THE MAHATMA GANDHI UNIVERSITY

Bachelor in Computer Applications (Honours)

SYLLABUS

MGU-BCA (Honours)

(2024 Admission Onwards)

Faculty: Technology and Applied Sciences

Programme: Bachelor in Computer Applications (Honours)

Mahatma Gandhi University Priyadarshini Hills
Kottayam – 686560, Kerala, India

CONTENTS

Fifth Semester								
Course Code	Course Type	Course Title	Hours / week	*L	*T	*P	*O	Credit
MG5CCRBCA300	CC	Computer Networks	3	3	0	0	0	3
MG5CCRBCA301	CC	Digital Marketing	2	2	0	0	0	2
MG5VACBCA300	VAC	Disaster Management	2	2	0	0	0	2
# Professional Elective – III, IV and V								
MG5DSEBCA300	DSE	Introduction to Data Science (*Data Science specialization*)	6	4	0	2	0	5
MG5DSEBCA301		Time Series Analysis (*Data Science specialization*)	6	4	0	2	0	5
MG5DSEBCA302		Machine Learning (*Data Science specialization)*	6	4	0	2	0	5
MG5DSEBCA303		Neural Network (*Artificial Intelligence & Machine Learning specialization*)	6	4	0	2	0	5
MG5DSEBCA304		Digital Image Processing (*Artificial Intelligence & Machine Learning specialization*)	6	4	0	2	0	5
MG5DSEBCA305		Natural Language Processing (*Artificial Intelligence & Machine Learning specialization*)	6	4	0	2	0	5
MG5DSEBCA306		Web Development with Python - Django/Flask (*Full Stack Development specialization*)	6	4	0	2	0	5
MG5DSEBCA307		Cross-Platform Application Development with Dart and Flutter (*Full Stack Development specialization*)	6	4	0	2	0	5
MG5DSEBCA308		Modern Web Application Development with React.js (*Full Stack Development specialization*)	6	4	0	2	0	5
MG5SECBCA300	**SEC	Internship	0	0	0	0	0	4
		TOTAL	25	19	0	6	0	26
Sixth Semester								
MG6CCRBCA300	CC	Generative AI	5	3	0	2	0	4
MG6SECBCA300	SEC	Software Development Lab	8	0	0	8	0	4
#Professional Elective – VI & VII								
MG6DSEBCA300	DSE	Big Data Analytics (*Data Science Specialization*)	6	4	0	2	0	5
MG6DSEBCA301		Exploratory Data Analysis (*Data Science Specialization*)	6	4	0	2	0	5
MG6DSEBCA302		Deep Learning for Computer Vision (*Artificial Intelligence & Machine Learning Specialization*)	6	4	0	2	0	5

MG6DSEBCA303		Predictive Analysis (*Artificial Intelligence & Machine Learning Specialization*)	6	4	0	2	0	5
MG6DSEBCA304		DevOps Fundamentals with Docker and Jenkins (*Full Stack Development Specialization*)	6	4	0	2	0	5
MG6DSEBCA305		Web Security and Penetration Testing with Kali (*Full Stack Development Specialization*)	6	4	0	2	0	5
		TOTAL	25	11	0	14	0	18

*L-Lecture; *T-Tutorial; *P-Practical/Practicum; *O- Others

The student can choose any ***three*** DSE courses from the available options in fifth semester and any ***two*** in the sixth semester.

** At the end of the Fourth Semester every student shall undergo Internship for Eight Weeks or 240 hours in the industry/Research/ Academic Institute. This component will be evaluated during the fifth semester based on the guidelines provided by the university.

	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Computer Networks**
Type of Course	**Core Course**
Course Code	**MG5CCRBCA300**
Course Level	**NA**
Course Summary	This course focuses on the theoretical foundations of networking and provides an overview of key networking concepts, topologies and network models. It also covers network protocols, security mechanisms, applications and emerging technologies.

Semester	5	Credits			3	
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	Total Hours
		3	0	0	0	45
Pre-requisites, if any	Basic knowledge of computer fundamentals.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the concepts of Computer Networks, networking devices, circuit-switched and packet-switched networks.	U	1
2	Discuss network models, Data link layer and Network protocols .	A	1,2
3	Illustrate network applications, network security issues and emerging trends in networking.	A	2,3,10

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

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Overview of Computer Networks: Definition and Objectives, Applications and Examples, Types of Networks. Network Topologies: Physical vs. Logical Topologies Common Topologies: Star, Ring, Bus, Mesh, Hybrid. Advantages and Disadvantages of Each Topology.	6	1
	1.2	Data Transmission: Analog vs. Digital Signals. Transmission Modes: Simplex, Half-Duplex, Full-Duplex. Networking Devices: Routers, Switches, Hubs, Bridges, Gateways, Functions of each device.	5	1
	1.3	Switching: Circuit Switched Network, Three Phases, Packet Switching, Datagram Networks. Virtual Circuit Networks, Three Phases, Connection Oriented and Connectionless Services.	4	1
2	2.1	Network Models: OSI Model -Layers and Functions, TCP/IP Model - Layers and Functions, Comparison between OSI and TCP/IP Models.	5	2
	2.2	Data Link Layer: Error Detection and Error correction Framing, Flow and Error Control Mechanisms, protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels (Stop and Wait and Piggy Backing). Multiple Access Protocols. Random Access-ALOHA, CSMA. Wired LANs-IEEE standards, standard Ethernet Wireless LANs-IEEE standard, Bluetooth. WirelessWAN-Cellular Telephony.	6	2
	2.3	Network Protocols: Introduction to TCP/IP Protocol Suite, IP Addressing: IPv4 and IPv6 .	4	2
3	3.1	Transport Layer: TCP vs. UDP: Characteristics and Use Cases, TCP Handshake and Connection Management,Flow Control and Congestion Control in TCP. Congestion Control Techniques: Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery. Application Layer Protocols: HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, IMAP: Protocols and Uses, DNS: Domain Name System and Resolution.	7	3
	3.2	Network Security Fundamentals: Common Threats and Vulnerabilities. Basic Security Mechanisms: Firewalls, VPNs, Encryption.	4	3
	3.3	Emerging Technologies: Software-Defined Networking (SDN), Network Function Virtualization (NFV), Internet of Things (IoT) and Its Impact on Networking.	4	3

		Network Management: SNMP: Simple Network Management Protocol, Network Monitoring Tools and Techniques. Future Trends in Networking: 5G and Beyond, Network Automation and Artificial Intelligence in Networking.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 25 Marks** • Written test • Assignment • MCQ, Viva etc. **B. End Semester Examination (ESE)** **ESE for Theory: Written test (50 Marks, 1.5 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks) Part B: Short Answer Questions (3 out of 5 Questions) - (3*5=15 Marks) Part C: Essay Questions (1 out of 2 Questions) - (1*15=15 Marks)

REFERENCES:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, 2012.
2. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2011.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson, 2021.

SUGGESTED READINGS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019.
2. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2023.

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**
Course Name	**Digital Marketing**
Type of Course	**Core Course**
Course Code	**MG5CCRBCA301**
Course Level	**NA**
Course Summary	This course introduces the fundamentals of digital marketing and search engine optimization (SEO). It covers digital marketing strategies, customer journey mapping, search engine mechanics, social media marketing, content creation, influencer marketing, online reputation management, and performance analytics. Students will gain practical knowledge of digital tools and emerging trends to design and evaluate effective digital marketing campaigns.

Semester	5	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	0	30
Pre-requisites, if any	Fundamentals of computer.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Implement both on-page and off-page SEO strategies to improve a website's search engine rankings.	An	1,3,4
2	Create engaging content and manage social media communities to build a positive online brand reputation and track campaign performance using analytics platforms.	An	2,3, 10

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	**Overview and Landscape:** Key differences between digital and traditional marketing, digital marketing channels, and the modern business environment.	3	1
	1.2	**Strategy & The Consumer:** The digital customer journey and strategic planning.	3	1
	1.3	**Search Engine Mechanics:** Understanding how search engines crawl, index, and rank pages.	3	1
	1.4	**On-Page SEO:** Keyword research, meta tags, URL structure, and content optimization.	3	1
	1.5	**Off-Page SEO & Tools:** Link building techniques, common mistakes to avoid, and using SEO analysis tools (e.g., Google Search Console).	3	1
2	2.1	**Social Media Strategy:** The role of social media, advertising, and building online communities.	3	2
	2.2	**Content Marketing:** Creation, curation strategies, and influencer marketing.	3	2
	2.3	**Reputation Management:** social media listening and managing online brand perception.	3	2
	2.4	**Performance Analytics:** Tracking campaign performance using data-driven insights and analytics platforms to optimize ROI.	3	2
	2.5	**Future Trends:** Emerging technologies in SEO, content, and social media marketing.	3	2

Teaching and Learning Approach	**Class room procedure (Mode of Transaction)** ● Use of ICT tools in conjunction with traditional classroom teaching methods ● Interactive sessions ● Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 15 Marks** ● Presentations ● Assignments ● Written Exam etc.
	B. End Semester Examination **ESE for Theory: 35 Marks (1 Hour)** Part A: Very Short Answer Questions (5 out of 7 Questions) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks)

REFERENCES

1. Digital Marketing: Strategy, Implementation and Practice by Dave Chaffey and Fiona Ellis-Chadwick (7th Edition) , Pearson Publication

SUGGESTED READING

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia (2nd Edition), Pearson Publication
2. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation by Damian Ryan
3. The Art of SEO: Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, and Jessie Stricchiola

Mahatma Gandhi University
Kottayam

Programme	**BCA(Honours)**
Course Name	**Disaster Management**
Type of Course	**VAC**
Course Code	**MG5VACBCA300**
Course Level	**NA**
Course Summary	The challenges emerge in diverse forms, transcending borders and intertwining economic, societal, and environmental realms profoundly affect vulnerable communities, magnifying their susceptibility to climate-related shocks and disasters. It is evident that aligning strategies with global Sustainable Development Goals (SDGs) across various geographical scales is paramount and it incorporates perspectives of environmental sustainability, climate adaptation, and disaster resilience. This course aims to equip students with the knowledge and skills necessary to address and mitigate the impacts of disasters in a holistic manner.

Semester	5	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	0	30

Pre-requisites, if any	NIL

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the concepts related to disaster management and its importance and role.	An	1,10
2	Analyse institutional processes and management strategies to mitigate the impacts of disasters.	An	6,8
3	Illustrate different types of emergencies and steps to manage their impact.	An	1,6

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

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	**Concepts and Terminologies**			
	1.1	Understanding key concepts of Hazards, disasters; Disaster types and causes (Geophysical, Hydrological, Meteorological, Biological and Atmospheric; Human-made)	2	1
	1.2	Global trends in disasters - Impacts (Physical, Social, Economic, Political, Environmental and Psychosocial)	3	1
	1.3	Defining Vulnerability (Physical Vulnerability; Economic Vulnerability; Social Vulnerability)	2	1
	1.4	Components of disaster management cycle (Phases: Response and recovery, Risk assessment, Mitigation and prevention, Preparedness planning, Prediction and warning)	3	1
2	**Initiatives at national and international level**			
	2.1	Disaster risk reduction (DRR), Community based disaster risk reduction.	3	2
	2.2	Disaster Risk Management in India and at international level: Related policies, plans, programmes and legislation.	4	2
	2.3	International strategy for disaster reduction and other initiatives.	3	2
3	**Emergency Management**			
	3.1	Explosion and accidents (Industrial, Nuclear, Transport and Mining) - Spill (Oil and Hazardous material);	5	3
	3.2	Threats (Bomb and terrorist attacks) - Stampede and conflicts	5	3

NOTE: At least two Training and Demonstration Workshops be organized in association with the organizations like NIDM, NDRF, NCDC, Para Military, Fire Brigade, CISF, Fire and safety, local administration.

Students should prepare a report based on

i. Any three case studies from the give list.

ii. Two workshops conducted.

Case Studies for Disaster Management Topics

1. 2004 Indian Ocean Tsunami
2. 2018 Kerala Floods

3. COVID-19 Pandemic

4. Chernobyl Disaster

5. 2013 Uttarakhand Floods

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Demonstration, Discussions, Case Analysis etc.
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory- 15 Marks** • Assignment • MCQ/Quiz • Viva etc.
	B. End Semester Examination (ESE) **ESE for Theory :35 Marks** Report - 15 Marks Viva - 20Marks (Viva based on CO1, CO2, CO3 and Report.

REFERENCES

1. Sharma, S.C. (2022), Disaster Management, Khanna Book Publishing. (AICTE Recommended Textbook).

2. Clements, B. W., (2009): Disasters and Public Health: Planning and Response, Elsevier Inc.

3. Dunkan, K., and Brebbia, C. A., (Eds.) (2009): Disaster Management and Human Health Risk: Reducing Risk, Improving Outcomes, WIT Press, UK.

4. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

5. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.

6. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

7. Carter, N. (1991) Disaster Management: A Disaster Management Handbook. Asian Development Bank, Manila.

8. Govt. of India (2008) Vulnerability Atlas of India. BMTPC, New Delhi.

9. Govt. of India (2011) Disaster Management in India. Ministry of Home Affairs, New Delhi.

10. Matthews , J.A., (2002) Natural Hazards and Environmental Change, Bill McGuire, Ian Mason.

11. Gupta, O.P. (2023), Elements of Solid Hazardous Waste and Management, Khanna Publishing House.

12. Poonia, M.P. & Sharma, S.C. (2022), Environmental Studies, Khanna Publishing House.

Web Resources

http://www.ndma.gov.in/en/

http://nidm.gov.in/

https://www.unisdr.org/

http://www.emdat.be

https://www.weather.gov/safety/ https://www.preventionweb.net/risk/vulnerability

	Mahatma Gandhi University Kottayam
Programme	**BCA (Honours)**
Course Name	**Introduction to Data Science**
Type of Course	**DSE**
Course Code	**MG5DSEBCA300**
Course Level	**NA**
Course Summary	This course covers key concepts from data collection to modeling, emphasizing practical skills in preprocessing, exploratory analysis, and linear regression. With real-world applications and security considerations, learners gain essential knowledge for success in data science.

Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Knowledge in computer programming and statistical calculations.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the need, evolution, roles, life cycle, applications, prerequisites, tools, and security issues in data science.	U	1
2	Illustrate data types, sources, collection methods, statistical descriptions, and pre-processing techniques.	An	1,2
3	Analyse the importance, types, techniques, steps, and tools for performing exploratory data analysis.	An	2,3
4	Analyze the steps in data science modeling,	An	2
5	Implement data analysis using R.	A	2,3

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to Data Science - Need of data Science - Evolution of Data Science – Data Science Roles	5	1
	1.2	Data Science Life Cycle - Applications of Data Science in various fields – Prerequisites & Tools for Data Science - Data Security Issues.	10	1
2	2.1	Introduction to Data - Types of data - Sources of data – Data Collection methods - Basic Statistical Descriptions of Data.	5	2
	2.2	Data Pre-Processing Overview: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization.	5	2
	2.3	Introduction to R – Basics - RStudio - R Data Types - Operators - Basic Read and Write functions. R Objects: Vector, Matrix, Array, Data Frame, Factor, List ()– Decision Making Statements – Control Structures.	5	2
3	3.1	Exploratory Data Analytics – Importance of EDA – Types of EDA.	5	3
	3.2	Univariate Analysis, Bivariate Analysis, Multivariate Analysis Specialized EDA Techniques - Steps for performing EDA - Tools for Performing EDA.	5	3
	3.3	Exploratory Data Analysis using R- Data Preprocessing	5	3
4	4.1	Data Science Modelling – Steps in Data Science Modelling - Simple Linear Regression - Multiple LinearRegression	5	4
	4.2	Linear Model Selection and Diagnostics. - Mode Evaluation and Metrics in Data Science - Common Evaluation Metrics: Confusion matrix - Mean Absolute Error (MAE) - Mean Squared Error (MSE) - Root MeanSquared Error (RMSE) Cross Validation: K-fold cross-validation - stratified cross-validation.	7	4
	4.3	Descriptive Statistics in R- Central Tendency - Variability - Mean - Median - Range - Variance.	3	4

	Lab Practice			
5		1. Import and export Data into and from R: CSV Text file Excel file 2. Implement Exception Handling – Progress and Timing. 3. Implement data visualization in R: Scatter Plot, Boxplot, Bar Chart, Histogram, Box and Whiskers plot 4. Implementation of Multiple Linear Regression in R. 5. Implement Descriptive Statistics in R: Central Tendency - Variability - Mean - Median - Range - Variance.	30	5

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Demonstration • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Written test • Assignments • Viva, MCQ etc. **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Viva etc.

	B. End Semester Examination (ESE) **ESE for Theory: Written Test (70 Marks, 2 Hrs.)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions(5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) **ESE for Practical: (35 Marks, 1.5 Hrs.)** • Logic - 10 Marks • Successful Compilation - 5 Marks • Output - 5 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES:

1. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.

2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.

SUGGESTED READINGS:

1. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global
2. Tilman M. Davies " The Book of R" 2016, No Starch Press
3. T. M. Mitchell, "Machine Learning", McGraw Hill, 2017

	Mahatma Gandhi University Kottayam					
Programme	**BCA (Honours)**					
Course Name	**Time Series Analysis**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA301**					
Course Level	**NA**					
Course Summary	This course covers key concepts of Time Series Analysis, time series model for forecasting, time series regression models, ARIMA modelling of stationary and nonstationary time series.					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Illustrate basic concepts in time series analysis and forecasting.	U	1
2	Analyse statistical methods and forecasting techniques to analyse, model,and interpret time series data.	An	1
3	Analyse various time series regression models.	An	2
4	Distinguish the ARIMA modelling of stationary and nonstationary time series.	An	2
5	Implement time series analysis with Tableau	A	2

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	INTRODUCTION OF TIMESERIES ANALYSIS: Introduction to Time Series and Forecasting -Different types of data-Internal structures of time series Models for time series analysis - Autocorrelation and Partial autocorrelation.	10	1
	1.2	Nature and uses of forecasting-Forecasting Process-Data for forecasting – Resources for forecasting.	5	1
2	2.1	STATISTICS BACKGROUND FOR FORECASTING: Graphical Displays -Time Series Plots - Plotting Smoothed Data - Numerical Description of Time Series Data - Use of Data Transformations and Adjustments	10	2
	2.2	General Approach to Time Series Modeling and Forecasting-Evaluating and Monitoring Forecasting Model Performance.	5	2
3	3.1	TIME SERIES REGRESSION MODEL: Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in Linear Regression - Prediction of New Observations - Model Adequacy Checking -Variable Selection	5	3
	3.2	Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data-Exponential Smoothing-First order and Second order.	10	3
4	4.1	Multivariate Time Series Models and Forecasting - Multivariate Stationary Process- Vector ARIMA Models - Vector AR (VAR) Models.	10	4
	4.2	Neural Networks and Forecasting -Spectral Analysis - Bayesian Methods in Forecasting.	5	4
5	5.1	Practical Component: Working with Tableau: Navigating Tableau. design flow, File types, Data types, Fields Operations, adding colours, Adding Labels and formatting, Joining and blending data. Tableau Worksheets, Tableau calculations, sort, Charts, Time Series, Aggregation and Filters, Working with Data extracts in Tableau , Working with Time Series, Adding Filter and Quick Filter, Tableau dashboard. 1.Time Series Data Cleaning 2.Loading and Handling Times series data 3. Preprocessing Techniques 4. Joining and blending data	30	5

		5. Working with data extracts 6.Creating various types of charts in Tableau. 7. Adding filter and quick filter 8. Regression analysis using Tableaus		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Demonstration • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Written test • Assignments • Viva • MCQ etc. **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Viva etc.
	B. End Semester Examination (ESE) **ESE for Theory: Written Test (70 Marks, 2 Hrs.)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) **ESE for Practical: (35 Marks, 1.5 Hrs.)** • Logic - 10 Marks • Successful Compilation - 5 Marks • Output - 5 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES:

1. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015)
2. Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek Pal Dr. Pks Prakash (2017)
3. Time Series Analysis And Forecasting By Example Søren Bisgaard Murat Kulahci Technical

SUGGESTED READINGS:

1. Peter J. Brockwell Richard A. Davis Introduction To Time Series And Forecasting Third Edition.(2016),

2. Multivariate Time Series Analysis and Applications William W.S. Wei Department of Statistical Science Temple University, Philadelphia, PA, SA This edition first published 2019 John Wiley & Sons Ltd.

	Mahatma Gandhi University Kottayam
Programme	**BCA (Honours)**
Course Name	**Machine Learning**
Type of Course	**DSE**
Course Code	**MG5DSEBCA302**
Course Level	**NA**
Course Summary	This course deals with various algorithms to enable computers to learn data without being explicitly programmed. An insight into various types of machine learning algorithms, strategies for model generation and evaluation are given in this course.

Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe fundamental concepts of machine learning.	U	1
2	Analyse regression and classification techniques , perform data preprocessing and feature engineering.	An	1,2
3	Describe the fundamentals of Artificial Neural Networks, Perceptron Learning Algorithm.	An	2
4	Apply clustering algorithms and evaluate their performance using validation measures.	A	2,3
5	Implement various machine learning algorithms	A	2

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

COURSE CONTENT

Content for classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to Machine Learning, History of Machine Learning, Examples of Machine Learning applications.	5	1
	1.2	Types of learning: supervised, unsupervised, semi-supervised learning and Reinforcement Learning. Labelled and Unlabeled Dataset.	5	1
	1.3	Learning Framework: Training, Validation and Testing of ML Models. Performance Evaluation Parameters: Confusion Metric, Accuracy, Precision, Recall, F1 Score and AUC	5	1
2	2.1	Regression, Classification, Training versus testing. Model Selection and Generalization, Data Preprocessing, Feature Selection, Feature Extraction.	5	2
	2.2	Regression: Simple Linear Regression, Multiple Linear Regression, Ridge Regression, Lasso Regression, Metrics for evaluating regression problems – MAE, MSE, RMSE, MAPE, R^2 .	5	2
	2.3	Classification- Logistic Regression, KNN, Decision Trees- Entropy, Information Gain, Tree construction, Issues in Decision Tree learning.	5	2
3	3.1	Linear model: Introduction to Artificial Neural Networks, Biological Neurons, Idea of computational units, Linear Perceptron, Multilayer Perceptron, Perceptron Learning Algorithm, Linear Separability, Loss Functions- Various Types, Hyper Parameter Tuning, Feed Forward Neural Networks, Forward Propagation, Activation Functions and its Derivatives, Back Propagation and optimization Functions	10	3
	3.2	Introduction to Support Vector Machine for linearly separable data.	5	3
4	4.1	Clustering: K-Means, K-Medoids, Hierarchical Clustering – Agglomerative Vs Divisive Clustering, BIRCH, Chameleon, DBSCAN, Grid Based methods- STING, Clustering Validation Measures.	10	4
	4.2	ML Applications: Ethical Considerations in Machine Learning, Real-world Applications.	5	4
	5.1	1.Implement linear regression on a dataset and visualize the regression line.		

5		2. Implement logistic regression on a binary classification dataset and plot the decision boundary. 3 Implement and evaluate the performance of Decision tree ID3/Cart classifier for any given dataset. 4.Implement and evaluate the performance of the Naive Bayes Classifier on a given dataset. 5.Implement K-Means clustering on a point dataset and visualize and evaluate the clusters. 6. Implement hierarchical clustering on a dataset and plot the dendrogram. 7. Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters. 8. Implement a support vector machine for linearly separable classes and visualize the margins and decision boundary.	30	5

REFERENCES:

1. Mitchell T M. (2017). Machine Learning, McGraw-Hill.

2.Rajiv Chopra (2024), Machine Learning and Machine Intelligence, Khanna Publishing House.

3. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN9780323917780

SUGGESTED READINGS:

1.Flach, P. A. (2012). Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press. ISBN: 9781107422223, 2012.

2. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.

3. Haykin S. (2009). Neural Networks and Learning Machines, Third Edition, PHI Learning.

4. Chollet, F. (2018). Deep Learning with Python. Manning Publications.

5. Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.

6. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

7. Géron, A. (2017). Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (1st ed.). O'Reilly Media.

	Mahatma Gandhi University Kottayam
Programme	BCA (Honours)
Course Name	**Neural Networks**
Type of Course	**DSE**
Course Code	**MG5DSEBCA303**
Course Level	NA
Course Summary	This course provides a comprehensive introduction to neural networks and deep learning, covering both theoretical foundations and practical implementation. It begins with the fundamental concepts of artificial neural networks and progresses to advanced architectures such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs), and reinforcement learning models. Learners will gain practical experience using modern deep learning frameworks such as TensorFlow and PyTorch, enabling them to design, train, and evaluate models effectively.

Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Programming Knowledge, Basic Understanding of Artificial Intelligence and machine Learning					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Illustrate the fundamentals of neural networks, and deep learning frameworks.	An	1,2
2	Design Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), and analyse transfer learning techniques.	An	1,2
3	Analyse advanced RNN architectures and reinforcement learning algorithms to solve complex problems.	An	2,3

4	Analyse Generative Adversarial Networks (GANs), including DCGAN and WGAN, as well as clustering and dimensionality reduction techniques.	An	1,2
5	Implement neural networks, CNNs, GANs, reinforcement learning algorithms, clustering algorithms, and dimensionality reduction techniques.	A	2,3
Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate I, Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Basics of Neural Networks:-Neurons and their mathematical representation.	3	1
	1.2	Activation functions – sigmoid, ReLU. Feedforward process and the role of weights and biases.	3	1
	1.3	Backpropagation algorithm for training neural networks.	3	1
	1.4	Deep Learning Frameworks:-Introduction to TensorFlow and PyTorch.	3	1
	1.5	Setting up the development environment, Overview of basic operations and syntax.	3	1
2	2.1	Fundamentals of Convolutional Neural Networks (CNNs), Convolution operation and feature extraction, Understanding filters/kernels, Basics of Feature maps and representation	2	2
	2.2	Convolutional Layer Design: Stride and its impact on output size, Padding, Filter design and parameter selection, Output dimension calculations	2	2
	2.3	Purpose of pooling, Types of pooling: Max pooling and Average pooling, Role in dimensionality reduction, Impact on model performance	3	2
	2.4	Over view of popular CNN Architectures- LeNet, AlexNet, VGG, ResNet. Parameters and design choices.	4	2
	2.5	Transfer Learning: Concept and importance of transfer learning, Pre-trained models, Fine-tuning models for custom datasets.	4	2
3	3.1	Basics of Recurrent Neural Networks:- Concept of sequential data processing, Need for RNNs in handling temporal data, Architecture and working of basic RNNs	3	3

	3.2	Training Challenges in RNNs: Vanishing and exploding gradient problems, Techniques to mitigate these issues	3	3
	3.3	Advanced RNN Architectures: Long Short-Term Memory (LSTM) networks, Gated Recurrent Unit (GRU), Handling long-term dependencies, Comparison of LSTM and GRU	3	3
	3.4	Fundamentals of Reinforcement Learning-Introduction to Reinforcement Learning, Markov Decision Processes (MDPs), Exploration vs exploitation trade-off.	3	3
	3.5	Reinforcement Learning Algorithms: Q-Learning algorithm, Deep Q Networks (DQN) for Handling complex and high-dimensional state spaces.	3	3
4	4.1	Introduction to Generative Models and GANs: Generative models and their Applications of GANs, Concept of adversarial training.	2	4
	4.2	Advanced GAN Architectures: Deep Convolutional GAN (DCGAN), Wasserstein GAN (WGAN), Variations and improvements in GAN models.	4	4
	4.3	Fundamentals of Unsupervised Learning: Introduction to unsupervised learning, Importance and applications, Types of unsupervised learning methods.	3	4
	4.4	Clustering algorithms :K-Means	3	4
	4.5	Dimensionality reduction techniques : PCA.	3	4
5	Lab Practice			
	5.1	Implement using Python: 1. Basic neural network using TensorFlow or PyTorch. 2. Single artificial neuron using NumPy (with weights, bias, and input). 3. Visualize activation functions (Sigmoid vs ReLU) using plots. 4. Feedforward neural network (FFNN), Perform forward propagation for a given dataset. 5. Train a neural network using a small dataset (e.g., XOR problem). 6. Backpropagation for a simple neural network. 7. Train the model using gradient descent. Plot loss vs epochs. Compare learning with different learning rates. 8. Train a basic classifier 9. Perform 2D convolution operation on an image. 10. Apply different filters (edge detection, blur, sharpen). 11. Visualize feature maps after convolution. 12. Write a program to compute output dimensions of convolution layers. Experiment with: Different stride values, Padding techniques 13. Design a CNN architecture for image classification.	30	5

		14. Max Pooling and Average Pooling. Compare outputs of both pooling techniques. 15. Analyze dimensionality reduction effects. 16. Load a pre-trained CNN model, Perform feature extraction using the model. Fine-tune the model for a custom dataset. 17. Basic RNN for sequence prediction, Train on time-series or text data. 18. Image Classification using CNNs, Generating Synthetic Images with GANs, 19. k-mean Clustering Algorithm, 20. Apply PCA for a sample dataset and classify.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Presentations • Demonstration • Discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** 1. Written test 2. Assignments 3. Viva 4. MCQ etc. **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Viva etc. • Lab Record
	B. Semester End Examination **ESE for Theory: Written Test (70 Marks, 2 Hrs)** Part A: Very Short Answer Questions. (Answer all) - (5 x 2 = 10 marks) Part B: Short answer questions (5 out of 7 Questions) - (5 x 6 = 30 marks). Part C: Essay questions (2 out of 3 Questions) - (2 x 15 = 30 marks) **ESE for Practical: (35 Marks, 1.5 Hrs)** 1. Coding - 10 Marks 2. Output - 10 Marks 3. Viva - 10 Marks 4. Record - 5 Marks

REFERENCES:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville;[Module1]
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.[Module 1]
3. "Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani;[Module2]
4. "Deep Reinforcement Learning" by Pieter Abbeel and John Schulman.[Module 3]
5. "Generative Deep Learning" by David Foster; [Module4]
6. "Unsupervised Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.[Module 4]

SUGGESTED READINGS:

1. “Deep Learning with Python" by François Chollet.
2. "Reinforcement Learning: An Introduction" by Richard S. Sutton and Andrew G. Barto;

Mahatma Gandhi University
Kottayam

Programme	BCA (Honours)					
Course Name	**Digital Image Processing**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA304**					
Course Level	NA					
Course Summary	The course imparts a comprehensive knowledge about the digital image processing techniques					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Computer fundamentals and Python Programming.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Illustrate digital images, processing steps, acquisition, sampling, quantization and color models.	U	1,2,3
2	Analyse spatial domain techniques for image enhancement effectively.	An	1,2,3
3	Examine the role of morphological image processing techniques in pattern detection.	An	1,2,3
4	Analyse image restoration and segmentation techniques proficiently.	An	1,2,3
5	Implement image processing techniques	A	2,3

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Digital Image Fundamentals: Image, Digital Image, Digital image processing-definitions, Elements of visual perception- Brightness adaptation and Discrimination	3	1
	1.2	Fundamental steps in Digital Image Processing	2	1
	1.3	Components of Digital Image Processing system,	4	1
	1.4	Digital Image Formation Model: Image sensing and acquisition, Image sampling and quantization	3	1
	1.5	Color image fundamentals, Color Models-RGB, CMY, HSI	3	1
2	2.1	Spatial and Intensity resolution, Basic relationship among Pixels.	3	2
	2.2	Basic Intensity transformation functions - Image Negatives, Log Transformations, Power Law Transformations, Piecewise Linear Transformations,	3	2
	2.3	Histogram processing: Histogram Matching, Histogram Stretching, Histogram Equalization.	3	2
	2.4	Spatial filtering – Spatial correlation and convolution; Smoothing Spatial Filters, Sharpening Spatial Filters - Laplacian Filter - Unsharp masking - High Boost Filter. Gradient operators	3	2
	2.5	Fourier transform and frequency domain- Introduction to Fourier transform: 1- DFT, 2 –D DFT and its Inverse Transform, Properties of 2-D DFT	3	2
3	3.1	Introduction to Morphological Image Processing: Fundamentals of image morphology, Applications of morphological operations, Basic concepts and terminology	3	3
	3.2	Set Theory Foundations for Morphology: Basics of set theory, Basic Set operations in image processing.	3	3
	3.3	Basic Morphological Operations: Dilation: concept and effects, Erosion: concept and effects, Role of structuring elements.	3	3
	3.4	Advanced Morphological Operations: Opening operation Closing operation, Applications in noise removal and shape analysis.	3	3
	3.5	Hit-or-Miss Transformation: Concept and definition Pattern detection using hit-or-miss	3	3
4	4.1	Noise models-Gaussian Noise, Rayleigh Noise, Gamma Noise, Exponential Noise, Impulse Noise	3	4

	4.2	Restoration using Mean Filters, Order Statistics filters, Adaptive filters	3	4
	4.3	Image Segmentation basics: Point, Line, Edge detection- detection of isolated points, Basic edge detection;	3	4
	4.4	Thresholding- Global Thresholding using otsu's method	3	4
	4.5	Region based segmentation – Region growing, Region splitting and merging, watershed segmentation	3	4
5	Lab Practice			
	5.1	Implement using Python: 1. Load a grayscale and color image and display, Convert a color image to grayscale. 2. Simulate image sampling and quantization by reducing resolution and gray levels. 3. Demonstrate spatial and intensity resolution differences using image resizing and quantization. 4. Compute and visualize adjacency and connectivity in a binary image. 5. Read an image and separate it into RGB components. Convert RGB image to CMY and HSI color models. 6. Modify hue, saturation, and intensity and display the output. 7. Plot color histograms for each channel. 8. Image negative transformation. 9. Apply log transformation and analyze contrast enhancement. 10. Pwer-law (gamma) transformation for different gamma values. 11. Perform piecewise linear transformations (contrast stretching, thresholding). 12. Perform histogram equalization and compare results. 13. Implement histogram stretching. 14. Apply histogram matching (specification) with a reference image. 15. Perform spatial correlation and convolution using custom kernels. 16. Apply smoothing filters (mean, Gaussian). 17. Sharpening filters using Laplacian, 18. Perform unsharp masking and high-boost filtering. 19. Apply gradient operators (Sobel, Prewitt) for edge detection. 20. Compute and visualize the 2D Fourier Transform of an image. Implement inverse DFT and reconstruct the image. 21. Apply low-pass and high-pass filters in frequency domain. 22. Demonstrate properties of DFT (translation, scaling). 23. Perform basic morphological operations: dilation and erosion. Use different structuring elements and analyze effects,Opening and closing operations. 24. Hit-or-miss transformation for pattern detection. 25. Add different types of noise: Gaussian, Salt & Pepper (Impulse), Rayleigh / Gamma / Exponential, Apply mean filters and analyze results.	30	5

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecturing • Collaborative learning • Self-directed learning • ICT enabled Lectures
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** 1. Written tests 2. Assignments 3. Viva 4. MCQ etc **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Lab Record • Viva
	B. Semester End Examination **ESE for Theory: Written Test (70 Marks, 2 Hrs)** Part A: Very Short Answer Questions. (Answer all) - (5 x 2 = 10 marks) Part B: Short answer questions (5 out of 7 Questions) - (5 x 6 = 30 marks). Part C: Essay questions (2 out of 3 Questions) - (2 x 15 = 30 marks) **ESE for Practical: (35 Marks**, 1.5 Hrs) 1. Coding -10 Marks 2. Output - 10 Marks. 3. Viva - 10 Marks. 4. Record - 5 Marks

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods.(2010). Digital Image Processing(Third Edition).Pearson.

SUGGESTED READINGS:

1. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

2. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
3. William K. Pratt, Digital Image Processing, John Wiley, Fourth Edition, New York, 2002.
4. Milan Sonka et al, Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, Fourth edition, 2007.
5. AzrielRosenfield, Avinash C. Kak, "Digital Picture Processing", Morgan Kaufmann, 2nd Ed., 1982.
6. Bernd Jahne, “Digital Image Processing”, Springer, 6th Ed., 2005.

Mahatma Gandhi University
Kottayam

Programme	BCA (Honours))					
Course Name	**Natural Language Processing**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA305**					
Course Level	**NA**					
Course Summary	This course provides a comprehensive foundation for understanding and applying natural language processing techniques. It covers language fundamentals, linguistics resources, and advanced NLP topics, including part-of-speech tagging, parsing, semantics, word sense disambiguation, information retrieval, and practical applications like machine translation and automatic speech recognition.					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic knowledge of programming and statistics.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe different levels of linguistic analysis.	U	2
2	Distinguish between various NLP techniques used for managing and analyzing linguistic data.	An	1
3	Compare and contrast various aspects of natural language structure and linguistic analysis methods.	An	2,3
4	Analyze word sense disambiguation techniques and examine key applications of Natural Language Processing.	An	2,3
5	Develop and implement basic NLP algorithms using programming tools such as Python.	A	2,3

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to NLP: Human languages, models, ambiguity NLP processing paradigms,	3	1
	1.2	Levels of Language Analysis: Syntax, Semantics, Pragmatics	3	1
	1.3	Phonetics- Speech Sounds and Phonetic, Articulatory Phonetics, Prosody.	3	1
	1.4	Text representation in computers, encoding schemes.	3	1
	1.5	Linguistics resources- Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML	3	1
2	2.1	Management of linguistic data with the help of GATE, NLTK.	3	2
	2.2	Regular expressions, Finite State Automata, word recognition, lexicon.	3	2
	2.3	Morphology, acquisition models, Finite State Transducer. N-grams, smoothing, entropy, HMM, ME, SVM, CRF.	3	2
	2.4	Part of Speech tagging- Stochastic POS tagging, HMM,	3	2
	2.5	Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions.	3	2
3	3.1	Overview of natural language grammars, Basic linguistic units - lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement	3	3
	3.2	Formal Grammar and Spoken Language: Introduction to formal grammars, Context Free Grammar, spoken language syntax	3	3
	3.3	Parsing Techniques: Introduction to parsing in NLP, Top-down and bottom-up parsing, Chart parsing techniques, Unification-based parsing, Probabilistic parsing (PCFGs).	3	3
	3.4	TreeBank: structure and applications, Evaluation of parsing systems, Applications of parsing in NLP systems.	3	3

	3.5	Semantics and Meaning Representation: Introduction to semantics in NLP, Meaning representation techniques, Semantic analysis and interpretation, Lexical semantics, Semantic networks and resources – WordNet.	3	3
4	4.1	Fundamentals of Word Sense Disambiguation (WSD)-Introduction to Word Sense Disambiguation, Types of lexical ambiguity, Importance of context in determining meaning, Overview of WSD approaches	2	4
	4.2	Techniques in Word Sense Disambiguation: Selectional restrictions and semantic constraints, Dictionary-based approaches, Machine learning approaches, Performance evaluation of WSD systems	2	4
	4.3	Discourse and Reference Resolution: Introduction to discourse in Natural Language Processing, Reference resolution: anaphora, cataphora, and deixis, Constraints on co-reference, Linguistic features used in discourse processing	4	4
	4.4	Discourse Analysis and Structure: Algorithms for pronoun resolution, Text coherence and cohesion, Discourse structure models (RST, discourse representation), Applications of discourse analysis in NLP	4	4
	4.5	Applications of Natural Language Processing: Machine Translation, Information Retrieval and Information Extraction, Text Categorization and Text Summarization, Automatic Speech Recognition (ASR), Text-to-Speech (TTS) systems	3	4
5	Lab Practice			
		Implement using Python: 1.Write a Python program to tokenize a paragraph into sentences and words using NLTK. 2. Build a simple unigram language model for a given corpus. 3. Implement a rule-based system to identify parts of a sentence. 4. Perform basic semantic analysis using word similarity. 5. Demonstrate pragmatics by identifying speech acts (question, command, statement). 6. Use Python libraries to analyze speech signals. 7. Convert text to phoneme representation using a phonetic dictionary. 8. Write a program to demonstrate ASCII vs Unicode encoding. 9. Handle multilingual text input and normalization in Python. 10. Implement text preprocessing: tokenization, stopword removal, stemming, lemmatization. 11. Load and explore a corpus using NLTK. 12. Access and query WordNet for synonyms, antonyms, and	30	5

		hypernyms. 13. Parse and extract information from an XML-based linguistic resource. 14. Write regex patterns to extract emails, dates, and URLs from text. 15. Implement a simple Finite State Automaton (FSA) for word recognition. 16. Implement a simple morphological analyzer (prefix, suffix stripping). 17. Implement a simple Hidden Markov Model (HMM) for sequence prediction. 18. Train a classifier using Naïve Bayes / SVM for text classification. 19. Apply Conditional Random Fields (CRF) for sequence labeling (NER). 20. Perform POS tagging using NLTK. 21. Implement a stochastic POS tagger using HMM. 22. Demonstrate Transformation-Based Learning (TBL) tagging. 23. Handle unknown words in POS tagging. 24. Identify named entities and multiword expressions. 25. Define a Context-Free Grammar (CFG) in Python and parse sentences. 26. Implement top-down and bottom-up parsing. 27. Use chart parsing to analyze ambiguous sentences. 28. Implement probabilistic parsing using PCFG. 29. Load and analyze TreeBank data using NLTK. 30. Evaluate parsing performance using precision and recall. 31. Visualize parse trees for given sentences. 32. Represent sentence meaning using logical forms. 33. Perform lexical semantic analysis using WordNet similarity measures. 34. Build a semantic network from a small dataset. 35. Implement the Lesk algorithm for WSD. 36. Use WordNet to disambiguate word meanings in context. 37. Build a supervised WSD model using machine learning. 38. Analyze text coherence using sentence similarity. 39. Build a simple Machine Translation system using sequence models. 40. Implement Information Retrieval using TF-IDF. 41. Perform text classification (spam detection / sentiment analysis). 42. Generate text summaries using extractive methods.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** 1. Written tests 2. Assignments 3. Viva 4. MCQs **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Lab Record • Viva etc.
	B. Semester End Examination **ESE for Theory: Written Test (70 Marks, 2 Hrs)** Part A: Very Short Answer Questions. (Answer all) - (5 x 2 = 10 marks) Part B: Short answer questions (5 out of 7 Questions) - (5 x 6 = 30 marks). Part C: Essay questions (2 out of 3 Questions) - (2 x 15 = 30 marks) **ESE for Practical: (35 Marks, 1.5 Hrs)** 1. Coding -10 Marks 2. Output - 10 Marks 3. Viva - 10 Marks 4. Record - 5 Marks

REFERENCES:

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

SUGGESTED READINGS

1. James Allen, Natural Language Understanding, 2e, The Benjamin/Cummings Publishing Company Inc., Redwood City, CA.

2. U. S. Tiwary and Tanveer Siddiqui. Natural language processing and Information retrieval, OUP, 2008

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Web Development with Python - Django/Flask**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA306**					
Course Level	**NA**					
Course Summary	This course covers the Flask framework, Jinja2 templating, Bootstrap integration, form handling with Flask-WTF, database operations using SQLAlchemy and Flask-Migrate, email integration with Flask-Mail, RESTful API development, and automated testing. It also introduces Django fundamentals including the MVT architecture, URL routing, views, templates, models, the ORM, and the Admin interface. Advanced topics include Django forms, authentication, password management, permissions, and deployment with WhiteNoise, Gunicorn, and Heroku.					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic to Intermediate knowledge of Python programming (including OOP concepts), HTML, CSS, and fundamental understanding of web technologies (HTTP protocol, client-server architecture).					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Build structured Flask applications with dynamic pages and secure form handling.	A	1
2	Design databases, integrate email, develop RESTful APIs, and implement automated testing in Flask.	A	2
3	Apply Django's MVT architecture, configure routing, create models, and manage data with the ORM and Admin interface.	A	2
4	Implement CRUD operations with GCBVs, manage user accounts and permissions, and deploy Django applications securely.	A	2
5	Apply theoretical knowledge through hands-on projects, gaining	A	3

	practical experience in building and deploying Flask and Django applications.		
Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	**Basic Application Structure:** Understanding the Flask application instance, setting up routes, view functions, and the request-response cycle.	3	1
	1.2	**Jinja2 Templates:** Rendering dynamic HTML by utilizing template variables, control structures and template inheritance.	4	1
	1.3	**Frontend Integration:** Integrating the Flask-Bootstrap extension for styling, serving static files, and setting up custom error pages.	4	1
	1.4	**Web Forms:** Safely handling form data, rendering forms, and using validators with the Flask-WTF extension. Implementing the Post/Redirect/Get pattern and message flashing for user feedback.	4	1
2	2.1	**Databases & Migrations:** Introduction to SQL vs NoSQL, configuring the Flask-SQLAlchemy extension, defining models, establishing database relationships, and performing CRUD database operations. Tracking schema changes using Flask-Migrate.	5	2
	2.2	**Email Integration:** Sending asynchronous emails on a background thread using Flask-Mail.	3	2
	2.3	**RESTful APIs:** Understanding REST architectural principles,handlingJSON serialization/deserialization, and implementing token-based authentication using Flask-HTTPAuth.	4	2
	2.4	**Testing:** Writing unit tests with the Python unittest package and the Flask test client to verify application logic, and generating code coverage reports.	3	2
3	3.1	**Django Architecture & Setup:** The Model-View-Template (MVT) pattern, configuring settings.py, working with the command line, and isolating code into apps.	3	3
	3.2	**URLs, Views, and Templates:** Configuring URL dispatchers, transitioning from Function-Based Views (FBVs) to Generic Class-Based Views (GCBVs) like	4	3

		TemplateView, and utilizing the Django Template Language.		
	3.3	**Models and the ORM:** Designing relational database models, understanding primary and foreign keys, executing makemigrations and migrate, and querying the database via the ORM.	4	3
	3.4	**The Django Admin:** Registering models and visually interacting with database tables using Django's built-in Admin interface.	4	3
4	4.1	**Forms & Generic Editing Views:** Rendering HTML forms and handling validation automatically by extending GCBVs like ListView, DetailView, CreateView, UpdateView, and DeleteView.	3	4
	4.2	**User Accounts & Custom Models:** Leveraging Django's built-in auth app for secure login, logout, and signup flows. Overriding the default User model by extending AbstractUser.	3	4
	4.3	**Password Management:** Configuring built-in views and custom templates to support secure password change and password reset via email.	3	4
	4.4	**Permissions & Authorizations:** Restricting view access using LoginRequiredMixin and adding object-level authorization via UserPassesTestMixin.	3	4
	4.5	**Deployment:** Moving to production using environment variables with environs, securing settings (DEBUG, SECRET_KEY, ALLOWED_HOSTS), serving static files with WhiteNoise, transitioning to a Gunicorn WSGI server, and configuring a Procfile for Heroku deployment.	3	4
. 5	5.1	**Practical Exercises and Labs** **Flask** 1. **Flask Setup & Routing:** Create a virtual environment, install Flask, and build an application with static and dynamic routes. 2. **Jinja2 Templates:** Implement template inheritance and integrate Flask-Bootstrap to dynamically style web pages. 3. **Web Forms:** Use Flask-WTF to build a secure user input form, handle a POST request, and display flashed messages. 4. **Database & Models:** Configure Flask-SQLAlchemy, define models, perform CRUD operations, and upgrade schemas using Flask-Migrate. 5. **Application Structure & Email:** Refactor the	30	5

		application using Blueprints and integrate Flask-Mail for asynchronous emails. 6. **RESTful** APIs: Build an API Blueprint that serializes database resources to JSON and secures endpoints with token-based authentication. 7. **Automated** Testing: Write an automated test suite utilizing the Flask test client to verify routes and generate a code coverage report. **Django** 8. **Django Setup & Views:** Initialize a project, configure apps, and build generic class-based views with URL routing. 9. **Models & The Admin:** Construct database models, generate/apply migrations, and register the models to populate data via the Admin panel. 10. **Generic Class-Based Views (CRUD):** Implement ListView, CreateView, UpdateView, and DeleteView to allow users to interact with database records from the frontend. 11. **Custom User Models:** Override the default Django user model using AbstractUser to add custom database fields. 12. **Authentication Flow:** Build login, logout, and customized signup flows utilizing Django's built-in auth views. 13. **Password Resets:** Implement custom templates for the full password change and password reset by email workflows. 14. **Permissions & Relationships:** Restrict access to views using LoginRequiredMixin and establish foreign key relationships. 15. **Live Deployment:** Extract secrets to a .env file, compile static files with WhiteNoise, configure a Procfile, and deploy the application to Heroku		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** ● Lecture ● Demonstration ● Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **Continuous Comprehensive Assessment (CCA)**

	CCA for Theory : 30 Marks • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Practical assignments • Observation of practical skills • Viva etc.
	B. End Semester Examination • **ESE for Theory: Written Test (70 Marks , 2 Hour)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) • **ESE for Practical: 35 Marks (1.5 Hours)** • Logic - 10 Marks • Implementation - 10 Marks • Output - 5 Marks • Viva - 5 Marks • Record - 5 Marks

REFERENCES:

1. Miguel Grinberg – Flask Web Development: Developing Web Applications with Python, 2nd Edition, O'Reilly Media.
2. William S. Vincent – Django for Beginners: Build Modern Web Applications with Python, 5th Edition.

Web Resources

Flask: https://flask.palletsprojects.com/
Django: https://docs.djangoproject.com/
Django REST Framework: https://www.django-rest-framework.org/

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Cross-Platform Application Development with Dart and Flutter**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA307**					
Course Level	**NA**					
Course Summary	This course covers Dart fundamentals including variables, data types, object-oriented programming, conditionals, loops, functions, and classes. It advances into Dart operators, asynchronous programming, and the basics of Flutter project structure and widgets. Key topics include building UIs, responsive layouts, state management with Provider and BLoC, navigation, animations, networking, JSON/XML parsing, and local data persistence. Practical labs reinforce these concepts through hands-on Dart and Flutter applications.					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic to Intermediate knowledge of any programming language (preferably with OOP concepts), HTML, and CSS.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Develop structured Dart programs applying object-oriented principles.	A	1
2	Apply advanced Dart operators to implement asynchronous programming and describe the basics of Flutter.	A	2
3	Build responsive user interfaces, manage application state using Provider and BLoC patterns and implement navigation and routing between pages.	A	2
4	Create smooth animations with Flutter's animation library, handle networking and JSON/XML data parsing, and implement local data persistence using Shared Preferences, SQLite, and Hive.	A	2

5	Develop Dart and Flutter programs, covering collections, exception handling, asynchronous programming, widgets, state management, navigation, animations, and data storage.	A	2
Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to DART, Key Features, Dart Basics: Variables and Data types.	3	1
	1.2	Dart Object-oriented Programming: Classes and Objects, Inheritance, Polymorphism, Encapsulation, Abstraction, Collections and Iteration, Error handling with Exceptions.	3	1
	1.3	Conditionals: if statement, else block, ternary operator, switch statement. Loops: while loop, for loop, for-in loop, do-while loop, iterable specific loops.	3	1
	1.4	Functions: structure of a Dart function, optional parameters, positional parameters, named parameters, passing default values to optional parameters, functions as first-class objects, defining function types in Dart, extensions methods.	3	1
	1.5	Classes: dart classes, constructors in dart, named constructors, inheritance, interfaces, mixins.	3	1
2	2.1	Operators: Ternary operator, ?? operator, ?. operator, ??= operator, cascade(..) notation, fat arrow (=>) operator, ~/ operator, spread (…) operator, null-aware index (?[]) operator, null-aware cascade(?..) operator.	5	2
	2.2	Asynchronous Programming in Dart: Need of asynchronous programming, Understanding the async/await structure, Futures, Handling Futures, delayed futures, future builder, Streams, Isolates.	3	2
	2.3	Basics of Flutter: Structure and tools, Folder structure, pubspec.yaml file, Hot Reload, Linter rules, Tree shaking and constants.	3	2
	2.4	Basic widgets: Text, Row, Column, ListView, Container, Stack and Positioned, Stateless and Stateful widgets, Keys, Rebuilds and optimization, const constructor, Prefer widget composition over functions, Architecture, Element and RenderObject, Foreign Function Interface, Method channels.	4	2

3	3.1	Building UIs in Flutter: Material, Scaffold, Material widgets, Buttons, Dialogs, Cupertino, CupertinoPageScaffold, Cupertino widgets.	3	3
	3.2	Building layouts: Platform support, Single OS, Multiple OSes. Responsive UIs, LayoutBuilder, MediaQuery, Scrolling and constraints, Using themes.	4	3
	3.3	State management: Updating the UI, Passing the state with Provider. BLoC pattern: BlocListener class, BlocObserver class, Persisting the state with HydratedBloc, Undo and redo with ReplayBloc, The internals of Bloc: Cubit.	4	3
	3.4	Routes and navigation: Basics of navigation and routing, Passing data between pages and widgets, other routing techniques.	4	3
4	4.1	Animations: Implicit animations, The animation library, AnimatedWidget, AnimationBuilder, Curves, Tweens, Custom animations.	4	4
	4.2	Working with JSON and other formats: Parsing JSON, Manual parsing, Automatic parsing, Parsing XML, parsing strings, Building XML strings.	4	4
	4.3	Networking in Flutter: Connecting to the internet, Http packages.	3	4
	4.4	Local Data Persistence: Shared preferences, SQLite, Hive.	4	4
. 5	5.1	**Practical Exercises and Labs** **Dart Programs** 1. Programs to familiarize Collections (lists, maps) in Dart. 2. Programs to familiarize Polymorphism with method overriding. 3. Programs to familiarize Exception handling in Dart. 4. Programs to familiarize if-else statements, switch statement to handle multiple cases. 5. Programs to familiarize Loops (while, for, for-in, do-while) and Iterable-specific loops to process collections. 6. Programs to familiarize Function with optional parameters. 7. Programs to familiarize Class (constructors, methods, named constructors), inheritance, interfaces and mixins. 8. Programs to familiarize Asynchronous programming using async/await, Future and Stream objects in a program.	30	5

		Flutter Programs 9. Programs to familiarize Widgets and its state management. 10. Programs to familiarize State management with Provider. 11. Programs to familiarize Bloc pattern, BlocListener and BlocObserver. 12. Programs to familiarize Navigation and routing between pages. 13. Programs to familiarize Passing data between pages and widgets using various techniques. 14. Programs to familiarize Implicit animations using Flutter, Animation library, AnimatedWidget, and AnimationBuilder. 15. Programs to familiarize Curves and Tweens for custom animations. 16. Programs to familiarize Parse JSON data manually and automatically. 17. Programs to familiarize Local data management (Shared preferences, SQLite, Hive).		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Demonstration • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA) CCA for Theory: 30 Marks** • Written test • Assignments • Viva • MCQ, etc. **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Viva etc.
	B. End Semester Examination (ESE) **ESE for Theory: Written Test (70 Marks, 2 Hrs.)**

	Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) **ESE for Practical: (35 Marks, 1.5 Hrs.)** • Logic - 10 Marks • Successful Compilation - 5 Marks • Output - 5 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES:

1. Deven Joshi - Building Cross- platform Apps with Flutter and Dart, BPB publications.
2. Kris Hermans - Mastering Dart: A Comprehensive Guide to Learn Dart Programming, Cybellium Ltd.
3. Alberto Miola - Flutter Complete Reference, AWS Kindle Edition.

SUGGESTED READING:

1. Dr. Deepti Chopra, Roopal Khurana - Flutter and Dart: Up and Running, BPB publications.

Eric Windmill - Flutter in Action 1st Edition, Manning publications.

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Modern Web Application Development with React.js**					
Type of Course	**DSE**					
Course Code	**MG5DSEBCA308**					
Course Level	**NA**					
Course Summary	This course provides comprehensive knowledge and hands-on experience in building modern, scalable, and performant single-page web applications using React.js. It covers React fundamentals, component architecture, hooks, state management, data fetching, styling strategies, TypeScript integration, performance optimization, and testing. The course emphasizes clean code principles, design patterns, and best practices to develop production-ready applications. Extensive practical sessions enable students to build real-world projects.					
Semester	5	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic Knowledge of HTML, CSS, JavaScript (ES6+) and OOP Concepts.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe React fundamentals, JSX, component architecture, props, and clean code principles.	U	1
2	Apply React Hooks, state management techniques, and handle forms and side effects effectively.	A	2
3	Develop responsive UIs, implement navigation, and manage application state using modern patterns.	A	2
4	Perform data fetching, apply performance optimization, styling strategies, TypeScript, and testing in React applications.	A	2
5	Apply theoretical concepts through hands-on development of complete React applications including CRUD operations, API integration, optimization, and testing.	A	2

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to React.js, Single Page Applications (SPAs), Virtual DOM, and Component-based Architecture.	3	1
	1.2	JSX Syntax, Expressions, Rendering, and List Rendering with Keys.	3	1
	1.3	Functional and Class Components, Props, and Component Composition.	3	1
	1.4	React Anti-Patterns and Clean Code Principles (DRY, Separation of Concerns).	3	1
	1.5	Project Setup using Vite/Create React App and Project Structure.	3	1
2	2.1	Introduction to Hooks and Rules of Hooks.	3	2
	2.2	Local State with useState, Controlled vs Uncontrolled Components, and Form Handling.	4	2
	2.3	useEffect for Side Effects, useRef, Lifting State Up.	4	2
	2.4	useReducer, Custom Hooks, and Complex State Management.	4	2
3	3.1	Data Fetching using Fetch API, Axios, Async/Await, and Error Handling.	4	3
	3.2	Conditional Rendering, React Router for Navigation and Routing.	4	3
	3.3	State Management with Context API and Introduction to Redux Toolkit.	4	3
	3.4	REST vs GraphQL, and Introduction to Server-Side Rendering with Next.js.	3	3
4	4.1	Styling in React: CSS Modules, Styled Components, Tailwind CSS, and BEM Convention.	4	4
	4.2	Performance Optimization: useMemo, useCallback, React.memo, and Code Splitting.	3	4
	4.3	TypeScript in React: Interfaces, Typing Props & State.	4	4

	4.4	Testing React Applications: Jest, React Testing Library, and Cypress basics.	4	4
. 5	5.1	**Practical Exercises and Labs** 1. Programs on JSX, Components, Props, and List Rendering with Keys. 2. State Management using useState, useReducer, and Form Handling. 3. Programs using useEffect, useRef, and Custom Hooks. 4. CRUD Application with Local State. 5. Data Fetching from Public APIs (e.g., Hacker News / JSONPlaceholder). 6. Navigation and Routing using React Router with Data Passing. 7. Responsive UI Development using Tailwind CSS / Styled Components. 8. State Management with Context API. 9. Performance Optimization using Memoization. 10. Integration of TypeScript in React Project. 11. Writing Unit & Integration Tests using Jest and React Testing Library. ***Note:*** *Students should develop a Full-featured Application (E-commerce / Blog / Dashboard / Todo with API) as mini project by the end of the semester. Evaluation of this project will be done as ESE for practical.*	30	5

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Demonstration • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA) CCA for Theory: 30 Marks** • Written test • Assignments • Viva • MCQ etc. **CCA for Practical: 15 Marks** • Practical assignments • Observation of practical skills • Viva etc.

	B. End Semester Examination **ESE for Theory: Written Examination (70 Marks , 2 Hrs)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) **ESE for Practical: 35 Marks** *Project Report - 15 Marks* *Viva / Presentation - 20 Marks*

REFERENCES:

1. Robin Wieruch - The Road to React (2025 Edition)
2. Anthony Onyekachukwu Okonta - React.js Design Patterns, BPB Publications

SUGGESTED READINGS:

1. Official React Documentation (react.dev)

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**
Course Name	**Internship**
Type of Course	**SEC**
Course Code	**MG5SECBCA300**
Course Level	NA
Course Summary	Internship provides learners with first-hand exposure to professional environments, enabling them to understand organisational work practices, enhance job-related skills and aptitudes, and develop research capabilities through structured learning opportunities. Students shall complete a 4-credit Summer Internship, after the completion of the 4th semester of Honours degree programme and learners must complete 240 hours of internship engagement to earn 4 credits.

Semester	5	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		0	0	0	0	240
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Analyse workplace practices and task requirements to identify issues, interpret patterns, and propose logical, evidence-based improvements.	An	1,2,3, 6,7,8, 10
2	Carry out assigned professional tasks using appropriate tools, methods, or procedures, demonstrating accuracy, efficiency, and responsible work practices.	S	1,2,3, 4,5,9, 10

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

Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA: 30 Marks** • Activity logbook and the evaluation report submitted by the Mentor/Internship Supervisor • Evaluation based on work quality • Teamwork and collaboration • Acquisition of relevant skill sets • Attendance and regularity • Feedback from the Mentor
	B. End Semester Examination (ESE) **ESE : 70 Marks** • Internship Report: 20 Marks • Originality and innovative contributions made during the Summer Internship: 20 Marks • Viva Voce:20 Marks • Performance feedback from the IPO: 10 Marks