Department of Artificial Intelligence

Discipline Specific Core Course: Artificial Intelligence

Sem	Theory/ Practical	Course Title	Teaching/ Practical Instruction hour/week	Total Hours/ Sem	Duration of Exam in hours	Assessment Marks			Credits
						Summative	Formative	Total	
V	Theory	Generative AI	4	60	3	80	20	100	4
	Practical	Generative AI Lab	4	60	3	40	10	50	2
	OR								
	Theory	Data Science	4	60	3	80	20	100	4
	Practical	Data Science Lab	4	60	3	40	10	50	2
	Elective	Cyber Security	4	60	3	80	20	100	3

SEMESTER: V

Course Code: CC 5.1	Course Title: Generative AI
Course Credits: 04	Contact Hours per Week: 04
Total Contact Hours: 64	IA Marks: 20
Exam Marks: 80	Examination Duration: 03 Hours

Course Learning Objectives:

1. To learn Python and Tensor Flow skills for Generative AI.
2. To study techniques for cleaning and preparing data for Generative AI tasks.
3. To implement generative AI models
4. To develop innovative applications using generative AI tools and techniques

Course Outcomes: On successful completion of the course, the students shall be able to

1. Implement Python and Tensor Flow basics, including data handling and preprocessing techniques.
2. Implement Generative AI models such as GANs, VAEs, LSTM networks, and Transformer models for image, text, and music generation tasks.
3. Evaluate model performance and experiment with hyper parameters and optimization techniques to enhance Generative AI outcomes.
4. Develop innovative applications in image and text generation, showcasing practical skills.

Unit-I	**16 Hrs.**
Introduction to Large Language Models: Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies.	
Unit-II	**16 Hrs.**
GPT Models and Applications: Study of GPT architecture and variants. Applications of GPT models in text generation and dialogue systems. Case study based implementation of GPT-based tasks.	
Unit-III	**16 Hrs.**
Python and Tensor Flow 2 in Generative AI: Overview of Python and TensorFlow 2, Preprocessing and cleaning data for Generative AI applications. Visualizing data distributions and patterns in Generative AI datasets. Introduction to Tensor Flow's computation graph and eager execution.	
Unit-IV	**16 Hrs.**
Image and Text Generation with Generative AI: Introduction to Image Generation, Implementing GANs for Image Generation Training and Fine-Tuning GANs , Generating Images with VAEs, Advanced Techniques in Image Generation, and Image and Video Generation Applications, Introduction to Text Generation.	

Course Code: LAB 6	Generative AI Lab
Course Credits: 02	Contact Hours per Week: 04
Total Contact Hours: 32	IA Marks: 10
Exam Marks: 40	Examination Duration: 03 Hours

List of Assignments

1. Write Python scripts to implement basic operations and Tensor Flow 2 tensors
2. Preprocess and clean datasets for Generative AI applications using Python libraries such as Pandas and NumPy. Handle missing data, normalize features, and encode categorical variables.
3. Use Matplotlib or Seaborn to visualize data distributions and patterns in Generative AI datasets. Plot histograms, scatter plots, and heatmaps to analyze data characteristics.
4. Implement a Generative Adversarial Network (GAN) architecture using TensorFlow 2. Train the GAN model on a dataset such as MNIST or CIFAR-10 for image generation tasks.
5. Train a GAN model on a custom dataset for image generation. Experiment with hyperparameters, loss functions, and optimization techniques to optimize GAN training.
6. Develop applications for image and video generation using trained Generative AI models. Use the models to generate art, create deep fakes, or synthesize video content.
7. Text Generation: Implement a Long Short-Term Memory (LSTM) network using TensorFlow 2 for text generation tasks. Train the LSTM model on a dataset of text sequences and generate new text samples.
8. Text generation: Implement a Transformer-based language model (e.g., GPT) using TensorFlow 2 for text generation
9. Text generation: Develop applications for text generation tasks such as story generation, dialogue generation, or code generation using trained Generative AI models.
10. Text generation: Fine-tune a pre-trained language model (e.g., GPT, BERT) using transfer learning techniques.

Examination:

- Student has to answer and execute Two programs

Evaluation Scheme for Lab Examination:

Criteria	**Marks**
Writing Program	10
Execution	20
Record + Viva-Voce	10
IA	10
Total	**50**

Course Code: CC 5.2	Course Title: Data Science
Course Credits: 04	Contact Hours per Week: 04
Total Contact Hours: 64	Formative Assessment Marks: 20
Exam Marks: 80	Examination Duration: 03 Hours

Course Learning Objectives:

1. Understand core concepts of data science, including data collection, preprocessing, analysis, and interpretation.
2. Explore and manipulate data using appropriate tools and programming languages (e.g., Python, R).
3. Apply statistical and machine learning techniques for data-driven problem solving.
4. Visualize and communicate insights effectively from datasets.
5. Work with real-world datasets and implement end-to-end data science workflows.
6. Understand ethical and legal issues related to data handling, privacy, and bias.

Course Outcomes: On successful completion of the course, the students shall be able to

1. Define the data science lifecycle and identify key roles, tools, and techniques in data science.
2. Perform data cleaning, transformation, and exploratory data analysis using libraries such as Pandas and NumPy.
3. Apply descriptive and inferential statistics to analyze data distributions and relationships.
4. Implement supervised and unsupervised machine learning models for classification and clustering problems.
5. Visualize data insights using tools like Matplotlib, Seaborn, or Tableau to support decision-making.
6. Evaluate model performance using appropriate metrics and improve models through feature selection and hyperparameter tuning.
7. Demonstrate the ability to complete a data science project involving problem definition, data handling, modeling, and result communication.

Unit-I	**16 Hrs.**
Introduction to Data Science: Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation.	
Unit-II	**16 Hrs.**
Big Data: Problems when handling large data – General techniques for handling large data –	

Case study – Steps in big data – Distributing data storage and processing with Frameworks – Case study.	
Unit-III	**16 Hrs.**
Data Visualization: Introduction to data visualization – Data visualization options – Filters – MapReduce – Dashboard development tools – Creating an interactive dashboard with dc.js-summary.	
Unit-IV	**16 Hrs.**
Ethics and Recent Trends: Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.	
Text books: 1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016. 2. An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 1st edition, 2013. References: 1. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 1st edition, 2016. 2. Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O' Reilly, 1st edition, 2018.	

Course Code: LAB 5.2	Data Science Lab
Course Credits: 02	Contact Hours per Week: 04
Total Contact Hours: 32	IA Marks: 10
Exam Marks: 40	Examination Duration: 03 Hours

List of Assignments

1. Introduction to Python for Data Science

   Write Python programs to perform basic data operations.

   Use data types, loops, lists, dictionaries, and functions.

2. Numpy Basics

   Perform matrix operations using NumPy.

   Create arrays, reshape, indexing, and basic math functions.

3. Data Handling with Pandas

   Load CSV files using Pandas.

Perform operations like filtering, grouping, and sorting.

4. Data Cleaning and Preprocessing

Handle missing data, drop duplicates, convert data types.

Normalize/standardize data using Pandas or Scikit-learn.

5. Data Visualization

Use Matplotlib and Seaborn to create:

Bar graphs, histograms, pie charts, line graphs, heatmaps.

6. Exploratory Data Analysis (EDA)

Analyze a dataset (e.g., Titanic or Iris).

Perform descriptive statistics, correlation, and feature analysis.

Course Code: OE 1	Course Title: Cyber Security
Course Credits: 04	Contact Hours per Week: 04
Total Contact Hours: 64	Formative Assessment Marks: 20
Exam Marks: 80	Examination Duration: 03 Hours

Course Learning Objectives:

1. **Introduce fundamental concepts** of cyber security, including threats, vulnerabilities, and risk management.
2. **Explain types of cyber attacks** (e.g., phishing, malware, ransomware) and corresponding defenses.
3. **Provide practical knowledge** of tools and techniques used in securing systems, networks, and data.

Course Outcomes: On successful completion of the course, the students shall be able to

1. **Identify and analyze cyber threats and vulnerabilities** in real-world systems.
2. **Design and implement basic security mechanisms** like firewalls, encryption, and authentication.

Unit 1 **16 Hrs.**

Introduction to information systems, Types of information Systems, Development of

Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

Unit 2 **16 Hrs.**

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Unit 3 **16 Hrs.**

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

Unit 4 **16 Hrs.**

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in

Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

Text Book

1.Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security ", Pearson. Education India.

2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.

Reference

Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.