MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS)
2024 Admission Onwards

SYLLABUS						
SIGNATURE COURSE						
Name of the College	B.C.M. College, Kottayam					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Liju Alex					
Contributors	Dr. Liju Alex, Dr. Anu Varghese, Ms. Ann Johns, Ms. Jintumol K U					
Course Name	Introduction to Data Analysis using Python					
Type of Course	DSE					
Specialization title	Data Science with Artificial Intelligence					
Course Code	MG3DSEMATA01					
Course Level	200					
Course Summary	Introduction to Data Analysis using Python is an undergraduate course designed specifically for Mathematics students to provide a foundational understanding of data science principles through the lens of Python programming. The course bridges mathematical thinking with computational tools, enabling students to explore data systematically, apply analytical techniques, and draw meaningful insights from real-world datasets. Students begin by learning core Python programming concepts necessary for data manipulation and analysis. As the course progresses, they are introduced to powerful libraries such as NumPy and Pandas for structured data handling, and Matplotlib and Seaborn for effective data visualization. Emphasis is placed on understanding statistical measures, visual interpretation of data patterns, and the application of key preprocessing techniques including handling missing values, encoding, and scaling. The course combines theory with hands-on practice through coding exercises, case studies, and mini projects using real-world datasets. Assessments are structured to evaluate conceptual clarity, coding skills, and the ability to apply data science techniques in practical scenarios.						
Semester	3	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Students are expected to have basic programming knowledge (preferably in Python or any other language) and a foundational understanding of mathematical concepts such as functions, statistics, and matrices.					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Understand the fundamental concepts of data analytics and Python programming constructs for data handling.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10
2	Perform data manipulation and transformation using NumPy.	AN	PO1, PO2, PO3, PO4, PO5, PO9, PO10

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
3	Apply data visualization techniques and understand statistical measures using Python Matplotlib Library.	AN	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10
4	Execute data preprocessing and prepare datasets for analysis through real-world examples.	AN	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	1	1	-	-	-	1	3
CO 2	3	3	2	1	1	-	-	-	1	3
CO 3	3	3	2	1	1	1	-	-	1	3
CO 4	3	3	3	3	2	1	-	-	2	3

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Foundations of Data Analytics and Python Programming			
	1.1	Introduction to Data Analytics: Definition, types of analytics, data analytics lifecycle, tools used.	3	["1"]
	1.2	Python Basics: Operations, Control Flow, Loops, variables, control statements, loops, functions, modules.	5	["1"]
	1.3	Data Structures: List, Tuple, Dictionary. Built-in Modules in python for data science.	7	["1"]
2	NumPy for Data Handling			
	2.1	Modules: string and time, User Defined Module.	4	["2"]
	2.2	Numpy Library for array: One -Dimensional Array; Creating 1-D array, Mathematical Operations, Relational Operations.	4	["2"]
	2.3	Numpy Library for array: Multidimensional Array; Accessing Elements, Functions and Mathematical operations in Multidimensional arrays.	4	["2"]
3	Data Visualization and Statistical Analysis			
	3.1	Data Visualization using Matplotlib : Line plot, bar chart, histogram, pie chart, subplots, customizations.	5	["3"]
	3.2	Data Visualization using Seaborn: Distribution plots, categorical plots, regression plots, pair plots, heatmaps.	5	["3"]
	3.3	Descriptive statistics using Python: central tendency, dispersion, skewness, kurtosis, correlation.	5	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Data Preprocessing, Cleaning and Analysis			
	4.1	Pandas for Data Science, Importing Data, Data Frame, Functions on Data Frame.	6	["4"]
	4.2	Data Preprocessing: Data Extraction, Handling missing values, label encoding, one-hot encoding, feature scaling, binning.	6	["4"]
	4.3	Data Analysis of Real world data using SciPy. The linalg, stats subpackages, Rank, Normality, Chi-Square Test.	6	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course Introduction to Data Analysis using Python adopts a hands-on, student-centered teaching methodology tailored for undergraduate Mathematics students. The approach emphasizes four key strategies: live coding, flipped classrooms, practical lab sessions, and mini projects. Each module begins with a flipped classroom model, where students review pre-class materials such as textbook readings or Python tutorials. This allows classroom time to focus on active engagement rather than passive lectures. During sessions, instructors conduct live coding demonstrations, where they write and explain code in real time to show how concepts are applied—such as manipulating arrays, visualizing data, or preprocessing datasets. A major focus is placed on weekly lab-based practical sessions, where students perform guided exercises using NumPy, Pandas, Matplotlib, Seaborn, and scikit-learn. These sessions reinforce coding skills and offer real-time problem-solving support. Students also maintain a data exploration journal to track their learning and observations. Toward the end of the course, students complete a mini project, applying the full data science pipeline to a real-world dataset. This capstone experience integrates programming, analysis, and communication skills. Peer reviews, group tasks, and interactive discussions further enhance learning, ensuring students develop both conceptual understanding and practical proficiency.
Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Quiz, Classroom Interaction, Assignment, Mini Project. **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Written Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ MCQ - (10 out of 15) – 10 × 3 = 30 ◦ PART - B ◦ One or two Sentences - (4 out of 6) – 4 × 5 = 20 ◦ PART - C ◦ Short Essays - (2 out of 4) – 2 × 10 = 20

References

- 1. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reil 2.Wes McKinney, Python for Data Analysis, O'Reilly 3. Bharti Motwani, Data Analytics using Python, Wiley India 4. Reema Thareja, Data Science and Machine Learning using Python, Oxford University Press

Suggested Readings

- 1. Jake VanderPlas, Python Data Science Handbook, O'Reilly 2. Allen B. Downey, Think Stats: Exploratory Data Analysis in Python, O'Reilly

Affidavit

- We, B.C.M. College, Kottayam and Liju Alex, retain the copyright of this syllabus and expressly prohibit its distribution in complete form to any institution outside our own.
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Name of the College	B.C.M. College, Kottayam					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Liju Alex					
Contributors	Dr. Anu Varghese, Ms. Ann Johns, Dr. Liju Alex, Ms. Jintumol K. U.					
Course Name	Introduction to Artificial Intelligence and Machine Learning					
Type of Course	DSE					
Specialization title	Data Science with Artificial Intelligence					
Course Code	MG4DSEMATA01					
Course Level	200					
Course Summary	This course provides a comprehensive introduction to Artificial Intelligence (AI), covering its definition, historical evolution, major breakthroughs, and current trends, including Edge and Cloud AI. It explores key AI development tools, emphasizing both hardware and software, and offers a practical introduction to AI frameworks. Learners gain exposure to essential AI datasets and environments for hands-on practice. The course progresses into Machine Learning, focusing on supervised learning techniques such as SVM, Naive Bayes, Decision Trees, Random Forests, and Neural Networks, using Scikit-learn. Designed for beginners, the course blends theory with practical skills, laying a strong foundation for AI exploration.						
Semester	4	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Basic knowledge of mathematics, logical reasoning, and computer fundamentals; familiarity with programming concepts is helpful but not mandatory					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Understand the fundamentals of Artificial Intelligence, including its history, types, current trends, and key milestones.	U	PO1, PO2, PO3, PO4, PO5, PO9, PO10
2	Identify and utilize essential AI development tools, including AI frameworks, and datasets.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10
3	Learn how some common machine learning methods work, like decision trees and neural networks.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10
4	Try out simple AI programs and see how AI can be used in real life.	AN	PO1, PO2, PO3, PO4, PO5, PO9, PO10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	1	2	1	1	-	-	-	1	2
CO 2	3	3	2	1	1	-	-	-	1	3
CO 3	3	3	2	1	1	-	-	-	1	2
CO 4	3	2	3	2	1	-	-	-	2	2

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Understanding Artificial Intelligence			
	1.1	What Is AI? Introduces the basic idea of AI and how machines can mimic human intelligence in various fields.	5	["1"]
	1.2	The History of AI Traces the origin and evolution of AI from early beginnings to present-day advancements and challenges.	5	["1"]
	1.3	AI Hypes and AI Winters Explores cycles of excitement and setbacks in AI development throughout history.	5	["1"]
2	Types and Trends in AI			
	2.1	The Types of AI Explains narrow AI, general AI, and super AI with simple examples and real-world relevance.	5	["2"]
	2.2	Edge AI and Cloud AI Differentiates between Edge and Cloud AI, highlighting usage in smart devices and large-scale systems.	5	["2"]
	2.3	AI Datasets and Frameworks Describes how datasets fuel AI and introduces popular frameworks like Scikit-learn and TensorFlow.	5	["2"]
3	AI Tools			
	3.1	AI Hardware and Software Tools Introduces essential hardware like GPUs and software platforms used in AI projects.	5	["3"]
	3.2	AI applications Environments needed for AI applications.	5	["3"]
	3.3	AI Datasets and Frameworks Describes how datasets fuel AI and introduces popular frameworks like Scikit-learn and Tensor Flow.	5	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Introduction to Machine Learning			
	4.1	Introduction to Machine Learning Defines machine learning and its role in making predictions and decisions based on data.	5	["4"]
	4.2	Supervised Learning Techniques Explains common supervised learning methods like SVM, Decision Trees, and Naive Bayes	5	["4"]
	4.3	Practical ML Using Scikit-learn Provides hands-on practice in building simple machine learning models using Python and Scikit-learn.	5	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course will be delivered through interactive lectures, demonstrations, and hands-on lab sessions using AI tools. Group discussions and collaborative activities will enhance conceptual understanding. Students will engage in real-time practice with datasets and machine learning models. Project-based learning and regular assessments will ensure active participation and application.

Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Module Tests, Quiz, Classroom Interaction, Assignment,Practical **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B Answer Type: ∘ PART - A ∘ MCQ - (20 out of 25) – 20 × 2 = 40 ∘ PART - B ∘ Essays - (3 out of 5) – 3 × 10 = 30

References

- 1. Stuart Russel, Peter Norvig, Artificial Intelligence : A Modern Approach –Fourth Edition, Pearson 2. Perry Xiao, Artificial Intelligence Programming with Python : From Zero to Hero, Wiley 3. Stephen Lynch, Python for Scientific Computing and Artificial Intelligence, CRC Press 4. Prateek Joshi, Artificial Intelligence with Python, Packt

Suggested Readings

- 1. Charu C. Arrarwal, Artificial Intelligence, Springer 2. Philippe R. Richard · M. Pilar Velez, Steven Van Vaerenbergh, Mathematics Education in the Age of Artificial Intelligence, Springer 3. Charu C. Arrarwal, Linear Algebra and Optimization for Machine Learning, Springer 4. Charu C. Arrarwal, Neural Networks and Deep Learning, Springer

Affidavit

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SIGNATURE COURSE						
Name of the College	B.C.M. College, Kottayam					
Faculty/ Discipline	Mathematics					
Programme	BSc (Hons) Mathematics					
Course Coordinator	Liju Alex					
Contributors	Dr. Liju Alex, Ms. Jintumol K U, Dr. Anu Varghese, Ms. Ann Johns					
Course Name	Advanced Data Analysis using Python					
Type of Course	DSE					
Specialization title	Data Science with Artificial Intelligence					
Course Code	MG5DSEMATA01					
Course Level	300					
Course Summary	This course introduces undergraduate mathematics students to the essential techniques and tools used in advanced data analysis and machine learning, with a strong emphasis on practical implementation using Python. The course bridges statistical, mathematical theory with real-world data-driven applications. The course emphasizes hands-on programming using popular Python libraries, enabling students to perform data preprocessing, build models, evaluate performance, and interpret results. By the end of the course, students will gain the ability to apply machine learning algorithms to real datasets and understand the mathematical foundations behind these methods.					
Semester	5	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Students enrolling in this course should have a basic understanding of Python programming, including functions, loops, and data structures. Familiarity with fundamental statistical concepts and linear algebra is also recommended for grasping machine learning algorithms and data analysis techniques.					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Apply statistical methods from SciPy to perform basic, parametric, and non-parametric statistical analysis for real-world data.	A	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10
2	Use SQLAlchemy for efficient querying, manipulating, and transforming data in relational databases.	AN	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10
3	Apply time series analysis techniques to real-world datasets using the Statsmodels library, including stationarity checks and trend adjustment methods.	A	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
4	Implement and evaluate unsupervised learning algorithms like dimensionality reduction and clustering techniques on real-world datasets.	AN	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	1	1	1	-	-	1	3
CO 2	3	3	2	1	1	1	-	-	1	3
CO 3	3	3	2	1	1	1	-	-	1	3
CO 4	3	3	2	1	1	1	1	-	1	3

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Statistical Techniques & Image Data Analysis			
	1.1	Parametric Techniques for Comparing Mean	6	["1"]
	1.2	Non-Parametric Techniques for Comparing Means	6	["1"]
	1.3	ndimage package: uses and applications	3	["1"]
2	SQL and Data Manipulation with SQLAlchemy			
	2.1	Basic SQL, Insert, Update, Delete Statements.	5	["2"]
	2.2	In-Built SQL Functions ORDER BY, GROUP BY, and Ranking Functions.	4	["2"]
	2.3	Advanced SQL for Multiple Tables, Intersect and Union	4	["2"]
3	Time Series Analysis with Statsmodels			
	3.1	Time Series Object, Reading Time Series Data, Creating Time Series Subsets.	5	["3"]
	3.2	Determining Stationarity.	4	["3"]
	3.3	Making Time Series Stationary, Adjusting Trend Using Smoothing, Adjusting Seasonality and Trend.	4	["3"]
	3.4	ARIMA Modeling.	4	["3"]
4	Unsupervised Machine Learning Algorithms and Applications			
	4.1	Dimensional Machine Learning Algorithms, Factor Analysis, Principal Component Analysis (PCA), Case Study.	7	["4"]
	4.2	Clustering Algorithms, K-Means Clustering, Agglomerative Hierarchical Clustering, Case Study.	8	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** This course follows a hands-on, practical-first teaching approach designed to bridge theoretical concepts with implementation skills in Python. The central strategies include live coding, flipped classrooms, lab-based practical sessions, and a project-driven learning model. In each module, students are first introduced to the conceptual background through pre-reading materials and short videos. These serve as the foundation for in-class sessions, where instructors conduct live coding demonstrations using real-world datasets to walk students through implementation of statistical comparisons, time series models, and machine learning algorithms. Students are encouraged to replicate and modify these examples during the session to reinforce learning. Each week includes a dedicated lab session, where students complete structured programming exercises and mini challenges using libraries such as scipy.stats, scikit-learn, ndimage, and statsmodels. These labs focus on practical competencies such as data preprocessing, model fitting, clustering, classification, and evaluation. Faculty provide real-time support, and peer discussions are encouraged. To integrate learning outcomes, students complete a mini project during the final module. They select a real-world problem, apply appropriate machine learning techniques, and present findings in a report and oral presentation. Peer review and feedback are used to enhance collaborative and critical thinking skills.
Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Mini Project, Practical Exams. **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Exam Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ∘ PART - A ∘ MCQ - (10 out of 15) – 10 × 3 = 30 ∘ PART - B ∘ One or two Sentences - (4 out of 6) – 4 × 5 = 20 ∘ PART - C ∘ Short Essays - (2 out of 4) – 2 × 10 = 20

References

- 1. Bharti Motwani, Data Analytics using Python, Wiley India 2. Wes McKinney, Python for Data Analysis, O'Reilly 3. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly 4. Reema Thareja, Data Science and Machine Learning using Python, Oxford University Press

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Course Coordinator	Liju Alex					
Contributors	Dr. Liju Alex, Ms. Ann Johns, Dr, Anu Varghese, Ms. Jintumol K U					
Course Name	Machine Learning Using Python					
Type of Course	DSE					
Specialization title	Data Science with Artificial Intelligence					
Course Code	MG6DSEMATA01					
Course Level	300					
Course Summary	This course provides a comprehensive introduction to Machine Learning (ML) techniques using Python, focusing on both theoretical understanding and practical implementation. It begins with supervised learning, covering essential processes such as data exploration, feature engineering, model building, regression, classification, and performance evaluation. The course covers key supervised learning methods, particularly regression and classification, through real-world case studies that deepen conceptual understanding. In addition to structured data, the course introduces machine learning applications for unstructured data, especially text and images. Students learn to preprocess textual data—removing noise, extracting features, and analyzing sentiment—to build predictive models for tasks like recruitment analysis and social media content classification. For image data, students gain experience with image preprocessing techniques and implement models to detect similarities and classify visual content.						
Semester	6	**Credits**			4	**Total Hours**
Course Details	**Learning Approach**	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	To successfully engage with the Machine Learning using Python course, students should have a foundational understanding of Python programming, including experience with variables, functions, loops, and commonly used libraries such as pandas, numpy, and matplotlib. A basic knowledge of data analysis techniques—such as data cleaning, handling missing values, and visualizing datasets—is essential.					

Course Outcomes (CO)

Number of COs		**4**	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
1	Apply supervised learning algorithms and evaluate model performance using suitable metrics.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10
2	Apply linear and advanced regression techniques to real-world datasets, evaluate model performance.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10

Number of COs		4	
CO No.	**Expected Course Outcome**	**Learning Domains ***	**PO No**
3	Perform text preprocessing and apply machine learning algorithms to analyze, classify, and interpret unstructured text data.	A	PO1, PO2, PO3, PO4, PO5, PO9, PO10
4	Apply image preprocessing techniques and machine learning algorithms to classify, compare, and organize image data for use in real-world applications.	AN	PO1, PO2, PO3, PO4, PO5, PO9, PO10

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CO 2	3	3	2	1	1	-	-	-	1	2
CO 3	3	3	2	1	1	-	-	-	1	3
CO 4	3	3	2	1	1	-	-	-	1	1

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Supervised Machine Learning			
	1.1	Basic Steps in Machine Learning, Data exploration and preparation, Handling missing values and duplicates, Assumptions of regression models.	8	["1"]
	1.2	Creating Better Models, Avoiding overfitting and underfitting, Feature extraction and selection, Hyperparameter tuning for model optimization.	7	["1"]
2	Regression Analysis in Machine Learning			
	2.1	Introduction to Regression in Machine Learning, Definition, importance, and applications of regression analysis, Types of regression models.	4	["2"]
	2.2	Simple Linear Regression, Concept, line of best fit, and assumptions, Model building, error terms, and evaluation metrics.	4	["2"]
	2.3	Multiple Linear Regression, Multivariate regression concepts, Feature selection and multicollinearity.	4	["2"]
	2.4	Polynomial and Ridge Regression, Handling non-linear data with polynomial features, Introduction to regularization.	3	["2"]

Module	Units	Course Description	Hrs	CO No.
3	Machine Learning for Text Data			
	3.1	Text Mining and Preprocessing, Understanding text data: structure and challenges, Text cleaning: removing noise, tokenization, stop word removal.	5	["3"]
	3.2	Sentiment Analysis, Polarity-based sentiment detection, Techniques to determine polarity and sentiment score.	5	["3"]
	3.3	Text Similarity Techniques, Cosine similarity and Euclidean distance, Applications in document clustering and content categorization.	5	["3"]
4	Machine Learning for Image Data			
	4.1	Image Acquisition and Preprocessing, Image acquisition and representation (arrays, pixels), Image rotation, rescaling, intensity adjustments, Image cropping for feature focus.	8	["4"]
	4.2	Image Similarity Techniques, Measuring similarity using Euclidean and Manhattan distances, Applications in comparing and matching image data.	7	["4"]

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** The course will follow a structured and interactive classroom procedure combining theory, practical implementation, and real-world application. Each session will begin with a brief review of previously covered topics to reinforce understanding. New concepts will be introduced through lectures supported by presentations, demonstrations, and discussions. Emphasis will be placed on hands-on coding using Python in environments like Jupyter Notebook or Google Colab, enabling students to apply concepts such as data preprocessing, regression, classification, and clustering to real datasets.
Assessment Types	**MODE OF ASSESSMENT** Mode of Assessment: Theory **A. Continuous Comprehensive Assessment (CCA)** **• Theory – 30 Marks** Practical Exam, Mini Project. **B. End Semester Evaluation (ESE)** **• Theory – 70 Marks** Assessment Methods – Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ∘ PART - A ∘ MCQ - (10 out of 15) – 10 × 3 = 30 ∘ PART - B ∘ One or two Sentences - (4 out of 6) – 4 × 5 = 20 ∘ PART - C ∘ Short Essays - (2 out of 4) – 2 × 10 = 20

References

- 1. Bharti Motwani, Data Analytics using Python, Wiley India, 1st Edition Chapters: 12, 13, 16, 17 2. Reema Thareja, Data Science and Machine Learning using Python, Oxford University Press Chapter: 10 (Regression Analysis in Machine Learning)

Suggested Readings

- 1.Joel Grus, Data Science from Scratch: First Principles with Python, 2nd Edition, O'Reilly 2.Wes McKinney, Python for Data Analysis, 2nd Edition, O'Reilly

Affidavit

- We, B.C.M. College, Kottayam and Liju Alex, retain the copyright of this syllabus and expressly prohibit its distribution in complete form to any institution outside our own.
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