

## SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - IV Year – I Semester

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### (R20CSM4101) NEURAL NETWORKS AND DEEP LEARNING

#### Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

#### Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

#### UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

#### UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

#### UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

#### UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

#### UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

#### TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3<sup>rd</sup> Edition, Pearson Prentice Hall.

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**(R20MED4202) REINFORCEMENT LEARNING**

**Course Objectives:** Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks.

**Course Outcomes**

1. Understand basics of RL.
2. Understand RL Framework and Markov Decision Process.
3. Analyzing RL through the use of Dynamic Programming and Monte Carlo.
4. Understand TD(0) algorithm, TD( $\lambda$ ) algorithm.

**UNIT - I**

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sublinear regret, UCB algorithm, KL-UCB, Thompson Sampling.

**UNIT - II**

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

**UNIT - III**

The Reinforcement Learning problem, prediction and control problems, Model-based algorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

**UNIT - IV**

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

**UNIT - V**

n-step returns; TD( $\lambda$ ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD( $\lambda$ ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

**TEXT BOOKS:**

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition, Sugiyama, Masashi. CRC Press 2015.

**REFERENCE BOOKS:**

1. "Bandit algorithms," First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

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(R20CSM4104) EXPERT SYSTEMS (Professional Elective – IV)

### Course Objectives:

1. Understand the basic techniques of artificial intelligence.
2. Understand the Non-monotonic reasoning and statistical reasoning.

### Course Outcomes:

1. Apply the basic techniques of artificial intelligence.
2. Discuss the architecture of an expert system and its tools.
3. Understand the importance of building an expert systems.
4. Understand various problems with an expert systems.

### UNIT - I

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO\* algorithm – game trees, Min- max algorithms, game playing – Alpha-beta pruning.

### UNIT - II

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

### UNIT - III

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

### UNIT - IV

**Expert System Tools:** Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

### UNIT - V

**Building an Expert System:** Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

**Problems with Expert Systems:** Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

### TEXT BOOKS:

1. Elain Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill, New Delhi.
2. Waterman D.A., “A Guide to Expert Systems”, Addison Wesley Longman.

### REFERENCE BOOKS:

1. Stuart Russel and other Peter Norvig, “Artificial Intelligence – A Modern Approach”, Prentice-Hall.
2. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley.
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley.
5. Weiss S.M. and Kulikowski C.A., “A Practical Guide to Designing Expert Systems”, Rowman & Allanheld, New Jersey.

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(R20CSM4107) SOCIAL NETWORK ANALYSIS (Professional Elective - V)

### Course Objectives:

1. It introduces the concepts of social media
2. It provides the mechanisms for social network analysis
3. Includes the concepts that allow for better visualization and analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.

### Course Outcomes:

1. Ability to construct social network maps easily
2. Gain skills in tracking the content flow through the social media
3. Use NodeXL to perform social network analysis

### UNIT - I:

**Introduction:** Social Media and Social Networks.

**Social Media:** New Technologies of Collaboration.

**Social Network Analysis:** Measuring, Mapping, and Modeling collections of Connections.

### UNIT - II:

NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualizing Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

### UNIT - III:

#### CASE STUDIES - I:

**Email:** The lifeblood of Modern Communication.

**Thread Networks:** Mapping Message Boards and Email Lists.

**Twitter:** Conversation, Entertainment and Information.

### UNIT - IV:

**CASE STUDIES - II:** Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

### UNIT-V:

#### CASE STUDIES - III:

**You Tube:** Contrasting Patterns of Content Interaction, and Prominence. **Wiki Networks:** Connections of Creativity and Collaboration.

### TEXT BOOKS:

1. Hansen, Derek, Ben Shneiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.

### REFERENCE BOOK:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1<sup>st</sup> Edition, MGH, 2011.

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**B.Tech. - IV Year – I Semester****OPEN ELECTIVE - II**

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**(R20INF4185) E – COMMERCE****COURSE OUTCOMES:** At the end of the course, the students will be able to :

1. Understand the E – commerce strategies and value chains
2. Understand the E-commerce services
3. Understand E - commerce infrastructure, its applications and Supply Chain Management.
4. Know the availability of latest technology and applications of E-Payment Mechanism.
5. Apply E-Commerce in business-to-business application.

**UNIT 1: Electronic Commerce:** Overview, Definition, Advantages & Disadvantages of E-Commerce, Threats of E-Commerce, Managerial Prospective, Rules & Regulation for Controlling Commerce, Relationship Between E-Commerce & Networking, Different Types of Networking for E-Commerce, internet, Intranet, EDI Systems, Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce Model, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement for E-Commerce, Business Model of E-Commerce; Model Based on Transaction Type, Model Based on Transaction Party- B2B, B2C, C2B, C2C, E-Governance.

**UNIT 2: E-Strategy:** Overview, Strategic Methods for developing E-Commerce. Four C's (Convergence, Collaborative, Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence - Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing: Collaborative Product Development, contract as per CAD, Simulations Collaboration, Security. Content Management: Definition of Content, Authoring Tools and Content Management, Content Management, Content - partnership, repositories, convergence, providers, Web Traffic.

**UNIT 3: Traffic Management:** Content Marketing Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weakness of Call Center, Customer Premises Equipment (CPE).

**Supply Chain Management:** E-logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution(SCE), SCEFramework, Internet's Effect on Supply Chain Power.

**UNIT 4: E-Payment Mechanism:** Payment through card system, E-Cheque, E-Cash, E-Payment, Threats& Protections.

**E-Marketing:** Home - Shopping, E-Marketing, Tele- Marketing

**UNIT 5: Electronic Data Interchange (EDI):** Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI, FACT/ GTDI), ANSI-X12, Data Encryption (DES/RSA)

**Risks of E-Commerce:** Overview, Security for E-Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital Certificates, Digital Signatures.

**Text Book:**

1. Electronic Commerce - Technologies & Applications, Bhaskar Bharat, TMH

**Reference Books:**

1. E-commerce, MM Oka, EPH
2. Frontiers of Electronics Commerce, Kalakotia, Whinston, Pearson Education
3. Electronic Commerce, Loshinpete, Murphy P. A., Jaico Publishing Housing
4. E-Commerce, Murthy, Himalaya Publishing.