IV Year - I Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	PC	UGAI7T0623	Reinforcement Learning	3	0	0	3	30	70	100
2	MC-II	UGMB7T0123	Human Resource & Project Management	2	0	0	2	30	70	100
3	PE	UGCS7T0223 UGAI7T1323 UGAI7T0223 UGAI7T1423	**Professional Elective-IV** 1. Software Architecture & Design Pattern 2. Responsible A.I. 3. Blockchain Technology 4. Quantum Computing 5. MOOCs (Any of the 12-Week SWAYAM /NPTEL Course recommended by the BoS)	3	0	0	3	30	70	100
4	PE	UGAI7T0523 UGCS7T0423 UGAI7T0723 UGAI7T1523	**Professional Elective-V** 1. Agile Methodologies 2. Augmented Reality & Virtual Reality 3. High Performance Computing 4. Big Data Analytics 5. MOOCs (Any of the 12-Week SWAYAM /NPTEL Course recommended by the BoS)	3	0	0	3	30	70	100
5	OE		Open Elective – III	3	0	0	3	30	70	100
6	OE		Open Elective – IV	2	0	0	3	30	70	100
7	SEC	UGCS7K1123 UGAI7K0923 UGAI7K1023	Prompt Engineering OR Robotic Process Automation OR SWAYAM Plus-Certificate Program in Prompt Engineering and ChatGPT	0	1	2	2	30	70	100
8	AC	UGAI7A1123	Constitution of India	2	0	0	0	30	-	30
9	Internship	UGAI7I1223	Evaluation of Industry Internship/Mini Project	-	-	-	2	-	50	50
			Total	**18**	**2**	**2**	**21**	**240**	**540**	**780**
Honors/Minor Course (3 or 4.5 Credits)										

IV Year - II Semester

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Internship & Major Project	UGAI8J0123	Full Semester Internship & Project Work	0	0	24	12	60	140	200
			Total	**0**	**0**	**24**	**12**	**60**	**140**	**200**

Syllabus
IV B.Tech I SEM

REINFORCEMENT LEARNING

Subject Code: UGAI7T0623		L	T	P	C
IV Year / I Semester		3	0	0	3

COURSE OBJECTIVE:	
➢ To provide the fundamentals of Reinforcement learning.	
SYLLABUS:	
UNIT I:	**(09 hrs)**
The Reinforcement Learning Problem: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe, Summary, History of Reinforcement Learning.	
UNIT II:	**(10 hrs)**
Multi-arm Bandits: An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, tracking a Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search (Contextual Bandits)	
UNIT III:	**(10 hrs)**
Finite Markov Decision Processes: The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation.	
UNIT IV:	**(10 hrs)**
Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off- policy Prediction via Importance Sampling, Incremental Implementation, Off-Policy Monte Carlo Control, Importance Sampling on Truncated Returns	
UNIT V:	**(09 hrs)**
Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, The Acrobot, Elevator Dispatching, Dynamic Channel Allocation, Job-Shop Scheduling.	

COURSE OUTCOMES:

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

CO1:	Understand the fundamental principles of reinforcement learning, including agent–environment interaction and learning paradigms.(L2)
CO2:	Apply reinforcement learning algorithms to solve decision-making problems under uncertainty.(L3)
CO3:	Analyze reinforcement learning models such as bandits and Markov Decision Processes for optimal policy formulation. (L4)
CO4:	Evaluate the effectiveness of reinforcement learning techniques in real-world applications and complex environments. (L5)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	–	–	2	–	–	–	–	–	–	-	3	3
CO2	3	3	2	–	3	–	–	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	–	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning-An Introduction",2nd Edition, The MIT Press,2018
2.	Marco Wiering, Martijn van Otterlo Reinforcement Learning: State-of-the-Art(Adaptation,Learning,andOptimization(12)) 12th Edition

REFERENCE BOOKS:

1.	Vincent François-Lavet, Peter Henderson, Riashat Islam, An Introduction to Deep Reinforcement Learning (Foundations and Trends(r) in Machine Learning) , 2019

HUMAN RESOURCE & PROJECT MANAGEMENT
CSE(AI & ML)

Subject Code: UGMB7T0123		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

The main objectives of the course are to

- Provide knowledge about HR planning, recruitment, selection, and job design.
- Develop skills in managing HR functions such as performance appraisal, compensation, and employee relations.
- Emphasize the importance of ethical practices and HR audits in maintaining organizational health.
- Understand the HRD framework and its impact on organizational success.
- Improve group interaction and team dynamics for better collaboration and performance.
- Understand the Fundamentals of Project Management and Project Networks
- Implement appropriate management strategies tailored to specific challenges in different project types.

SYLLABUS:

UNIT I: **(10 hrs)**

HRM: Nature, Scope, Concept of HRM, Functions of HRM, Role of HR manager, emerging trends in HRM, E-HRM, HR audit models, ethical aspects of HRM. HR Planning, Demand and Supply forecasting of HR, Job Design, Recruitment, Sources of recruitment, Selection- Selection Procedure.

UNIT II: **(09 hrs)**

HRD, HR accounting, Models, Concept of Training and Development, Methods of Training. Performance Appraisal: Importance Methods of performance appraisal, Career Development and Counseling, group interaction.

UNIT III: **(12 hrs)**

Basics of Project Management, Concept, resource management, Project environment, Types of Projects, project networks-DPR, Project life cycle, Project proposals, Monitoring project progress, Project appraisal and Project selection, 80-20 rules, production technology, communication matrix

UNIT IV: **(08 hrs)**

Identify various project types and their unique management challenges and apply appropriate management strategies for each. Project Implementation and Review: Forms of project organization, project planning, project control, human aspects of project management, prerequisites for successful project implementation, project review, performance evaluation, abandonment analysis

UNIT V: **(08 hrs)**

Project Implementation and Review: Forms of project organization, project planning,

project control, human aspects of project management, prerequisites for successful project implementation, project review, performance evaluation, abandonment analysis

Course Outcomes:

CO1	Understand the concepts of Human Resource Management including HR planning, recruitment, selection, HR audit, and emerging trends (L2)
CO2	Explain Human Resource Development practices such as training, performance appraisal, career development, and HR accounting models (L2)
CO3	Apply project management principles including project planning, resource management, monitoring, and evaluation techniques (L3)
CO4	Analyze project management strategies for different project types including planning, control, review, and performance evaluation (L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	-	3	-	3	3	3	3	-	-	-
CO3	3	3	-	-	-	-	-	3	3	3	3	-	-	-
CO4	3	3	-	-	-	-	-	3	3	3	3	-	-	-

TEXT BOOKS:

1.	Robert L. Mathis, John H. Jackson, Manas Ranjan Tripathy, Human Resource Management, Cengage Learning 2016.
2.	Sharon Pande and Swapnalekha Basak, Human Resource Management, Text and Cases, Vikas Publishing, 2e, 2016.
3.	Stewart R. Clegg, Torgeir Skyttermoen, Anne Live Vaagaasar, Project Management, Sage Publications, 1e, 2021.
4.	K. Nagarajan, Project Management, New Age International Publishers, 8e, 2017.

REFERENCE BOOKS:

1.	Subba Rao P, "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.
2.	K Aswathappa, "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013.
3.	Prasanna
4.	Vasanth Desai, "Project Management", 4th edition, Himalaya Publications, 2018.
5.	Lalitha Balakrishnan, Gowri, "Project Management", Himalaya Publishing

	house, New Delhi, 2022.

SOFTWARE ARCHITECTURE & DESIGN PATTERNS
(Professional Elective – IV)

Subject Code: UGCS7T0223		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:	
The main objectives of the course are to make student ➢ Understand the basic concepts to identify state behavior of real world objects ➢ Apply Object Oriented Analysis and Design concepts to solve complex problems ➢ Construct various UML models using the appropriate notation for specific problem context ➢ Design models to Show the importance of systems analysis and design in solving complex problems using case studies ➢ Study Pattern Oriented approach for real world problems	
SYLLABUS:	
UNIT I:	**(10 hrs)**
Introduction: design pattern, Describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern What is object oriented development? key concepts of object oriented design other related concepts, benefits and drawbacks of the paradigm	
UNIT II:	**(10 hrs)**
Analysis a System: Overview of the analysis phase, stage 1 gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain Design and Implementation, discussions and further reading	
UNIT III:	**(10 hrs)**
Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.	
UNIT IV:	**(10 hrs)**
Interactive systems and the MVC architecture: Introduction The MVC architectural pattern, analyzing a simple drawing program designing the system, designing of the subsystems, getting into implementation, implementing undo operation drawing incomplete items, adding a new feature pattern based solutions	
UNIT V:	**(10 hrs)**
Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object oriented system on the web, Web services (SOAP, Restful), Enterprise Service Bus	

Course Outcomes:

CO1	Understand the concepts of object-oriented design and design patterns

	including their classification, benefits, and application in solving design problems (L2)
CO2	Analyze system requirements and design conceptual models using object-oriented principles and relationships (L4)
CO3	Apply structural design patterns and MVC architecture to develop modular and maintainable software systems (L3)
CO4	Analyze distributed object-based systems using client-server models, RMI, and web services (SOAP and RESTful) (L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	3	3	3	3	3	3	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	3	-	3	-	-

TEXT BOOKS:

1.	Object Oriented Analysis, Design and Implementation, Brahma Dathan, Sarnath Rammath , Universities Press, 2013
2.	Design Patterns, Erich Gamma, Richard Helan, Ralph Johman, John Vlissides, PEARSON Publication, 2013

REFERENCE BOOKS:

1.	Frank Bachmann, Regine Meunier, Hans Rohnert "Pattern Oriented Software Architecture", Volume 1, 1996.
2.	William J Brown et al., "Anti Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.

RESPONSIBLE AI
(Professional Elective – IV)

Subject Code: UGAI7T1323		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- To understand AI basics, misconceptions, responsible AI principles, and challenges in implementation.
- To understand and analyse biases in AI, fairness metrics, and mitigation techniques.
- To understand explainability, challenges, methods, and evaluation for interpretable machine learning models.
- To understand AI safety, security, privacy, and resilience, including model and data protection.
- To explore ethical issues and implications of AI in various real-world applications.

SYLLABUS:

UNIT I: **(09 hrs)**

INTRODUCTION TO RESPONSIBLE AI: Overview of AI – Common misconception of AI – Introduction to Responsible AI – Characteristics of Responsible AI – Key principles of responsible AI - Challenges in implementing responsible AI – ELSI. Framework and AI - Safety and Alignment – Fairness and Privacy.

UNIT II: **(10 hrs)**

FAIRNESS AND BIAS : Human Bias - Types of biases - Effects of biases on different demographics - Bias vs Fairness - Sources of Biases - Exploratory data analysis - Bias Mitigation Techniques - Pre-processing techniques - In- processing techniques - Post-processing techniques - Bias detection tools - Overview of fairness in AI - Demographic parity - Equalized odds - Simpson's paradox and the risks of multiple testing - Group fairness and Individual fairness - Counterfactual fairness - Fairness metrics - Bias and disparity mitigation with Fairlearn.

UNIT III: **(12 hrs)**

EXPLAINABILITY & INTERPRETABILITY: Importance of Explainability and Interpretability – Challenges - Interpretability through simplification and visualization - Intrinsic interpretable methods - Post Hoc interpretability – Interpretability Evaluation methods - Explainability through causality - Model agnostic Interpretation - LIME (Local Interpretable Model-agnostic Explanations) - SHAP (SHapley Additive exPlanations).

UNIT IV: **(08 hrs)**

SAFETY, SECURITY, AND PRIVACY : Overview of safety – security – privacy - resilience - Taxonomy of AI safety and Security - Adversarial attacks and mitigation- Model and data security - The ML life cycle - Adopting an ML life cycle MLOps and

ModelOps - Model drift - Data drift - Concept drift - Privacy-preserving AI techniques- Differential privacy - Federated learning.	
UNIT V:	**(09 hrs)**
CASE STUDIES : COMPAS Algorithm - Google Photos Tagging Controversy - ProPublica's Analysis of Recidivism Predictions - Amazon's AI Recruiting Tool - Facial Recognition Technology Misidentification - AI in Healthcare: Predictive Analytics in Patient Care - Tesla Autopilot and Ethical Implications of Autonomous Vehicles.	

Course Outcomes:

CO1	Understand the principles, challenges, and frameworks of responsible AI including fairness, privacy, and ethical considerations.(L2)
CO2	Apply bias detection, fairness metrics, and mitigation techniques to develop equitable AI systems.(L3)
CO3	Analyze explainability and interpretability techniques to assess transparency in machine learning models.(L4)
CO4	Evaluate AI systems with respect to safety, security, privacy, and ethical implications in real-world applications.(L5)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	–	–	2	3	3	3	–	–	–	3	3	2
CO2	3	3	3	3	3	3	3	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	3	3	–	–	–	3	3	3

TEXT BOOKS:

1.	Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way", 2019.
2.	Adnan Masood, Heather Dawe, "Responsible AI in the Enterprise", 2023.
3.	Beena Ammanath, "Trustworthy AI", O' Reilly, 2022.
4.	Christoph Molnar "Interpretable Machine Learning", 1st edition, 2019.

BLOCK CHAIN TECHNOLOGY
(Professional Elective – IV)

Subject Code: UGAI7T0223		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- To provide a strong foundation in blockchain technology, including its evolution, architecture, and underlying cryptographic principles.
- To develop understanding of blockchain mechanisms such as Bitcoin technology, consensus algorithms, and smart contracts for decentralized applications.
- To expose students to enterprise blockchain platforms like Hyperledger Fabric and explore real-world applications, challenges, and limitations of blockchain technology.

SYLLABUS:

UNIT I: **(09 hrs)**

INTRODUCTION TO BLOCKCHAIN: Introduction, history of Bitcoin and origins of Blockchain, Fundamentals of Blockchain and key components (Chapter 1-book1), Permission and Permission-less platforms(Chapter 1-book2), Introduction to Cryptography, SHA256 and ECDSA, Hashing and Encryption, Symmetric/ Asymmetric keys, Private and Public Keys(Chapter 3-book2).

UNIT II: **(10 hrs)**

TECHNOLOGIES BORROWED IN BLOCKCHAIN: Technologies Borrowed in Blockchain hash pointers- - Digital cash etc.- Bitcoin blockchain - Wallet Blocks Merkley Tree - hardness of mining - Transaction verifiability - Anonymity - forks - Double spending - Mathematical analysis of properties of Bitcoin - Bitcoin- the challenges and solutions. (Chapter 3-book2).

UNIT III: **(12 hrs)**

CONSENSUS MECHANISMS: Consensus Algorithms: Proof of Work (PoW) as random oracle - Formal treatment of consistency- Liveness and Fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS), Byzantine Models of fault tolerance. ((Chapter 1-book2))

UNIT IV: **(08 hrs)**

ETHEREUM: Ethereum -Ethereum Virtual Machine (EVM) -Wallets for Ethereum - Solidity - Smart Contracts (Chapter 5-book1), - The Turing Completeness of Smart Contract Languages and verification challenges- Using smart contracts to enforce legal contracts- Comparing Bitcoin scripting vs. Ethereum Smart Contracts-Some attacks on smart contracts (Chapter 6 and Chapter 7-book2)

UNIT V: **(09 hrs)**

HYPERLEDGER FABRIC: Hyperledger fabric- the plug and play platform and

mechanisms in permissioned blockchain - Beyond Cryptocurrency applications of blockchain in cyber security- integrity of information- E-Governance and other contract enforcement mechanisms - Limitations of blockchain as a technologyand myths vs reality of blockchain technology (Chapter 16-book1), (Chapter 9 -book2)

Course Outcomes:

CO1	Understand the fundamentals of blockchain technology, cryptographic principles, and different blockchain architectures.(L2)
CO2	Apply blockchain concepts such as Bitcoin mechanisms, transaction validation, and consensus algorithms in decentralized systems. (L3)
CO3	Analyze smart contracts, Ethereum architecture, and consensus mechanisms for secure and efficient blockchain solutions. (L4)
CO4	Evaluate enterprise blockchain platforms and real-world applications to assess scalability, security, and limitations of blockchain systems. (L5)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	–	–	2	–	–	–	–	–	–	3	3	3
CO2	3	3	2	–	3	–	–	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	3	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Blockchain Technology Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, University Press, 2020.
2.	Mastering Blockchain - Distributed ledger technology, decentralization, and smart contracts explained, Imran Bashir,2nd ed. Edition,2018, pakct publication

REFERENCE BOOKS:

1.	S. Shukla, M.Dhawan, S.Sharma.S, Venkatesan "Blockchain Technology: Cryptocurrency and Applications", Oxford University Press 2019.
2.	Cryptography and network security principles and practice, William Stallings, Pearson, 8th edition,

WEB REFERENCES:

1.	https://drive.google.com/file/d/1PtYaDmWYaqPVGjKDnMYGWO5eoI5wMPtJ/view
2.	https://archive.nptel.ac.in/courses/106/104/106104220/
3.	https://www.tutorialspoint.com/blockchain/index.html

QUANTUM COMPUTING
(Professional Elective – IV)

Subject Code: UGAI7T1423		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:	
➢ To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics.	
SYLLABUS:	
UNIT I:	**(09 hrs)**
History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations	
UNIT II:	**(10 hrs)**
Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Back**ground Physics:** Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. **Background Biology:** Basic concepts of Genomics and Proteomics (Central Dogma)	
UNIT III:	**(12 hrs)**
Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states **Introduction to Simulations Single Qubit gate, Multiple Qubit gate, Qiskit (IBM Simulator)**	
UNIT IV:	**(08 hrs)**
Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.	
UNIT V:	**(09 hrs)**
Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. **Quantum Information and Cryptography:** Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation	

Course Outcomes:

CO1	Understand the fundamental concepts of quantum computing, including qubits, quantum mechanics principles, and mathematical foundations.(L2)

CO2	Apply quantum gates, circuits, and mathematical models to represent and manipulate quantum information.(L3)
CO3	Apply quantum algorithms such as Deutsch, Shor, and Grover to solve computational problems.(L3)
CO4	Analyze quantum error correction techniques, cryptographic methods, and system limitations in quantum computing.(L4)

Mapping CO's to PO's

POs/ COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	–	–	3	–	–	–	–	–	–	3	3	3
CO2	3	3	3	–	3	–	–	–	–	–	–	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2.	Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II
3.	Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

AGILE METHODOLOGIES
(Professional Elective – V)

Subject Code: UGAI7T0523		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:	
➢ The main objectives of this course are to introduce the important concepts of Agile software development Process, emphasize the role of stand-up meetings in software collaboration, impart the knowledge on values and principles in understanding agility	
SYLLABUS:	
UNIT I:	**(09 hrs)**
Agile Methodology: Theories for Agile Management, Agile Software Development Traditional Model vs. Agile Model, Classification of Agile Methods, Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams, Agility in Design, Testing, Agile Documentations, Agile Drivers, Capabilities and Values.	
UNIT II:	**(10 hrs)**
Agile Process: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview Lifecycle Work Products, Roles and Practices.	
UNIT III:	**(12 hrs)**
Agile Knowledge Sharing Role of Story-Cards Story-Card Maturity Model (SMM).	
UNIT IV:	**(08 hrs)**
Agility and Requirements Engineering: Impact of Agile Processes in RE, Current Agile Practices, Variance, Overview of RE Using Agile, Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization, Agile Requirements Modelling, Generation Concurrency in Agile Requirements Generation.	
UNIT V:	**(09 hrs)**
Agility and Quality Assurance: Agile Product Development, Agile Metrics, Feature Driven Development (FDD), Financial and Production Metrics in FDD, Agile Approach to Quality Assurance, Test Driven Development, Agile Approach in Global Software Development.	

Course Outcomes:

CO1	Understand Agile concepts, values, principles, and methodologies including Agile Manifesto and project initiation (L2)
CO2	Apply Agile principles in project execution, teamwork, communication, and

	continuous improvement (L3)
CO3	Implement Scrum practices and XP techniques for effective project planning, development, and adaptability (L3)
CO4	Analyze Lean, Kanban, and coaching practices to improve workflow, eliminate waste, and enhance team performance (L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	–	–	–	–	–	3	3	3	-	-	-	-
CO2	3	3	3	–	3	–	–	3	3	3	3	3	-	-
CO3	3	3	3	3	3	–	–	–	3	3	3	3	-	-
CO4	3	3	3	3	3	–	–	–	3	3	2	3	-	-

TEXT BOOKS:

1.	Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015.

REFERENCE BOOKS:

1.	Andrew stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
2.	Rubin K , Essential Scrum : A practical guide to the most popular Agile process, Addison- Wesley, 2013

AUGMENTED REALITY & VIRTUAL REALITY
(Professional Elective – V)

Subject Code: UGCS7T0423		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

SYLLABUS:

UNIT I: **(09 hrs)**

Introduction to Augmented Reality: Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Related fields

Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT II: **(10 hrs)**

Computer Vision for Augmented Reality: Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

Interaction: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

Software Architectures: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

UNIT III: **(12 hrs)**

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception

The Geometry of Virtual Worlds: Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

UNIT IV: **(08 hrs)**

The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, **Perception of Color Visual Rendering:** Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT V:	**(09 hrs)**
Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection **Interaction:** Motor Programs and Remapping, Locomotion, Social Interaction **Audio:** The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering	

Course Outcomes:

CO1	Understand the fundamentals of Augmented Reality and Virtual Reality including history, components, displays, tracking, and perception (L2)
CO2	Explain computer vision techniques, interaction methods, and software architectures used in AR/VR systems (L2)
CO3	Apply geometric modeling, rendering techniques, and visualization methods for developing AR/VR environments (L3)
CO4	Analyze human perception, motion, audio, and interaction principles for designing immersive AR/VR applications (L4)

Mapping CO's to PO's

POs/ COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	–	–	2	–	–	–	–	–	–	3	3	3
CO2	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	–	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494
2.	Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

REFERENCE BOOKS:

1.	Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2.	Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3.	Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4.	Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN:9781491962381

5.	Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6.	Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005

HIGH PERFORMANCE COMPUTING
(Professional Elective – V)

Subject Code: UGAI7T0723		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:	
➢ The main objectives of the course is to study parallel computing hardware and programming models, performance analysis and modeling of parallel programs	
SYLLABUS:	
UNIT I:	**(09 hrs)**
INTRODUCTION: Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Scalable design principles, Architectures: N-wide superscalar architectures, Multi-core architecture	
UNIT II:	**(10 hrs)**
PARALLEL PROGRAMMING: Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU.	
UNIT III:	**(12 hrs)**
BASIC COMMUNICATION: Operations- One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations. Programming shared address space platforms: threads- basics, synchronization, OpenMP programming	
UNIT IV:	**(08 hrs)**
ANALYTICAL MODELS: Sources of overhead in Parallel Programs, Performance Metrics for Parallel Systems, and The effect of Granularity on Performance, Scalability of Parallel Systems, Minimum execution time and minimum cost, optimal execution time. **Dense Matrix Algorithms**: MatrixVector Multiplication, Matrix-Matrix Multiplication.	
UNIT V:	**(09 hrs)**
PARALLEL ALGORITHMS- SORTING AND GRAPH : Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Parallelizing Quick sort, All-Pairs Shortest Paths, Algorithm for sparse graph, Parallel Depth-First Search, Parallel BestFirst Search. CUDA Architecture: CUDA Architecture, Using the CUDA Architecture, Applications of CUDA Introduction to CUDA C-Write and launch CUDA C kernels, Manage GPU memory, Manage communication and synchronization, Parallel	

programming in CUDA- C.

Course Outcomes:

CO1	Understand the fundamentals of parallel computing architectures, performance metrics, and scalability principles. (L2)
CO2	Analyze parallel algorithm design techniques, task decomposition, and load balancing strategies for efficient computation. (L2)
CO3	Apply communication operations, synchronization mechanisms, and OpenMP programming for shared memory parallel systems.
CO4	Analyze parallel algorithms and GPU-based programming models (CUDA) for solving computationally intensive problems.

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	–	–	3	–	–	–	–	–	–	-	-	3
CO2	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	–	–	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley, 2003, ISBN: 0-201-64865-2
2.	Jason Sanders, Edward Kandrot, "CUDA by Example", Addison-Wesley, ISBN-13: 978-0-13-138768-3

REFERENCE BOOKS:

1.	Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998, ISBN: 0070317984
2.	Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013, ISBN: 9780124159884
3.	David Culler, Jaswinder Pal Singh, "Parallel Computer Architecture: A Hardware/Software Approach", Morgan Kaufmann, 1999, ISBN: 978-1-55860-343-1
4.	Rod Stephens, "Essential Algorithms", Wiley, ISBN: ISBN: 978-1-118-61210-1

BIG DATA ANALYTICS
(Professional Elective – V)

Subject Code: UGAI7T1523		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop echo system

SYLLABUS:

UNIT I: **(12 hrs)**

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT II: **(10 hrs)**

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files

UNIT III: **(08 hrs)**

Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API forMap Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Practitioner

UNIT IV: **(10 hrs)**

Stream Memory and Spark: Introduction to Streams Concepts– Stream Data Model and Architecture , Stream computing, Sampling Data in a Stream , Filtering Streams ,Counting Distinct Elements in a Stream , Introduction to Spark Concept , Spark Architecture and components , Spark installation , Spark RDD(Resilient Distributed Dataset) – Spark RDD operations**.**

UNIT V: **(08 hrs)**

Pig: Hadoop Programming Made EasierAdmiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin**.**

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analysing data

COURSE OUTCOMES:

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

CO1:	Understand Hadoop architecture, HDFS components, and Big Data ecosystem tools. (L2)
CO2:	Apply Java programming concepts to develop MapReduce applications for Big Data processing. (L3)
CO3:	Develop data processing pipelines using Spark RDD operations and streaming data models. (L3)
CO4:	Implement data processing workflows using Pig Latin and analyze large datasets. (L3)
CO5:	Design and execute data analysis queries using Apache Hive for structured Big Data. (L4)

Mapping CO's to PO's:

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	-	-	-	3	3
CO2	3	3	2	-	3	-	-	-	-	-	-	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	3	3
CO4	3	2	3	3	3	-	-	-	-	-	-	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3

TEXT BOOKS:

1.	Wiley & Big Java 4th Edition, Cay Horstmann, Wiley John Sons, INC
2.	Hadoop: The Definitive Guide by Tom White, 3rd. Edition, O'reilly

REFERENCE BOOKS:

1.	Hadoop in Action by Chuck Lam, MANNING Publ.
2.	Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss
3.	Hadoop in Practice by Alex Holmes, MANNING Publ.
4.	Big Data Analytics by Dr. A.Krishna Mohan and Dr.E.Laxmi Lydia

5.	Hadoop Map Reduce Cookbook, SrinathPerera, ThilinaGunarathne

SOFTWARE LINKS:

1.	Hadoop:http://hadoop.apache.org/
2.	Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3.	Piglatin: http://pig.apache.org/docs/r0.7.0/tutoria

PROMPT ENGINEERING
(SKILL ENHANCEMENT COURSE)

Subject Code: UGCS7K1123		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

The main objectives of the course are to

- Apply iterative prompting for clarity and context.
- Create varied prompts to steer model outputs.
- Construct chain-of-thought and structured prompts.
- Develop retrieval-augmented pipelines to ground outputs.
- Evaluate LLM agents and multimodal apps for ethics and robustness.

SYLLABUS:

UNIT I: **(09 hrs)**

Foundations of Prompt Engineering: Definition of prompt engineering, Distinction between prompt engineering and model fine-tuning, Motivation and benefits of prompt engineering, Core principles of effective prompt design**,** Anatomy of a prompt, Setting up the Python environment for LLM interaction, Iterative prompting lifecycle, Common prompt pitfalls and remediation

Lab Experiments:

1. Environment & Connectivity: Install required packages (e.g., transformers, openai); securely configure the API key; run a simple "Hello, world" prompt to verify model access.
2. Baseline vs. Enhanced Prompts: Execute a naïve prompt ("Write a one-paragraph bio of Ada Lovelace.") and an enhanced prompt that adds role framing, specificity, and explicit format instructions; compare both outputs for relevance, completeness, and style.
3. Iterative Refinement on a Simple Task: Summarize the plot of the Shakespearean play Romeo and Juliet in two sentences through three rounds of prompt tweaking:
    a. Minimal instruction.
    b. Addition of length and style constraints
    c. Specification of key content elements (setting and theme) Document how each iteration changes and improves the result.
4. Diagnosing Prompt Failures & Edge Cases: Craft a vague or contradictory prompt; analyze the failure mode (ambiguity, missing context, or format errors); refine the prompt by adding examples or clarifying instructions.

UNIT II:	**(10 hrs)**

Advanced Prompt Patterns & Techniques: Enhanced prompt anatomy: contextual detail and explicit output specifications, Few-shot in-context prompting, Prompt structuring and template design, Role-based prompting to establish personas or system behavior, Negative prompting to filter or suppress undesired content, Constraint specification and instruction enforcement (e.g., length, format), Iterative prompt refinement and optimization

Lab Experiments:

1. Few-Shot vs. Zero-Shot Comparison: Design and execute a zero-shot prompt and a few-shot prompt (with 2–3 exemplar input-output pairs) for a chosen text task (e.g.,sentiment classification or translation); compare outputs for accuracy, consistency, and adherence to examples.
2. Role-Based & Negative Prompting: Craft a role-based prompt to establish a specific persona (e.g., "You are a financial advisor…"); then create a negative prompt to suppress undesired content (e.g., "Do not mention any brand names"); evaluate how each influences the model's response.
3. Constraint Specification & Iterative Refinement: Select an open-ended task (e.g., summarizing a technical article); issue a basic prompt; identify failures in length or format; refine the prompt by adding explicit constraints (word count, bullet format, etc.); document improvements over two refinement cycles.

UNIT III:	**(12 hrs)**

Structured Output & Reasoning Techniques: Importance of structured outputs for real-world applications, Prompting for specific formats (lists, tables, Markdown), Generating valid JSON and YAML via explicit instructions, Eliciting chain-of-thought reasoning in zero-shot prompts, Decomposing complex tasks into manageable sub-tasks

Lab Experiments:

1. Structured Format Prompting: Instruct the model to output information as bullet lists and Markdown tables (e.g., "List three benefits of daily exercise in a Markdown table with columns 'Benefit' and 'Description.'"); verify the output matches the requested structure.
2. JSON/YAML Generation: Provide a brief dataset description (e.g., three books with title, author, publication year) and prompt the model to produce valid JSON or YAML; use a parser to validate syntax and refine the prompt if errors occur.
3. Chain-of-Thought & Task Decomposition: Present a multi-step problem (e.g., a logic puzzle) and apply zero-shot CoT prompting (e.g., "Let's think step by step. Explain your reasoning before the final answer."); separately, decompose the problem into sequential sub-questions, collect partial answers, combine them, and compare accuracy against a direct-answer baseline

UNIT IV:	**(08 hrs)**

Retrieval-Augmented Generation & LangChain Workflows: Limitations of LLM internal knowledge, Need for external data sources, Introduction to Retrieval-Augmented Generation (RAG), Overview of RAG architecture (indexing vs. retrieval + generation), Getting started with LangChain for LLM applications, Basics of LangChain Expression Language (LCEL), Simplified indexing pipeline: document loading & text splitting, Fundamentals of embeddings and vector stores, Building a basic retrieval-generation pipeline with an LCEL chain.

Lab Experiments:

1. Building a Simple LCEL Chain: Create a minimal LCEL script that accepts a fixed instruction (e.g., "Summarize this text: …"), passes it to an LLM, and prints the result; verify end-to-end execution.
2. Basic Data Indexing for RAG: Load a small collection of documents; split into uniform chunks (e.g., 200 tokens); generate embeddings for each chunk; store them in an in-memory vector store; inspect for consistency.
3. Constructing & Running a Basic RAG Chain: Build a pipeline that:
    a. Receives a user query
    b. Retrieves the top-k relevant chunks
    c. Constructs a combined prompt with context + query
    d. Send it to the LLM
    e. Returns the answer

Test with sample queries and compare factual accuracy against a prompt without retrieval.

UNIT V:	**(09 hrs)**

Agents, Multimodal AI & Ethical Evaluation: Introduction to LLM agents and their basic architecture, Overview of multimodal AI models (VLMs), Prompting for text-to-image generation and image understanding, Importance of prompt evaluation beyond subjective judgment, Manual evaluation techniques (heuristic checks for accuracy, relevance, format), Introduction to "LLM-as-Judge" for automated evaluation, Security considerations (prompt injection, sensitive-information risks), Prompt-based mitigation strategies for safety and robustness, Ethical concerns (bias, misinformation, data privacy), Brief exploration of UI frameworks (Streamlit/Gradio) for deploying prompt-driven apps, Adapting to the evolving nature of prompt engineering through continuous learning.

Lab Experiments:

1. Building a Simple LLM Agent: Register a tool (e.g., a calculator function) and craft prompts that instruct the agent to invoke it when required; implement using LangChain or a function-calling API; test on queries requiring tool execution.
2. Multimodal Prompting Exploration: Generate images from detailed text prompts; feed one generated image into an image-understanding model or API with an appropriate prompt; compare the returned caption to the

original prompt to evaluate alignment.

3. Prompt Evaluation & Ethics Workshop:
    a. Select two existing prompts and generate multiple outputs; apply manual heuristic checks for accuracy, relevance, and format compliance.
    b. Use an "LLM-as-Judge" prompt (e.g., "Rate these outputs on a scale of 1–5 for clarity and correctness.") to automate evaluation.
    c. Design a prompt- injection test (e.g., "Ignore previous instructions…"), observe the response, then refine system prompts to mitigate the vulnerability.

Course Outcomes:

CO1	Understand the fundamentals of prompt engineering including prompt design principles, lifecycle, and common pitfalls (L2)
CO2	Apply advanced prompt techniques such as few-shot learning, role-based prompting, constraint specification, and structured output generation (L3)
CO3	Apply retrieval-augmented generation (RAG), LangChain workflows, and agent-based systems for building LLM applications (L3)
CO4	Analyze ethical, security, and evaluation aspects of prompt engineering including bias, prompt injection, and model assessment techniques (L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	–	–	2	–	–	–	–	–	–	1	2	1
CO2	3	3	2	–	3	–	–	–	–	–	–	2	3	2
CO3	3	3	3	2	3	–	–	–	–	–	–	2	3	3
CO4	3	3	3	3	3	2	2	2	–	–	–	3	3	3

ROBOTIC PROCESS AUTOMATION
(Professional Elective – IV)

Subject Code: UGAI7K0923		**L**	**T**	**P**	**C**
IV Year / I Semester		**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

- To understand the basics of Robotic Process Automation.
- To demonstrate the use of sequence and control flow for a task.
- To understand different mouse and keyboard activities
- To design an Assistant bot on a keyboard event
- To understand deploying and managing the bot.

SYLLABUS:

UNIT I: **(09 hrs)**

INTRODUCTION TO ROBOTIC PROCESS AUTOMATION: Scope and techniques of automation, Robotic process automation, Benefits of RPA, Components of RPA, RPA platforms, UiPath studio, UiPath Robot, UiPath orchestrator, the future of automation.

UNIT II: **(10 hrs)**

RECORD AND PLAY: UiPath Stack, Types of Robots, the user interface, Quick Access Toolbar, Different panels, Task recorder, Step by step examples using recorder. Sequence, Activities, Control flow, various types of loops, decision making, step by step example using sequence and flow chart, step by step example using sequence and control flow.

UNIT III: **(12 hrs)**

DATA MANIPULATION AND CONTROLS: Variables and Scope, Collections, Arguments, Data table usage, clipboard management, File operations, CSV/Excel to data table and vice versa. Finding and attaching windows, finding the control, techniques for a waiting for a control, act on controls, mouse and keyboard activities, working with UiExplorer, Handling events, Screen scraping, OCR.

UNIT IV: **(08 hrs)**

ASSISTANT BOTS, EXCEPTION HANDLING: Assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger Monitoring image and element triggers, Example of monitoring email, Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event. Exception Handling, common exceptions, logging and taking screenshots, Debugging techniques, collecting crash dumps, error reporting.

UNIT V: **(09 hrs)**

DEPLOYING AND MAINTAINING THE BOT: Publishing using publish utility, publish a workflow in Uipath, Overview of Orchestartion server, using orchestration server to control bots, using orchestration server to deploy bots, license management, publishing and managing updates.

Course Outcomes:

CO1	Understand the fundamentals of robotic process automation, its architecture, tools, and real-world applications. (L2)
CO2	Analyze recording mechanisms, control flow structures, and automation workflows to design efficient RPA processes.(L4)
CO3	Apply data manipulation, UI interaction, and event-handling techniques to develop functional automation bots.(L3)
CO4	Analyze deployment, orchestration, and maintenance mechanisms for managing scalable and reliable RPA solutions.(L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	–	–	-	–	–	–	–	–	–	3	3	3
CO2	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO3	3	3	3	3	3	–	–	–	–	–	–	3	3	3
CO4	3	3	3	3	3	3	–	–	–	–	–	3	3	3

TEXT BOOKS:

1.	Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.

REFERENCE BOOKS:

1.	Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation, 1st Edition 2015.
2.	Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.
3.	Srikanth Merianda, "Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.
4.	Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

WEB REFERENCES:

1.	https://www.uipath.com/rpa/robotic-process-automation
2.	https://www.academy.uipath.com

CONSTITUTION OF INDIA

Subject Code: UGAI7A1023		L	T	P	C
IV Year / I Semester		3	0	0	3

COURSE OBJECTIVE:

The objectives of the course are to

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

SYLLABUS:

UNIT I:	**(09 hrs)**

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution- Preamble, Salient, Features

UNIT II:	**(10 hrs)**

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III:	**(12 hrs)**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, **Executive-** President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT IV:	**(08 hrs)**

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V:	**(09 hrs)**

Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes:

CO1	Understand the historical background, philosophy, and key features of the Indian Constitution (L2)
CO2	Explain fundamental rights, directive principles, and duties of citizens in the constitutional framework (L2)
CO3	Apply knowledge of governance structures including legislature, executive, and judiciary in real-world contexts (L3)
CO4	Analyze local governance, election systems, and institutional roles in strengthening democracy (L4)

Mapping CO's to PO's

POs/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	3	-	-	-	-	–	–
CO2	3	-	-	-	-	-	3	3	3	-	-	-	–	–
CO3	3	-	-	-	-	-	3	3	3	3	3	3	–	–
CO4	3	-	-	-	-	3	3	3	3	3	3	3	–	–

TEXT BOOKS:

1.	The Constitution of India, 1st Edition, (Bare Act), Government Publication, 1950
2.	Framing of Indian Constitution, 1st Edition, Dr. S. N. Busi, Dr. B. R. Ambedkar, 2015

REFERENCE BOOKS:

1.	Indian Constitution Law, 7th Edition, M. P. Jain, Lexis Nexis, 2014