E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

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B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

R-2019

VII Semester									
COURSE CODE	**COURSE NAME**	**CATEGORY**	**L**	**T**	**P**	**C**	**MAX. MARKS**		
							CA	**ES**	**TOTAL**
Theory Courses									
1901MGX07	Universal Human Values & Ethics	HSS	3	0	0	3	40	60	100
1902AS701	IT Project Management	PC	3	0	0	3	40	60	100
1903AS006	Professional Elective –III (Computer Vision)	PE	3	0	0	3	40	60	100
1903AS009	Professional Elective –IV (Reinforcement Learning)	PE	3	0	0	3	40	60	100
1903AS012	Professional Elective – V (Time Series Analysis and Forecasting)	PE	3	0	0	3	40	60	100
1903AS028	Open Elective - II (Natural Language Processing)	OE	3	0	0	3	40	60	100
Laboratory Courses									
1902AS751	IT Project Management Laboratory	PC	0	0	2	1	60	40	100
1904AS751	Inplant Training / Internship Presentation	EEC	0	0	0	1	100	-	100
Other Courses									
1904GE751	Life Skills – Comprehensive Viva	EEC	2	0	0	2	100	-	100
TOTAL			**20**	**0**	**2**	**22**	**500**	**400**	**900**

1901MGX07	UNIVERSAL HUMAN VALUES & ETHICS	L	T	P	C
		3	0	0	3

PREREQUISITE: Nil

COURSE OBJECTIVES:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they "really want to be" in their life and profession.
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession.
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession.
CO4	Understand the role of a human being in ensuring harmony in society and nature.
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

COURSE CONTENTS:

Module-I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	**09 Hours**

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; "Natural Acceptance" and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

Method to fulfil the above human aspirations: understanding and living in harmony at various levels

Module-II	**Understanding Harmony in the Human Being - Harmony in Myself**	**09 Hours**

7. Understanding human being as a co-existence of the sentient "I" and the material "Body"
8. Understanding the needs of Self ("I") and "Body" - Sukh and Suvidha
9. Understanding the Body as an instrument of "I" (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of „I" and harmony in "I"
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya.

Module-III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**	**09 Hours**

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
15. Understanding the meaning of Vishwas; Difference between intention and competence
16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!

Module-IV	**Understanding Harmony in the Nature and Existence - Whole Existence as Co-Existence**	**09 Hours**

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence

Module-V	**Implications of the Above Holistic Understanding of Harmony on Professional Ethics**	**09 Hours**

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order,
b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b) At the level of society: as mutually enriching institutions and organizations

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	2	3	2	2	1	3	-	-	-
CO2	-	2	-	-	-	2	-	3	-	1	-	2	-	-	-
CO3	-	-	-	-	-	2	-	3	3	2	1	2	-	-	-
CO4	-	-	-	-	-	2	3	3	1	1	1	2	-	-	-
CO5	-	-	-	-	-	2	2	3	2	2	2	3	-	-	-

REFERENCES:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
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6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
7. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
8. A N Tripathy, 2003, Human Values, New Age International Publishers.
9. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
10. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
11. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
12. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
13. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

1902AS701	IT PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES:

- This course primarily aims at introducing the basics of managing projects, including popular methods like Agile, Scrum, Kanban, and Waterfall. The course also provides how to plan and start projects by defining goals, estimating resources, and identifying risks.
- The course covers how to run projects, track progress, manage changes, and optimize cloud resources. It also explores using Agile for AI and Data Science projects, handling data pipelines, and deploying models in the cloud using Kubernetes and DevOps practices like CI/CD.

COURSE OUTCOMES:

Upon successful completion of the Course, Students will be able to

CO1	Examine the fundamentals of project management, including methodologies like Agile, Scrum, Kanban, and Waterfall, along with AI/Data Science-specific project success factors.
CO2	Analyze project execution and monitoring strategies, focusing on progress tracking, change management, communication, and cloud resource optimization.
CO3	Apply Agile and Scrum principles in AI/Data Science projects for iterative model development, sprint execution, and data pipeline management.
CO4	Examine DevOps practices and CI/CD pipelines in AI/Data Science projects, focusing on automation, version control, model retraining, and deployment using tools like Git, Docker, and MLflow.
CO5	Evaluate cloud and Kubernetes-based project lifecycle management, including model deployment, scaling, ethical considerations, and post-project documentation and handover.

COURSE CONTENTS:

Module I	**Project Management, Initiation and Planning**	**09 Hours**

Fundamentals of project management: definitions, objectives, and constraints - Project life cycle and process groups - Introduction to Agile, Scrum, Kanban, and Waterfall methodologies - Project success factors in AI and Data Science - Project charter and stakeholder analysis - Scope definition and Work Breakdown Structure (WBS) - Estimating project time and resources (including specialized AI/Data Science resources) - Risk management planning: identification, assessment, and mitigation in AI/Data Science - Requirement gathering and analysis for AI/Data Science projects (data quality, model performance, etc.) - Introduction to MLOps planning.

Module II	**Project Execution and Monitoring**	**09 Hours**

Project execution and team management-Progress tracking and performance measurement (including AI/Data Science metrics)-Change management and configuration control-Communication and reporting in AI/Data Science Projects-Monitoring cloud consumption and cost optimization-Monitoring model performance and data drift.

Module III	**Agile and Scrum in AI/Data Science**	**09 Hours**

Agile principles and practices in AI/Data Science-Scrum framework: roles, ceremonies, and artifacts-Sprint planning and execution in data-driven projects-Managing iterative model development and deployment-Managing data pipelines in agile.

Module IV	**DevOps and CI/CD for AI Projects**	**09 Hours**

Introduction to DevOps culture and automation in AI/ML projects - Continuous Integration and Continuous Deployment (CI/CD) concepts and workflows - Tools for DevOps in AI (Git, GitHub Actions, Jenkins, Docker, MLflow) - Managing code, data, and model versioning - Integrating testing, linting, and validation for AI pipelines - Automating model retraining and deployment pipelines - Monitoring pipelines and rollback strategies - Collaboration between development and operations for faster deployment cycles - Security, compliance, and audit trails in DevOps workflows for AI/Data Science.

Module V	**Cloud, Kubernetes, and AI Project Lifecycle Management**	**09 Hours**

Cloud computing basics: IaaS, PaaS, SaaS models and their roles in AI projects - Using cloud platforms (AWS, Azure, GCP) for hosting and scaling data pipelines - Introduction to Kubernetes and container orchestration - Deploying and scaling AI models using Kubernetes clusters - Managing storage, compute, and GPU resources in cloud-native environments - Lifecycle management of models: training, deployment, monitoring, retraining, and decommissioning - Ethical and regulatory considerations (e.g., fairness, GDPR) - Explainable AI (XAI) for transparency and trust - Project closure, documentation, and handover - Archiving data, models, and lessons learned.

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	2	2	-	3	3	2	-
CO2	2	2	3	2	-	-	-	-	3	3	-	2	2	3	-
CO3	3	2	3	-	3	-	-	-	2	3	-	2	3	2	2
CO4	3	2	3	3	2	-	-	-	3	2	-	2	3	3	3
CO5	2	2	3	3	2	3	2	1	3	3	-	3	3	3	3

REFERENCES:

1. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Wiley, 2017.
2. Peter Taylor, AI for Project Managers, Routledge, 2022.
3. Jeff Sutherland, Scrum: The Art of Doing Twice the Work in Half the Time, Crown Business, 2014.
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1903AS006	PROFESSIONAL ELECTIVE –III (COMPUTER VISION)	L	T	P	C
		3	0	0	3

PREREQUISITE: Nil

COURSE OBJECTIVES:

- To provide a strong foundation in image formation, representation, and preprocessing techniques essential for digital image analysis and understanding.
- To equip students with knowledge and skills to detect and recognize shapes and objects using classical and advanced computer vision techniques, including Hough Transform and 3D vision methods.
- To enable students to design and implement real-world computer vision applications and analyze case studies involving facial recognition, object tracking, and feature detection using modern tools and algorithms.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Understand the fundamental concepts of image formation, representation, and enhancement techniques including sampling, quantization, and segmentation.
CO2	Apply the Hough Transform and its variants for detecting geometric shapes like lines, circles, and ellipses in digital images.
CO3	Analyze various 3D vision and motion estimation techniques such as shape from shading, optical flow, and 3D reconstruction.
CO4	Develop computer vision applications such as object recognition, face detection, biometric authentication, and intelligent surveillance systems.
CO5	Evaluate advanced case studies using techniques like Generalized Hough Transform, matched filtering, and feature collation for practical object detection tasks.

COURSE CONTENTS:

Module-I	Image Formation and Representation	9 Hours

Image acquisition, sampling and quantization, Image quality, Pixel transform, Color Transform, Histogram Equalization, Bandpass filters, 2D Convolution: Discrete & continuous, Segmentation: Edge detection, Linking, Thresholding, Region Based Segmentation. **Shapes and Regions:** Binary shape analysis, object labeling and counting, size filtering, distance functions, skeletons and thinning, boundary tracking procedures, active contours, shape models and shape recognition, Fourier descriptors region descriptors, moments.

Module-II	**Hough Transform**	**9 Hours**

Line detection, Hough Transform (HT) for line detection, foot-of-normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection, accurate center location, speed problem, ellipse detection.

Module-III	**3D Vision and Motion**	**9 Hours**

Methods for 3D vision, projection schemes, shape from shading, photometric stereo, shape from texture, shape from focus, active range finding, surface representations, point-based representation, volumetric representations, 3D object recognition, 3D reconstruction, introduction to motion, triangulation, bundle adjustment, translational alignment, parametric motion, spline-based motion, optical flow, layered motion.

Module-IV	**Computer Vision Applications**	**9 Hours**

Face and Facial recognition application: personal photo collections – Instance recognition application: Object recognition, Object Tracking, Biometric Authentication, Emotion Recognition, Intelligent Surveillance.

Module-V	**Case study**	**9 Hours**

Human Iris location, hole detection, generalized Hough Transform (GHT), spatial matched filtering GHT for ellipse detection, object location, GHT for feature collation.

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	3	2	-	3	-	-	-	-	-	-	2	3	2	-
CO3	2	3	2	3	2	-	-	-	-	-	-	2	3	2	1
CO4	3	3	3	2	3	-	-	-	-	-	-	3	3	3	1
CO5	3	3	2	2	3	-	-	-	1	1	1	2	3	3	2

REFERENCES:

1. D. L. Baggio et al. “Mastering OpenCV with Practical Computer Vision Projects‖”, Packt Publishing, 2012.
2. E. R. Davies, “Computer & Machine Vision"‖, Fourth Edition, Academic Press, 2012
3. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.
4. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
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8. Computer Vision “A Modern Approach, Forsyth, Ponce”, Pearson Education, 2012.
9. David A. Forsyth and Jean Ponce, “Computer Vision: A Modern Approach”, Prentice Hall, Pearson Education, 2nd Edition, 2012

1903AS009	PROFESSIONAL ELECTIVE –IV (REINFORCEMENT LEARNING)	L	T	P	C
		3	0	0	3

PREREQUISITE: 1902AS603 – Deep Learning Techniques

COURSE OBJECTIVES:

- To understand the basics purpose and concepts of Reinforcement Learning
- To make students understand the nature of the problems and solve it through Reinforcement Learning
- To utilize Reinforcement Learning Algorithms for solving Uncertainty problems
- To teach the techniques to build system of agents applying deep learning architectures

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Understand the underpinnings to structure classical solutions for Reinforcement Learning problem
CO2	Apply deep learning architectures to train agents navigating from virtual world from sensory data.
CO3	Analyze basic Reinforcement Learning algorithms for simple sequential decision making and control problems in uncertain conditions
CO4	Build system of agents to demonstrate collaboration or cooperation
CO5	Investigate deep reinforcement learning techniques to develop intelligent agents and analyze the challenges in model-based reinforcement learning.

COURSE CONTENTS:

Module-I	**Foundations of Reinforcement Learning**	**09 Hours**

Reinforcement Learning - A Preamble - Reinforcement Learning Frameworks: Problems and Solutions - Dynamic Programming - Monte Carlo Methods - Temporal-Difference Methods - Reinforcement Learning in Continuous Space. Case Study: Classic Problem of Gym's Taxi using OpenAI & V2 Task.

Module-II	**Value-Based Methods**	**09 Hours**

Build and Train Neural Networks, Convolutional Neural Networks - Bandit Algorithms - Deep Q-Learning – Deep Q-Network - Double Deep Q-Network - Dueling-DQN - Prioritized Replay. Case Study: Leveraging Neural Networks to predict machine failures that learns intelligent behaviors from sensory data.

Module-III	**Policy-Based Methods**	**09 Hours**

Theory behind Evolutionary Algorithms, Stochastic Policy Search, REINFORCE Algorithms - Improving Policy Gradient Methods - Generalised Advantage Estimation - Policy Optimization methods: Trust Region Policy Optimization (TRPO), Proximal Policy Optimization (PPO) - Actor-Critic Methods: Deep Deterministic Policy Gradient (DDPG) Case Study: Deep Reinforcement Learning for Robotics (Robotic arm/ four-legged creature walk).

Module-IV	**Multi-Agent Reinforcement Learning**	**09 Hours**

Hierarchical Reinforcement Learning - Markov Games for Multiplayer Games -Agent training in Collaborative and Competitive Setting Case Study: Intuition behind DeepMind's Alphazero.

Module-V	**Deep Reinforcement Learning**	**09 Hours**

Deep Reinforcement Learning – Q-Learning – Deep Q-Learning – Policy Gradients - Advantage Actor Critic (A2C) and Asynchronous Advantage Actor Critic (A3C) – Model based Reinforcement Learning – Challenges.

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	2	3	-	-	-	-	-	-	-	3	2	-
CO3	3	3	2	2	2	-	-	-	-	1	-	3	3	2	-
CO4	2	2	2	-	2	-	-	-	3	2	2	2	2	2	1
CO5	3	3	2	3	3	-	-	-	1	1	2	3	3	2	1

REFERENCES:

1. Richard S Sutton and Andrew G Barto, “Reinforcement Learning- An Introduction", 2nd Edition, MIT Press, 2018.
2. Laura Graesser, "Foundations of Deep Reinforcement Learning: Theory and Practice in Python", Addison Wesley Data &Analytics series, 2020
3. Csaba Szepesvári, Morgan & Claypool, "Algorithms for Reinforcement Learning", Morgan & Claypool Publishers, 2010
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1903AS012	PROFESSIONAL ELECTIVE – V (TIME SERIES ANALYSIS AND FORECASTING)	L	T	P	C
		3	0	0	3

PREREQUISITE: Nil

COURSE OBJECTIVES:

- This course provides a comprehensive introduction to time series analysis and forecasting, with a focus on business and economic applications. It covers core concepts, statistical foundations, and modern modeling techniques, including ARIMA and seasonal models. Students will learn how to evaluate data, identify suitable models, estimate parameters, and assess forecasting accuracy. Practical examples from domains such as marketing, finance, operations, and supply chain management illustrate real-world applications.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Explain the key components and objectives of time series analysis and forecasting.
CO2	Apply classical time series models such as AR, MA, and ARMA to model and forecast stationary data.
CO3	Implement ARIMA and seasonal ARIMA models for nonstationary and seasonal time series.
CO4	Develop advanced forecasting techniques such as Holt–Winters and ARAR algorithms in practical scenarios.
CO5	Investigate and interpret time series data in business and economic applications using statistical and machine learning techniques.

COURSE CONTENTS:

Module-I	**Introduction to Time Series Analysis**	**9 Hours**

Introduction, Objectives of Time Series Analysis, Simple Time Series Models: Zero-Mean Models, Models with Trend and Seasonality, General Approach to Time Series Modeling, Stationary Models and Autocorrelation Function, Estimation and Elimination of Trend and Seasonal Components.

Module-II	**Stationary Processes and ARMA Models**	**9 Hours**

Basic Properties, Linear Processes, Forecasting Stationary Time Series: Durbin–Levinson Algorithm, Innovations Algorithm. ARMA Models, Modeling and Forecasting with ARMA Processes, Yule–Walker Estimation, Burg's Algorithm, The Innovations Algorithm, Hannan–Rissanen Algorithm, Order Selection: FPE and AICC Criterion.

Module-III	**Nonstationary and Seasonal Time Series Models**	**9 Hours**

ARIMA Models, Identification Techniques, Forecasting ARIMA Models, Seasonal ARIMA Models, Regression with ARMA Errors, Multivariate Time Series, Multivariate ARMA Processes, State-Space Representation of ARIMA Models, Kalman Recursions, The EM Algorithm.

Module-IV	**Forecasting Techniques**	**9 Hours**

ARAR Algorithm, Holt–Winters Algorithm, Holt–Winters Seasonal Algorithm, Transfer Function Models, Intervention Analysis, Nonlinear Models, Continuous-Time Models, Long-Memory Models.

Module-V	**Time Series Analysis in Data Science and Machine Learning**	**9 Hours**

Time Series Analysis in Data Science: Stock Price Prediction, Energy Consumption Forecasting, Website Traffic Prediction, Sales Demand Forecasting, Temperature Forecasting, Financial Market Analysis, Healthcare Patient Admission Prediction, Traffic Flow Prediction. **Time Series Analysis in ML**: Partial Auto-Correlation Function and ACF.

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-	1	3	3	-
CO4	3	2	3	2	-	-	-	-	-	-	-	1	3	2	1
CO5	3	3	3	3	3	-	-	-	-	3	1	1	3	3	1

REFERENCES:

1. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung, Time Series Analysis: Forecasting and Control, Wiley, 5th Edition, 2015.
2. Peter J. Brockwell, Richard A. Davis, Introduction to Time Series and Forecasting, Springer, 2nd Edition, 2002.
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1903AS028	OPEN ELECTIVE - II (NATURAL LANGUAGE PROCESSING)	L	T	P	C
		3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES:

This course introduces the core concepts and applications of Natural Language Processing (NLP). It covers text preprocessing, feature extraction, machine learning for text classification, and real-world NLP use cases like sentiment analysis, chatbots, and document summarization. Students will gain practical experience through domain-based case studies and projects using modern NLP tools and frameworks.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Understand the foundations of NLP including language structure and grammar
CO2	Apply text preprocessing, feature engineering, and text similarity techniques.
CO3	Implement NLP models using classical ML and deep learning algorithms.
CO4	Develop real-world NLP applications like sentiment analysis and chatbots.
CO5	Investigate domain-specific NLP case studies and present project outcomes

COURSE CONTENTS:

Module I	**Fundamentals of NLP**	**09 Hours**

Introduction to Natural Language Processing - Human and Computer Language Differences - Language Structure and Grammar Basics - Text Preprocessing Techniques - Tokenization and Normalization - Stemming and Lemmatization.

Module II	**Text Representation and Analysis**	**09 Hours**

Bag of Words Model - TF-IDF Representation - Word Embeddings and Vector Space Models - N-gram Models and Applications - Stopword Removal and Noise Reduction - Basic Text Similarity Measures

Module III	**Predictive Techniques in NLP**	**09 Hours**

Text Classification - Spam Detection Example - Language Modelling and Next Word Prediction - Introduction to Deep Learning in NLP - Recurrent Neural Networks (RNN) Basics

Module IV	**Real World NLP Applications**	**09 Hours**

Sentiment Analysis in Product Reviews - Email Spam Detection - Chatbot Design Principles - Automatic Text Summarization - Machine Translation Basics - Voice Assistants and Speech Interfaces

Module V	**Case Studies**	**09 Hours**

Healthcare: Disease Diagnosis Chatbot - Education: Auto Essay Scoring - Finance: Fraud Detection from Text Reports - social media: Hate Speech Detection - Legal: Case Document Summarization - Engineering: Requirement Analysis from Technical Reports

TOTAL: 45 HOURS

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	1	-
CO4	3	2	2	2	3	-	-	-	-	-	-	-	2	2	-
CO5	3	3	3	3	2	-	-	-	-	-	2	1	3	2	1

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1902AS751	IT PROJECT MANAGEMENT LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE: 1902AS404-Artificial Intelligence

COURSE OBJECTIVES:

1.	Develop a structured project plan using WBS, estimate resources, and simulate Agile workflows for AI/Data Science projects.
2.	Set up cloud environments, deploy AI models using Kubernetes, and scale resources efficiently for model training and inference.
3.	Design automated data pipelines, deploy AI models with MLOps tools, and implement monitoring & CI/CD for continuous improvement.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1	Develop project charters, create WBS, and estimate tasks/resources for AI/Data Science projects.
CO2	Simulate Scrum sprints, conduct sprint planning, and manage projects using Jira or similar tools.
CO3	Set up cloud environments, containerize models with Docker, and deploy using Kubernetes for scalability.
CO4	Build automated data pipelines using Apache Airflow or Prefect, integrating with cloud storage and databases.
CO5	Deploy AI models with MLflow/Kubeflow, monitor performance, detect data drift, and automate deployments using CI/CD.

LIST OF EXPERIMENTS:

Project Planning and WBS	4 Hours
1.Develop a project charter for a sample AI/Data Science project.	
2.Create a detailed WBS and estimate project tasks and resources using project management software (e.g., MS Project, Jira)	
Agile/Scrum Simulation	6 Hours
3.Simulate a Scrum sprint for a data preprocessing task.	
4.Conduct Agile Sprint Processes and Manage Sprints Using Jira or Similar Tools.	
Cloud Project Setup	6 Hours
5.Set up a cloud environment for an AI/Data Science project (e.g., AWS SageMaker, Azure Machine Learning).	
6.Deploy and Manage Cloud Resources for Data Storage, Processing, and Cloud-Based Databases/Data Lakes.	
Kubernetes Deployment	6 Hours
7.Containerize an AI model using Docker.	
8.Deploy the model on a Kubernetes cluster using Minikube or cloud Kubernetes services (EKS, AKS, GKE).	

9.Scale Machine Learning Models and Manage Data Pipelines Using Kubernetes.	
Data Pipeline and Model Deployment	8 Hours
10.Design and Implement a Data Pipeline and Deploy an AI Model Using MLOps Tools.	
11.Model performance and data drift using dashboards	
12.Implement CI/CD pipeline for model deployment.	
TOTAL: 30 HOURS	

COs Vs POs & PSOs MAPPING:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	2	1	2	3	3	2	3	2	-
CO2	3	2	3	2	-	-	2	1	3	3	3	2	3	2	-
CO3	3	3	2	2	3	-	2	1	2	2	2	2	3	2	2
CO4	3	3	2	2	3	-	2	1	2	2	2	2	3	3	2
CO5	3	3	2	2	3	-	3	1	2	3	2	2	3	3	3

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1. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide), 7th Edition, Project Management Institute, 2021.
2. Ken Schwaber and Jeff Sutherland, The Scrum Guide: The Definitive Guide to Scrum: The Rules of the Game, Scrum.org, 2020.
3. Andreas Müller and Sarah Guido, Introduction to Machine Learning with Python: A Guide for Data Scientists, O'Reilly Media, 2016.
4. Holden Karau, Rachel Warren, and Matei Zaharia, High Performance Spark: Best Practices for Scaling and Optimizing Apache Spark, O'Reilly Media, 2017.
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