COURSE TITLE: Deep Learning

Course Code: MCA24308DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56						External	80	-
Total number of Practical Hours: -						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits		4

Course Objectives

- To provide a comprehensive understanding of deep learning principles, including the distinction between shallow and deep architectures.
- To equip students with the skills to design, implement, and train artificial neural networks (ANNs) and convolutional neural networks (CNNs) for various applications.
- To introduce students to advanced deep learning architectures, techniques, and challenges, including regularization, transfer learning, and neural architecture search.
- To explore cutting-edge topics in deep learning, such as Graph Neural Networks, Meta Learning, Auto encoders, Generative Adversarial Networks (GANs), and Deep Reinforcement Learning.

Course Content	TEACHING HOURS
UNIT I: Artificial Neural Networks	**14 Hrs**
Deep Learning- Historical Overview, Importance and Applications, Deep Learning vs. Traditional Machine Learning, Key Deep Learning Terminology, Shallow Architectures and Deep Architectures, Deep Learning Basics: Biological Neural Network, Artificial Neural Networks, Neuron as a basic building element of ANN, Activation Functions, Perceptron, learning with Perceptron, Limitations of Perceptron, Multilayer neural network, Learning with Multilayer Perceptron, Training ANN using Backpropagation algorithm	
UNIT II: Convolutional Neural Networks	**14 Hrs**
Loss Functions, Hyper parameters, Vanishing and Exploding Gradient Regularization Techniques: L1 and L2 regularization, Dropout, Batch Normalization, Convolutional Neural networks: Evolution of Convolutional neural network models, Convolution Operation, Architecture of CNN, one hot encoding, Calculation of Trainable parameters in CNN, Advanced Convolutional Architectures: AlexNet, Visual Geometry Group, Residual Networks, Inception Networks and recent trends.	
UNIT III : Neural Architecture Search	**14 Hrs**
Overview of NAS: History and Motivation, significance in Deep Learning. Baseline methods and its limitations: Random and Grid search. Evolutionary based Search, Reinforcement Learning based Search, Gradient based methods-DARTS , Challenges in NAS	

UNIT IV: Applications of Deep Learning Architectures	14 Hrs
Restricted Boltzmann Machine, Auto encoders, Deep Belief Networks, Generative Adversarial Networks, Recurrent Neural Networks, Graph Neural Networks. Transfer Learning and Fine Tuning, Meta Learning- Zero shot and One shot learning. Deep Reinforcement Learning: introduction and applications. Applications of Convolutional Neural Network: Image classification, object detection, and image segmentation, Limitations of Convolutional Networks.	

Textbooks

1. Deep Learning by Ian GoodFellow, MIT Press.2016
2. Advanced Deep Learning with Python, Ivan Vasilev, 2019
3. Advances in Deep Learning, M. Arif Wani, 2019

Reference Books

1. Deep Learning with Python, Francois Chollet, 2nd edition, 2021
2. Deep Reinforcement Learning Hands-On, Maxim Lapan, 2nd edition, 2020
3. Automated Machine Learning Methods, Systems, Challenges, 2019
4. Deep Learning: A Visual Approach, Andrew Glassner, 2021
5. Selected Journal and Conference Papers.

COURSE OUTCOMES (CO):

CO1: Differentiate between traditional machine learning and deep learning, and explain the importance and applications of deep learning.

CO2: Implement and train artificial neural networks (ANNs) using multilayer perceptrons and backpropagation, and address challenges like vanishing/exploding gradients.

CO3: Apply regularization techniques, design and analyze convolutional neural networks (CNNs), and explore advanced architectures like ResNet and Inception Networks.

CO4: Explore advanced deep learning concepts including Graph Neural Networks, Meta Learning, Restricted Boltzmann Machines, Auto encoders, and Generative Adversarial Networks (GANs).

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	2	2	1	1	-	1	1	-	2
2	3	3	2	2	3	-	1	-	1	1	1	3
3	3	3	3	3	3	-	1	1	2	2	2	3
4	3	3	3	3	3	2	1	2	2	2	1	3

To be effective from year-2024

COURSE TITLE: Internet of Things

Course Code: MCA24309DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits		4

Course Objectives

- **Introduce students to the basic principles and architecture of the Internet of Things (IoT).**
- **Familiarize students with the key components and communication protocols used in IoT systems.**
- **Explore various practical applications of IoT across different domains, including smart homes, healthcare, and industry.**
- **Examine the challenges, ethical considerations, and future trends in IoT technology.**

Course Content	TEACHING HOURS
UNIT 1: Introduction to IoT	**14 Hrs**
Introduction to IoT: Definition and basic concept of IoT, Evolution and importance of IoT in various domains (e.g., healthcare, smart cities, agriculture) Key Components of IoT: Sensors and actuators: Types and functionalities, IoT devices: Overview of different types (e.g., wearables, smart home devices), Communication protocols: Overview of MQTT, CoAP, HTTP, etc. IoT Architecture: Overview of IoT architecture layers (perception, network, application), Cloud computing and edge computing in IoT, IoT platforms: Examples and their roles in IoT deployments.	
UNIT 2: Applications and Challenges of IoT	**14 Hrs**
IoT Applications: Smart home systems: Examples and functionalities (e.g., home automation, security systems), Healthcare IoT: Remote patient monitoring, smart medical devices, Industrial IoT (IIoT): Industry 4.0 concepts, smart factories Challenges and Considerations: Security and privacy issues in IoT: Threats and mitigation strategies, Scalability and interoperability challenges, Ethical considerations and societal impacts of IoT Future Trends in IoT: Emerging technologies influencing IoT (e.g., AI, blockchain), Predictions for the future of IoT: Opportunities and challenges.	
UNIT 3: IoT Architecture and Real-World Design Constraints	**14 hrs**

IoT Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again Data representation and visualization, Interaction and remote control. Industrial Automation- Service oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.	
UNIT 4 : Internet of Things with Arduino: Connectivity, Sensor Interaction, and Cloud Integration	**14 hrs**
Internet of Things with Arduino Setting up the Arduino development environment: Options for Internet connectivity, Interacting with basic sensors, Interacting with basic actuators, Configuring Arduino for the IoT Grabbing the content from a web page, Sending data to the cloud, Monitoring sensor data from a cloud dashboard, Monitoring several Arduino boards at, Storing data on Google Drive, Basic local M2M interactions, Cloud M2M with IFTTT; Case Study: IoT based Flood Monitoring and Alert System	

Textbooks

1. Internet of Things: Principles and Paradigms" by Rajkumar Buyya, Amir Vahid Dastjerdi, and Sriram Illikkal.
2. Schwartz, Marco. "Internet of Things with Arduino Cookbook". Packt Publishing Ltd, 2016.
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014. (ISBN-13: 978-0124076846)

Reference Books

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN-13: 978-8173719547)
2. Schwartz, Marco. "Internet of Things with Arduino Cookbook". Packt Publishing Ltd, 2016

COURSE OUTCOMES (CO):

CO1: Grasp the fundamental concepts and architecture of IoT and its significance in modern technology.
CO2: Identify and explain the key components and communication protocols essential for IoT systems.
CO3: Analyze and describe practical applications of IoT across various sectors, including smart homes, healthcare, and industry.
CO4: Evaluate the challenges and future trends in IoT, including security, privacy, and emerging technologies.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	1	2	2	2	2	-	1	1	2
2	3	3	3	2	3	2	2	1	1	2	1	2
3	2	3	3	2	2	3	3	2	2	3	2	2
4	2	2	2	2	2	2	2	3	2	3	2	3

To be effective from year-2024

COURSE TITLE: Cyber Security and Digital Forensics

Course Code: MCA24310DCE						**Examination Scheme**	**T**	**P**
Total number of Lecture Hours: 56						**External**	**80**	**-**
Total number of Practical Hours: -						**Internal**	**20**	**-**
Lecture (L):	**4**	**Practical (P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**	**4**	

Course Objectives

- Describe the fundamentals of cybersecurity
- Analyze security challenges faced by different IT components
- Describe the fundamentals of digital forensics
- Apply digital forensic methods to analyze disk drives and file systems
- Use computer forensic tools to perform file system forensics
- Describe anti-forensic techniques, types and tools

Course Content	**TEACHING HOURS**
UNIT 1: Cyber security	**14 Hrs**
Introduction – history, relevance, major incidents. Basic terminology. CIA triad. Cyber attacks and classification. Cyber crimes and classification. Cyber laws and penalties. IT Act, 2000. System security and Software security. Web security and Network security.	
UNIT 2: Digital forensics	**14 Hrs**
Introduction – principles, procedures, phases, types. Sources of digital evidence and chain-of-custody. Data acquisition and validation. Computer forensic tools (CFTs). Timeline analysis. Proactive and reactive forensics.	
UNIT 3: File system forensics	**14 Hrs**
Storage drive design and working. Volume analysis, PC-based partitions, Server-based partitions. File system analysis, FAT file system concepts, data structures and analysis. Using CFTs to perform forensic analysis of the FAT file system.	
UNIT 4: Anti-forensics	**14 Hrs**
Introduction, artifact-wiping, data-hiding, cryptography, steganography, trail obfuscation, attacking CFTs. Anti-forensics tools. Anti-forensics countermeasures. Forensic readiness.	

Textbooks:

1. E. Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2010.

Reference Books:

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1. B. Carrier, File System Forensic Analysis, Addison-Wesley, 2005.
2. J.R. Vacca and K. Rudolph, System Forensics, Investigation and Response, Jones and Bartlett Learning, 2011.
3. M. T. Britz, Computer Forensics and Cyber Crime, Pearson, 2013.

COURSE OUTCOMES (CO):

CO1: Students will be able to describe the fundamentals of cybersecurity
CO2: Students will be able to analyze security challenges faced by different IT components
CO3: Students will be able to describe the fundamentals of digital forensics
CO4: Students will be able to apply digital forensic methods to analyze disk drives and file systems
CO5: Students will be able to use computer forensic tools to perform file system forensics
CO6: Students will be able to describe anti-forensic techniques, types and tools.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	-	-	-	-	2	2	3	-	-	-	-
2	3	3	3	2	2	2	2	3	3	-	-	-
3	3	-	-	-	-	2	2	3	-	-	-	-
4	3	2	3	3	3	2	2	3	3	2	2	2
5	3	2	3	3	3	2	2	3	3	2	2	2
6	3	-	-	-	-	2	2	3	-	-	-	-

COURSE TITLE: Web Development

Course Code: MCA24003OE						Examination Scheme	T	P
Total number of Lecture Hours: 28 Total number of Practical Hours: -						External	40	-
						Internal	10	-
Lecture (L):	2	Practical (P):	-	Tutorial (T):	-	Total Credits		2

Course Objectives

- Develop proficiency in HTML for structuring content and CSS for styling, including layout, typography, and responsive design.
- Learn to implement interactivity using JavaScript and enhance user experience through animations and dynamic content.
- Develop a portfolio of diverse web projects demonstrating design skills, creativity, and practical application of web design principles.

Course Content	TEACHING HOURS
UNIT 1: HTML	**14 Hrs**
HTML: Understanding HTML, create a Web Page, Linking to other Web Pages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, Hyper Links and link within a Page, Creating HTML Forms, Creating Web Page Graphics, Putting Graphics on a Web Page, Custom Backgrounds and Colors.	
UNIT 2: CSS	**14 Hrs**
Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format. Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties), Creating page Layout and Site Designs.	

Textbooks

1.HTML and CSS: Design and Build Webs by Jon Duckett, 2011

Reference Books

1. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, Fifth Edition Robbins, Jennifer, 2018
2. Schaum's Outline of HTML by David Mercer, 2001

COURSE OUTCOMES (CO):

CO1: Proficiency in Web Technologies: Students will demonstrate proficiency in HTML, CSS, and JavaScript, enabling them to create well-structured, visually appealing, and interactive websites.

CO2: Responsive Design Skills: Students will be able to design and develop responsive websites that provide optimal viewing and interaction experience across a wide range of devices and screen sizes.

CO3: Enhanced User Experience: Students will apply design principles and interactive elements effectively to enhance user experience and usability of websites.

LEVEL OF CO-PO MAPPING TABLE

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
1	2	2	3	-	3	-	1	2	3	2	2	2
2	1	2	3	-	3	2	1	2	3	2	2	1
3	-	2	3	-	2	2	1	2	2	3	2	2

COURSE TITLE: Data Analytics

Course Code: MCA24003GE	Examination Scheme	T	P
Total number of Lecture Hours: 28 Total number of Practical Hours: -	External	40	-
	Internal	10	-
Lecture (L): 2 Practical (P): - Tutorial (T): -	Total Credits		2

Course Objectives

- Introduce the fundamental concepts and significance of data analytics.
- Equip students with knowledge of basic statistical methods and data visualization techniques.
- Familiarize students with data preprocessing and cleaning techniques to prepare data for analysis.
- Provide hands-on experience with data analysis tools such as Excel, Python, and R for practical application.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Data Analytics	**14 Hrs**
Understanding Data Analytics: Definition, importance, and applications in various fields. Types of Data: Structured vs. unstructured data, sources of data, and data collection methods. Basic Statistical Concepts: Mean, median, mode, standard deviation, and data distributions. Data Visualization: Importance of visualization, tools like Excel and Tableau, and basic visualization techniques. Data Preprocessing: Cleaning, transforming, and preparing data for analysis.	
UNIT 2: Techniques and Tools in Data Analytics	**14 Hrs**
Descriptive Analytics: Summarizing and interpreting data using descriptive statistics. Exploratory Data Analysis (EDA): Techniques for discovering patterns and insights in data. Introduction to Predictive Analytics: Basic concepts of regression, classification, and clustering. Data Mining: Overview of data mining processes and techniques. Using Software Tools: Introduction to software tools like Excel, Python, and R for data analysis.	

Textbooks

1. Data Analytics Made Accessible by Anil Maheshwari (2017, 1st Edition)

Reference Books

1. **Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett (2013, 1st Edition)**
2. **Practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python" by Peter Bruce and Andrew Bruce (2017, 1st Edition)**

COURSE OUTCOMES (CO):

CO1: Students will understand and explain the fundamental concepts and importance of data analytics.

CO2: Students will apply basic statistical methods and data visualization techniques to analyze data.

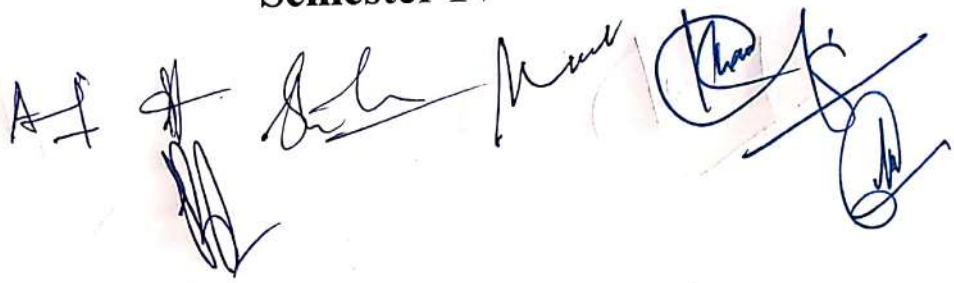
CO3: Students will demonstrate skills in data preprocessing and cleaning to prepare datasets for analysis.

CO4: Students will use data analysis tools such as Excel, Python, and R to perform practical data analytics tasks.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	2	-	-	-	2	2	-	2
2	3	2	3	2	3	-	-	-	2	2	-	3
3	3	2	2	3	3	-	-	-	2	2	-	3
4	3	2	2	3	3	-	-	-	2	2	-	3

Semester IV



COURSE TITLE: Latex

Course Code: MCA24004OE						Examination Scheme	T	P
Total number of Lecture Hours: 28 Total number of Practical Hours: -						External	40	-
						Internal	10	-
Lecture (L):	2	Practical (P):	-	Tutorial (T):	-	Total Credits		2

Course Objectives

- Students will gain a comprehensive understanding of LaTeX, including the ability to format text, manage document structures, and create well-organized documents with various sections, lists, and tables.
- Students will learn to apply advanced LaTeX typesetting skills, such as typesetting mathematical expressions, managing floats, and integrating graphics, as well as using referencing tools like natbib for citation management and bibliographic databases.
- Students will be equipped to create professional-quality technical documents, incorporating advanced features such as customized formatting, detailed tables, and structured content, ensuring clarity and precision in academic and professional writing.

Course Content	TEACHING HOURS
UNIT 1: Basic Typesetting and Formatting	**14 Hrs**
What is LATEX? Why Latex? Simple typesetting: Spaces, Quotes, Dashes, Accents, Special symbols, Text positioning; Fonts: Type Style, Type Size. The Document: Document class, Font and Paper size, Page formats; Page style: Heading declarations, Page numbering, Formatting Lengths; Parts of a Document: Title, Abstract, Chapters, Sections, Subsections, Paragraph etc.; Footnotes and Endnotes. Making Lists: Bulleted, Numbered, Descriptions and Definitions; Using Tabs: Rows and Columns; Creating tables using the tabular: Enhancements to the tabular, Array package, Multirow package; Using other external packages.	
UNIT 2: Advanced Typesetting, Floats and Referencing	**14 Hrs**
Typesetting Mathematics: Basics, Superscripts and Subscripts, Mathematical Symbols; Custom commands and operators; Formatting Equations: Numbering and Groups; Typesetting Theorems. Using Floats: The Figure environment, Creating floating figures, Figure placement; Using graphics in LATEX: Rotating and Scaling objects; The Table environment: Constructing tables, Table Style parameters. Table of Contents, Index and Glossary; Bibliography: Introduction; Using natbib: basic commands and options, Selecting citation style and punctuation; Bibliographic Databases: Using external style files, creating a bibliographic database.	
Textbooks	

3. E. Krishnan. LATEX Tutorials A PRIMER. Indian TEX Users Group, Trivandrum, India
4. "LaTeX in 24 Hours: A Practical Guide for Scientific Writing" by Dilip Datta

Reference Books

4. "The LaTeX Companion" by Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, and Chris Rowley

COURSE OUTCOMES (CO):

CO1: Will be able to design and produce well-structured LaTeX documents, including titles, abstracts, sections, and various formatting elements, demonstrating a clear understanding of document classes and page layouts.

CO2: Students will acquire the skills to typeset complex content, such as mathematical equations, theorems, and custom commands, ensuring precise and accurate presentation of technical material.

CO3: Students will develop the ability to effectively manage floats, figures, and tables in LaTeX, including the integration of graphics and the use of advanced table formatting techniques, enhancing the visual appeal and organization of documents.

CO3: Students will demonstrate proficiency in managing bibliographic references using LaTeX tools like natbib, creating bibliographic databases, and generating comprehensive indices, ensuring proper citation and reference practices in academic writing.

LEVEL OF CO-PO MAPPING TABLE

	POs											
Cos	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	3	1	3	-	1	2	2	3	2	2
2	3	3	3	2	3	-	2	2	2	3	2	2
3	3	2	3	2	3	2	1	2	2	3	2	2
4	3	3	2	2	3	2	2	3	2	3	2	3

COURSE TITLE: AI Tools

Course Code: MCA24004GE						Examination Scheme	T	P
Total number of Lecture Hours: 28						External	40	-
Total number of Practical Hours: -						Internal	10	-
Lecture (L):	2	Practical (P):	-	Tutorial (T):	-	Total Credits		2

Course Objectives

- Understand the evolution and impact of AI across various domains, focusing on key categories like NLP, Computer Vision, and Data Analytics.
- Explore and evaluate AI-driven content generation tools, including ethical considerations and practical applications in marketing and automation.
- Gain hands-on experience with AI assistance tools and their customization for various tasks in personal and professional settings.
- Analyze the role of AI in enhancing data analytics, social media, and marketing through practical case studies and tool demonstrations.

Course Content	TEACHING HOURS
UNIT 1: AI Tools and Their Impact Across Modern Applications	**14 Hrs**
Overview of AI in Modern Applications: Evolution and impact of AI in various domains, Categories of AI tools: Natural Language Processing (NLP), Computer Vision, Data Analytics, etc. **Text and Content Generation Tools:** Quiltbolt: Overview, applications in content creation, ethical considerations, GPT-based Tools: OpenAI's ChatGPT and similar AI models, their usage in automating tasks, Jasper AI: Use cases in marketing and content creation **AI Assistance Tools: Virtual Assistants:** Alexa, Google Assistant, and Siri—how they work and their impact on daily life, AI in Customer Service: Tools like IBM Watson Assistant and Zendesk AI **AI in Creative Industries:** DeepArt and DALL-E: AI tools for visual content creation, their application in art and design, AIVA: AI in music composition, implications for creative professionals.	
UNIT II: Practical Applications of AI Tools: From Content Creation to Data Analytics and Marketing	**14 Hrs**
Hands-On with AI Tools: Using Quiltbolt for content generation, creating art with DALL-E, AI Assistance in Action: Setting up and customizing virtual assistants for various tasks **AI in Data Analytics:** AI for Data Analysis: Tools like Tableau and Power BI with integrated AI features, Google Cloud AI and Microsoft Azure AI: Case studies on how AI is enhancing data analytics	

AI in Social Media and Marketing: AI-Powered Social Media Tools: Tools like Hootsuite's AI for content scheduling and analysis, Ad Targeting with AI: How AI tools are used in personalized advertising and marketing

Textbooks

1. **Paul Kurowski - "The Creative AI Handbook: What Artists, Programmers, and Designers Should Know," 1st Edition, Apress, 2020.**
2. **Alex Castrounis - "AI for People and Business: A Framework for Better Human Experiences and Business Success," 1st Edition, O'Reilly Media, 2019.**

References

1. Foster Provost and Tom Fawcett - "Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking," 1st Edition, O'Reilly Media, 2013.

COURSE OUTCOMES (CO):

CO1: Students will be able to identify and categorize different AI tools and understand their applications in modern technology.

CO2: Students will demonstrate proficiency in using AI tools like Quiltbolt and DALL-E for content generation and creative tasks.

CO3: Students will apply AI assistance tools effectively in both personal and business contexts, customizing them for specific needs.

CO4: Students will critically assess the impact of AI in data analytics, social media, and marketing, using case studies to illustrate real-world applications.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	-	3	-	2	-	-	1	-	2
2	2	2	3	1	3	-	2	-	2	2	-	2
3	2	3	3	2	3	2	1	2	2	3	2	1
4	2	3	2	3	3	3	2	3	2	3	2	3