



## TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

AN AUTONOMOUS INSTITUTION

Accredited by NAAC with 'A+' Grade.

(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTU H)

Medbowli, Meerpet, Balapur, Hyderabad, Telangana – 500 097

Phone: 9100377790, email: info@tkrcet.ac.in, web site: www.tkrct.ac.in



### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

#### SEMESTER VII

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
01	PC	D87PC22	Cloud Computing	3	0	0	3	40	60	100
02	PC	D87PC23	Web and Social Media Analytics	3	0	0	3	40	60	100
03	PE	D87PE5	Professional Elective V 1 Exploratory Data Analysis 2 Database Security 3 Recommender Systems	3	0	0	3	40	60	100
04	OE	D87OE2	Open Elective II	3	0	0	3	40	60	100
05	PC	D87PC24	Web and social media Analytics Lab	0	0	2	1	40	60	100
06	PW	D87PW1	Project Work Phase 1	0	0	14	7	100		100
07	MC	D6MCM	MOOCS							
<b>TOTAL</b>				12	0	16	20			



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

B.Tech IV Year I Semester

L/T/P/C

3/0/0/1

#### CLOUD COMPUTING - D87PC22

#### COURSE OBJECTIVES:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

#### COURSE OUTCOMES:

Upon on completion of course the student will be to

1. Describe architecture and underlying principles of cloud computing.L2
2. Explain need, types and tools of Virtualization for cloud. L2
3. Describe Services Oriented Architecture and various types of cloud services. L2
4. Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing. L2
5. Analyze advanced cloud technologies.L4

#### UNIT-I

Introduction To Cloud Computing: Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On demand Provisioning.

#### UNIT-II

Cloud Enabling Technologies Service Oriented Architecture: REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

#### UNIT-III

Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage as a Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

#### UNIT-IV

Resource Management And Security In Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software as a Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****UNIT-V**

Cloud Technologies And Advancements Hadoop: MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

**TEXT BOOKS:**

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, “Cloud Application Architectures: Building Applicat



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year I Semester**

**L/T/P/C**

**3/0/0/1**

#### WEB AND SOCIAL MEDIA ANALYTICS - D87PC23

##### Course Objectives:

Exposure to various web and social media analytic techniques.

##### Course Outcomes:

Upon on completion of course the student will be to

1. Knowledge on decision support systems.L2
2. Apply natural language processing concepts on text analytics and Text Mining.L3
3. Understand sentiment analysis.L2
4. Knowledge on Web Analytics, Web Mining.L2
5. Knowledge on search engine optimization and web analytics.L2

##### UNIT - I

**An Overview of Business Intelligence, Analytics, and Decision Support:** Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics.

##### UNIT - II

**Text Analytics and Text Mining:** Machine Versus Men on Jeopardy!: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools.

##### UNIT - III

**Sentiment Analysis:** Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics.

##### UNIT - IV

**Web Analytics, Web Mining:** Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools.

##### UNIT - V

**Social Analytics and Social Network Analysis:** Social Analytics and Social Network Analysis, SocialMedia Definitions and Concepts, Social Media Analytics.

**Prescriptive Analytics - Optimization and Multi-Criteria Systems:** Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking.

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****TEXT BOOK:**

1. Ramesh Sharda, Dursun Delen, Efraim Turban, business intelligence and analytics: systems for decision support, Pearson Education.

**REFERENCE BOOKS:**

1. Rajiv Sabherwal, Irma Becerra-Fernandez, "Business Intelligence – Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.



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**B.Tech IV Year I Semester**

**L/T/P/C**

**3/0/0/1**

#### EXPLORATORY DATA ANALYSIS - D87PE5

#### Course Objectives:

Analysis of data, exploring various models in exploratory data analysis, question answering and predictive analysis

#### Course Outcomes:

Upon on completion of course the student will be to

1. Apply the Epicycle of Analysis process effectively.L3
2. Articulate and refine data-related questions using the Epicycle approach.L3
3. Conduct Exploratory Data Analysis (EDA).L3
4. Understand that models are simplified representations of reality used to make predictions .L2
5. Develop the skills necessary to use formal modeling techniques for data inference.L3

#### UNIT – I

Epicycles of Analysis: Setting the Scene, Epicycle of Analysis, Setting Expectations, Collecting Information, Comparing Expectations to Data, Applying the Epicycle of Analysis process.

#### UNIT – II

Stating and Refining the Question: Types of Questions, Applying the Epicycle to stating and Refining Your Question, Characteristics of good Question, Translating a Question into a Data Problem, Case Study.

#### UNIT- III

Exploratory Data Analysis: Formulate your question, read in your data, Checking Packaging, look at the top and bottom of the data, always be checking, validate with at least one External Source, make a plot, Try the Easy Solution First.

#### UNIT – IV

Using Models to Explore your data: Models as Expectations, Reacting to Data Refining Our Expectations, Examining Linear Relationships, Stopping Criteria. Inference: Identify the population, Describe the sampling process, Describe the Model for the population, Factors Affecting the Quality of Inference, Case Study.

#### UNIT – V

Formal Modeling: Goals of Formal Modeling, General Frame work, Associational Analysis, Prediction Analysis, and Summary

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****TEXT BOOK:**

1. "The Art of Data Science: A Guide for Anyone Who Works with Data" by Roger D. Peng and Elizabeth Matsui.

**REFERENCE BOOKS:**

1. "Exploratory Data Analytics" by John Tukey.
2. "Python for Data Analysis" by Wes McKinney



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**B.Tech IV Year I Semester**

**L/T/P/C**

**3/0/0/1**

#### RECOMMENDER SYSTEMS - - D87PE5

#### Course Objective:

To learn the significance of machine learning and data mining algorithms for Recommender systems

#### Course Outcomes:

Upon on completion of course the student will be to

1. Apply the knowledge of dimensionality reduction techniques and understand how it helps in designing a recommender system. L3.
2. Develop content based recommendation system using a given domain knowledge. L3
3. Implement the Collaborative Filtering technique to study the performance evaluation of recommender systems based on various metrics. L3
4. Develop security features for effective use of recommender systems and study the potential impact of attacks on user experience and trust. L3
5. Experiment formally with different paradigms used for evaluating recommender systems. L3

#### UNIT I :INTRODUCTION

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

#### UNIT II :CONTENT-BASED RECOMMENDATION SYSTEMS

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

#### UNIT III :COLLABORATIVE FILTERING

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

#### UNIT IV :ATTACK-RESISTANT RECOMMENDER SYSTEMS

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

#### UNIT V EVA:LUATING RECOMMENDER SYSTEMS

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures



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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****TEXTBOOKS:**

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Systems Handbook, 1st ed, Springer (2011),
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year I Semester**

**L/T/P/C**

**3/0/0/1**

#### **DATABASE SECURITY - - D87PE5**

#### **Course Objectives:**

- To learn the security of databases

#### **Course Outcomes:**

Upon on completion of course the student will be to

1. Identify database security problems.L3
2. Implement different security models.L3
3. Provide security for software design.L3
4. Protect object-oriented systems.L3
5. Handle security issues for active databases.L3

#### **UNIT - I**

Introduction: Introduction to Databases Security, Problems in Databases Security, Controls, Conclusions Security Models -1: Introduction Access Matrix Model, Take-Grant Model, Acten Model, PN Model.

#### **UNIT - II**

Security Models -2: Hartson and Hsiao's Model, Fernandez's Model, Bussolati and Martella's Model for Distributed databases, Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control.

#### **UNIT - III**

Security Mechanisms: Introduction User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation Security Functionalities in Some Operating Systems Trusted Computer System Evaluation Criteria Security Software Design: Introduction A Methodological Approach to Security Software Design Secure Operating System Design Secure DBMS Design Security Packages Database Security Design

#### **UNIT - IV**

Statistical Database Protection & Intrusion Detection Systems: Introduction Statistics Concepts and Definitions Types of Attacks Inference Controls Evaluation Criteria for Control Comparison. Introduction IDES System RETISS System ASES System Discovery

#### **UNIT - V**

Models For the Protection of New Generation Database Systems: Introduction A Model for the Protection of Frame Based Systems A Model for the Protection of Object-Oriented Systems

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)**

SORION Model for the Protection of Object-Oriented Databases, The Orion Model, Jajodia and Kogan's Model- A Model for the Protection of Active Databases Conclusions

**TEXT BOOKS:**

1. Database Security by Castano Pearson Edition (1/e)

**REFERENCE BOOK:**

1. Database security by alfred basta, melissa zgola, CENGAGE learning.
2. Database Security and Auditing: Protecting Data Integrity and Accessibility, 1st Edition, Hassan Afyouni, THOMSON Edition.



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year I Semester**

**L/T/P/C**

**0/0/2/1**

#### WEB AND SOCIAL MEDIA ANALYTICS LAB - D87PC24

**Course Objectives:** Exposure to various web and social media analytic techniques.

#### Course Outcomes:

Upon on completion of course the student will be to

1. Knowledge on decision support systems.L2
2. Apply natural language processing concepts on text analytics & sentiment analysis.L3
3. Knowledge on search engine optimization and web analytics.L2

#### List of Experiments

1. Pre-processing text document using NLTK of Python
  - a. Stop word elimination
  - b. Stemming
  - c. Lemmatization
  - d. POS tagging
  - e. Lexical analysis
2. Sentiment analysis on customer review on products
3. Web analytics
  - a. Web usage data (web server log data, clickstream analysis)
  - b. Hyperlink data
4. Search engine optimization- implement spamdexing
5. Use Google analytics tools to implement the following
  - a. Conversion Statistics
  - b. Visitor Profiles
6. Use Google analytics tools to implement the Traffic Sources.

#### Resources:

1. Stanford core NLP package
2. GOOGLE.COM/ANALYTICS

#### TEXT BOOKS:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, BUSINESS INTELLIGENCE AND ANALYTICS: SYSTEMS FOR DECISION SUPPORT, Pearson Education.

#### REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence –Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, “Business Intelligence Roadmap”, Addison-Wesley It Service.
3. Yuli Vasiliev, “Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

#### SEMESTER VIII

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
01	PC	D88PC25	Predictive Analytics	3	0	0	3	40	60	100
02	PE	D88PE6	Professional Elective VI 1 Video Analytics 2 Reinforcement Learning 3 Privacy Preserving Data Publishing	3	0	0	3	40	60	100
03	OE	D88OE3	Open Elective III	3	0	0	3	40	60	100
04	OE	D88OE4	Open Elective IV	3	0	0	3	40	60	100
05	PW	D87PW2	Major Project Phase 2	0	0	16	8	40	60	100
<b>TOTAL</b>				12	0	16	20			



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year II Semester**

**L/T/P/C**

**3/0/0/1**

#### PREDICTIVE ANALYTICS - D88PC25

##### Course Objectives:

To learn the basics and applications of predictive analytics using different techniques

**Course Outcomes:** At the end of this course, the student will be able to

1. Understand the processing steps for predictive analytics.L2
2. Construct and deploy prediction models with integrity.L3
3. Explore various techniques (machine learning/data mining, ensemble) for predictive analytics.L3
4. Explore various ensemble techniques for predictive analytics.L3
5. Apply predictive analytics to real world examples.L3

##### UNIT - I

**Introduction** – types of analytics, applications of predictive analytics, overview of predictive analytics. Setting up the problem - processing steps, business understanding, objectives, data for predictive modeling, columns as measures, target variables, measures of success for predictive models.

##### UNIT - II

Prediction effect, deployment of prediction model, ethics and responsibilities The Data effect

##### UNIT - III

**Machine Learning for prediction:** Predictive modeling – decision trees, logistic regression, neural network, kNN, Bayesian method, **Regression model:** Assessing Predictive models - Batch Approach to Model Assessment, Percent Correct Classification, Rank-Ordered Approach to Model Assessment, Assessing Regression Models

##### UNIT - IV

**Ensemble effect:** Model ensembles – motivation, wisdom of crowds, Bagging, Boosting, Random forests, stochastic gradient boosting, heterogeneous ensembles.

##### UNIT - V

**Case studies:** Survey analysis, question answering– challenges in text mining, persuasion by the numbers



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### **B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)**

#### **TEXT BOOKS:**

1. Eric Siegel, Predictive analytics- the power to predict who will Click, buy, lie, or die, John Wiley& Sons, 2013.
2. Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the professional Data Analyst, 2014.

#### **REFERENCE BOOKS:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
2. G. James, D. Witten, T. Hastie, R. Tibshirani-An introduction to statistical learning with applications in R, Springer, 2013.
3. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2010.



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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year II Semester**

**L/T/P/C**

**3/0/0/1**

#### VIDEO ANALYTICS - D88PE6

#### Course Objectives:

- To understand the models used for recognition of objects in videos.

#### Course Outcomes:

Upon completion of the course the student will be able to

- Apply the principles of multi-dimensional signal processing to solve problems related to signal manipulation, system analysis, and sampling. L3
- Apply differential methods, matching methods, non-linear optimization methods, and transform domain methods to estimate motion in 2D images and 3D images. L3
- Apply articulated human motion tracking techniques in low-dimensional latent spaces, considering factors such as occlusion and pose variation. L3
- Utilize knowledge of behavioral analysis to develop algorithms for human activity recognition in various contexts. L3
- Utilize knowledge of gait recognition techniques, including HMM frameworks and view-invariant approaches, to develop gait recognition systems. L3

#### UNIT - I

Introduction: Multi-dimensional signals and systems: signals, transforms, systems, sampling theorem. Digital Images and Video: human visual system and color, digital video, 3D video, digital-video applications, image and video quality.

#### UNIT - II

Motion Estimation: Image formation, motion models, 2D apparent motion estimation, differential methods, matching methods, non-linear optimization methods, transform domain methods, 3D motion and structure estimation.

#### UNIT - III

Video Analytics: Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modelling and Subtraction- Pedestrian Detection and Tracking Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.





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### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

#### UNIT - IV

Behavioral Analysis & Activity Recognition Event Modelling- Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition Activity modelling using 3D shape, Video summarization, shape-based activity models- Suspicious Activity Detection.

#### UNIT - V

Human Face Recognition & Gait Analysis Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition

#### TEXT BOOKS:

1. A. Murat Tekalp, “Digital Video Processing”, second edition, Pearson, 2015
2. Rama Chellappa, Amit K. Roy-Chowdhury, Kevin Zhou. S, “Recognition of Humans and their Activities using Video”, Morgan & Claypool Publishers, 2005.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.

#### REFERENCE BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer, 2011.
2. Yao Wang, Jorn Ostermann and Ya-Qin Zhang, “Video Processing and Communications”, Prentice Hall, 2001.
3. Thierry Bouwmans, Fatih Porikli, Benjamin Höferlin and Antoine Vacavant, “Background Modeling and Foreground Detection for Video Surveillance: Traditional and Recent Approaches, Implementations, Benchmarking and Evaluation”, CRC Press, Taylor and Francis Group, 2014.
4. Md. Atiqur Rahman Ahad, “Computer Vision and Action Recognition-A Guide for Image Processing and Computer Vision Community for Action Understanding”, Atlantis Press, 2011.



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Medbowli, Meerpet, Balapur, Hyderabad, Telangana – 500 097

Phone: 9100377790, email: info@tkrcet.ac.in, web site: www.tkrct.ac.in



### B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)

**B.Tech IV Year II Semester**

**L/T/P/C**

**3/0/0/1**

#### REINFORCEMENT LEARNING - D88PE6

**Course Objective:** To understand the foundation of Reinforcement learning is an area of machine learning, where an agent or a system of agents learn to archive a goal by interacting with their environment. RL is often seen as the third area of machine learning, in addition to supervised and unsupervised areas, in which learning of an agent occurs as a result of its own actions and interaction with the environment.

#### Course Outcomes:

At the end of this course, the student will be able to

1. Understand the Basic concepts of Reinforcement learning L2
2. Implement tabular methods to solve classical control problems.L3
3. Understand the policy gradient methods from vanilla to more complex cases.L2
4. Apply various model based RL approaches to solve real world applications.L3
5. Recognize current advanced techniques and applications in RL.L3

#### UNIT\_1:

**Introduction and Basics of RL**, Defining RL Framework and Markov Decision Process, Policies, Value Functions and Bellman Equations, Exploration vs. Exploitation, Code Standards and Libraries used in RL (Python/Keras/Tensorflow)

#### UNIT\_2:

**Tabular methods and Q-networks**, Planning through the use of Dynamic Programming and Monte Carlo, Temporal-Difference learning methods (TD(0), SARSA, Q-Learning) ,Deep Q-networks (DQN, DDQN, Dueling DQN, Prioritized Experience Replay)

#### UNIT\_3:

**Introduction to policy-based methods:** Vanilla Policy Gradient, REINFORCE algorithm and stochastic policy search, Actor-critic methods (A2C, A3C) ,Advanced policy gradient (PPO,TRPO, DDPG)

#### UNIT\_4:

**Model-based RL approach:** Analytic gradient computation, Sampling-based planning, Model-based data generation, Value-equivalence prediction, Model-based policy optimization. Model-based RL approach Recent Advances and Applications .

#### UNIT\_5:

**Meta-learning** :Multi-Agent Reinforcement Learning. Partially Observable Markov Decision Process. Ethics in RL . Applying RL for real-world problems

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****TEXT BOOKS:**

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019
2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).
3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3

**Reference books:**

1. Russell, Stuart J., and Peter Norvig. "Artificial intelligence : a modern approach." Pearson Education Limited, 2016.
2. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016. • David Silver' s course on Reinforcement Learning (link)

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****B.Tech IV Year II Semester****L/T/P/C****3/0/0/1****PRIVACY PRESERVING DATA PUBLISHING - D88PE6****Prerequisites**

A course on “Data Mining”.

**Course Objectives**

The aim of the course is to introduce the fundamentals of Privacy Preserving Data Mining Methods. The course gives an overview of - Anonymity and its Measures, Multiplicative Perturbation for Privacy-Preserving Data Mining, techniques for Utility-based Privacy Preserving Data

**Course Outcomes**

At the end of this course, the student will be able to

1. Understand the concepts of Privacy Preserving Data Mining Models and Algorithms
2. Demonstrate a comprehensive understanding of different tasks associated in Inference
3. Understand the concepts of Data Anonymization Methods and its Measures
4. Evaluate and Appraise the solution designed for Multiplicative Perturbation
5. Formulate, Design and Implement the solutions for Utility-based Privacy Preserving Data

**UNIT-I**

Introduction, Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization, Distributed Privacy-Preserving Data Mining.

**UNIT -II****Interface Control Methods**

Introduction, A Classification of Micro data Protection Methods, Perturbative Masking Methods, Non-Perturbative Masking Methods, Synthetic Micro data Generation, Trading off Information Loss and Disclosure Risk.

**UNIT -III****Measure of Anonymity**

Data Anonymization Methods, A Classification of Methods, Statistical Measure of Anonymity, Probabilistic Measure of Anonymity, Computational Measure of Anonymity, reconstruction Methods for Randomization, Application of Randomization.

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**B.TECH–COMPUTER SCIENCE & ENGINEERING (DATASCIENCE)****UNIT-IV****Multiplicative Perturbation**

Definition of Multiplicative Perturbation, Transformation Invariant Data Mining Models, Privacy Evaluation for Multiplicative Perturbation, Attack Resilient Multiplicative Perturbation, Metrics for Quantifying Privacy Level, Metrics for Quantifying Hiding Failure, Metrics for Quantifying Data Quality.

**UNIT-V****Utility-Based Privacy-Preserving Data**

Types of Utility-Based Privacy Preserving Methods, Utility-Based Anonymization Using Local Recording, The Utility-Based Privacy Preserving Methods in Classification Problems, Anonymization Marginal: Injection Utility into Anonymization Data Sets.

**TEXT BOOK:**

1. Privacy – Preserving Data Mining: Models and Algorithms Edited by Charu C. Aggarwal and S. Yu, Springer

**REFERENCE BOOKS:**

1. Charu C. Agarwal, Data Mining: The Textbook, 1st Edition, Springer.
2. Han and M. Kamber, Data Mining: Concepts and Techniques, 3rd Edition, Elsevier.
3. Privacy Preserving Data Mining by Jaideep Vaidya, Yu Michael Zhu and Chirstopher W. Clifton, Springer