DETAILED SYLLABUS FOR 7th SEMESTER

Approved by BoS of USAR : 15/06/2022,   Approved by AC sub-committee: 04/07/2022

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Paper code: ARM401	L	P	Credit
Subject: Reinforcement Learning	4	0	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

➢ There should be 9 questions in the end term examination question paper
➢ Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
➢ Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:
CO1: Ability of students to understand the basics concepts of reinforcement learning and MDP **[K1, K2]**
CO2: Ability of students to understand and apply planning by dynamic programming and model free prediction **[K1,K2,K3]**
CO3: Ability of students to understand deep and multi agent reinforcement learning **[K1, K2]**
CO4: Ability of students to apply and analyze various reinforcement learning applications and case studies [**K3,K4]**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	-	-	1	2
CO2	3	3	3	3	3	-	-	-	1	-	2	2
CO3	3	3	3	3	3	-	-	-	1	2	2	3
CO4	3	3	3	3	3	-	-	-	1	2	2	3

Course Content	No of lectures
Unit I	[10]
Introduction to Reinforcement Learning: Introduction to Reinforcement Learning, The Reinforcement Learning Problem, Markov Decision Process (MDP)-Markov Process, Markov Reward Process, Markov Decision Process and Bellman Equations, Partially Observable MDPs. Exploration and Exploitation (Bandits), Multi-arm Bandits, Contextual Bandits and MDP Extensions	

Unit II **Planning by Dynamic Programming (DP):** Policy Evaluation, Value Iteration, Policy Iteration, DP Extensions and Convergence using Contraction Mapping **Model-free Prediction**: Monte-Carlo (MC) Learning, Temporal-Difference (TD) Learning, TD-Lambda and Eligibility Traces **Model-free Control-**On-Policy MC Control, On-Policy TD Learning and Off-Policy Learning **Value Function Approximation:** Incremental Methods and Batch Methods, Deep Q-Learning, Deep Q-Networks and Experience Replay **Policy Gradient Methods**: Finite-Difference, Monte-Carlo and Actor-Critic Methods	[12]
Unit III **Hierarchical Reinforcement Learning**: Semi-Markov Decision Process, Learning with Options, Abstract Machines and MAXQ Decomposition **Deep Reinforcement Learning**: PPO, DDPG, Double Q-Learning, Advanced Policy Gradients etc. **Multi-Agent Reinforcement Learning**: Cooperative vs. Competitive Settings, Mixed Setting, Games, MARL Algorithms	[10]
Unit IV **Integrating Planning with Learning**: Model-based Reinforcement Learning, Integrated Architecture and Simulation-based Search **Integrating AI Search and Learning**: Classical Games: Combining Minimax Search and **Reinforcement Learning applications and case Studies:** TD-Gammon, Samuel's Checkers Player, Watson's Daily-Double Wagering, Optimizing Memory Control, Human-Level Video game play, Mastering the game of Go, Personalized Web Services, Thermal Soaring	[10]
Text Books: [T1] Richard S. Sutton and Andrew G. Barto; Reinforcement Learning: An Introduction; 2nd Edition, MIT Press, 2020.	
Reference Books: [R1] Csaba Szepesvári; Algorithms of Reinforcement Learning; Synthesis Lectures on Artificial Intelligence and Machine Learning, vol. 4, no. 1, 2010. [R2] Dimitri P. Bertsekas; Reinforcement Learning and Optimal Control; 1st Edition, Athena Scientific, 2019. [R3] Leslie Pack Kaelbling, Michael L. Littman and Andrew W. Moore; Reinforcement Learning: A Survey; Journal of Artificial Intelligence Research, vol.4, pp. 237-285, 1996.	

Paper code: ARM403	L	P	Credit
Subject: Introduction to Deep Learning	4	0	4

Marking Scheme:

Teachers Continuous Evaluation: As per university examination norms from time to time.

End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

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➢ Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.

➢ Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.

➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.

➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:

CO1: Ability of students to understand the basics concepts of Deep feed forward networks **[K1, K2]**

CO2: Ability of students to understand and apply convolution networks and adversarial networks **[K1,K2,K3]**

CO3: Ability of students to understand and apply recurrent and recursive nets for sequential data **[K1,K2,K3]**

CO4: Ability of students to apply and analyze various deep learning applications with case studies **[K3,K4]**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	-	1	1	2
CO2	3	3	3	3	3	-	-	-	1	1	2	2
CO3	3	3	3	3	3	-	-	-	1	1	2	3
CO4	3	3	3	3	3	-	-	-	1	1	2	3

Course Content	No of lectures
Unit I **Deep Feedforward Networks:** Artificial Neural Networks, Artificial Neuron, Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms, Regularization for Deep Learning- Parameter Norm Penalties, Dataset Augmentation, Noise Robustness, Early Stopping, Dropout, Adversarial Training, Optimization for Training Deep Models- How Learning Differs from Pure Optimization? Challenges in Neural Network Optimization, Basic Algorithms- Stochastic Gradient Descent, momentum. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Optimization Strategies and Meta-Algorithms	[10]

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Unit II **Convolutional Networks:** The Convolution Operation, Motivation, Pooling, Data Types, building block of CNN, Transfer Learning, Autoencoders- Under Complete, regularized, sparse Denoising, Generative Modeling with DL, Generative Adversarial Network Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam	[12]
Unit III **Recurrent and Recursive Nets:** Sequential data, Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory	[10]
Unit IV **Deep Learning applications and case Studies:** Large Scale Deep Learning, Deep Learning in Computer Vision, Deep Learning in Speech Recognition, Deep Learning in Natural Language Processing, Deep Learning for Recommender Systems	[10]

Text Books:
  [T1] Ian Goodfelllow, Yoshua Benjio, Aaron Courville , (2016),Deep Learning, The MIT Press
  [T2] Josh Patterson, Adam Gibson, (2017), Deep Learning: A Practitioner's Approach, O'Reilly

Reference Books:
  [R1] Duda, R. O. & Hart, P. E. (2006). Pattern Classification. John Wiley & Sons.
  [R2] Sebastian Raschka,Vahid Mirjalili, (2019), Python Machine Learning - Third Edition, Pact Publisher

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Paper code : ARD 425	L	P	Credit
Subject : E-commerce	4	-	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

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➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:
CO1: To understand the concept of E-Commerce. **[K1,K2]**
CO2: To explain Electronic data interchange and electronic payment methods.**[K2]**
CO3: To discuss security and issues in E-Commerce field. **[K1,K2]**
CO4: To gain knowledge about recent trends in business and E-Governance techniques. **[K2]**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	1	2	3	3	2	1	1	-	2	1	1
CO2	2	1	2	3	3	2	1	1	-	2	1	1
CO3	2	1	2	3	3	2	1	2	-	2	1	1
CO4	2	1	2	3	3	2	1	2	-	2	1	1

Course Content	No of Lectures
Unit I Introduction to E-Commerce: Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Benefits and limitations of E-Commerce, generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture, Electronic Markets, Electronic Data Interchange and Internet Commerce.	[12]
Unit II Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. Electronic Payment Systems, Need of Electronic Payment System: use of Electronic Payment system and the protocols used, Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques and credit cards on the Internet.	[12]

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Unit III Security in E Commerce Threats in Computer Systems: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server.	[10]
Unit IV Issues in E Commerce Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance.	[10]
Text Books: [T1] Dave Chaffey, E-Business and E-Commerce Management, 3rd Edition, 2009, Pearson Education. [T2] Ravi Kalakota, Andrew B. Whinston, Frontiers of E-Commerce, 2013, Addison Wesley Longman [T3] Elias. M. Awad, Electronic Commerce, Prentice-Hall of India Pvt Ltd.	
Reference Books: [R1] Gary P. Schneider, Electronic Commerce, Tenth Edition, May 2012, CENGAGE Learning India [R2] Elias M Award, Electronic Commerce from Vision to Fulfilment, 3rd Edition, PHI, [R3] Reba Jones, Introduction to E-Commerce, A beginner's guide with examples and descriptions, 2019	

Paper code : ARD 429	L	T/P	C
Subject : Introduction to Large Language Models	4	-	4

Marking Scheme:

Teachers Continuous Evaluation: As per university examination norms from time to time.

End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

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➢ Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.

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➢ The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.

➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:

CO1: Recall the definition, characteristics, and applications of large language models, including ChatGPT and BART architecture. **[K1]**

CO2: Explain the architecture, components, and training techniques used in large language models, including ChatGPT and BART. **[K2]**

CO3: Apply techniques and methodologies of natural language understanding and generation using large language models, including ChatGPT and BART, to solve text classification, summarization, and other related tasks. **[K4]**

CO4: Analyze the ethical considerations, biases, and emerging trends in large language models, including ChatGPT and BART, and critically evaluate their impact on society. **[K3]**

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	2	1	-	-	-	2	1	2
CO2	2	2	3	3	2	1	-	-	-	2	1	2
CO3	2	3	3	3	2	1	-	-	-	2	2	3
CO4	3	3	3	2	2	1	-	-	-	1	2	3

Course Content

Unit I Introduction to Large Language Models: Definition and characteristics of large language models, Overview of pre-training and fine-tuning processes, Applications and use cases of large language models, Ethical considerations and challenges in using large language models   **[10]**

Unit II

Architecture and Components of Large Language Models: Architecture and structure of large language models, Transformer models and self-attention mechanism, Training data and model size considerations, Fine-tuning and transfer learning techniques   **[12]**

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Unit III **Natural Language Understanding and Generation with Large Language Models:** Natural language understanding (NLU) tasks: text classification, named entity recognition, sentiment analysis, Natural language generation (NLG) tasks: text completion, summarization, question answering, Techniques and methodologies for NLU and NLG using large language models, including ChatGPT and BART, Evaluation and challenges in NLU and NLG with large language models	[10]
Unit IV **Ethical Considerations and Future Trends in Large Language Models:** Ethical considerations and biases in large language models, Privacy and data security concerns, Interpretability and explainability of large language models, Emerging trends and future directions in large language models, including ChatGPT and BART	[10]

Text Books:

[T1] Radford, A., Wu, J., Child, R., Luan, D., Amodei, D., & Sutskever, I. (2019). Language Models are Unsupervised Multitask Learners. OpenAI.

[T2] Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). Attention is All You Need. In Advances in Neural Information Processing Systems (pp. 5998-6008).

[T3] Jurafsky, D., & Martin, J. H. (2020). Speech and Language Processing (3rd ed.). Pearson.

Reference Books:

[R1] Goldberg, Y. (2017). Neural Network Methods for Natural Language Processing. Morgan & Claypool Publishers.

[R2] Manning, C. D., & Schütze, H. (1999). Foundations of Statistical Natural Language Processing. MIT Press.

Paper code : ARM 415	L	P	Credit
Subject : Social Media Analytics	4	0	4

Marking Scheme:
Teachers Continuous Evaluation: As per university examination norms from time to time.
End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks : AS per University norms

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Course Outcomes [Bloom's Knowledge Level (KL)]:
CO1: Ability of students to understand the concept of social media analytics and understand its significance.
CO2: Ability of students to develop skills required for analyzing the effectiveness of social media.
CO3: Ability of students to use different tools of social media analytics.
CO4: Ability of students to acquire the fundamental perspectives and hands-on skills needed to work with social media data.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	1	1	2	1	2
CO2	2	3	3	3	2	1	1	1	1	2	1	2
CO3	2	3	3	3	2	1	1	1	1	2	2	3
CO4	3	3	3	3	2	1	1	1	1	1	2	3

Course Content	No of lectures
Unit I **Social Media Analytics: Introduction** Core Characteristics of Social Media, Types of Social Media, Social media landscape, Need for Social Media Analytics (SMA), SMA in small & large organizations. Purpose of Social Media Analytics, Social Media vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, Social Media Analytics Tools	[10]

Unit II **Social Network Structure, Measures & Visualization:** Basics of Social Network Structure - Nodes, Edges & Tie Describing the Networks Measures - Degree Distribution, Density, Connectivity, Centralization, Tie Strength & Trust Network Visualization - Graph Layout, Visualizing Network features, Scale Issues. Social Media Network Analytics - Common Network Terms, Common Social Media Network Types, Types of Networks, Common Network Terminologies, Network Analytics Tools **Social Media Text Analytics** - Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools **Social Media Action Analytics** - What Is Actions Analytics? Common Social Media Actions, Actions Analytics Tools. **Social Media Hyperlink Analytics** - Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools.	[10]
Unit III **Social Media Location & Search Engine Analytics :** Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics and Privacy Concerns, Location Analytics Tools Search Engine Analytics - Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools. **Social Information Filtering :** Social Information Filtering - Social Sharing and filtering , Automated Recommendation systems, Traditional Vs social Recommendation Systems Understanding Social Media and Business Alignment, Social Media KPI, Formulating a Social Media Strategy, Managing Social Media Risks	[10]
Unit IV **Social Media Analytics Applications and Privacy :** Social media in public sector - Analyzing public sector social media, analyzing individual users, case study. Business use of Social Media - Measuring success, Interaction and monitoring, case study. Privacy - Privacy policies, data ownership and maintaining privacy online.	[10]
Text Books: [T1] F Khan, Gohar. SEVEN LAYERS OF SOCIAL MEDIA ANALYTICS Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data. Gohar F. Khan, 2015. [T2] Russell, Matthew A. Mining the social web: Analyzing data from Facebook, Twitter, LinkedIn, and other social media sites. " O'Reilly Media, Inc.", 2011.	
Reference Books: [R1] Russell, Matthew A. Mining the social web: Analyzing data from Facebook, Twitter, LinkedIn, and other social media sites. " O'Reilly Media, Inc.", 2011.	

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Paper Code: ARO 479	L	T/P	Credits
Subject: Personal Finance	3	0	3

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End Term Theory Examination: As per university examination norms from time to time.

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➢ The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes [Bloom's Knowledge Level (KL)]:

CO1: Understand the meaning and relevance of financial planning, time value of money & process of financial planning. **[K1, K2]**
CO2: Explain the concept of investment planning and its methods. **[K2]**
CO3: Examine the concept of personal tax planning. **[K3]**
CO4: Analyse and understand insurance planning retirement planning. **[K1, K2]**

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	3	2	-	-	-	-	2	3
CO2	3	3	3	2	3	2	-	-	-	-	2	3
CO3	3	3	3	2	3	2	-	-	-	-	2	3
CO4	3	2	3	2	3	2	-	-	-	-	2	3

Course Content	No of lectures
Unit I: **Introduction to Financial Planning:** Financial goals, Time value of money, steps of financial planning, personal finance/loans, education loan, car loan & home loan schemes. Introduction of savings, benefits of savings, management of spending & financial discipline, Net banking and UPI, digital wallets, security and precautions against Ponzi schemes and online frauds such as phishing, credit card cloning, skimming etc.	[8]
Unit: II **Investment planning:** Process and objectives of investment, Concept and measurement of return & risk for various assets class, Measurement of portfolio risk and return, Diversification & Portfolio	[8]

formation. Real estate, financial derivatives & Commodity market in India. Mutual fund schemes including SIP.	
Unit III: **Personal Tax Planning:** Tax Structure in India for personal taxation, Steps of Personal tax planning, Exemptions and deductions for individuals, tax avoidance versus tax evasion.	[12]
Unit IV: **Insurance Planning and Retirement Planning:** Need for Protection planning. Risk of mortality, health, disability and property. Importance of Insurance: life and non-life insurance schemes. Retirement Planning Goals, Process of retirement planning, Pension plans available in India, Reverse mortgage, New Pension Scheme.	[12]
Text Books: 　[T1] Introduction to Financial Planning (4th Edition 2017) — Indian Institute ofBanking & Finance. 　[T2] Sinha, Madhu. Financial Planning. A Ready Reckoner July 2017, McGraw Hill.	
Reference Books: 　[R1] Halan, Monika. Lets Talk Money: You've Worked Hard for It, Now Make It Work for You July 2018 Harper Business. 　[R2] Pandit, Amar The Only Financial Planning Book that You Will Ever Need , Network 18 Publications Ltd.	