYER							4
Introduction to Computer Networks- OSI layers- Physical Layer Protocols Emerging Physical Layer Technologies- Network Performance Evaluation- Energy-Efficient Communication.								
Guided Self Study Topics								

• Networking Devices and Technologies • Network Protocols and Model • Network Security in the Physical Layer			
Module II	DATA LINK LAYER AND MEDIA ACCESS CONTROL	9	4
Frame Structure-Error Detection and Correction-Medium Access Control protocols-Virtual LANs -Link Layer Addressing Flow Control -Error Recovery and Retransmission, Transportation and Vehicle Networking, Cross- Layer Optimization in Data Link Layer Protocols.			
Guided Self Study Topics			
• Switching Techniques • Ethernet • Wireless LAN (WLAN) Technologies			
Module III	NETWORK LAYER	9	4/5
Routing Protocols, IP Addressing and Routing, Quality of Service and Traffic Engineering, Network Performance Analysis and Optimization, Overlay and Peer-to-Peer Networks, IPv6 Adoption and Transition Strategies, Content Delivery Networks and Edge Computing, Collaboration and Networking Opportunities.			
Guided Self Study Topics			
• IP Fragmentation and Reassembly • Networking Standards and Protocols • Mobile and Wireless Networking			
Module IV	TRANSPORT LAYER	9	5/6
Transport Layer Protocols, Transport Layer Performance Optimization, Multipath Transport Protocols, Network Function Virtualization in Transport Layer, High-Performance Computing and Data Center Networking, Transport Layer Security Enhancements.			
Guided Self Study Topics			
• Transport Layer for Mobile and Wireless Networks • Development of Transport Layer Security Standards			
Module V	APPLICATIONS WITH CURRENT TRENDS	10	4/5
Remote Access and Virtual Private Networks , IoT Applications and Smart Devices, Content Delivery Networks and Streaming Media, Cybersecurity Applications and Threat Detection			
Cybersecurity Orchestration and Threat Intelligence Platforms, Machine Learning for Network Optimization, AI-driven Network Management and Automation.			

Guided Self Study Topics	
• Networked Gaming and Entertainment • E-commerce and Online Transactions	
Total Hours 45	
Learning Resources:	
Text Books:	
1	Data Communications and Networking with TCPIP Protocol Suite, Behrouz A. Forouzan, 6th Edition, 3 August 2022.
2	"Computer Networking Problems and Solutions: An innovative approach to building resilient, modern networks" by Russ White and Ethan Banks, Addison-Wesley.
Reference Books:	
1	Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2018 William.
2	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Seventh Edition, Morgan Kaufmann Publishers Inc., 2018.
3	"Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, Pearson Education, Sixth edition 2016.

Course Code	Course Title	Sem	Category	Periods/ Week				C	
				L	T	P	S		
ADC1291	GENERATIVE AI FUNDAMENTALS AND DESIGN	IV	EM	2	1	0	3	3	
Prerequisite	NIL	Course Type	Theory	QP Type				QP1	
Course Objectives:									
This Course will comprehensively study generative AI models, particularly ChatGPT. The curriculum covers essential principles of Generative AI, prompt engineering, explainable AI, conversational AI, ChatGPT, and other large language models.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							BTL	
CO1	Build strong foundations in generative AI models, understanding their core principles and various types.							3	
CO2	Recognize the importance of explainable AI and distinguish between different approaches to achieve transparency in AI systems.							4/5	
CO3	Apply effective prompt engineering techniques to optimize performance and control the behavior of generative AI models.							4/5	
CO4	Develop a comprehensive understanding of ChatGPT, exploring its operational mechanisms, notable features, and limitations.							4/5	
CO5	Dive into the future of generative AI, identifying challenges and the necessary steps to unlock its full potential.							4/5	
Syllabus									
Module I	INTRODUCTION TO GENERATIVE AI							10	3
Introduction of Machine Learning & ML Algorithms-Brief History of the Evolution of AI-Machine Learning Algorithms in AI-How does AI Systems Work: How they Learn. The Definition and Objective of Generative AI-Generative AI vs Discriminative Intelligence.									
Self-Study Topics									
- Real-World Application of AI: Translation, Copywriting, Medicine, etc. - Current Major Players in GenAI Apps: OpenAI, MS, Meta, Google, etc.									

Module II	EXPLAINABLE AI and CONVERSATIONAL AI	9	4/5
Understanding Explainable AI and its Importance-Explainable AI in the Context of Generative Models-Role of Explainable AI in Trust and Transparency. Large Language Models (LLMs) & Conversational AI-Types of Conversational AI- Chatbot, VA, Text-to-speech, Speech Recognition.			
Self-Study Topics			
• Real-world Examples of Explainable AI • Applications of Conversational AI- Dialog flow, IBM Watson Assist., Azure Bot, e • Real-World Applications of Conversational AI- Marketing, Healthcare, Banking, etc.			
Module III	PROMPT ENGINEERING 9		4/5
Definition and Importance of Prompt Engineering-Basic Architecture and Components of a Prompt-Basic Prompt Engineering w/ ChatGPT-Prompting ChatGPT: Q&A; Summarize; Explain; Translate; & Completion-Design and Generation of Effective Prompts-Intermediate Prompt Engineering Techniques.			
Advance Prompt Engineering Techniques: COT, Priming, Transfer Learning-Exploring the Limitations of Prompt Engineering-Playground Parameter Options- Models, Temperature Chat-Playground Usage - Summarization, classification-Personalizing, and You ChatGPT.			
Self-Study Topics			
• Personalizing, and Your ChatGPT • Playground Parameter Options- Models, Temperature, Chat, etc. • Playground Usage - Summarization, classification. • Advanced Uses of ChatGPT: Outlines, Research; Business Plans, Code, etc.			
Module IV	LARGE LANGUAGE MODEL	8	4/5
Microsoft Bing AI-Google BardAI-Anthropic Claude-GPT4all - NomicAI, OpenChatKit, LLAMA- Introduction to fine-tuning- The Advantages-The Basic Steps in Fine-tuning ChatGPT.			
Data Preparation and Best Practices in Fine-tuning ChatGPT-Practical Examples of a Fine-Tuned ChatGPT-Evaluation and Troubleshooting a Fine-tuned ChatGPT Model-Responsible Data Usage and Privacy.			
Self-Study Topics			
• Mitigating Harm and Ensuring Ethical AI Deployment • The potential for misuse of ChatGPT models • Mitigating risks of using ChatGPT			
Module V	ADVANCE ChatGPT	9	4/5

Advance Uses of ChatGPT for NLP and ML-The Basics of ML in AI: Data mining, Knowledge Discovery, Analytics.	
Data-Centric AI for Optimizing GenAI-AI Techniques and Technologies for Innovation.	
Self-Study Topics	
• API Key • Open AI-SORA	
Total Hours 45	
Learning Resources:	
Text Books:	
1	Pam Baker," ChatGPT for Dummies (Computer/tech)), Edition 1, ISBN-13978-1394204632 for Dummies, 2023.

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
CGA1221	PROBABILITY AND STATISTICS	IV	BS	3	1	0	4	4
Pre-requisite	Statistical Theory, Differential and Integral Calculus	Course Type	Theory	QP TYPE				QP1
Course Objectives								
Understand the fundamental concepts of probability and statistical techniques used in engineering problems.								
Course Outcomes								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Solve Engineering problems with discrete and continuous random variables concepts.							
CO2	Apply two dimensional random variable concepts and central limit theorem in solving real time Engineering problems.							
CO3	Analyze and interpret relationships between variables.							
CO4	Apply various methods of estimation and Principal Component Analysis in Engineering problems.							
CO5	Analyse and improve the quality of products and processes on industrial experiments.							
Syllabus								
Module I	RANDOM VARIABLES AND MOMENT GENERATING							12
Random Variables-Discrete random variables - Moments - Moment generating functions Continuous random variables - Moments - Moment generating functions								
Guided Self-Study Topics								
Properties of Random Variables								
Module II	TWO - DIMENSIONAL RANDOM VARIABLES							12
Two Dimensional Discrete Random Variables-Joint distributions-Marginal distributions - conditional distributions – Covariance Two Dimensional Continuous Random Variables-Joint distributions-Marginal distributions -								

conditional distributions – Covariance - Transformation of two-dimensional Random Variables- Central Limit Theorem (CLT) (Statement Only) - Problems on CLT.		
Guided Self-Study Topics		
Transformation of one-dimensional Random Variables		
Module III	CORRELATION AND REGRESSION ANALYSIS	12
Correlation: Karl Pearson's Co-efficient of correlation-Rank Correlation-Repeated Rank Correlation-		
Regression: Lines of regression-Regression Coefficients- Relation between correlation and regression		
Guided Self-Study Topics		
Method of Least square		
Module IV	ESTIMATION THEORY AND PRINCIPAL COMPONENT ANALYSIS	12
Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of Moments.		
Principal Component Analysis: Introduction – Problems on PCA.		
Guided Self-Study Topics		
MLE asymptotics		
Module V	STATISTICAL QUALITY CONTROL	12
Control charts for measurements (X and R charts) – Tolerance limits - Acceptance sampling		
Control charts for attributes (p, c and np charts) - Tolerance limits - Acceptance sampling		
Guided Self-Study Topics		
ImR, XmR charts		
Total Hours		60
Learning Resources:		
Text Books:		
1	Johnson, R.A. and Gupta, C.B.,“Miller and Freund”s Probability and Statistics for Engineers”, Pearson Education, Asia, 9th edition, 2020.	
2	Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007	
Reference Books:		

1	Papoulis, A. and Unnikrishna Pillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
2	Devore. J.L., "Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2014.
3	Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4	Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
5	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
ADB1221	FUNDAMENTALS OF DATA SCIENCE	IV	PC	2	0	4	2	4	
Pre-requisite	Python Programming for Data Science	Course Type	TCPL	QP TYPE				QP1	
Course Objectives:									
Students will gain solid foundation in data science principles, techniques and tools, enabling them to tackle data-driven problems and make well-informed decisions based on insightful analysis and interpretation of data.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Analyze the intricacies of the data science process to gain a deeper understanding of its complexities and its significant impact on shaping modern society.							2/3	
CO2	Build the data for application along with a range of descriptive statistical methods and models across different scenarios.							3/4	
CO3	Build the data for utilization across a spectrum of inferential statistical methods and models for a variety of contexts.							3/4	
CO4	Develop applications leveraging NumPy to enhance numerical computing efficiency and data manipulation skills across diverse domains.							4	
CO5	Utilize Pandas to proficiently manipulate, explore, and analyze real- world datasets, extracting valuable insights effectively.							4	
Syllabus									
Module I	INTRODUCTION							6	2/3
Introduction to the Data Science - Benefits and Uses of Data Science – Facets Of Data The Data Science Process –Machine Learning – Handling Large Data.									
Guided Self Study Topics									
• Case study: Classifying Reddit posts									
Module II	DESCRIPTIVE STATISTICS							6	3/4

Introduction to Statistics - Frequency Distributions – Graphs – Describing Data With Averages– – Describing Variability			
Normal Distributions And Standard (Z) Scores - Describing Relationships: Correlation –Regression.			
Guided Self Study Topics			
• Retail Case Study Analysis			
Module III	INFERENCEAL STATISTICS	6	3/4
Populations and Samples – Probability - Sampling Distribution Of The Mean			
Introduction To Hypothesis Testing: The z test - More About Hypothesis Testing - Estimation: Confidence Intervals.			
Guided Self Study Topics			
• t Test for one sample : Gas Mileage Investigation			
Module IV	DATA HANDLING WITH NUMPY	6	4
The Basics of NumPy Arrays - Computation on NumPy Arrays: Universal Functions – Aggregations			
Computation on Arrays: Broadcasting - Comparisons, Masks, and Boolean Logic - Fancy Indexing - Sorting Arrays.			
Guided Self Study Topics			
• Open-Source Python Library: SciPy • Image manipulation and processing			
Module V	DATA MANIPULATION WITH PANDAS	6	4
Introducing Pandas Objects - Data Indexing and Selection - Operating on Data in Pandas Hierarchical Indexing - Combining Datasets: Concat and Append - Combining Datasets: Merge and Join - Group By: Split, Apply, Combine - Pivot Tables - Vectorized String Operations.			
Guided Self Study Topics			
• Stock Market Analysis			
List of Experiments			60
1.	Create a dataset in CSV file format that contains the scores of students in five different subjects: Maths, Science, History, English, and Geography. Find the relationships between these subjects by examining their correlation matrix. - Load the dataset named student_scores.csv into a NumPy array. - The dataset has 50 rows (representing 50 students) and 5 columns (representing the scores in each subject). - Compute the correlation matrix for the dataset.		

	iv. Plot the correlation matrix as a heatmap using Matplotlib. v. Ensure that the heatmap is visually appealing and includes proper labels for the subjects on both axes. vi. Interpret the correlation values and discuss the relationships between the subjects based on the heatmap.
2.	You are given the UCI Heart Disease dataset which contains various attributes such as age, sex, cholesterol levels, and others, along with a target variable indicating the presence or absence of heart disease. Your task is to build a logistic regression model to predict the presence of heart disease based on these attributes. i. Load the UCI Heart Disease dataset. ii. Perform necessary data preprocessing steps such as handling missing values and splitting the dataset into features (X) and target variable (y). iii. Split the dataset into training and testing sets with 80% of the data for training and 20% for testing. iv. Scale the features using standard scaling. v. Train a logistic regression model on the training data. vi. Evaluate the trained model on the testing data using accuracy, precision, recall, F1-score, and confusion matrix.
	You are provided with a dataset containing information about cancer-related deaths in the USA over the past few decades. Your task is to analyze the dataset and build a linear regression model to demonstrate the trend of increasing death rates due to cancer. i. Load the cancer dataset of the USA. ii. Explore the dataset to understand the features available and their significance in predicting cancer related deaths. iii. Perform any necessary data preprocessing steps such as handling missing values and feature selection. iv. Visualize the dataset to identify any trends or patterns related to cancer-related deaths over time. v. Split the dataset into features (independent variables) and the target variable (cancer- related deaths). vi. Train a linear regression model to predict cancer-related deaths based on the available features. vii. Evaluate the trained model's performance using appropriate metrics and visualize the regression line.
4.	Create a dataset as CSV file format, which contains employee details like empid, empname, designation then collect and display 25% of random sampling for the given dataset using python.

5.	Implement Z-test case study using python to identify whether Null hypothesis retained or rejected based on z score for the following parameters taken from heights of the persons in the particular district. Collect the random array of 40 persons height samples having mean 150 and standard deviation 10 with significance 0.05, mean value of Null hypothesis is 140. Prove that, whether the alternative hypothesis(heights of the persons) is greater than 140.
6.	You are provided with a dataset representing the monthly sales of a company's products over the past year. Perform the following operations using NumPy: - Load the dataset into a NumPy array and examine its shape. - Calculate the mean of the monthly sales. - Compute the sum of the monthly sales. - Find the product of the monthly sales. - Reshape the array to have 12 rows and 1 column. - Transpose the reshaped array to interchange rows and columns.
7.	Write a python program to perform below operations using Numpy. - Replace NaN values with average of columns. - Remove rows from the array which contains non-numeric values. - Check whether the array contains a specified row
8.	Create a python application for financial modeling and analysis using NumPy to analyze financial data, calculate risk measures, optimize investment portfolios, and simulate stock price movements using NumPy's array operations and mathematical functions.
9.	You are given a dataset containing information about student scores in different subjects over multiple semesters. The dataset is structured as a NumPy array where each row represents a student, and each column represents a subject. Perform below operations by the way of analyzing the given dataset NumPy. - Calculate the average score for each subject across all students. - Identify the student(s) with the highest and lowest average scores. - Determine the overall pass rate for each subject (assuming a passing score is 60 or above). - Calculate the correlation matrix between different subjects to identify any patterns or relationships. - Analyze the performance trend of students over the semesters. Are there any subjects where students consistently improve or decline in performance? - Determine the overall average score for each semester and visualize the trend over time. - Calculate the standard deviation of scores for each subject to measure the variability in student performance.

10.	You are given a dataset containing information about sales transactions for a retail store. The dataset includes columns such as "Date", "Product_ID", "Quantity", "Unit_Price", and "Customer_ID". Perform below operations by the way of analyzing the given dataset using corresponding python libraries. i. Find the total revenue generated by the store during the given time period. ii. Print the product(s) which has highest sales revenue. iii. Print the average quantity of products sold per transaction. iv. Analyze the monthly sales trend over the given time period. v. Visualize the correlation between the quantity of products sold and the unit price.	
Total Hours		90
Learning Resources:		
Text Books:		
1.	David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (Unit I).	
2.	Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017. (Unit II and III).	
3.	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016. (Units IV and V)	
4.	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem Solving, Packages and Libraries, Edition 1, Tata McGraw Hill, 2018.	
Reference Books:		
1.	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.	
2.	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
AGI1252	Fundamentals of Data Science Using R	IV	PC	2	0	4	2	4
Pre-requisite	R Programming for Data Science	Course Type	TCPR	QP TYPE				QP1
Course Objectives:								
This Course learn the foundational of statistical computing and data analysis using R, including data structures, loop functions, debugging, and object-oriented programming.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							BTL
CO1	Demonstrate how to install and configure R Studio							3
CO2	Apply OOP concepts in R programming							3/4
CO3	Analysis the use of data structure and loop functions							4/5
CO4	Analyse data and generate reports based on the data							4/5
CO5	Apply various concepts to write programs in R							4/5
Syllabus								
Module I	INTRODUCTION TO R						9+9	3
Introducing to R – R Data Structures– Help functions in R – Vectors– Scalars– Declarations recycling– Common Vector operations– Using all and any– Vectorized operations – NA and NULL values– Filtering– Vectorized if-then else– Vector Equality–Vector Element names.								
Guided Self Study Topics								
1. R Data Structures. 2. R Graphics. 3. R Statistics.								
Case Study Problems:								
1. Develop an interactive application using R for exploring a single variable dataset. Design the application with user-friendly interfaces and interactive features. i. Create an application that allows users to upload their dataset file (in CSV								

format) and visualize a single variable from the dataset. ii. Implement functionality to display summary statistics (mean, median, and standard deviation, minimum, maximum) of the selected variable. iii. Provide interactive plots including histograms, box plots, and density plots for visualizing the distribution of the data. iv. Design a user-friendly interface with clear instructions and intuitive controls for selecting the variable and customizing the plots. v. Ensure proper error handling and informative messages for cases such as invalid file format or missing data. vi. vi) Test the application with sample datasets and verify that it functions as expected. 2. Develop an application using R for smoothing time series data. The application should allow users to upload their time series dataset, apply different smoothing techniques, and visualize the original and smoothed time series plots. i. Create an application with a user-friendly interface that enables users to upload their time series dataset (in CSV format). ii. Implement functionality to apply different smoothing techniques such as moving average, exponential smoothing, and LOESS smoothing to the uploaded time series data. iii. Provide interactive controls for users to adjust the smoothing parameters (e.g., window size for moving average, smoothing factor for exponential smoothing). iv. Display both the original and smoothed time series plots on the same graph, with the option to toggle between different smoothing techniques. v. Ensure proper error handling and informative messages for cases such as invalid file format or missing data. vi. Test the application with sample time series datasets and verify that it functions as expected.			
Module II	Matrices, Array & List	9+9	3/4
Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns-Vector/Matrix Distinction – Avoiding Dimension Reduction–Higher Dimensional arrays Lists – Creating lists-General list operations – Accessing list components and values – applying functions to lists – recursive lists.			
Guided Self Study Topics			
Multivariate Analysis			
Case Study Problems			
1. Develop an application using R for exploring relationships between two variables in a dataset. The application should allow users to upload their dataset, select two			

variables for comparison, and visualize the relationship using scatter plots. - Develop an application with a user-friendly interface that enables users to upload their dataset (in CSV format). - Implement functionality to select two variables for comparison from the uploaded dataset. - Display a scatter plot showing the relationship between the two selected variables. - Provide interactive controls for users to customize the appearance of the scatter plot (e.g., point size, color). - Ensure proper error handling and informative messages for cases such as invalid file format or missing data. - Test the application with sample datasets and verify that it functions as expected. 2. Develop an application using R for exploring relationships between three variables in a dataset. The application should allow users to upload their dataset, select three variables for comparison, and visualize the relationship using 3D scatter plots. - Develop an application with a user-friendly interface that enables users to upload their dataset (in CSV format). - Implement functionality to select three variables for comparison from the uploaded dataset. - Display a 3D scatter plot showing the relationship between the three selected variables. - Provide interactive controls for users to customize the appearance of the 3D scatter plot (e.g., point size, color). - Ensure proper error handling and informative messages for cases such as invalid file format or missing data. - Test the application with sample datasets and verify that it functions as expected.			
Module III	Data Frames	9+9	4/5
Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames– Factors and Tables– factors and levels – Common functions used with factors -Working with tables - Other factors and table related functions.			
Guided Self Study Topics			
Dimensionality Reduction			
Case Study Problems			
Develop an application using R for creating scatter plot maps with trees and hierarchies. The application should allow users to upload their dataset, select			

variables for the X and Y axes, and visualize the scatter plot map with the option to include trees and hierarchies. - Upload the dataset (in CSV format). - Select variables for the X and Y axes from the uploaded dataset. - Provide interactive controls for users to customize the appearance of the scatter plot map (e.g., point size, color, shape). - Incorporate the option to include trees and hierarchies in the scatter plot map, allowing users to specify the hierarchical structure. 2. Develop an application using R for visualizing networks and graphs. The application should allow users to upload their dataset containing nodes and edges, customize the appearance of the network, and explore its structure interactively. - Upload the dataset (in CSV format) containing nodes and edges. Visualize the network/graph based on the uploaded dataset, allowing users to customize the appearance (e.g., node color, size, edge color, width).			
Module IV	CONTROL STATEMENT, FUNCTIONS, R GRAPH	9+9	4/5
Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues Writing Upstairs -Recursion – Replacement functions – Tools for composing function code– Math and Simulations in R Creating Graphs– Customizing Graphs – Saving graphs to files– Creating three- dimensional plots			
Guided Self Study Topics			
Data with dplyr package in R: manipulate, clean and summarize unstructured data			
Case Study Problems			
- Develop a user-friendly application in R that facilitates diverse data transformation tasks and provides visual representations of the transformed data. The application should enable users to: - Upload their dataset in CSV format. - Perform the following data transformation operations: - Filtering: Allow users to filter the dataset based on specified conditions. - Sorting: Enable sorting of the dataset based on selected columns. - Aggregation: Support aggregation of the dataset, including summarization and grouping. - Visualize the transformed data using interactive plots, tables, or summary statistics. - Develop an application which allows user to upload messy data, perform data cleaning and reshaping operations, and visualize the resulting tidy data. - Upload the dataset (in CSV format).			

ii. Implement functionality to clean and reshape the data into a tidy format using packages like dp lyr and ti dyr. iii. Provide interactive controls for users to customize data cleaning operations such as removing missing values, renaming columns and pivoting. iv. Visualize the original and tidy datasets in tabular format for users to compare.			
Module V	PROJECT SPECIMEN	18	4/5
1. Exploring movie recommendation system. 2. Exploring uber data analysis. 3. Analyzing fake news detection. 4. Exploring voice gender recognition. 5. Investigating credit card fraud detection.			
Total Hours			90
Learning Resources:			
Text Books:			
1.	Norman Mat off, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011		
Reference Books:			
1.	Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley, 2013		
2.	Robert Knell, “Introductory R: A Beginner's Guide to Data Visualization, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013		

Course Code	Course Title	Semester	Category	Periods / Week				C
				L	T	P	S	
CGB1221	DATABASE MANAGEMENT SYSTEMS	IV	PC	2	0	4	2	4
Pre-requisite	Data Structures	Course Type	TCPR	QP TYPE				QP1
Course Objectives: This course will provide comprehensive skills in designing and implementing enterprise-level databases by utilizing Entity Relationship Diagrams for effective modeling, applying normalization techniques to minimize data redundancy, ensuring transaction reliability through serializability and concurrency control mechanisms, exploring advanced database management systems for enhanced functionality and developing real-time applications.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							Max BTL
CO1	Design database for enterprise applications using Entity Relationship Diagrams.							4
CO2	Normalize databases to reduce cost due to data redundancy.							4
CO3	Apply serializability and concurrency control on database transaction.							4
CO4	Apply Advanced database management system.							4
CO5	Build a database for real-time problems.							6
Syllabus								Max BTL
Module I	DATABASE FUNDAMENTALS 6+9							4
Purpose of Database Systems – View of Data - Database System Architecture – integrity constraints – Entity Relationship Model – E-R Diagrams - Design Issues- Extended E-R Features. Introduction of Relational Databases- Relational Algebra. SQL data definition, SQL data manipulation, SQL Join.								
Guided Self Study Topics Data Models								
Case Study Problems a. Data Definition Commands, Data Manipulation Commands for inserting, deleting								

updating and retrieving Tables and Transaction Control statements.			
b. Database Querying– Simple queries, Nested queries, Sub queries and Joins.			
Module II	LOGICAL DATABASE DESIGN	6+9	4
Need for good database design – Functional Dependencies and Keys – Closure of Functional Dependencies Set –Closure of attributes - Dependency Preservation - Decomposition using functional dependencies – Canonical Cover .			
Normalization: First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Fourth Normal Form – Fifth Normal Form -Join Dependencies.			
Guided Self Study Topics			
Multi valued Dependencies - Decomposition using Multi valued dependencies			
Case Study Problems			
a) Database Design using ER Modelling.			
b) Procedures and Functions.			
Module III	TRANSACTION	6+9	4
Transaction Model– ACID properties – Transaction States - Serializability - Conflict Serializability – View Serializability– Testing Serializability.			
Concurrency control: Lock-based protocols – Locks, granting of locks, The two-phase locking protocol, implementation of locking, Time stamp based protocol. Deadlock handling: Deadlock prevention, Deadlock detection and recovery.			
Guided Self Study Topics			
Graph-based protocols.			
Case Study Problems			
a. Triggers			
b. Exception Handling			
Module IV	ADVANCED DATA BASE	6+9	4
Distributed Databases: Architecture, Data Storage, Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, OQL.			
XML Databases: Structured, Semi structured, and Unstructured Data, XML Hierarchical Model, DTD, XML Schema, XQuery			
Guided Self Study Topics			
ODL, Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.			
Case Study Problems			
a. Implementation of XQuery			
Module V	Project Specimen	15	6
1. Library management system			

2. Student management system	
3. College management system	
4. Company management system	
Total Hours	
75	
Learning Resources:	
Text Books	
1	HenryF Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGrawHill, Seventh Edition, 2021.
2	R.Elmasri, S.B.Navathe, "Fundamentals of Database Systems" ,Pearson Education /Addison Wesley, Sixth Edition, 2010.
3	Dr.Sanjeev Sharma , Jitendra Agrawal , Shikha Agrawal. " Advanced Database Management System" , Dreamtech Press, 2017.
Reference Books:	
1	Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, Fifth Edition, 2009.
2	C.J.Date,A.KannanandS.Swamynathan,"AnIntroductiontoDatabaseSystems",Pearson Education,EighthEdition,2006
3	RaghuRamakrishnan, JohannesGehrke, "DatabaseManagement Systems", McGrawHill, ThirdEdition,2004.

Course Code	Course Title	Semester	Category	Periods/Week				C
				L	T	P	S	
AMI1211	MACHINE LEARNING FUNDAMENTALS	IV	PC	2	0	4	4	4
Pre-requisite	Python Programming	Course Type	TCPR	QP TYPE				QP1
Course Objectives:								
The main purpose of machine learning is to discover patterns in user data and then make predictions based on these and complex patterns to answer business questions and solve business problems. Machine learning helps analyze the data and identify trends.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Characterize the machine learning algorithms as supervised learning and unsupervised learning, and apply and analyze the different algorithms of supervised and unsupervised learning							
CO2	Analyze and apply various cloud programming models to solve problems on IBM Cloud							
CO3	Apply difficult real-world problems in a state space representation to solve them using NLP techniques such as IBM Watson tools.							
CO4	Apply IBM Watson Machine Learning, you can deploy models, scripts, and functions, manage your deployments.							
CO5	Gain a foundational understanding of a subject or tool and Develop job-relevant skills with hands-on projects							
Syllabus								
Module I	INTRODUCTION TO MACHINE LEARNING							9+9
Machine Learning Introduction- Types of Machine Learning -Supervised, Unsupervised, and Reinforcement- Overfitting and Regression Classification-Clustering-Parametric vs non-Parametric Models-Linear model.								
Self-Study Topics								
Feature Engineering in Machine Learning- Cross-Validation Techniques- Ensemble Learning Methods- Transfer Learning Concepts-Anomaly Detection in Machine Learning								

Module II	INTRODUCTION TO IBM CLOUD & WATSON STUDIO	9+9
Introduction to IBM Cloud: Resources- IBM Cloud Infrastructure- Security- IBM Cloud Foundry- Cloud Park for data- IBM Cloud vs Amazon Cloud - Cloud Native Storage and Data Service- Introduction to Watson Studio: Project creation- Storage- Access control- Prebuilt Watson application Watson Solutions: Catalog and govern data- Watson knowledge studio and Watson knowledge catalog- Watson Discovery Services-Watson Auto AI: Watson Open Scale-visual recognition- Watson API.		
Self-Study Topics		
Innovative Applications of Watson Studio in AI Projects- Project Management Collaboration in AI Development- Custom Machine Learning Models: Techniques and Applications Preparation Mastery: Advanced Techniques for Model Success- Integration Strategies: Enhancing AI Projects with Other IBM Cloud Services		
Module III	NATURAL LANGUAGE PROCESSING	9+9
Natural Language Processing using Watson Studio- Visual recognition Models using Watson Studio - NLP Introduction- Natural Language Understanding (NLU) Conversational AI- Building blocks of chatbot- Watson Assistant- Speech to Text -Text to Speech		
Self-Study Topics		
Python Flask: Beyond Basics - Advanced Web Service Deployment- Unleashing the Full Potential of Watson Knowledge Catalog- Watson Studio Project Lifecycle: Administration and Optimization - Data Refinery Mastery: Techniques for Efficient Data Preparation		
Module IV	ADVANCED DATABASE	9+9
Deploying apps using Python Flask- Watson Knowledge Catalog- Creating Projects- Administering Projects Data refinery - Preparing the data, Streams flow- Using Notebooks in Watson Studio- Decision Optimization.		
Self-Study Topics		
Python Flask: Advanced Techniques for Dynamic Web Applications- Optimizing Data Management with Watson Knowledge Catalog- Watson Studio Project Administration: Best Practices		
Module V	PROJECT SPECIMEN	18
Predictive Maintenance for Cloud Resources- IBM Cloud DevOps Automation with Security Measures for Hybrid Cloud Environments- Watson Studio Collaborative Data Science		

Project with Advanced Model, House Price Prediction Using Linear Regression, Spam Email Classification Using Naïve Bayes, Sentiment Analysis on Social Media Posts		
Total Hours		90
Learning Resources:		
Text Books		
1	T1: IBM Course Ware	
Reference Books		
1	Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning)ll, The MIT Press 2004.	
2	Stephen Marsland, —Machine Learning: An Algorithmic Perspectivell, CRC Press, 2009.	

Course Code	Course Title	Sem	Category	Periods/Week				C	
				L	T	P	S		
AMB1221	MACHINE LEARNING FUNDAMENTALS	IV	PC	2	0	4	2	4	
Pre-requi site	PYTHON PROGRAMMING FOR MACHINE LEARNING	Course Type	TCPR	QP Type				QP1	
Course Objectives:									
To comprehend the ideas of machine learning, its mathematical underpinnings, myriad issues it addresses. Inculcating various facets of reinforcement, supervised and unsupervised learning, along with fundamental ideas behind deep learning and neural networks.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Understand the mathematical and statistical perspectives of machine learning algorithm and list the issues with each kind of machine learning.							3	
CO2	Create and relate various supervised algorithms to solve real time complex problems and create a random forest and decision tree for a given application.							4	
CO3	Explore a diverse landscape of machine learning techniques, from clustering algorithms like K-Means, hierarchical methods such as AGNES and DIANA, to classification approaches like KNN.							4/5	
CO4	Construct an HMM for a Sequence Model application and find applications that make sense for various machine learning modalities and provide appropriate context.							4/5	
CO5	Create solutions for various real-world problems using the concepts of Machine Learning in Python Programming.							5/6	
Syllabus									
Module I	OVERVIEW AND FUNDAMENTAL MATHEMATICS							12	3
Introduction and Motivation for Machine Learning; Definitions - History – Need – Applications - Challenges - Advantages, Disadvantages - Types of Machine Learning Problems – Mathematical Foundations - Linear Algebra & Analytical Geometry Probability and Statistics - Bayesian Conditional Probability - Vector Calculus &									

Optimization - Decision Theory.			
Guided Self Study Topics			
• Sentiment Analysis • Music Recommendation			
Case Study			
Integrating OCR into ERP system to handle critical business functions also to leverage data from document scans and reduce its manual processing and entry because it was taking much time. The major challenge was to capture and retrieve data from photo scans that often vary in orientations, positions, colours, backgrounds, and lighting conditions. This will find out how to use facial recognition to identify an individual's face in the driver's license photo or any other document scan. Write a case study using computational intelligence techniques to deliver a service that helps recognize objects in the image scans and determine what data needs to be derived. Investigate the feasibility of extracting and recognizing text fields such as name, surname, ID, valid from/to from driver's licenses from DMV databases, business cards, ID books, and smart cards using OCR. When it comes to leveraging data, these types of documents are uneasy to deal with. In this case, facial recognition comes to aid and helps derive data from damaged driver's licenses or blurred ID books.			
Module II	SUPERVISED LEARNING ALGORITHMS	12	4
Introduction - Regression: Linear Regression - Multiple Linear Regression - Lasso Regression - Logistic Regression - Gradient Linear Models - Discriminative and Generative Models - Under-fitting / Over-fitting - Cross-Validation Support vector machines: Linear and Non-Linear - Kernel Functions - K-Nearest Neighbours - Decision Trees: ID3 - Classification and Regression Trees (CART) – Random Forest.			
Guided Self Study Topics			
• Stock Prediction • Email Spam Filtering • Autonomous Vehicles			
Case Study			
The Client operates in the Smart TV digital home entertainment market. It's a leading premium video-on-demand service, which allows users to watch newly released movies in perfect quality or choose from a library of more than 7000 titles. Their Smart TV application has 1.5 million monthly active users. In order to improve customer experience and drive more sales from the recommendation page, the Client decided to build a recommendation engine that would offer up-to-date personalized movie recommendations for every user. Write a case study to custom movie recommendation engine powered by machine learning for			

• improving customer experience by offering personalized movie recommendations • helping customers find desired movies faster • improving visitor-to-customer conversion rate		
Module III	UNSUPERVISED LEARNING ALGORITHMS AND REINFORCEMENT LEARNING	12 4/5
Introduction - Clustering Algorithms – K-Means – Hierarchical Clustering – AGNES - DIANA - KNN - Dimensionality Reduction - Principal Component Analysis Recommendation Systems - EM algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning.		
Guided Self Study Topics		
• Recommender systems • Market Research		
Case Study		
A revamped AI-based fitness coaching app was expected to support working with large amounts of data on user health and fitness activities stored in the Client's database. Also, this app was anticipated to function as a fitness and health recommender system generating related personalized recommendations. Write a case study to solve this problem using suitable machine learning techniques for building predictive analytics module and enable exploratory data analysis.		
Module IV	PROBABILISTIC METHODS AND ENSEMBLE LEARNING	12 4/5
Introduction -Naive Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Inference in Bayesian Belief Networks Probability Density Estimation - Sequence Models - Markov Models - Hidden Markov Models - Ensemble Learning Model Combination Schemes: Voting - Bagging - Boosting - Adaboost - Stacking.		
Guided Self Study Topics		
• Text Classification • Speech recognition		
Case Study		
Dogs of the same breed look practically the same. Many dogs of one particular breed can be difficult to tell apart. In case there are several listings of Alaskan Malamute in the app, an algorithm struggles to recognize the faces of dogs without good facial technology. Write a case study to solve this problem, by collecting datasets of dog breed images and use appropriate technique for training, learning algorithm as well as test them to identify the dog.		
Module V	PROJECT	12 5/6

1. Skin Cancer Detection 2. Hate Speech Detection 3. Traffic Signs Recognition	
Total Hours 60	
Learning Resources:	
Text Books:	
1.	Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Chapman & Hall/CRC, 2nd Edition, 2014.
2.	Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3.	Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014.
Reference Books:	
1.	Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.
2.	Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
3.	Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
AGI1251	Data Visualization Using Power BI	IV	PC	2	0	4	2	4	
Pre-requisite	Data Analytics	Course Type	TCPL	QP TYPE				QP1	
Course Objectives:									
This course helps learners master Power BI, including how to connect, transform, and organize data. They will use DAX for analysis, create interactive charts, and apply advanced tools to find insights.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Develop proficiency in data modelling and structuring using Power BI tools.							4	
CO2	Demonstrate the ability to create new measures and calculations to enhance data analysis using DAX.							4	
CO3	Apply cardinality reduction and query optimization techniques to enhance direct query model performance.							4/5	
CO4	Utilize advanced analytics features to identify outliers and perform time series analysis.							4/5	
CO5	Create visually appealing dashboards using Power BI reports and widgets.							4/5	
Syllabus								Max BTL	
Module I	Introduction							6	4
Introduction to Power BI – Terminologies and Interfaces – Connecting Data Sources – Importing Data – Files, Databases, Web URLs, Google sheets Data Modelling – Query Editor - Data Transformations – Data Structure Enhancement.									
Guided Self-Study Topics									
- Importing vs. Direct Query - Power BI Mobile									
Case Study Problems:									
Dive deeper into data modeling concepts such as star schema, snowflake schema, and relationships in Power BI. Practice creating complex relationships and managing them									

effectively.			
Module II	Data Profiling Using DAX	6	4
Data Anomalies – Interrogate Column Properties - Data Statistics Overview of DAX – DAX Functions – DAX Calculations Types - Types of DAX Functions – Demo on DAX Functions – DAX to create new measure.			
Guided Self-Study Topics			
- Filtering & Conditional DAX - Virtual Tables & Iterators:			
Case Study Problems			
Experiment with outlier detection techniques and implement them in Power BI using DAX calculations.			
Module III	Data Visualization and Model Performance Optimization	6	4/5
Working with Visuals – Creating Tables, Cards, Tree map – Scatter plots, Donut Charts – Waterfall Chart, Gauge Chart – Custom Visuals Creating Mobile Layout - Data Model Performance Optimization - Cardinality Reduction - Optimize Direct Query Model - Query Diagnostics.			
Guided Self-Study Topics			
- Custom visuals from Power BI Marketplace - Designing dashboards for mobile view			
Case Study Problems			
Explore techniques for improving query performance, minimizing data latency, and optimizing data source queries.			
Module IV	Advanced Analytics and Publishing Power Bi	6	4/5
Sorting and Grouping Data – Types, Levels of filters – Creating Interactivity, Conditional Formatting – Advanced Analytics: Identify Outliers, Conduct Time Series Analysis Grouping and Binning - Key Influencer Visual - Decomposition Tree Visual- Publishing and Sharing Dashboards - Schedule Refresh.			
Guided Self-Study Topics			
- Trend Analysis with Outlier Detection - Decomposition Tree			
Case Study Problems:			
Key Influencer Analysis: Practice conducting key influencer analysis on sample datasets and interpreting the results.			
Module V	Creating Dashboards Using Power BI	6	4/5
Managing Datasets – Dataset Scheduled Refresh - Incremental Data Refresh Settings –			

Promote Power BI Datasets	
Creating Dashboards using Reports – Adding Widgets to Dashboard –Exploring Queries - Setting Gateway for Auto Refresh – PROJECT: Data Manipulation and Reporting with Power BI.	
List of Experiments	
	4/5
1.	Connect to a sample CSV file and import it into Power BI. Explore different options available during the connection process.
2.	Use Query Editor to perform basic data transformations such as renaming columns, removing duplicates, and changing data types.
3.	Explore various DAX functions such as SUM, AVERAGE, MAX, MIN, and COUNT ROWS. Use them to calculate statistics for different columns.
4.	Utilize DAX to create new measures for calculating metrics like total sales, average order value, and customer retention rate based on provided datasets.
5.	Create a dashboard containing tables, cards, and tree maps to visualize sales data from a sample dataset.
6.	Build scatter plots and donut charts to analyze the distribution of sales across different product categories.
7.	Optimize the data model by reducing cardinality and improving query performance. Use techniques like summarization and aggregation to enhance model efficiency.
8.	Identify outliers in sales data using advanced analytics techniques and visualize them using appropriate charts like box plots.
9.	Create a comprehensive dashboard using reports and widgets to present key metrics and insights derived from the dataset.
10.	Set up a gateway for auto-refresh to enable seamless data updates and ensure data integrity in the dashboard.
Total Hours	
75	
Learning Resources	
Text Books	
1.	Brett Powell, “Mastering Microsoft Power BI”, Packt Publications, 2018.
2.	Alberto Ferrari, “Introducing Microsoft Power BI”, Microsoft Press Publications, 2016.
3.	Greg Deckler, “ Learn Power BI A beginner's guide to developing interactive business intelligence solutions using Microsoft Power BI ”, Packt Publications, 2019.
Reference Books	
1.	Soheil Bakhshi, “Expert Data Modelling with Power BI”, 2nd edition, Packt Publications, 2023.

Course Code	Course Title	Sem	Category	Periods / Week				C
				L	T	P	S	
GEA1211	Business Communication	III / IV	HS	0	0	4	0	2
Pre-requisite	Nil	Course Type	Practical	QP TYPE				ASPR
Course Objectives								
Ensure unambiguous communication flow in the work environment.								
Course Outcomes								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							Max BTL
CO1	Identify the key principles in business communication.							4
CO2	Comprehend discourse such as conversations, interviews, and discussions.							4
CO3	Incorporate appropriate vocabulary to express ideas precisely.							4
CO4	Draw inferences relying on the context.							4
CO5	Highlight the educational background, achievements and goals in an impressive manner.							4
Syllabus								
List of Exercises								
1	Soft Skills and Hard Skills							
2	Psychometric Test (Situational Judgement)							
3	SWOC Analysis							
4	Listening to the interviews of Scientists and Engineers							
5	Listening to TED talks							
6	Listening to TOEFL and IELTS practice test audios							
7	Personal Introduction							
8	Group Discussion							
9	Mock Interview							
10	PPT presentation (Advancements in the field of Science and Technology)							

11	Public Speaking (Speaking on the current issues)
12	Interpersonal Communication (Situation based)
13	Reading Scientific Articles
14	Comprehension of Science Text
15	Job Application Letter and Curriculum Vitae
16	Statement of Purpose (SoP)
Total Hours	
60	
Learning Resources:	
Text Books:	
1	Mable Chan. English for Business Communication. India: Routledge. 2020.
2	Dr. Vinod Mishra, Dr. Narendra Shukla and Dr. Ranjana Patel. Business Communication. India: SBPD Publishing House. 2015.
Reference Books:	
1	Mary Ellen Guffey. Essentials of Business Communication. USA: South Western Educational Publishing. 2013.
2	Courtland L. Bovee and John V. Thill. Business Communication Essentials: International Edition. London. 2009

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
GEA1221	Career Skill Development III	IV	HS	1	0	0	1	1	
Pre-requisite	NIL	Course Type	Theory	QP TYPE				QP1	
Course Objectives:									
Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions. Students will be able to Gain self-competency and confidence.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Strengthen their out of the box thinking & logical ability.							4	
CO2	Recognition of errors with proper usage of vocabulary and enhancing comprehending skills.							3	
CO3	Improve taking into consideration effective ways of implementing ones ideas in a business scenario with effective time management.							4	
SYLLABUS								Max BTL	
Module I	QUANTITATIVE APTITUDE AND REASONING							15	4
Alligations or Mixtures - Time and Work & Pipes & Cistern – Ages – Probability - Syllogism - Blood Relation									
Module II	VERBAL ABILITY							5	3
Reading Comprehension, One Word Substitution & Paraphrasing, Sentence Completion & Sentence correction									
Module III	SOFT SKILLS							10	4
Transition to Corporate World – Corporate Etiquette, Resume Building, Linked-in Optimization & Professional Networking, Goal Setting									
Total Hours								30	

Learning Resources	
Text Books	
1	Placement Training Companion (Career Skill Development Paper – III) 1E, Pearson Publication
Reference Books:	
1	Dr.R.S.Aggarwal, “Quantitative Aptitude”, S. Chand & Company Limited, 2022
2	Dr.R.S.Aggarwal, “A Modern Approach to Verbal & Non - Verbal Reasoning”, S. Chand & Company Limited, 2022
3	Nishit K. Sinha Quantitative Aptitude & Verbal Ability 6E, Pearson Publication

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
ADC1292	SOCIAL INTELLIGENCE AND ANALYTICS	IV	EM	2	1	0	3	3	
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP 2	
Course Objective									
This Course will understanding to analyze and navigate the pivotal role and significance of digital marketing within the dynamic landscape of modern business.									
Course Outcomes									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Explore the role and importance of digital marketing in today’s rapidly changing business environment.							4	
CO2	Analyze various principles and techniques of SEO to enhance website visibility and search engine rankings for businesses and organizations.							4	
CO3	Demonstrate comprehensive proficiency in conceptualizing and optimizing email marketing campaigns to drive customer engagement and retention in the digital landscape.							4/5	
CO4	Develop effective strategies, cultivate brand presence and drive meaningful engagement across various social platforms for various businesses and organizations.							5/6	
CO5	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.							4/5	
Syllabus								Max BTL	
Module I	INTRODUCTION TO ONLINE MARKET							9	4
Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website Planning and Creation - Content Marketing.									
Guided Self Study Topics									

Ethical and Legal Considerations.			
Module II	SEARCH ENGINE OPTIMIZATION	9	4
Search Engine optimization - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing How Search Engine works- SEM components- PPC advertising -Display Advertisement.			
Guided Self Study Topics			
SEO Tools.			
Module III	E- MAIL MARKETING	9	4/5
E- Mail Marketing - Types of E-Mail Marketing - Email Automation - Lead Generation – Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.			
Guided Self Study Topics			
Emerging Trends and Innovations.			
Module IV	SOCIAL MEDIA MARKETING	9	5/6
Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful/benchmark Social media campaigns. Engagement Marketing- Building Customer relationships- Creating Loyalty Drivers - Influencer Marketing.			
Guided Self Study Topics			
Platform-specific Strategies.			
Module V	DIGITAL TRANSFORMATION	9	4/5
Digital Transformation & Channel Attribution – Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.			
Guided Self Study Topics			
Cybersecurity and Risk Management.			
Total Hours			45
Learning Resources:			
Text Books:			
1.	Puneet Singh Bhatia “Fundamentals of Digital Marketing”, Pearson Education, 2 nd edition, June 2019.		

2.	Vandana Ahuja “Digital Marketing”, Oxford University Press, April 2015.
3.	Philip Kotler “Marketing 4.0: Moving from Traditional to Digital”, Wiley, 1 st edition, April 2017.
Reference Books:	
1.	Ryan, D. (2014), Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
2.	Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South- Western ,Cengage Learning.
3.	Pulizzi, J Beginner's Guide to Digital Marketing ,Mcgraw Hill Education.

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
ADI1251	GENERATIVE AI FUNDAMENTALS AND DESIGN	IV	EM	2	1	0	3	3	
Prerequisite	NIL	Course Type	Theory	QP TYPE				QP2	
Course Objectives:									
This Course will comprehensively study generative AI models, particularly ChatGPT.The curriculum covers essential principles of Generative AI, prompt engineering, explainable AI, conversational AI, ChatGPT, and other large language models.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							BTL	
CO1	Build strong foundations in generative AI models, understanding their core principles and various types.							3	
CO2	Recognize the importance of explainable AI and distinguish between different approaches to achieve transparency in AI systems.							4/5	
CO3	Apply effective prompt engineering techniques to optimize performance and control the behavior of generative AI models.							4/5	
CO4	Develop a comprehensive understanding of ChatGPT, exploring its operational mechanisms, notable features, and limitations.							4/5	
CO5	Dive into the future of generative AI, identifying challenges and the necessary steps to unlock its full potential.							4/5	
Syllabus									
Module I	INTRODUCTION TO GENERATIVE AI							10	3
Introduction of Machine Learning & ML Algorithms-Brief History of the Evolution of AI-Machine Learning Algorithms in AI-How does AI Systems Work: How they Learn. The Definition and Objective of Generative AI-Generative AI vs Discriminative Intelligence.									
Self-Study Topics									
- Real-World Application of AI: Translation, Copywriting, Medicine, etc. - Current Major Players in GenAI Apps: OpenAI, MS, Meta, Google,etc.									

Module II	EXPLAINABLE AI and CONVERSATIONAL AI	9	4/5
Understanding Explainable AI and its Importance-Explainable AI in the Context of Generative Models-Role of Explainable AI in Trust and Transparency. Large Language Models (LLMs) & Conversational AI-Types of Conversational AI- Chatbot, VA, Text- to-Speech, Speech Recognition.			
Self-Study Topics			
• Real-world Examples of Explainable AI • Applications of Conversational AI- Dialog flow, IBM Watson Assist., Azure Bot, etc; • Real-World Applications of Conversational AI- Marketing, Healthcare, Banking, etc			
Module III	PROMPT ENGINEERING	9	4/5
Definition and Importance of Prompt Engineering-Basic Architecture and Components of a Prompt-Basic Prompt Engineering w/ ChatGPT-Prompting ChatGPT: Q&A; Summarize; Explain; Translate; & Completion-Design and Generation of Effective Prompts-Intermediate Prompt Engineering Techniques.			
Advance Prompt Engineering Techniques: COT, Priming, Transfer Learning-Exploring the Limitations of Prompt Engineering-Playground Parameter Options- Models, Temperature Chat-Playground Usage - Summarization, classification-Personalizing, and You ChatGPT.			
Self-Study Topics			
• Personalizing, and Your ChatGPT • Playground Parameter Options- Models, Temperature, Chat, etc. • Playground Usage - Summarization, classification. • Advanced Uses of ChatGPT: Outlines, Research; Business Plans, Code, etc.			
Module IV	LARGE LANGUAGE MODEL	8	4/5
Microsoft Bing AI-Google BardAI-Anthropic Claude-GPT4all - NomicAI, OpenChatKit, LLAMA- Introduction to fine-tuning- The Advantages-The Basic Steps in Fine-tuning ChatGPT.			
Data Preparation and Best Practices in Fine-tuning ChatGPT-Practical Examples of a Fine-Tuned ChatGPT-Evaluation and Troubleshooting a Fine-tuned ChatGPT Model-Responsible Data Usage and Privacy.			
Self-Study Topics			
• Mitigating Harm and Ensuring Ethical AI Deployment • The potential for misuse of ChatGPT models • Mitigating risks of using ChatGPT			
Module V	ADVANCE ChatGPT	9	4/5

Advance Uses of ChatGPT for NLP and ML-The Basics of ML in AI: Data mining, Knowledge Discovery, Analytics. Data-Centric AI for Optimizing GenAI-AI Techniques and Technologies for Innovation.	
Self-Study Topics	
• API Key • Open AI-SORA	
Total Hours 45	
Learning Resources:	
Text Books:	
1	Pam Baker," ChatGPT for Dummies (For Dummies (Computer/tech)), Edition 1,ISBN-13978- 1394204632 for Dummies, 2023.

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
ADC1293	DATA WAREHOUSING	IV	EM	2	1	0	3	3	
Pre-requisite	Python Programming and Database Management System	Course Type	Theory	QP TYPE				QP2	
Course Objectives:									
This course introduces the fundamental concepts and techniques of data warehousing. Students will learn about the design, implementation, and management of data warehouses, including topics such as dimensional modeling, Extract-Transform-Load (ETL) processes, data quality, the partitioning strategy and the roles of process manager & system manager.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Design data warehouse architecture for various Problems.							4	
CO2	Apply the OLAP Technology.							4	
CO3	Analyse the partitioning strategy.							4	
CO4	Critically analyze the differentiation of various schema for given problem.							4/5	
CO5	Frame roles of process manager & system manager.							4/5	
Syllabus								Max BTL	
Module I	INTRODUCTION TO DATA WAREHOUSE							9	4
Data warehouse Introduction - Data warehouse components Operational database Vs data warehouse Data warehouse Architecture Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake.									
Guided Self-Study Topics									
• Modern Data Warehouse									
Module II	ETL AND OLAP TECHNOLOGY							9	4
What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling Delivery Process Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction									

Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP.			
Guided Self-Study Topics			
ROLAP Vs MOLAP Vs HOLAP			
Module III	META DATA, DATA MART AND PARTITION STRATEGY	9	4
Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management			
Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition - Normalization.			
Guided Self-Study Topics			
- Row Splitting - Horizontal Partition			
Module IV	DIMENSIONAL MODELING AND SCHEMA	9	4/5
Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Database Parallelism.			
Guided Self-Study Topics			
Data warehouse Tools.			
Module V	SYSTEM & PROCESS MANAGERS	9	4/5
Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager System Database Manager			
System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager - Query Manager.			
Guided Self-Study Topics			
- Tuning - Testing			
Total Hours			45
Learning Resources:			
Text Books:			
1	Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, TataMcGraw – Hill Edition, Thirteenth Reprint 2008.		
2	Ralph Kimball, “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, Third edition, 2013		
Reference Books:			
1	Paul Raj Ponniah, “Data warehousing fundamentals for IT Professionals”, 2012		
2	K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.		

Course Code	Course Title	Sem	Category	Periods/Week				C	
				L	T	P	S		
AMC1291	RECOMMENDER SYSTEMS	IV	EM	2	1	0	3	3	
Pre-requisite	Principles of Artificial Intelligence	Course Type	Theory	QP TYPE				QP2	
Course Objectives:									
Comprehend the recommender system's fundamentals. Understand the relevance of data mining and machine learning algorithms for recommender systems. Gain knowledge about collaborative filtering, make students design and implement a recommender system. Evaluation and measures the recommender systems.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							MAX BTL	
CO1	Understood the basic techniques and problems in the field of recommender systems							3	
CO2	Learned about content based recommendation							3	
CO3	Implementation of Collaborative Filtering and techniques to develop Recommender Systems that are widely used in the Internet industry							4	
CO4	Gain knowledge of detection attacks and strategies used in recommender systems							5	
CO5	Performance evaluation of recommender systems based on various metrics							5	
Syllabus									
Module I	INTRODUCTION							9	3
Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems-similarity measures Dimensionality reduction – Singular Value Decomposition (SVD) - Linear Algebra notation: Matrix addition – Multiplication - Transposition and Inverses - Covariance Matrices.									
Guided Self Study Topics									
- Implement Data similarity measures - Python Tools available for Implementing Recommender Systems									
Module II	CONTENT - BASED RECOMMENDATION							9	3
High level architecture of content-based systems – Advantages and drawbacks of content based									

filtering – Item profiles – Discovering features of documents.		
Obtaining item features from tags – Representing item profiles – Methods for learning user profiles – Similarity based retrieval – Classification algorithms.		
Guided Self Study Topics		
• Similarity-Based retrieval		
Module III	COLLABORATIVE FILTERING	94
A systematic approach – Nearest-neighbor collaborative filtering (CF) – user-based and item-based CF .		
Components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection).		
Guided Self Study Topics		
• Security Measures of Recommender Systems		
Module IV	ATTACK-RESISTANT RECOMMENDER SYSTEMS	95
Introduction – Types of Attacks – Detecting attacks on recommender systems		
Individual attack – Group attack - Strategies for robust recommender design - Robust recommendation algorithms.		
Guided Self Study Topics		
• Attacks and their Mitigation • Preventing Attacks using the CAPTCHAs		
Module V	EVALUATING RECOMMENDER SYSTEMS	95
Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design.		
Design Issues – Accuracy metrics – Limitations of Evaluation measures		
Guided Self Study Topics		
• Goals of Evaluation Design		
TOTAL HOURS		45
Learning Resources:		
Text Books:		
1	Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.	
2	Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed	
Reference Books:		
1	Francesco Ricci, Lior Rokach, Bracha Shapira, Recommender Sytems Handbook, 1st ed, Springer (2011),	
2	Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
AMC1292	ARTIFICIAL INTELLIGENCE IN HEALTH CARE	IV	EM	2	1	0	3	3
Pre-requisite	HANDBOOK	Course Type	Theory	QP Type				QP2
Course Objectives: This study endeavors to navigate the complexities of healthcare provider organizations amidst the transformative shift to value-based reimbursement, delving into the intricate realm of biomedical imaging and its signaling. It seeks to cultivate adept data analytical skills, empowering decision-making prowess in the dynamic landscape of health management.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Explicate a deeper understanding of the interplay between Healthcare Data Sources and Basic Analytics.							
CO2	Implement the biomedical imaging modalities, image segmentation and use the sensor data mining applications.							
CO3	Create a comprehensive understanding of biomedical signal analysis and genomics, including techniques for signal denoising, multivariate analysis, cross-correlation, genomic data generation, and computational studies towards personalized medicine.							
CO4	Explore NLP's core components and methodologies to effectively extract insights from clinical text, overcome challenges in processing clinical reports, and leverage NLP's clinical applications to optimize healthcare outcomes.							
CO5	Develop proficiency in basic statistical prediction models, mastering evaluation and validation methodologies for accurate clinical prediction model development.							
Syllabus								
Module I	INTRODUCTION							9
Introduction- Healthcare Data Sources and Basic Analytics – Advanced Data analytics for Healthcare – Applications and practical systems for healthcare – Components of Electronic Health Records– Coding systems - Benefits, Barriers, Challenges of EHR.								

Guided Self Study Topics		
Healthcare Quality and Patient Safety		
Case Study		
Write a case study to investigate how logistics processes in a hospital can be benchmarked to improve process performance.		
Module II	BIOMEDICAL IMAGE ANALYSIS	9
Introduction – Biomedical imaging Modalities – Object detection – Image Segmentation – Image Registration – Feature Extraction – Challenges in Healthcare Data Analysis – Sensor Data Mining Applications – Nonclinical Healthcare Applications.		
Guided Self Study Topics		
- TensorFlow - PyTorch		
Case Study		
Which Foods and Products Are Dangerous for the Human Health and Where to Find an Alternative for Them? Write a case study to analyze the Food Products.		
Module III	BIOMEDICAL SIGNAL ANALYSIS	9
Types of Biomedical Signals – ECG Signal Analysis – Denoising of Signals – Multivariate Biomedical Signal Analysis – Cross – Corelation Analysis – Genomic Data Generation – Methods and standards for Genomic Data analysis – Types of Computational Genomic Studies towards personalized Medicines.		
Guided Self Study Topics		
Signal Classification and Pattern Recognition		
Case Study		
Write a case study about the classification of lung disease and how will you predict it? Also explain the method to protect the liver from disease.		
Module IV	NATURAL LANGUAGE PROCESSING	9
Natural Language Processing – Core components of NLP – Mining information from Clinical Text – Information Extraction – Current Methodologies – challenges of processing Clinical reports – Clinical Applications.		
Guided Self Study Topics		
SpaCy		

Scikit-learn		
Case Study		
Write a case study to analyze Why Do Japanese Live for So Long? Is Their Health Care Industry That Effective?		
Module V	ADVANCED DATA ANALYTICS FOR HEALTHCARE	9
Basic Statical Prediction Models- Linear Regression – Generalized additive Model – Logistic Regression – Bayesian Models – Markov Random Fields- Alternative Clinical Prediction models – Decision Tree – Artificial Neural Networks – Cost – Sensitive Language – Advanced prediction models – Survival models – Basic Concepts – Nonparametric Survival Analysis – Cox Proportional Hazards Model – Survival Trees – Evaluation and Validation		
Guided Self Study Topics		
Survival Analysis		
Case Study		
Write a case study stating the Reasons for the Development of Cancer and How to Treat the Disease? Whether can we predict it?		
Total Hours		45
Learning Resources:		
Text Books:		
1.	Charu C. Aggarwal, Chandan K. Reddy - Healthcare Data Analytics – published 23 June 2015, CRC Press	
Reference Books:		
1.	Hui Yang , Eva K. Lee - Healthcare Analytics: From Data to Knowledge to Healthcare Improvement , 13 October 2016 , Wiley publications.	
2.	Healthcare Analytics: Foundations and Frontiers, 12 September 2019 by Ross M. Mullner, Edward M. Rafalski, Wiley publications.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
ADC1292	SOCIAL INTELLIGENCE AND ANALYTICS	IV	EM	2	1	0	3	3
Pre-requi site	Nil	Course Type	Theory	QP TYPE				QP2
Course Objectives:								
Equip students with a robust understanding to analyze and navigate the pivotal role and significance of digital marketing within the dynamic landscape of modern business.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Explore the role and importance of digital marketing in today's rapidly changing business environment.							
CO2	Analyze various principles and techniques of SEO to enhance website visibility and search engine rankings for businesses and organizations.							
CO3	Demonstrate comprehensive proficiency in conceptualizing and optimizing email marketing campaigns to drive customer engagement and retention in the digital landscape.							
CO4	Develop effective strategies, cultivate brand presence and drive meaningful engagement across various social platforms for various businesses and organizations.							
CO5	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.							
Syllabus								
Module I	INTRODUCTION TO ONLINE MARKET							9
Online Market space - Digital Marketing Strategy - Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing .								
Guided Self Study Topics								
Ethical and Legal Considerations.								
Module II	SEARCH ENGINE OPTIMIZATION							9
Search Engine optimization - Keyword Strategy - SEO Strategy - SEO success factors - On-Page Techniques - Off-Page Techniques. Search Engine Marketing - How Search Engine works - SEM components - PPC advertising – Display Advertisement.								
Guided Self Study Topics								
SEO Tools.								

Module III	E- MAIL MARKETING	9
E- Mail Marketing - Types of E-Mail Marketing - Email Automation - Lead Generation – Integrating Email with Social Media and Mobile - Measuring and maximizing email campaign effectiveness . Mobile Marketing – Mobile Inventory/channels - Location based; Context based; Coupons and offers, Mobile Apps , Mobile Commerce, SMS Campaigns - Profiling and targeting.		
Guided Self Study Topics		
• Emerging Trends and Innovations.		
Module IV	SOCIAL MEDIA MARKETING	9
Social Media Marketing - Social Media Channels - Leveraging Social media for brand conversations and buzz. Successful / benchmark Social media campaigns. Engagement Marketing - Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.		
Guided Self Study Topics		
• Platform-specific Strategies.		
Module V	DIGITAL TRANSFORMATION	9
Digital Transformation & Channel Attribution – Analytics - Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis - Recent trends in Digital marketing .		
Guided Self Study Topics		
• Cybersecurity and Risk Management.		
Total Hours		45
Learning Resources:		
Text Books:		
1.	Puneet Singh Bhatia “Fundamentals of Digital Marketing”, Pearson Education, 2 nd edition, June 2019.	
2.	Vandana Ahuja “Digital Marketing” , Oxford University Press, April 2015.	
3.	Philip Kotler “Marketing 4.0: Moving from Traditional to Digital”, Wiley, 1 st edition, April 2017.	
Reference Books:		
1.	Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.	
2.	Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.	
3.	Pulizzi,J Beginner's Guide to Digital Marketing , McGraw Hill Education.	

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
CGI1251	AI Engineering Fundamentals with Azure	IV	EM	2	1	0	3	3	
Pre-requisite	Machine Learning Techniques	Course Type	Theory	QP TYPE				QP2	
Course Objectives:									
To Understand Core AI Concepts, explore Azure’s AI services and Open AI services, develop and optimize AI Solutions securely.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							Max BTL	
CO1	Understand the basics of Azure; Set Up and Manage Azure Accounts.							4	
CO2	Enable to create only the specific needed Azure resources using AI services.							4	
CO3	Identify and Choose Azure Compute Options using OpenAI services.							4	
CO4	Optimize and Monitor Azure Storage.							4	
CO5	Understand Azure Management Tools and Protect Data in Azure.							4	
Syllabus								Max BTL	
Module I	Getting Started with Microsoft Azure							9	4
Azure Overview- The new world: Azure Resource Manager (ARM)-The classic deployment model - Overview of Azure Portal – Azure CLI- Azure Architectural Framework. Overview of Azure Machine Learning- Key services offered by Azure- Benefits and use cases of Azure- Managing Subscriptions and Resources.									
Guided Self-Study Topics									
Azure AI Foundry									
Module II	Azure AI services							9	4
Video Analyzation - Language : Natural Language Processing (NLP) - conversational Language – text translator - speech translator									

Custom Vision (Classify images) - Detect, analyze, and recognize faces - Azure AI Vision Service – Containers.			
Guided Self- Study Topics			
Integrating AI services into real-world applications			
Module III	Azure OpenAI services	9	4
Get started with Azure OpenAI Service - Access Azure OpenAI Service - Natural language solutions - Prompt Engineering			
Generate images - Retrieval Augmented Generation (RAG) - Comparing Azure OpenAI and OpenAI - Generative AI Fundamentals.			
Guided Self-Study Topics			
Code with Azure OPenAI services			
Module IV	Azure Storage	9	4
An Introduction to storage Resources - Storage accounts - Azure Storage Services - Security and Azure Storage - Question Answering Solutions with Azure AI Language.			
AI Search solution - Knowledge store with Azure AI Search – AI Document Intelligence Solution - Prebuilt Document intelligence models.			
Guided Self-Study Topics			
Create a custom text classification solution			
Module V	Management Tools and Security in Azure	9	4
Management tools overview - Visual Studio 2015 and the Azure SDK - Windows PowerShell – Developer tools and SDKs.			
Responsible AI - Azure AI services consumption - Secure Azure AI services - Monitor Azure AI services			
Guided Self-Study Topics			
Deploy Azure AI services in containers			
Total Hours			45
Learning Resources:			
Text Books:			
1	“Fundamentals of Azure Second Edition Microsoft Azure Essentials” by Michael Collier, Robin Shahan, Microsoft.		
Reference Books:			
1	“Microsoft Azure AI Fundamentals”, Julian Sharp, Microsoft.		