INSTITUTE ELECTIVES

COMPUTER SCIENCE AND ENGINEERING

2023 SCHEME

(AUTONOMOUS)

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE,
Autonomous Institution Affiliated to APJ Abdul Kalam Technological University)
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INSTITUTE ELECTIVE 1

Slot	Category Code	Course Number	Courses	L-T-P-J	Hours	Credit
E	IEC	23IEL31E	Data Science for Engineers	3-0-0-0	3	3
		23IEL31F	Introduction to Mobile Application	3-0-0-0	3	3
		23IEL31G	Introduction to Cyber Security and Ethical Hacking	3-0-0-0	3	3
		23IEL31H	Digital Marketing and E-commerce	3-0-0-0	3	3

INSTITUTE ELECTIVE II

Slot	Category Code	Course Number	Courses	L-T-P-J	Hours	Credit
E	IEC	23IEL42E	Responsible AI	3-0-0-0	3	3
		23IEL42F	Prompt Engineering	3-0-0-0	3	3
		23IEL42G	Business Intelligence and Analytics	3-0-0-0	3	3
		23IEL42H	Game Development	3-0-0-0	3	3

INSTITUTE ELECTIVE -I

Course Code	Course Name	Categor	L	T	P	J	Credit	Year of Introduction
23IEL31E	DATA SCIENCE FOR ENGINEERS	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

The course is designed to provide fundamental knowledge on data science and to help learners understand the role of statistics and optimization in performing mathematical operations relevant to the field. It aims to equip students with the skills necessary to handle heterogeneous data and effectively visualize it for better interpretation and decision-making. Additionally, the course introduces various open-source data science tools, offering foundational knowledge of their functionalities and practical applications in solving real-world industrial problems.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Demonstrate the ability to obtain fundamental knowledge on data science.	Understand
CO 2	Demonstrate proficiency in statistical analysis of data.	Understand
CO 3	Apply basic tools and techniques of Exploratory Data Analysis (EDA) to explore, summarize, and visualize datasets.	Apply
CO 4	Apply the various types of data and visualize them using through programming for knowledge representation.	Apply
CO 5	Make use of numerous open source data science tools to solve real-world problems through industrial case studies.	Apply

iii. SYLLABUS

Introduction to data science, beginning with the typology of problems and the foundational

importance of linear algebra, statistics, and optimization. It emphasizes structured thinking in solving both structured and unstructured data problems. Core statistical concepts such as descriptive statistics, statistical features, outlier analysis, data summarization, and various forms of distribution and plotting are covered, along with advanced topics like dimensionality reduction, sampling techniques, Bayesian statistics, and statistical modeling. The Python programming component includes basics like variables, data types, control structures, string operations, and core data structures such as lists, tuples, dictionaries, sets, and regular expressions. Exploratory Data Analysis (EDA) is explored in depth, covering its motivation, steps, basic tools, data types, and the data analytics lifecycle. The syllabus also covers data acquisition, pre-processing, quality transformation, and text data handling. Students are introduced to principles of data visualization, including workflows, abstraction techniques, task validation, and a variety of chart types. The course concludes with hands-on exposure to open-source tools such as R, Octave, Scilab, and Python libraries like SciPy, scikit-learn, PyBrain, Pylearn2, and Weka for real-world data science applications.

iv(a)TEXTBOOKS

1.R. V. Hogg, J. W. McKean and A. Craig, Introduction to Mathematical Statistics, 8th Ed., Pearson Education India, 2019.

2. Avrim Blum, John Hopcroft, Ravindran Kannan, “Foundations of Data Science”, Cambridge University Press, 2020.

3.Hossein Pishro-Nik, “Introduction to Probability, Statistics, and Random Processes”, Kappa Research, LLC, 2014.

(b) REFERENCES

1.Ani Adhikari and John DeNero, „Computational and Inferential Thinking: The Foundations of Data Science‟ , GitBook, 2019.

2.Cathy O‟Neil and Rachel Schutt, „Doing Data Science: Straight Talk from the Frontline‟, O‟Reilly Media, 2013.

v. COURSE PLAN

Module	Contents	Hours
I	Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; Structured thinking for solving data science problems, Structured and unstructured data	9
II	Descriptive statistics, Statistical Features, summarizing the data, outlier analysis, Understanding distributions and plots, Univariate statistical plots and usage, Bivariate and multivariate statistics, Dimensionality Reduction,	6

III	Recap- Introduction to Python Programming, Types, Expressions and Variables, String Operations, selection, iteration, Data Structures- Strings, Regular Expression, List and Tuples, Dictionaries, Sets; Exploratory Data Analysis (EDA) - Definition, Motivation, Steps in data exploration, The basic datatypes, Data type Portability, Basic Tools of EDA, Data Analytics Life cycle, Discovery, Data Acquisition, Data Pre-processing and Preparation, Data Quality and Transformation, Handling Text Data;	**10**
IV	Introduction to data visualization, Introduction to Dimensions and Measures, Bar Chart, Line Chart, Table, Heat Map, Treemap, Packed Bubble, Tooltip Visualization workflow: describing data visualization workflow, Visualization Periodic Table; Data Abstraction -Analysis: Four Levels for Validation- Task Abstraction - Analysis: Four Levels for Validation Data Representation: chart types: categorical, hierarchical, relational, temporal & spatial	**10**
V	Overview and Demonstration of Open source tools such as R, Octave, Scilab. Python libraries: SciPy and sci-kitLearn, PyBrain, Pylearn2; Weka.	**10**
Total Hours		**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vi. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

vii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23IEL31F	INTRODUCTION TO MOBILE APPLICATION	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

This course introduces students to the fundamentals of mobile application development with a focus on the Android platform. It is designed to provide an in-depth understanding of Android architecture, application lifecycle, UI/UX design principles, advanced UI components, data persistence, networking, and app deployment. Students will gain practical experience in building, testing, and publishing Android applications, enabling them to create feature-rich, user-friendly mobile apps. By the end of the course, students will have the skills to develop and publish applications on the Android platform.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain mobile app types, Android architecture, and development tools, including MIT App Inventor basics.	Understand
CO 2	Describe the design of user interfaces using Activities, Intents, Layouts, and UI components.	Understand
CO 3	Discuss advanced UI features and data storage techniques using shared preferences, files, and SQLite.	Understand
CO 4	Illustrate content sharing, messaging, and networking concepts in Android apps.	Understand
CO 5	Outline location-based services and the process of publishing Android applications.	Understand

iii. SYLLABUS

Introduction to Android Development: Mobile app types: Native, Hybrid, Web-based App lifecycle and structure - Android features, architecture, and development tools - Basic components of an Android application - Introduction to MIT App Inventor: Interface, setup, and real-time testing

Designing User Interfaces: Activities and their lifecycle - Styling, theming, and dialog windows - Linking activities using Intents - Views, ViewGroups, and basic layouts (Linear, Relative, Table) - UI components: TextView, Button, EditText, CheckBox, ListView, Spinner, etc.

Advanced UI: Image Views: Gallery, ImageSwitcher, GridView - Menus: Options Menu, Context Menu - Data persistence: SharedPreferences, file storage (internal & external) - SQLite database: Create, retrieve, update, delete data

Content Providers and Networking: Content Providers: Data sharing and custom providers - Messaging: Sending and receiving SMS using BroadcastReceiver - Networking: Downloading data, accessing web services

Location-Based Services and App Publishing: Google Maps: Displaying maps, markers, and handling location data - Geocoding and navigation - App publishing: Versioning, signing APK, deploying on the Play Store

iv(a)TEXTBOOKS

1.Lee, Wei-Meng. Beginning android 4 application Development. John Wiley & Sons, 2012.

2.Hardy, Brian, and Bill Phillips. Android programming: the big nerd ranch guide. Addison- Wesley Professional, 2013.

3.Learning MIT App Inventor: A Hands-On Guide to Building Your Own Android Apps: Derek Walter and Mark Sherman, First Edition, 2015

(b) REFERENCES

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed., 2011.

2. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd, First Edition, 2010

3.App Inventor 2: Create Your Own Android Apps: David Wolber, Hal Abelson, Ellen Spertus, and Liz Looney, Second Edition, 2014

v. COURSE PLAN

Module	Contents	Hours

I	**Introduction to Android Development** **Overview of Mobile App Development:** Types of mobile apps: Native, Hybrid, and Web-based apps - Basic app lifecycle and structure. **Introduction to Android:** Android Features - Architecture of Android – Android Development Tools – Basic components of an Android application. **Introduction to MIT App Inventor:** Setting up your account on MIT App Inventor - Exploring the App Inventor interface: Designer and Blocks Editor - Connecting devices for real-time testing (via AI2 Companion App or Emulator).	**8**
II	**Designing User Interfaces** **Activities:** Understanding Activities and their Lifecycle - Applying Styles and Themes to Activity - Hiding the Activity Title, Displaying a Dialog Window, Progress Dialog - Linking Activities Using Intents - Passing Data Using Intent Object. **User Interface Basics:** Understanding Views and ViewGroups - Basic Layouts: LinearLayout, RelativeLayout, TableLayout - Adapting to Display Orientation. **UI Components and Layout Design:** TextView, Button, ImageButton, EditText, CheckBox, ToggleButton**,** RadioButton, RadioGroup**,** ListView, Spinner, and AutoCompleteTextView**,** ProgressBar, TimePicker, DatePicker Views.	**10**
III	**Advanced UI** **Advanced UI Elements:** Using Image Views to Display Pictures (Gallery, ImageSwitcher, GridView) - Using Menus with Views: Options Menu, Context Menu. **Managing State and Data Persistence:** Saving and Loading User Preferences using SharedPreferences - Persisting Data to Files (Internal and External Storage) **Working with SQLite Databases:** Creating a Database - Retrieving, Updating, and Deleting Data	**10**
IV	**Content Providers and Networking** **Content Providers:** Introduction to Content Providers - Sharing Data Using a Content Provider - Creating Custom Content Providers. **Messaging and Networking:** Sending SMS Messages Programmatically - Receiving SMS and Updating Activities Using BroadcastReceiver - Networking: Downloading Binary Data, Text Files, Accessing Web Services	**10**

V	**Location based Services and Publishing Android Applications** **Working with Google Maps:** Displaying Maps and Adding Markers - Handling Location Data (Geocoding, Reverse Geocoding) - Monitoring Location and Navigation. **App Publishing:** Preparing Apps for Publishing - Versioning and Digitally Signing APK - Deploying and Publishing Apps on the Android Market	**7**
	Total Hours	**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23IEL31G	INTRODUCTION TO CYBER SECURITY AND ETHICAL HACKING	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

This course provides a foundational understanding of cyber security principles and an introduction to ethical hacking methodologies. The course focuses on the growing importance of cyber security in protecting digital assets, understanding vulnerabilities, and applying risk management strategies. It covers essential concepts such as cryptography, network security, and incident response. It also introduces ethical hacking as a critical skill for identifying and mitigating security risks. Students will explore hacking methodologies, penetration testing techniques, and the ethical and legal frameworks that govern cybersecurity practices.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Describe the fundamental concepts of cybersecurity and its vulnerabilities.	Understand
CO 2	Explain about cryptography and network security practices.	Understand
CO 3	Demonstrate the Knowledge of Vulnerabilities and Risk Management.	Understand
CO 4	Explain ethical hacking fundamentals and methodologies.	Understand
CO 5	Apply ethical hacking tools to perform security assessments and study real-world cybersecurity incidents through case studies.	Apply

iii. SYLLABUS

Introduction to cybersecurity: Overview of cybersecurity, importance, and challenges. Types of cyber threats. Understanding vulnerabilities. Basic cyber defense mechanisms.

Cryptography and Network Security: Fundamentals of cryptography, Network security principles, Common network attacks, Wireless security

Cyber Security Frameworks and Risk Management:Cybersecurity frameworks. Risk assessment and mitigation. Incident response and recovery.

Ethical Hacking Fundamentals and Legal Aspects: Introduction to ethical hacking and its scope. Hacking methodologies, Types of hackers-white hat, black hat, grey hat) Ethical hacking process .

Ethical hacking tools – Kali Linux, Metasploit, Nmap, Wireshark, Burp Suite, John the Ripper. Case studies on ethical hacking practices.

iv(a)TEXTBOOKS

1.Principles of Information Security, Michael E. Whitman and Herbert J. Mattord, Publisher: Cengage Learning, 7th edition, 2021.

2.Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2011.

3.Ethical Hacking and Penetration Testing Guide**,** Rafay Baloch,Publisher: CRC Press, 2014.

(b) REFERENCES

1.Cyber Security: Understanding Cyber Crimes, Computer Forensics, and Legal Perspectives, Nina Godbole and Sunit Belapure, Publisher: Wiley , 2011.

2.Cryptography and Network Security: Principles and Practice, William Stallings, Publisher: Pearson Education, 2017.

3.Ethical Hacking, Ankit Fadia 2nd Edition, Macmillan India Ltd, 2006.

4.Hacking: The Art of Exploitation (2nd Edition) by Jon Erickson, 2007.

5.Information Warfare and Security, Dorothy F Denning, Addison Wesley, 1998.

v. COURSE PLAN

Module	Contents	Hours
I	Introduction to Cyber Security: Overview of Cyber Security-Importance, Scope, and Challenges, Types of Cyber Threats-Malware, Phishing, Ransomware, Social Engineering, Understanding Vulnerabilities-Web Application Security Vulnerabilities, Common Vulnerabilities and	9

	Exposures (CVE), Basic Cyber Defense Mechanisms-Antivirus, Firewalls, Patching.	
II	Cryptography and Network Security: Cryptography Fundamentals-Symmetric vs Asymmetric Cryptography, Public Key Infrastructure (PKI), Digital Signatures, Network Security Principles-Basics of Firewalls, IDS/IPS, Virtual Private Networks (VPNs, Attack Vectors in Networks- Denial of Service (DoS), Man-in-the-Middle (MITM), DNS Spoofing, Wireless Security-WPA2, Common Wi-Fi Attacks.	**9**
III	Cyber Security Frameworks and Risk Management: Cybersecurity Frameworks, NIST, CIS Controls, Risk Assessment and Management-Analyzing, and Mitigating Risks, Incident Response and Recovery-Phases of Incident Handling, Business Continuity Planning,	**9**
IV	Ethical Hacking Fundamentals and Legal Aspects: Introduction, Need and Scope, Hacking Methodologies-Reconnaissance, Scanning, Exploitation, Post-Exploitation, Types of Hackers, Ethical Hacking Process-Vulnerability Identification and Exploitation. Legal Frameworks and Policies-IT Act 2000 (India), Cybercrime Laws, Ethical Considerations-Responsible Disclosure, Consequences of Unethical Practices, Privacy and Data Protection- Ensuring Compliance with Regulations.	**10**
V	Ethical hacking tools – Kali Linux, Metasploit, Nmap, Wireshark, Burp Suite, John the Ripper. Case Studies-Notable Cybersecurity Incidents. Case Studies in Ethical Hacking-Real-World Examples of Ethical Hacking Practices.	**8**
	Total Hours	**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60 Continuous Assessment

Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23IEL31H	DIGITAL MARKETING AND E-COMMERCE	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

This course is designed to equip students with the essential skills and knowledge required to navigate and succeed in the rapidly evolving fields of digital marketing and e-commerce. With a focus on both theoretical concepts and practical applications, the course provides students with a comprehensive understanding of the digital landscape and its impact on business strategies and consumer behaviour. Students will explore various facets of digital marketing, including search engine optimization (SEO), social media marketing, content creation, and online advertising. They will also gain insights into e-commerce business models, platforms, and technologies that drive online commerce and digital transactions.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain the fundamental concepts, strategies, and tools of digital marketing, and differentiate between traditional and digital marketing approaches.	Understand
CO 2	Develop basic marketing strategies using various digital marketing channels.	Apply
CO 3	Build e-commerce website incorporating various features.	Apply
CO 4	Apply social media marketing techniques, content strategies, and tools to create effective campaigns that drive customer engagement and business outcomes.	Apply
CO 5	Explain advanced digital marketing techniques, affiliate marketing and mobile optimization	Understand

iii. SYLLABUS

Introduction to Digital Marketing, Overview of Digital Marketing, Digital Marketing Channels, Tools and Platforms,

Search Engine Optimization (SEO) and Content Marketing, SEO Basics, Content Marketing Strategy, SEO Tools and Techniques,

Social Media Marketing and Advertising, Social Media Platforms Overview, Social Media Content & Campaigns, Paid Social Advertising, Emerging Trends in Social Media,

E-Commerce Fundamentals and Platforms, Building an E-Commerce Website, E-Commerce Marketing, E-Commerce Analytics,

Advanced Digital Marketing and Emerging Trends, Affiliate Marketing, Mobile Marketing and App Store Optimization (ASO), Digital Marketing Automation, Emerging Trends in Digital Marketing, Ethics and Legal Aspects of Digital Marketing.

iv(a)TEXTBOOKS

1.Digital marketing: Strategy, implementation and practice, Chaffey, D. and Ellis-Chadwick, F, 8th Edition. Harlow: Pearson,2022.

2.E-Commerce 2023: Business, Technology, Society, Kenneth C. Laudon and Carol Guercio Traver, 17th Edition, 2023

3.Digital marketing: Strategy, implementation and practice, Chaffey, D. and Ellis-Chadwick, F, 8th Edition. Harlow: Pearson,2022.

(b) REFERENCES

1.Social Media Marketing: A Strategic Approach ,Melissa Barker, Donald I. Barker, and Nicholas F. P. Ojha, South Western Publications, 2012

2.The New Rules of Marketing and PR, David Meerman Scott, John Wiley & Sons Publications, 2015

3.Social Media Marketing Workbook: How to Use Social Media for Business, Jason McDonald, 2016

v. COURSE PLAN

Module	Contents	Hours
I	**Introduction to Digital Marketing**	**9**

	Overview of Digital Marketing-Traditional vs. Digital Marketing, Importance of Digital Marketing in today's world, Key Concepts and Terminologies, Digital Marketing Strategy and Planning, Role of Technology in Digital Marketing **Digital Marketing Channels-**Search Engine Optimization (SEO), Content Marketing, Social Media Marketing (SMM), Email Marketing, Online Advertising (PPC, Display Ads, Google Ads, Social Ads) **Tools and Platforms-** Google Analytics, Social Media Analytics, SEO Tools (Moz, SEMrush, Ahrefs), Marketing Automation Tools (HubSpot, MailChimp)	
II	**Search Engine Optimization (SEO) and Content Marketing** **SEO Basics-** Understanding Search Engines and Ranking Algorithms, On- Page SEO: Keywords, Meta Tags, Content Optimization, Off-Page SEO: Link Building, Social Signals. Technical SEO: Site Speed, Mobile Optimization, Crawling & Indexing. **Content Marketing Strategy-** Content Creation and Curation, Blogging and Video Marketing, Visual Content and Storytelling, Content Distribution and Promotion, Content ROI Measurement. **SEO Tools and Techniques-** Google Search Console, Keyword Research Tools, Content Optimization with AI tools.	**10**
III	**Social Media Marketing and Advertising** **Social Media Platforms Overview-** Facebook, Instagram, Twitter, LinkedIn, Pinterest, TikTok, Choosing the Right Platform for Business, Building a Social Media Strategy. **Social Media Content & Campaigns-** Content Creation, Scheduling, and Engagement, Influencer Marketing, Social Media Analytics and Metrics. **Paid Social Advertising-**Facebook and Instagram Ads, LinkedIn Ads, Twitter Ads, Ad Campaign Structuring and Budgeting, Campaign Optimization and A/B Testing. **Emerging Trends in Social Media-** Short-form Video Content (e.g., TikTok, Reels),Social Commerce	**9**
IV	**E-Commerce Fundamentals and Platforms** **Introduction to E-Commerce-** E-Commerce Business Models (B2B, B2C, C2C), E-Commerce Industry Trends, E-Commerce Platforms Overview: Shopify, WooCommerce, Magento, BigCommerce. **Building an E-Commerce Website-** E-Commerce Website Design and UX/UI Best Practices, Integrating Payment Gateways, Product Catalog Management. **E-Commerce Marketing-** Conversion Rate Optimization (CRO), Retargeting and Remarketing Strategies, Customer Journey Mapping and Personalization, Customer Reviews and Testimonials.	**8**

	E-Commerce Analytics- Google Analytics for E-Commerce, E-Commerce KPIs (Average Order Value, Cart Abandonment Rate), Analyzing and Improving Sales Performance.	
V	**Advanced Digital Marketing and Emerging Trends** **Affiliate Marketing-** Basics of Affiliate Marketing, Affiliate Networks and Programs, Commission Structures and Strategies. **Mobile Marketing and App Store Optimization (ASO)-** Mobile Marketing Strategies, App Marketing and User Acquisition, App Store Optimization Techniques. **Digital Marketing Automation-** Marketing Automation Platforms (HubSpot, Marketo), Workflow Automation and Lead Scoring, Personalized Marketing at Scale. **Emerging Trends in Digital Marketing-** Artificial Intelligence (AI) in Marketing, Voice Search Optimization, Blockchain in E-Commerce. Virtual Reality (VR) and Augmented Reality (AR) in Retail **Ethics and Legal Aspects of Digital Marketing-** Privacy Policies, Data Protection (GDPR), Digital Marketing Ethics, Online Reputation Management	**9**
	Total Hours	**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60

Continuous Assessment		
Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

INSTITUTE ELECTIVE -II

INSTITUTE ELECTIVE II

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23IEL42E	**Responsible AI**	**IEC**	**3**	**0**	**0**	**0**	**3**	**2023**

i. COURSE OVERVIEW

The objective of the course is to know about the responsibility of artificial intelligence (AI) to make AI more useful for society and humanity. The course will also teach principles and practices to perform responsible AI.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
1	Explain the sources of bias in AI systems and their impact on fairness.	Understand
2	Develop frameworks for ethical reasoning in AI decision-making processes.	Apply
3	Explain the importance of interpretability in AI models.	Understand
4	Develop real-world case studies on privacy preservation.	Apply
5	Explain the ethical status of AI systems and levels of ethical behavior.	Understand

iii. SYLLABUS

Fairness, Bias, and Ethics in AI, Bias sources, fairness (group/individual/counterfactual), AI harms, risks, and case studies.
Ethical Decision Making, Seven Principles of Responsible AI, ethical theories, values, and ART (Accountability, Responsibility, Transparency).
Interpretability and Explainability, Interpretability importance, methods, scope, evaluation, and interpretable models (linear/logistic regression, decision trees).
Privacy Preservation Data privacy, protection methods, privacy-utility balance, differential privacy, federated learning, and case studies.
Responsible AI Ethical reasoning, artificial moral agents, governance, codes of conduct, inclusion, and diversity.

iv. a TEXTBOOKS

1. Virginia Dignum, “Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way” Springer Nature, 2019.

b REFERENCES

1. Adnan Masood, Heather Dawe, Dr. Ehsan Adeli, " Responsible AI in the Enterprise", Packt Publishing, 2023.
2. Beena Ammanath, " Trustworthy AI", Wiley, 2022.
3. Christoph Molnar "Interpretable Machine Learning". Lulu, 1st edition, 2019.

v. COURSE PLAN

Module	Contents	Hours
I	Autonomy – Adaptability – Interaction – Need for Ethics in AI - Fairness and Bias: Sources of Biases – Exploratory data analysis, limitations of a dataset – Group fairness and individual fairness – Counterfactual fairness- AI harms – AI risks: Case Study	11
II	Seven Principles of Responsible AI - Ethical theories – Values - Ethics in practice – Implementing Ethical Reasoning – The ART of AI Accountability, Responsibility, Transparency	8
III	Importance of Interpretability and explainability – Taxonomy of Interpretability Methods – Scope of Interpretability – Evaluation of Interpretability – Model Transparency Techniques – Local and Global Explanation Methods: feature importance, SHAP, LIME) –Interpretable Models: Linear Regression – Logistic Regression – Decision Tree.	10
IV	Introduction to data privacy - Methods of protecting data - Importance of balancing data privacy and utility - Attack model – Privacy Preserving Learning - Differential Privacy – Federated Learning – Case Study	8
V	Approaches to Ethical Reasoning by AI – Designing Artificial Moral Agents – Implementing Ethical Deliberation – Levels of Ethical Behaviour – The ethical status of AI system – Governance for Responsible AI – Codes of Conduct – Inclusion and Diversity.	8
	Total Hours	**45**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60 Continuous Assessment

Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of introduction
23IEL42F	Prompt Engineering	IEC	3	0	0		3	2023

i. COURSE OVERVIEW

This course introduces students to the fundamentals of prompt engineering, focusing on designing effective prompts to leverage large language models (LLMs) such as OpenAI's GPT and other generative AI tools. It covers techniques to elicit accurate, creative, and domain-specific responses, manage limitations of LLMs, and apply prompting techniques across various domains, including natural language processing (NLP), creative writing, and problem-solving. By the end of the course, students will have a comprehensive understanding of prompt engineering principles and the ability to design, test, and refine prompts for real-world applications.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain the fundamental concepts of Generative AI and prompt engineering.	Understand
CO 2	Develop well-structured prompts to improve response quality and mitigate bias, ambiguity, and redundancy.	Apply
CO 3	Explain advanced prompt engineering techniques to enhance LLM performance and scalability.	Understand
CO 4	Explain ethical challenges, best practices, and emerging trends in prompt engineering to design and deploy responsible and effective AI-driven prompts for real-world applications.	Understand
CO 5	Utilize prompt engineering techniques for domain-specific applications.	Apply

i SYLLABUS

Introduction to Generative AI and Prompt Engineering, Introduction to Large Language Models: Architecture, Types of prompts – zero-shot, one-shot, and few-shot prompts.Evaluation Metrics for Prompts: Designing Basic Prompts. Common Pitfalls in Prompt Design.Advanced Prompt Engineering: Dynamic Prompting, Applications of Prompt Engineering: Domain-Specific Prompting: Debugging and Improving Model Responses: Identifying and mitigating model errors. Integrating Prompt Engineering with APIs: Using OpenAI API and other LLM services. Ethical Considerations and Future Directions: Ethical Challenges in Prompt Engineering: Bias mitigation, content filtering, and responsible AI usage.Best Practices for Safe and Reliable Prompt Design.

iv. a Text Books

1)Smith, John. Prompt Engineering: A Guide to Conversing with AI Models. AI Press, 2024.

2) Johnson, Alice. Generative AI and You: Harnessing the Power of Language Models. FutureTech Publications, 2023.

b REFERENCES

1)OpenAI Team. ChatGPT Prompt Engineering for Developers. Online Guide, 2023. 2)Brown, Tom, et al.

Language Models are Few-Shot Learners. NeurIPS Proceedings, 2020.

3)Patil, Surya, and Henshall, Emily. Practical Prompting for AI Models. Digital Insights Publishing, 2023.

v. COURSE PLAN

Module	Contents	Hours
I	**Introduction to Generative AI and Prompt Engineering:** Overview of Generative AI: Key concepts, types, and applications. Introduction to Large Language Models: Architecture, capabilities, and limitations. Fundamentals of Prompt Engineering: Types of prompts – zero-shot, one-shot, and few-shot prompts. Evaluation Metrics for Prompts: Accuracy, relevance, and user satisfaction.	9
II	**Designing Basic Prompts:** Structuring Prompts: Clarity, context, and specificity. Techniques for Improving Prompt Responses: Iterative refinement and phrasing. Experimenting with Prompt Styles: Open-ended vs. directive, creative, and instructional prompts. Common Pitfalls in Prompt Design: Bias, ambiguity, and redundancy.	9
III	**Advanced Prompt Engineering:** Chain-of-Thought Prompts: Step-by-step reasoning for complex queries. Multi-turn Conversations: Maintaining context and coherence over multiple interactions. Role-based Prompts: Using roles to guide LLM behaviour **Dynamic Prompting:** Using placeholders and templates for scalable applications.	9
IV	**Ethical Considerations and Future Directions:** Ethical Challenges in Prompt Engineering: Bias mitigation, content filtering, and responsible AI usage. Best Practices for Safe and Reliable Prompt Design. Innovations in Prompt Engineering: Emerging techniques and trends.	9

V	**Domain-Specific Prompting:** Applications in healthcare, education, customer support, and creative industries. Prompting for Creative Writing: Story generation, poetry, and scriptwriting. Debugging and Improving Model Responses: Identifying and mitigating model errors. Integrating Prompt Engineering with APIs: Using OpenAI API and other LLM services **Project: Designing and deploying a prompt for a real-world use case.**	**9**
		45

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60 Continuous Assessment

Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of introduction
23IEL42G	BUSINESS INTELLIGENCE AND ANALYTICS	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

This course provides a comprehensive understanding of Business Intelligence and Analytics, covering essential concepts, methodologies, and tools used to transform raw data into actionable insights for business decision-making. The course covers both technical aspects and practical application of analytics techniques, including data mining, predictive modeling, and data visualization. By applying these concepts to real-world business scenarios, students will learn how to leverage data for informed decision-making across various domains like marketing, and finance.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Summarize Business Intelligence concepts and the various types of analytics.	Understand
CO 2	Explain fundamental concepts and techniques of data management, including OLTP, relational databases, data warehousing, OLAP, and data mining, and their application in real-world business scenarios.	Understand
CO 3	Utilize data pre-processing, OLAP, and data warehousing methods to design and implement effective data management systems and analytical models for business intelligence.	Apply
CO 4	Explain the principles of classification, clustering, and machine learning techniques and recognize their role in advanced analytics and predictive modeling	Understand
CO 5	Apply data mining techniques to solve business problems.	Apply

iii. SYLLABUS

Overview of BIA- drivers of BIA, types of analytics, Technical architecture of BIA, Fundamentals of data management-OnLine Transaction Processing (OLTP), design process of databases, Relational databases, data warehousing, OnLine Analytical Processing (OLAP), data cube, Data Warehousing to Data Mining, Data Mining Concepts and Applications, Architecture of typical data mining system, Data Mining Functionalities, Data Mining Issues, Data pre-processing, overview of data mining techniques

Descriptive analytics and visualization- customer analytics, survival analysis, customer lifetime value, Classification- classification techniques, scoring models, classifier performance, ROC and PR curves, ensemble methods, Cluster analysis- clustering algorithms, cluster quality, Artificial Neural Networks (ANN), Text mining

iv. a TEXTBOOKS

1. Ramesh Sharda, Dursun Delen and Efraim Turban, Business Intelligence and Analytics: System for Decision Support, 10th Edition, Pearson Global Edition, 2013
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013
3. Jiawei Han, Jian Pei, Hanghang Tong, Data Mining Concepts and Techniques, 4th edition, Morgan Kaufmann Publishers, 2022.

b REFERENCES

1. Ramesh Sharda, Dursun Delen and Efraim TurbanR. Sharda, Business Intelligence: A Managerial Perspective on Analytics, 4th Edition, Pearson, 2017.
2. Wayne Winston and S. Albright, Business Analytics: Data Analysis & Decision Making, 5th Edition, South-Western College Publishing, 2014.
3. Foster Provost and Tom Fawcett, Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, First Edition, O'Reilly Media.
4. Rajkumar Buyya, Rodrigo N. Calheiros and Amir Vahid Dastjerdi, Big Data: Principles and Paradigms, Morgan Kaufmann Publishers, 2016.

v. COURSE PLAN

Module	Contents	No. of hours
I	Introduction to Business Intelligence & Analytics (BIA)-Overview of BIA, drivers of BIA, types of analytics: descriptive to prescriptive, technical architecture of BIA, Case study	8
II	Data Management Fundamentals-Fundamentals of data management, OnLine Transaction Processing (OLTP), design	9

	process of databases, Relational databases, data warehousing, OnLine Analytical Processing (OLAP), data cube	
III	Data Warehousing to Data Mining, Data Mining Concepts and Applications, Architecture of typical data mining system, Data Mining Functionalities, Data Mining Issues, Data pre-processing, overview of data mining techniques, case study Descriptive analytics and visualization, customer analytics, survival analysis, customer lifetime value, case study	**9**
IV	Classification- classification techniques, scoring models, classifier performance, ROC and PR curves, Introduction to decision trees, tree induction, measures of purity, tree algorithms, pruning, ensemble methods Clustering- measures of distance, clustering algorithms, K-means and other techniques, cluster quality	**10**
V	Artificial Neural Networks (ANN)- topology and training algorithms, back propagation, financial time series modelling using ANN Text mining- process, key concepts, sentiment scoring, text mining using R.	**9**
	Total	**45 hours**

vi. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60 Continuous Assessment

Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vii. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

viii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23IEL42H	Game Development	IEC	3	0	0	0	3	2023

i. COURSE OVERVIEW

This course introduces the fundamentals of game engines and explores the intricate art of game development. It emphasizes using the Unity platform, enabling students to gain a deeper understanding of programming concepts and the tools used while developing the games.

ii. COURSE OUTCOMES

After the completion of the course, the student will be able to:

Course Outcomes	Description	Level
CO 1	Explain the fundamentals of game engines and features of Unity IDE required to develop and deploy interactive video games	Understand
CO 2	Develop Scripting code with C# programming language	Apply
CO 3	Develop features of 2D games by using Unity IDE.	Apply
CO 4	Apply techniques to create dynamic audiovisual experiences that enhance gameplay using Unity IDE	Apply
CO 5	Explain the processes to successfully publish video games	Understand

iii. SYLLABUS

This course covers fundamental game design and C# coding skills such as:
Game Engines, Using the Unity framework, C# scripting concepts, Simple Movement and Input, Decisions and Flow Control, Object-Oriented Concepts and Functions, Exceptions and Debugging, Loops and Arrays, Animation and sound effects, User Interfaces, Publishing Games

iv. a TEXTBOOKS

1. Hands-On Unity 2021 Game Development, Nicolas Alejandro Borromeo , 2nd Edition
2. Learning C# by Developing Games with Unity , Harrison Ferrone, 2021

b REFERENCES

1. Unity 2021 Shaders and Effects Cookbook, 4th Edition
2. https://docs.unity3d.com/Manual/UnityManual.html

Module	Contents	Hours
I	**Game Engines** – Engine Concepts, Development Tools, Installation of Unity Software, IDE basics, Unity Concepts, Sprites. **Introduction to Scripting** – C# Language Concepts, Creating Scripts, C# coding Fundamentals, Game Loops and Functions. Data types and Variables, Mathematical Operations, Variable Scope and Access, Displaying Data (Develop Pinball Scoring)	**8**
II	**Simple Movement and Input** – Simple Movement of objects, Rotation and Scaling, Easy Input Handling in Unity (Develop the game Alien Dance Squad). **Decisions and Flow Control** – Logical Expressions, If/Else statements, switch statements. Organizing Game Objects – Parent-Child Objects, Sorting Layers, Tagging Game Objects, Collision Layers. (Develop the game Thunder Road/Mower Dodgeball)	**14**
III	**Object-Oriented Concepts and Functions-** Defining Classes, Creating and Using Classes, Defining Functions, Accessing Game Objects, Constructor and Property Functions. (Develop the game Deep Space). **Exceptions and Debugging-** Run-Time Exceptions, Finding Run-time Errors, Using the Debugger. (Develop the game Bug Hunt)	**14**
IV	**Loops and Arrays** -Arrays, for, foreach and while loops. **Animation and Sound Effects** -Simple Unity Animation, Animator States, Scripting Animations, Animations and Colliders, Adding Sounds to Game Objects, Scripting Sounds. (Develop games Banana Breakout / RoboDash Animation)	**14**
V	**User Interfaces -** Unity Buttons, Other UI Controls, UI Design Concepts. (Develop the game Space Creeps Settings) **Publishing Games** - Splash Screens, Credit Scenes and Icons, Publishing to PC, Mac and Linux Computers, Publishing to Smartphones, Publishing to Game Consoles.	**10**
	Total Hours	**45**

v. ASSESSMENT PATTERN

Continuous Assessment: End Semester Examination – 40: 60 Continuous Assessment

Attendance	:	5 marks
Assignments	:	15 marks
Assessment through Tests	:	20 marks
Total Continuous Assessment	:	**40 marks**
End Semester Examination	:	**60 marks**
TOTAL	:	**100 marks**

vi. CONTINUOUS ASSESSMENT TEST

- No. of Tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

vii. END SEMESTER EXAMINATION

- Maximum Marks: 60
- Exam Duration: 3 hours