

**New Scheme Based On AICTE Flexible Curricula**

**CSE- Data Science/Data Science, VII-Semester**

**CD703 (A) Cryptography & Information Security**

**Unit 1**

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**Unit 2**

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**Unit 3**

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

**Unit 4**

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

**Unit 5**

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

**TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

**REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**CSE- Data Science/Data Science, VII-Semester**

**CD703 (B) Intelligent Systems for Robotics**

**Course Objective:**

The students will be able to understand the basic concepts and fundamentals of robotics. They will also be able to use AI in the field of robotics.

**Detailed Contents:**

**Unit 1:**

Introduction: Introduction to Robotics Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

**Unit 2:**

Need of AI in Robotics: History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents.

**Unit 3:**

Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing.

**Unit 4:**

Robotics fundamentals: Robot Classification, Robot Specification, notation, kinematic representations and transformations, dynamics techniques; trajectory planning and control.

**Unit 5:**

Robotics and Its applications: DDD concept, Intelligent robots, Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot, Robot joints and links-Robot classifications Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system

**Suggested References:**

1. Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Peter Corke, Springer, 2011.
2. Robotics: Everything You Need to Know About Robotics from Beginner to Expert, Peter McKinnon, Createspace Independent Publishing Platform, 2016.
3. Introduction to AI Robotics, Second Edition, By Robin R. Murphy, MIT press, 2001.
4. Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, Francis X. Govers, Packt Publishers, 2018

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**CSE- Data Science/Data Science, VII-Semester**

**CD703 (C) Computer Vision**

**Unit 1**

Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts. Fundamental Concepts of Image Formation: Radiometry, Geometric Transformations, Geometric Camera Models.

**Unit-2**

Fundamental Concepts of Image Formation: Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections. Image Processing Concepts: Image Transforms.

**Unit 3**

Image Processing Concepts: Image Transforms, Image Enhancement. Image Processing Concepts: Image Filtering, Colour Image Processing, Image Segmentation. Image Descriptors and Features: Texture Descriptors, Colour Features, Edges/Boundaries.

**Unit 4.**

Image Descriptors and Features: Object Boundary and Shape Representations. Image Descriptors and Features: Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency

**Unit 5**

Applications of Computer Vision: Artificial Neural Network for Pattern Classification, Convolutional Neural Networks, Autoencoders. Applications of Computer Vision: Gesture Recognition, Motion Estimation and Object Tracking, Programming Assignments.

**Books and references**

1. Forsyth & Ponce, "Computer Vision-A Modern Approach", Pearson Education.
2. M.K. Bhuyan , " Computer Vision and Image Processing: Fundamentals and Applications", CRC Press, USA, ISBN 9780815370840 - CAT# K338147.
3. Richard Szeliski, "Computer Vision- Algorithms & Applications", Springer.

**Online Lectures links**

[https://onlinecourses.nptel.ac.in/noc23\\_ee39/preview](https://onlinecourses.nptel.ac.in/noc23_ee39/preview)

[https://onlinecourses.nptel.ac.in/noc19\\_cs58/preview](https://onlinecourses.nptel.ac.in/noc19_cs58/preview)

[https://onlinecourses.nptel.ac.in/noc23\\_ee78/preview](https://onlinecourses.nptel.ac.in/noc23_ee78/preview)

**Lab experiments**

4. Write a python program for image enhancement.
5. Write a python program to perform compression operation on the input image.
6. Write a python program for color image processing on the input image.
7. Write a python program to perform image segmentation operation.
8. Write a python program to perform image morphology operation on the image.
9. Write a python program for Image Restoration operation.
10. Write a python program to implement Scaling, Rotating, Shifting and Edge Detection operations on input image.
11. Write a program for object tracking using Open CV

**COURSE OBJECTIVES**

Students should understand the value of Historical data and data mining in solving real-world problems.

Students should become affluent with the basic Supervised and unsupervised learning algorithms commonly used in data mining .

Students develop the skill in using data mining for solving real-world problems.

Unit 1. Data Warehousing: Introduction, Delivery Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Data Warehouse schema, Partitioning strategy Data warehouse Implementation, Data Marts, Meta Data, Example of a Multidimensional Data model. Introduction to Pattern Warehousing.

Unit 2. OLAP Systems: Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc. Data Warehouse Hardware and Operational Design: Security, Backup And Recovery,

Unit 3. Introduction to Data & Data Mining :Data Types, Quality of data, Data Preprocessing, Similarity measures, Summary statistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy sets and fuzzy logic.

Unit 4. Supervised Learning: Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, Neural network-based algorithms, Rule-based algorithms, Probabilistic Classifiers

Unit 5. Clustering & Association Rule mining : Hierarchical algorithms, Partitional algorithms, Clustering large databases – BIRCH, DBSCAN, CURE algorithms. Association rules : Parallel and distributed algorithms such as Apriori and FP growth algorithms.

Books Recommended: Text Books:

1. Pang – ningTan , Steinbach & Kumar, “Introduction to Data Mining”, Pearson Edu, 2019.
2. Jaiwei Han, Micheline Kamber, “Data Mining : Concepts and Techniques”, Morgan Kaufmann Publishers.

Reference Books:

1. Margaret H. Dunham, “Data Mining : Introductory and Advanced topics”, Pearson Edu., 2009.
2. Anahory& Murray, “Data Warehousing in the Real World”, Pearson Edu., 2009.