24PE1009 SOFT COMPUTING (3-0-0)

Module I: (4 Hrs)
Basic tools of soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing,
Approximations of Multivariate functions, Non - linear Error surface and optimization

Module II: (10 Hrs)
Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations;
Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference; Defuzzification; Fuzzy logic control; Mamdani and Takagi and Sugeno architectures.
Applications to pattern recognition.

Module III: (14 Hrs)
Neural networks: Single layer networks, Perceptron; Activation functions; Adaline- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohenen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS).

Module III: (8 Hrs)
Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic, basic evolutionary programming concepts Applications, hybrid evolutionary algorithms.

Books:
1. F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design - Theory, Tools and Applications". Pearson Education.(Printed in India).
2. J. S. R. Jang. C. T. Sun and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.
3. Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
4. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India. 4) V. Keeman,"Learning and Soft computing", Pearson Education, India.
5. R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint).

sk, Creating and deploying smart contracts on Ethereum, Interoperability and Scalability: Challenges in blockchain scalability, Cross-chain interoperability solutions

Module 4 (10hrs)
Applications in Various Domains: Financial Services: Cryptocurrency, Digital Payments, and DeFi, Supply Chain Management, Healthcare, and Real Estate, Internet of Things (IoT) and Blockchain Integration, Government Services: Digital Identity and Voting Systems, Challenges and Limitations:Security and Privacy Concerns, Regulatory and Legal Issues, Energy Efficiency and Environmental Impact, Future Trends: Blockchain in AI and Machine Learning, Web3 and the Decentralized Web, Central Bank Digital Currencies (CBDCs)

Text Books:
- "Mastering Blockchain" by Imran Bashir
- "Blockchain Basics" by Daniel Drescher
- "Blockchain Revolution" by Don Tapscott and Alex Tapscott

Course Outcomes (COs):
CO1: Understand the fundamental principles and key components of blockchain technology, including cryptography, distributed ledger technology, and peer-to-peer networks.
CO2: Analyze different types of blockchain architectures and consensus algorithms (PoW, PoS, DPoS, PBFT) and assess their performance in terms of scalability, security, and energy efficiency.

CO3: Develop and deploy blockchain-based solutions using Ethereum, Hyperledger, and Solidity, including the creation of smart contracts and decentralized applications (DApps).

CO4: Evaluate the role of blockchain in various industries such as finance, supply chain management, healthcare, and government services, addressing challenges like privacy, security, and regulatory issues.

CO5: Explore future trends in blockchain technology, including its integration with AI, machine learning, IoT, and emerging innovations like Central Bank Digital Currencies (CBDCs) and Web3