AI-DS-401A	R Programming for Data Science						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**0**	**0**	**4**	**75**	**25**	**100**	**3 Hour**
Purpose	**To Describe what Data Science is and the skill sets needed to be a data scientist..**						
Course Outcomes (CO)							
CO1	To understand Basics of Data Science statistics, Identify probability distributions.						
CO2	To perform basics statistical analysis Using R.						
CO3	To Apply basic tools to carry out Exploratory data analysis.						
CO4	To explore the components data science Process to inter act via machine learning models.						

UNIT-I

Introduction to Data Science - Data Science, History of Data Science, Data Science Process, Benefits and Uses of data science and big data, how does Data Science relate to other fields, data science tools, Data analysis and its types.

Data Pre processing–Introduction, Data types and forms, Various data pre processing operations-Data cleaning, data integration, data transformation, data reduction ,data discretization.

UNIT-II

Data plotting and visualization –Introduction, Data visualization software, Data visualization libraries, Types of data visualization, Basic and specialized data visualization tools.

Statistical Data analysis and probability: Role of statistics and probability in data science, Descriptive statistics, Measures of frequency, central tendency, dispersion, position, Dependence and Independence,ConditionalProbability,Bayesianprobability,RandomVariables,probability distribution.

UNIT-III

IntroductiontoRProgramming:WhatisR,Uses,Advantagesanddisadvantages,BasicsinR-Syntax, Comments in R, reserved words, identifiers, constants, variables, operators and its precedence, Strings-Reading strings. Data types and operations in R: Basic Data types, Vectors, Lists, Matrices, Arrays, Factors, Data Frames ,Data type conversion

UNIT-IV

Connecting R to external Interfaces: CSV Files: Getting and Setting working Directory, creating, reading, analyzing, writing, Microsoft Excel: Install xlsx package, verifying and loading, creating, reading, writing. Machine Learning for Data Science: Regression Methods-Linear, polynomial and logistic, classification methods, clustering methods, Hidden Markov Model

Reference Books:

1. R for Data Analysis in Easy Steps by Mike Mc Grath.
2. BeginningDataScienceinR: DataAnalysis, Visualization, andModellingfortheDataScientistbyThomas Mailund.
3. TheElementsofStatisticalLearning, 2ndedition. —Springer, 2009.Hastie,T.,Tibshirani,R.,Friedman,J.
4. Statistical Analysis with R for Dummies by: Joseph Schmuller.
5. Machine Learning: AProbabilisticPerspective.Murphy,K.-MITPress,2012.
6. "PracticalDataSciencewithR".NinaZumel, JohnMount.Manning,2014.
7. Advanced R: Data Programming and the Cloud by by: MattWiley,JoshuaF. Wiley.
8. PythonforDataAnalysis: DataWranglingwithPandas, NumPy, andIPython, 2ndedition, WesMcKinney, O'Reilly Media.

PE-AI-DS-T401A	Robotic Process Automation Tools						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to Robotic Process Automation (RPA) tools and their applications in automating business processes.**						
Course Outcomes (CO)							
CO1	Understand RPA concepts and benefits						
CO2	Learn RPA toolsets: UiPath, Automation Anywhere, Blue Prism						
CO3	Design and develop RPA solutions						
CO4	Deploy and manage RPA bots						

UNIT-I

Introduction to RPA: RPA concepts and benefits, RPA vs. traditional automation

UNIT-II

RPA Toolsets: UiPath: installation, setup, and basic automation, Automation Anywhere: installation, setup, and basic automation, Blue Prism: installation, setup, and basic automation

UNIT-III

RPA Solution Design: Identifying automation opportunities, Designing RPA solutions, and Developing RPA workflows.

RPA Bot Development: Building RPA bots using UiPath, Automation Anywhere, Blue Prism, Debugging and testing RPA bots

UNIT -IV

RPA Deployment and Management: Deploying RPA bots, Managing RPA environments, Monitoring and maintaining RPA bots

Reference Books:

1. The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems by Tom Taulli
2. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant by Richard Murdoch

PE-AI-DS-T435A	Infrastructure Containers						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to infrastructure containers and their applications in AI and data science**						
Course Outcomes (CO)							
CO1	Understand containerization concepts and benefits						
CO2	Learn Dockers: installation, setup, and container management						
CO3	Learn Kubernetes: installation, setup, and cluster management						
CO4	Design and deploy containerized infrastructure for AI and data science workloads						

UNIT-I

Introduction to Containerization: Containerization concepts and benefits, Docker introduction: installation, setup, and basic container management.

Docker Advanced Topics: Docker networking and storage, Docker security and access control, Docker orchestration and swarm mode.

UNIT-II

Kubernetes Fundamentals , Kubernetes introduction: installation, setup, and basic cluster management, Kubernetes architecture and components, Kubernetes pods, services, and deployments

UNIT-III

Kubernetes Advanced Topics: Kubernetes networking and storage, Kubernetes security and access control, Kubernetes monitoring and logging

Containerized Infrastructure Design: Designing containerized infrastructure for AI and data science workloads, Containerizing AI and data science applications, Deploying containerized infrastructure on cloud and on-premises environments.

UNIT-IV

Containerized Infrastructure Management: Managing and monitoring containerized infrastructure, Troubleshooting containerized infrastructure, Best practices for containerized infrastructure management

Reference Books:

1. The Grid: The Fraying Wires Between Americans and Our Energy Future by Gretchen Bakke.
2. The Road Taken: The History and Future of America's Infrastructure by Henry Petroski.
3. The Big Roads: The Untold Story of the Engineers, Visionaries, and Trailblazers Who Created the American Superhighways by Earl Swift
4. Podman in Action by Daniel Walsh
5. Podman for DevOps by Alessandro Arrichiello and Gianni Salinett.
6. Kubernetes: Everything you need to know.

PE-AI-DS-T405A	Pattern Recognition						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to pattern recognition concepts and techniques, including supervised and unsupervised learning, deep learning, and optimization methods.**						
Course Outcomes (CO)							
CO1	Understand pattern recognition concepts and applications						
CO2	Learn supervised and unsupervised learning techniques						
CO3	Understand deep learning architectures and training methods						
CO4	Apply optimization methods for pattern recognition						

UNIT-I

Introduction to Pattern Recognition: Pattern recognition concepts and applications, Supervised and unsupervised learning fundamentals

Supervised Learning: Regression and classification techniques, Linear and non-linear models,
Model evaluation and selection

UNIT-II

Unsupervised Learning: Clustering and dimensionality reduction techniques, K-means and hierarchical clustering, PCA and t-SNE

UNIT-III

Deep Learning: Introduction to deep learning and neural networks, Convolutional neural networks (CNNs) and recurrent neural networks (RNNs), Training deep learning models.

UNIT-IV

Optimization Methods: Optimization fundamentals, Gradient descent and stochastic gradient descent, Regularization and normalization techniques.

Reference Books:

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
2. "Pattern Classification" by Richard O. Duda, Peter E. Hart
3. "Pattern Recognition" by Sergios.

OE-AI-DS-401A	Android Application Development						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to Android application development, focusing on designing and building intelligent Android apps using AI and DS concepts.**						
Course Outcomes (CO)							
CO1	Understand Android development fundamentals						
CO2	Design and build intelligent Android apps using AI and DS						
CO3	Apply machine learning and deep learning concepts in Android apps						
CO4	Develop apps with natural language processing, computer vision, and predictive analytics						

UNIT-I

Android Development Basics: Android architecture and components, Java/Kotlin programming for Android, Android Studio and development tools,

UNIT-II

AI and DS Fundamentals: Introduction to AI and DS concepts, Machine learning and deep learning basics, Python programming for AI and DS

UNIT-III

Intelligent Android Apps: Designing intelligent Android apps, Integrating AI and DS models into Android apps, Using Android ML Kit and Tensor Flow Lit

UNIT-IV

Natural Language Processing: NLP concepts and techniques, Building chat bots and voice assistants, Using Android NLP libraries and APIs.

Reference Books:

1. A Brain- Friendly Guide by Author: Dawn Griffiths
2. Android Programming for Beginners by John Horton
3. Android Programming with Kotlin for Beginners by John Horton

OE-AI-DS-403A	Chat Bot Development						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to Android application development, focusing on designing and building intelligent Android apps using AI and DS concepts.**						
Course Outcomes (CO)							
CO1	Understand Android development fundamentals						
CO2	Design and build intelligent Android apps using AI and DS						
CO3	Apply machine learning and deep learning concepts in Android apps						
CO4	Develop apps with natural language processing, computer vision, and predictive analytics						

UNIT-I

Introduction to Chat bots: Chat bot history and evolution, Chatbot types and applications, Chatbot development platforms and tools

UNIT-II

Natural Language Processing (NLP): NLP fundamentals and techniques, Text preprocessing and tokenization, Sentiment analysis and entity recognition

UNIT-III

Machine Learning (ML) for Chatbots: ML fundamentals and techniques, Supervised and unsupervised learning for chatbots, Intent recognition and dialogue management

UNIT-IV

Chatbot Development Frameworks: Dialog flow and Google Cloud AI, Microsoft Bot Framework and Azure AI, Rasa and Python-based chatbot development.

Reference Books:

1. AI- driven strategies and formulas for business success by Kaden Kashner
2. Hands- On Chatbots and Conversational UI Development by Srini Janarthanam

OE-AI-DS-405A	Computer Vision						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course introduces students to computer vision concepts and techniques, focusing on image and video analysis, object recognition, and machine learning for visual data.**						
Course Outcomes (CO)							
CO1	Understand computer vision fundamentals and applications						
CO2	Apply image and video processing techniques						
CO3	Develop object recognition and classification models						
CO4	Use machine learning for visual data analysis						

UNIT-I

Introduction to Computer Vision: Computer imaging systems, lenses, Image formation and sensing, Image analysis, pre processing and binary image analysis

UNIT-II

Edge detection, edge detection performance, Hough transform, corner detection Segmentation, Morphological Filtering , Fourier transform.

UNIT-III

.Feature Extraction, shape, histogram, color, spectral, texture, feature analysis, feature vectors, distance/similarity measures, data pre processing.

UNIT-IV

Pattern analysis: Clustering: k-means, k-medoids, mixture of Gaussians, Classification: Discriminant Function, Supervised, Un supervised, Semi supervised, Classifiers: Bayes, KNN, ANN models.
Reference Books:

Reference Books:

1. Computer vision: Algorithm and applications by Richard Szeliski.
2. Deep learning, by Good fellow, Bengio, and courville.
3. Dictionary of Computer Vision and image processing by Fisher et al.

AI-DS-403A	Block Chain Essentials						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	***Purpose To provide knowledge of various* Block chain*& Cyber Security***						
Course Outcomes (CO)							
CO1	*To learn the basics of Block chain Concepts & Architecture.*						
CO2	*To explore knowledge of various process of Cyber attacks on block chain*						
CO3	To understand the basics of security issues						
CO4	To implies the basic of solidity and its deployment						

UNIT I-

Block chain and Smart Contract Fundamentals: Introduction to Block chain, Importance of Block chain, need of Block chain, types of block chain, Decision Tree, Consensus Mechanism

Cryptography, Hashing, and Digital Signatures: Introduction, Hashing, Hash Function Characteristics, Digital Signatures, Data Encryption, Denial of Serviceman-in-The-Middle Attack, System Resiliency, Infrastructure Hardening.

UNIT II

Consensus Protocols: Proof of Work, Security Issues in Proof of Work, Proof of Stake, Security Issues in Proof of Stake, Other Consensus Types

Block chain Vulnerabilities and Attacks: Network and Consensus Security Issues, Smart Contract and Code Security Issues, Wallet and Client Security Issues, Centralization Security Issues, User Security Issues.

Unit-III

Cyber security for Block chain: Introduction, CIA Triad, AAA of Security, Non-repudiation, Risk Measurement, and Block chain Governance, Quantum Computing, and Smart Contracts.

Unit-IV

Solidity: Solidity Language Overview, Storage, Memory, and Call Data, Function Selectors, Interacting with EVM Smart Contracts, Compiling and Deploying Contracts

Smart Contract Security Issues: Security Hacks on Ethereum, Common Vulnerabilities and Attacks, Case Study: The DAO Hack,Case Study: The Poly-Network Hack.

Suggested Books:

1. Ashutosh Saxena “Blockchain Technology: Concepts and Applications”
2. Makoto Yano “Blockchain and Crypto Currency
3. Anand Shinde “Introduction to Cyber Security”

AI-DS-405LA	R Programming Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3hrs**
Purpose	To Describe what Data Science is and the skill sets needed to be a data scientist**.**						
Course Outcomes (CO)							
CO1	Install and use R for simple programming tasks. Extend the functionality of R by using add-on packages.						
CO2	To perform basics statistical analysis Using R.						
CO3	To Apply basic tools to carry out Exploratory data analysis.						
CO4	To explore the components data science Process to interact via machine learning models.						

LIST OF PRACTICALS

1. Write an R script, to create R objects for calculator application and save in a specified location in disk.
2. Write an R script to find basic descriptive statistics using summary, str, quartile function on sample data sets.
3. Write an R script to find subset of dataset by using subset (), aggregate () functions on sample dataset.
4. Write an R script for Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
5. Write an R script for Reading Excel data sheet and XML data set.
6. Find the data distributions using box and scatter plot of sample dataset.
   a. Find the outliers using plot.
   b. Plot the histogram, bar chart and pie chart on same data.
7. How to find a correlation matrix and plot the correlation on sample dataset.

- Plot the correlation plot on dataset and visualize giving an overview of relationships among data
- Analysis of covariance: variance(ANOVA), if data have categorical variables

8. Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based

AI-DS-402A	Reinforcement Learning						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**Purpose To provide knowledge of various Reinforcement Learning Algorithms**						
Course Outcomes (CO)							
CO1	To learn the basics of Reinforcement Learning concepts, various Reinforcement Learning architecture						
CO2	To explore knowledge of various process of Reinforcement Learning						
CO3	To understand the basics of Reinforcement Learning models						
CO4	To implies about the different Reinforcement Learning algorithms and their applications to solve real world problems.						

UNIT-I

Introduction to Reinforcement Learning: Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning. The Reinforcement Learning Process Elements of Reinforcement Learning RL Agent Taxonomy Reinforcement Learning Problem**.**

Unit-II

Markov Decision Process: Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.

Unit-III

Monte Carlo Methods for Model Free Prediction and Control: Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling.
TD Methods Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD (1) and TD(λ), k-step estimators, unified view of DP, MC and TDevaluation methods, TD Control methods - SARSA, Q-Learning and their variants.

Unit-IV

Function Approximation Methods: Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD (0) algorithms, Eligibility trace for function approximation, After states, Control with function approximation, least squares, Experience replay in deep Q-Networks

Suggested Books:

Richard S. Sutton and Andrew G. Barto "An Introduction to Reinforcement Learning Enes Bilgin "Mastering Reinforcement Learning with Python: Build next-generation, self-learning models using reinforcement learning techniques and best practices" 1st Edition Kindle

AI-DS-404A	Research Methodology & IPR						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**Understand research methodology principles and techniques.**						
Course Outcomes (CO)							
CO1	Understand research methodology principles and techniques.						
CO2	Design and conduct research studies in AI and data science						
CO3	Apply IPR concepts to protect innovations and research outputs						
CO4	Develop research proposals and reports						

Unit-I

Research Methodology: Introduction to research methodology, Research design: qualitative, quantitative, and mixed-methods, Data collection techniques: surveys, experiments, and case studies

Unit-II

Research Design and Proposal: Developing research proposals, Research questions and objectives, Literature review and study design

Unit-III

Data Collection and Analysis: Data collection methods, Data analysis techniques: statistical and machine learning, Data visualization and presentation

Unit-IV

Intellectual Property Rights (IPR): Introduction to IPR: patents, copyrights, trademarks, Patent law: filing, prosecution, and infringement, Copyright law: protection, infringement, and fair us.

Suggested Books:

1."Intellectual Property Law" by William Cornish
2. "Intellectual Property: The Law of Copyrights, Patents, and Trademarks" by Roger E. Schechter
3. "Intellectual Property Rights: A Practical Guide" by Richard Stim
4. "Patent Law: A Practitioner's Guide" by Dennis Crouch
5. "Copyright Law: A Practical Guide" by Richard Stim

PE-AI-DS-T402A	Artificial Intelligence in Cyber Security						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	**This course explores the application of artificial intelligence (AI) and machine learning (ML) in cyber security, including threat detection, incident response, and security analytics.**						
Course Outcomes (CO)							
CO1	Understand AI and ML concepts in cyber security						
CO2	Apply AI and ML techniques to detect and respond to cyber threats						
CO3	Develop predictive models for cyber security analytics						
CO4	Implement AI-powered security solutions						

Unit-I

Introduction to AI in Cyber Security: Overview of AI and ML in cyber security, Threat landscape and security challenges, AI-powered Threat Detection: Anomaly detection using ML, Predictive analytics for threat detection, AI-powered intrusion detection systems

Unit-II

Incident Response and Threat Intelligence: AI-powered incident response, Threat intelligence using ML, AI-powered security information and event management (SIEM)

Unit-III

Security Analytics and Visualization: Predictive analytics for security analytics, Data visualization for security analytics, AI-powered security analytics platforms

Unit-IV

AI-powered Security Solutions: AI-powered firewalls and intrusion prevention systems, AI-powered endpoint security, AI-powered security orchestration and automation

Suggested Books:

1. "Intellectual Property Law" by William Cornish
2. "Intellectual Property: The Law of Copyrights, Patents, and Trademarks" by Roger E. Schechter
3. "Intellectual Property Rights: A Practical Guide" by Richard Stim
4. "Patent Law: A Practitioner's Guide" by Dennis Crouch
5. "Copyright Law: A Practical Guide" by Richard Stim
6. "Deep Learning for Cyber Security" by S. S. Iyengar
7. "AI and Machine Learning in Cyber Security" by S. K. Goyal
8. "Cybersecurity Analytics Using Artificial Intelligence and Machine Learning" by M. S. S. K. Singh

PE-AI-DS-T404A	Game Theory in Artificial Intelligence						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	The course provides grounding in basic and advanced methods to big data technology and tools.						
Course Outcomes							
CO1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents.						
CO2	Understand search techniques and gaming theory.						
CO3	The student will learn to apply knowledge representation techniques and problem-solving strategies to common AI applications.						
CO4	Student should be aware of techniques used for classification and clustering. Student should be aware of basics of pattern recognition and steps required for it.						

Unit I

INTRODUCTION: Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Unit II

PROBLEM-SOLVING METHODS Problem-solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

Unit III

KNOWLEDGE REPRESENTATION First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

Unit IV

SOFTWARE AGENTS Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems. APPLICATIONS AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

Text books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
4. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
5. William F. Clocksin and Christopher S. Mellish, ‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
6. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.

PE-AI-DS-T406A	Convolutional Neural Network						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hrs.**
Purpose	This lab course provides hands-on experience with Convolutional Neural Networks (CNNs) for image and video analysis, including image classification, object detection, and segmentation.						
Course Outcomes –							
CO1	Implement CNNs using popular deep learning frameworks						
CO2	Apply CNNs to image classification, object detection, and segmentation tasks						
CO3	Analyze and visualize CNN performance						
CO4	Develop and train custom CNN models						

Unit I

Introduction to CNNs and Deep Learning Frameworks:Overview of CNNs and deep learning, Introduction to Tensor Flow, Py Torch, or Keras.

Image Classification using CNNs: Implementing CNNs for image classification, Data preprocessing and augmentation, Model evaluation and visualization

Unit II

Object Detection using CNNs: Implementing CNNs for object detection, Region-based CNNs (R-CNNs) and variants, Object detection metrics and evaluation

Unit III

Advanced Topics and Project Work: Transfer learning and fine-tuning, Custom CNN model development and training, Project work: applying CNNs to image and video analysis tasks

Unit IV

Presentations and Project Demonstrations: Students present their project work, Demonstrations of custom CNN models

Suggested books

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (Chapter 9 focuses on CNNs)
2. "Convolutional Neural Networks for Visual Recognition" by Ranjan Raghu and Anand Rangarajan
3. "Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani
4. "Convolutional Neural Networks: A Comprehensive Guide" by S. S. Iyengar
5. "CNNs for Image and Video Analysis" by M. S. S. K. Singh
6. "Deep Learning with Python" by François Chollet (Chapter 5 focuses on CNNs)

OE-AI-DS-402A	Cyber Security						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hours**
Purpose	1. Learn the foundations of Cyber security and threat landscape. 2. To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.						
Course Outcomes							
CO1	Understand the cyber security threat landscape.						
CO2	Develop a deeper understanding and familiarity with various types of cyber-attacks, cybercrimes, vulnerabilities and remedies thereto.						
CO3	Increase awareness about cyber-attack vectors and safety against cyber-frauds						
CO4	Analyze and evaluate existing legal framework and laws on cyber security.						

Unit-I

Overview of cyber security:Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker, non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.

Unit-II

Cyber Crimes: Cybercrimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach, Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, Crypto jacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cybercrime against persons -cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.

Unit-III

Cyber Laws and Data Privacy:passive Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Block chain, Darknet and social media, Cyber Laws of other countries, Case Studies.
Data Privacy and Data Security: Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles.

Unit-IV

Data Privacy and Data Security: Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations (GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., social media- data privacy and security issues.
Cyber security Management, Compliance and Governance: Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.

Suggested Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.
2. Nelson Phillips and Enfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.
3. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd.

OE-AI-DS-404A	Agile Software Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	This course makes student learn the fundamental principles and practices associated with each of the agile development methods. To apply the principles and practices of agile software development on a project of interest and relevance to the student.						
Course Outcomes							
CO1	Analyze existing problems with the team, development process and wider organization						
CO2	Apply a thorough understanding of Agile principles and specific practices						
CO3	Select the most appropriate way to improve results for a specific circumstance or need						
CO4	Judge and craft appropriate adaptations to existing practices or processes depending upon analysis of typical problems and risk analysis.						

Unit-I

Agile Software Development: Basics and Fundamentals, of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges Lean Approach: Waste Management, Kaizen and Kanban, add process and products add value. Roles related to the lifecycle, differences between Agile and traditional plans, differences between Agile plans at different lifecycle phases. Testing plan links between testing, roles and key techniques, principles, understand as a means of assessing the initial status of a project/ How Agile helps to build quality

Unit-II

Agile and Scrum Principles: Agile Manifesto, Twelve Practices of XP, Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values Agile Product Management: Communication, Planning, Estimation Managing the Agile Approach Monitoring progress, Targeting and motivating the team, managing business involvement, Escalating issue. Quality, Risk, Metrics and Measurements, Managing the Agile Approach Monitoring progress, Targeting and motivating the team, managing business involvement and Escalating issue

Unit-III

Agile Requirements: User Stories, Backlog Management. Agile Architecture: Feature Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test

Unit-IV

Agile Review: Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy,The rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools

Suggested Books:

1. Robert C. Martin ,Agile Software Development, Principles, Patterns, and Practices Alan Apt Series (2018)
2. Succeeding with Agile : Software Development Using Scrum, Pearson (2017)

OE-AI-DS-406A	Advanced Python for Data Science						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hrs.**
Purpose	This course covers advanced Python concepts and techniques for data science, including data manipulation, visualization, machine learning, and deep learning.						
Course Outcomes							
CO1	Apply advanced Python concepts to data science problems						
CO2	Use Python libraries like Pandas, NumPy, and Matplotlib for data manipulation and visualization						
CO3	Implement machine learning algorithms using Scikit-learn and TensorFlow						
CO4	Develop deep learning models using Keras and TensorFlow						

Unit-I

Advanced Python Concepts: Decorators, Generators, Lambda functions, Map, filter, and reduce

Unit-II

Data Manipulation and Visualization: Pandas: data structures, data manipulation, and data analysis, NumPy: numerical computing and data analysis, Matplotlib and Seaborn: data visualization

Unit-III

Machine Learning: Scikit-learn: supervised and unsupervised learning, model selection, and evaluationTensorFlow: introduction to TensorFlow and machine learning

Unit-IV

Deep Learning: Keras: introduction to Keras and deep learningTensorFlow: deep learning with TensorFlow

Suggested Books:

1."Python for Data Analysis" by Wes McKinney (creator of Pandas)
2. "Python Data Science Handbook" by Jake VanderPlas
3. "Advanced Python for Data Science" by David Donoho
4. "Python Machine Learning" by Sebastian Raschka
5. "Deep Learning with Python" by François Chollet
6. "Automate the Boring Stuff with Python" by Al Sweigart

AI-DS-406LA	Reinforcement Learning Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3 Hrs.**
Purpose	To implement the concepts of Reinforcement Learning Algorithms.						
Course Outcomes							
CO1	Implement Python programming advance and paradigm.						
CO2	Implement various process of Reinforcement Learning						
CO3	Implement various Reinforcement Learning models						
CO4	Implement various Reinforcement Learning algorithms.						

List of programs

1.	The probability that it is Friday and that a student is absent is 3 %. Sincethereare5schooldaysinaweek, theprobability that it is Friday is 20%.Whatisthe probability that a student is absent given that today is Friday? Apply Bayes rule in python to get the result. (Ans:15%)
2.	Extract the data from database using python
3.	Implement k-nearest neighbors classification using python
4.	Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606,using there sultofk-meansclusteringwith3means(i.e.,3centroids) VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1

5.	The following training examples map description so find visuals onto high, medium and low Credit-worthiness. medium skiing design single twenties no ->high Risk high golf trading married forties yes ->low Risk ow speedway transport married thirties yes ->med Risk medium football banking single thirties yes ->low Risk high flying mediamarried fifties yes ->high Risk ow football security single twenties no ->med Risk medium golf media single thirties yes ->med Risk medium golftransport married forties yes ->low Risk high skiing bankingsingle thirties yes ->high Risk ow golf unemployed married forties yes ->high Risk Input attributes are (from left to right) income, recreation, job, status, age- group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `med Risk' in the dataset?
6.	Implement linear regression using python.
7.	Implement Naïve Bayes theorem to classify the English text
8.	Implement an algorithm to demonstrate the significance of genetic algorithm

PE-AI-DS-402LA	Artificial Intelligence in Cyber Security LAB						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3 Hrs.**
Purpose	The purpose of an AI in Cyber Security lab is to provide a hands-on environment for students to learn and experiment with AI techniques and tools for cyber security.						
Course Outcomes							
CO1	Design and implement AI-powered cyber security systems to detect and respond to threats.						
CO2	Develop and train machine learning models to identify and classify cyber threats.						
CO3	Analyze and visualize cyber security data using AI techniques.						
CO4	Implement natural language processing (NLP) for cyber security threat intelligence.						

List of programs

1. Develop skills in AI-powered cyber security threat detection and response.
2. Understand AI-driven cyber security systems and their applications.
3. Design and implement AI-powered cyber security solutions.
4. Analyze and evaluate AI-powered cyber security systems.
5. Research and develop new AI techniques for cyber security.
6. Provide hands-on experience with AI tools and libraries for cyber security.
7. Foster innovation and experimentation in AI-powered cyber security.
8. Develop expertise in AI-powered cyber security analytics and visualization.
9. Prepare students for careers in AI-powered cyber security.
10. Support research and development in AI-powered cyber security.

PE-AI-DS-404LA	Game Theory in Artificial Intelligence LAB						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3 Hrs.**
Purpose	Develop AI agents that can make strategic decisions in complex, dynamic environments. Analyze and design AI systems that can interact with humans or other agents						
Course Outcomes							
CO1	Design and implement game-theoretic models for AI decision-making.						
CO2	Analyze and evaluate AI systems using game-theoretic concepts.						
CO3	Develop AI agents that can negotiate, bargain, and make deals.						
CO4	Implement machine learning algorithms for game-theoretic problems.						

List of programs

1. Develop AI agents that can make strategic decisions in complex, dynamic environments.
2. Analyze and design AI systems that can interact with humans or other agents.
3. Understand competitive and cooperative behaviors in AI systems.
4. Develop AI agents that can negotiate, bargain, and make deals.
5. Model and analyze AI decision-making under uncertainty and incomplete information.
6. Design AI systems that can adapt to changing environments and opponent strategies.
7. Apply game-theoretic concepts to AI areas like machine learning, robotics, and natural language processing.
8. Develop AI agents that can learn from experience and improve their strategic decision-making.
9. Investigate AI fairness, accountability, and transparency using game-theoretic frameworks.
10. Explore the intersection of game theory and AI in areas like autonomous vehicles, smart grids, and finance.

PE-AI-DS-406LA	Convolutional Neural Network LAB						
Lecture	**Tutorial**	**Practical**	**Credit**	**Minor Test**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3 Hrs.**
Purpose	Develop and train CNN models for image and signal processing tasks. Understand and apply CNN architectures for various applications.						
Course Outcomes							
CO1	Design and implement CNN models for image classification, object detection, segmentation, and generation.						
CO2	Understand and apply CNN architectures.						
CO3	Train and evaluate CNN models using popular deep learning frameworks.						
CO4	Analyze and visualize CNN performance using metrics.						

List of programs

1. Image Classification: Train a CNN to classify images from a dataset (e.g., MNIST, CIFAR-10).
2. Object Detection: Implement a CNN-based object detection system (e.g., YOLO, SSD).
3. Image Segmentation: Train a CNN to segment images (e.g., semantic segmentation, instance segmentation).
4. Image Generation: Use a CNN to generate new images (e.g., GANs, VAEs).
5. Image Denoising: Train a CNN to remove noise from images.
6. Image Super-Resolution: Use a CNN to upscale low-resolution images.
7. Facial Recognition: Implement a CNN-based facial recognition system.
8. Convolutional Autoencoders: Train a convolutional autoencoder to learn image representations.
9. Transfer Learning: Use pre-trained CNN models for new image classification tasks.
10. Data Augmentation: Apply data augmentation techniques to improve CNN performance.
11. Batch Normalization: Implement batch normalization to improve CNN training.
12. Residual Connections: Train a CNN with residual connections (e.g., ResNet).
13. Inception Networks: Implement an Inception-based CNN model.
14. U-Net: Train a U-Net for image segmentation tasks.