Annexure 15.1

**Avinashilingam Institute for Home Science and Higher Education for Women**
Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
**Coimbatore - 641 043, Tamil Nadu, India**

## Department of Information Technology
## M.Sc. Information Technology

**Programme Outcomes:**

1. Demonstrate in-depth knowledge and comprehension of advanced concepts, theories, and methodologies in the chosen field of study.
2. Develop and apply general, technical, and professional skills to effectively perform and accomplish tasks in diverse academic and industry settings.
3. Utilize acquired knowledge and skills to analyze, design, and implement solutions for complex real-world and research problems.
4. Engage in continuous learning, critical thinking, and self-improvement to adapt to new challenges, technologies, and interdisciplinary domains.
5. Uphold constitutional, humanistic, ethical, and moral values while addressing societal, environmental, and professional responsibilities.
6. Develop job-ready skills, entrepreneurial mindset, and leadership capabilities to excel in careers, contribute to industry growth, and create innovative solutions.

**Programme Specific Outcomes:**

1. Develop computational and analytical skills to design and implement efficient IT solutions for complex real-world challenges.
2. Apply IT knowledge with a strong emphasis on professional ethics, security, and sustainability in software development and digital transformation.
3. Demonstrate leadership in IT project management, entrepreneurship, and research while engaging in lifelong learning to adapt to emergingtechnologies.

1.3! Structural

## Scheme of Instruction and Examination
## (For students admitted from 2025 – 2026 & onwards)

| *Part* | *Subject Code* | *Name of paper/component* | *Hours of Instruction/Week* | | *Scheme of Examination* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Theory** | **Practical** | **Duration of Exam** | **CIA** | **CE** | **Total** | **Credit** |
| **First Semester** | | | | | | | | | |
| I | 25MITC01 | Essentials of Cyber Security | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC02 | Design and Analysis of Algorithms | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC03 | Advanced Java Programming | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC04 | Artificial Intelligence and Machine Learning | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC05A / 25MITC05B / 25MITC05C | **Elective I:** Cloud Computing / High Performance Computing / Parallel and Distributed Computing | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC06 | Advanced Java Programming –Practical I | - | 4 | 3 | 40 | 60 | 100 | 2 |
| | 25MITC07 | Artificial Intelligence and Machine Learning – Practical II | - | 6 | 3 | 40 | 60 | 100 | 3 |
| II | 25MXCSS1/ 25MXAED1/ 25MXCSR1 | CSS / Adult Education / Community Engagement and Social Responsibility | 2 | - | - | - | - | - | - |
| | 25MITPD1 | Professional Development Course: Full Stack Web Development using MERN | 2 | - | - | - | - | 100 | Remarks |
| **Second Semester** | | | | | | | | | |
| I | 25MITC08 | Deep Learning | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC09 | Web Programming with Open Source Technologies | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC10 | Digital Image Processing | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC11A /25MITC11B /25MITC11C | **Elective II:** Generative AI / Natural Language Processing / Large Language Model | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC12 | Web Programming with Open Source Technologies - Practical III | - | 4 | 3 | 40 | 60 | 100 | 2 |
| | 25MITC13 | Digital Image Processing - Practical IV | - | 6 | 3 | 40 | 60 | 100 | 3 |
| II | | Interdisciplinary Course | 4 | - | 3 | 100 | - | 100 | 4 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| II | | Professional Certification | - | - | - | - | - | - | 2 |
| | 25MXCSS1 / 25MXAED1 / 25MXCSR1 | CSS / Adult Education / Community Engagement and Social Responsibility | 2 | - | 2 | - | - | 100 | 2 |
| **Internship during Summer vacation for one month** | | | | | | | | | |

| *Part* | *Subject Code* | *Name of papers/component* | *Hours of Instruction/Week* | | *Scheme of Examination* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Theory** | **Practical** | **Duration of Exam** | **CIA** | **CE** | **Total** | **Credit** |
| **Third Semester** | | | | | | | | | |
| I | 25MITC14 | Quantum Computing | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC15 | Internet of Things | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC16 | Big Data Analytics | 4 | - | 3 | 40 | 60 | 100 | 4 |
| | 25MITC17A / 25MITC17B / 25MITC17C | **Elective III:** Block Chain Technology / Information Security / Ethical Hacking | 3 | - | 3 | 40 | 60 | 100 | 3 |
| | 25MITC18 | Internet of Things-Practical V | - | 4 | 3 | 40 | 60 | 100 | 2 |
| | 25MITC19 | Data Visualization – Practical VI | - | 6 | 3 | 40 | 60 | 100 | 3 |
| | 25MITC20 | Mini Project | 1 | - | - | 100 | - | 100 | 2 |
| | 25MITC21 | Software Project Management(Self Study) | 2 | - | 3 | 100 | - | 100 | 2 |
| | 25MITC22 | Internship | - | - | - | - | - | 100 | 2 |
| II | | Multidisciplinary Course | 2 | - | 3 | 100 | - | 100 | 2 |
| **Fourth Semester** | | | | | | | | | |
| I | 25MITC23 | Research Project - Thesis / Project / Patent | - | 30 | - | 100 | 100 | 200 | 20 |
| | | **Total credits** | | | | | | | **96** |

Other Courses to be undergone by the Student:

*** MOOC Courses- 2 to 4 Credits – Credit transfer may be claimed.**

**Minimum 96+ 2 to 4 Credits to earn the degree**

** Students who exit at the end of 1st year shall be awarded a **Postgraduate Diploma**.

Courses offered by the Department

1. **Interdisciplinary Course:** 1. 25MITI01 - Cyber Forensics
   2. 25MITI02- Cyber Security
2. **Multidisciplinary Course:** 25MITM01 - Introduction to Data Visualization
3. **Professional Development Course I:** 25MITPD1 - Full Stack Web Development using MERN
4. **Professional Certification Course:**
   1. 25MITPC1 – Artificial Intelligence for Data Science
   2. 25MITPC2 – WEB 3.0

## Essentials of Cyber Security

**Semester I** **Hours of Instruction/week: 3**
**25MITC01** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To understand the fundamental terminologies related to Cyber Security and current Cyber Security threats.
2. To understand about various cyber-attacks, cybercrimes and cyber laws in India and other countries
3. To educate the aspects related to personal data privacy, security, cyber security audit and compliance

**UNIT-I OVERVIEW OF CYBER SECURITY** **9**

Cyber Security increasing threat landscape, Cyber Security terminologies: - Cyberspace, attack and its types, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare.

**UNIT-II CYBER CRIMES** **9**

**Cybercrimes targeting Computer systems and Mobiles** - data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/credit card fraud, Online payment fraud, Cyber bullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds impersonation, identity theft, job scams, misinformation, fake news.,

**Cybercrime against persons-** cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Crime reporting procedures and Checklist for reporting cybercrime online

**UNIT-III CYBER LAW** **9**

Cybercrime and legal landscape around the world, Information Technology Act, 2000 and its amendments. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies. AI/ML, IoT, Blockchain, Darknet and social media, Cyber Laws of other countries.

**UNIT-IV DATA PRIVACY AND DATA SECURITY** **9**

Defining data, meta-data, big data, and non-personal data. Data protection, Data privacy and data security, Personal data protection bill and its compliance, Data protection principles, big data security issues and challenges, Data protection regulations of other countries: - General Data Protection Regulations (GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., social media- data privacy and security issues and registering compliant on a social media platform

**UNIT-V CYBER SECURITY MANAGEMENT, COMPLIANCE AND GOVERNANCE** **9**

Cyber Security Plan- Cyber Security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber Security audit and compliance, National Cyber Security policy and strategy.

**Total Hours: 45**

**REFERENCES:**


1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.
2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley

3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press.
5. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.
6. Auditing IT Infrastructures for Compliance by Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning

**WEB REFERENCES**

1. https://www.coursera.org/learn/introduction-to-cybersecurity-essentials
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. https://onlinecourses.swayam2.ac.in/cec21_cs09/preview

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand the basic terminologies related to Cyber Security and current Cyber Security threat landscape. They will also develop understanding about the Cyberwarfare and necessity to strengthen the Cyber Security of end user machine, critical IT and national critical infrastructure.
2. Have complete understanding of the cyber-attacks that target computers, mobiles and persons. They will also develop understanding about the type and nature of cybercrimes and as to how report these crimes through the prescribed legal and Government channels.
3. Understand the legal framework that exist in India for cybercrimes and penalties and punishments for such crimes, It will also expose students to limitations of existing IT Act,2000 legal framework that is followed in other countries and legal and ethical aspects related to new technologies.
4. 4. Understand the aspects related to personal data privacy and security. They will also get insight into the Data Protection Bill,2019 and data privacy and security issues related to social media platforms.
5. Understand the main components of Cyber Security plan. They will also get insight into risk-based assessment, requirements of security controls and need for cyber security audit and compliance

**CO-PO Mapping and Matrix**

| CO / PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|
| CO 1 | M | M | - | L | M | H | - | M | H |
| CO 2 | M | M | - | L | M | H | - | M | H |
| CO 3 | M | M | - | M | H | H | - | H | H |
| CO 4 | H | H | - | M | H | H | - | H | H |
| CO 5 | H | H | - | H | H | H | - | H | H |

## Design and Analysis of Algorithms

**Semester I** **Hours of Instruction/week: 4**
**25MITC02** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. To Learn and apply key strategies such as Divide and Conquer, Greedy Methods, and Dynamic Programming to develop efficient algorithms.
2. To Assess algorithm performance, including understanding computational complexity and the use of asymptotic notations
3. To Study classifications of computational problems, focusing on NP-Hard and NP-Complete problems

**UNIT I INTRODUCTION** **12**

Introduction to algorithms, Analysing algorithms. Divide and Conquer: General Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick sort, Selection sort, Strassen's matrix multiplication

**UNIT II THE GREEDY METHOD** **12**

General method, Optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Optimal merge patterns, Minimum spanning trees, Single source shortest paths.

**UNIT III DYNAMIC PROGRAMMING** **12**

General method, Multistage graphs, all pairs shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Flow-shop Scheduling.

**UNIT IV BASIC SEARCH AND TRAVERSAL TECHNIQUES** **12**

Traversal techniques of Binary trees, AND/OR graphs, Game trees, Red Black trees Back Tracking: General method, 8-queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem. Branch and Bound: General method, travelling salesperson problem.

**UNIT V NP-HARD and NP-COMPLETE PROBLEMS** **12**

Basic concepts: Non deterministic algorithms —The classes NP hard and NP complete, Cook's theorem .NP hard graph problems: Clique Decision Problem — Node cover decision problem — chromatic number decision problem — Directed Hamiltonian cycle — Travelling sales person decision problem.

**Total Hours: 60**

**TEXT BOOKS:**


1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.
2. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, Fourth Edition, The MIT Press Cambridge, Massachusetts London, England 2022
3. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser," Data Structures and Algorithms in Python(An Indian Adaptation",Wiley,2013

**REFERENCES:**


1. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.
2. Rance D. Necaise," Data Structures and Algorithms Using Python",John Wiley & sons,2011


**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://www.coursera.org/learn/analysis-of-algorithms

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Analyze algorithms and apply Divide and Conquer techniques to solve computational problems efficiently.
2. Solve optimization problems using Greedy algorithms like Knapsack, Job Sequencing, and Shortest Paths.
3. Apply Dynamic Programming techniques like Multistage Graphs, Shortest Paths, Knapsack, and Travelling Salesperson.
4. Construct efficient algorithms for simple computational tasks.
5. Classify problems as NP-Hard or NP-Complete and demonstrate solutions for graph, scheduling, and code generation problems

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | H | L | L | M | H | M | M |
| CO2 | H | M | H | L | L | M | H | M | M |
| CO3 | H | M | H | L | L | M | H | M | M |
| CO4 | H | M | H | L | L | M | H | M | M |
| CO5 | H | M | H | L | L | M | H | M | M |

## Advanced Java Programming

**Semester I** **Hours of Instruction/week: 3**
**25MITC03** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To understand core Java concepts, including object-oriented programming, multithreading, collections, and GUI development using Swing and event handling.
2. To explore Java networking, distributed computing with RMI, and web development using Servlets, JSP, and Spring Boot.
3. To implement database integration using JDBC, Hibernate ORM, and Spring Boot for developing enterprise applications.

**UNIT-I BASIC CONCEPTS AND GUI PROGRAMMING** **9**

Java Overview: Features and Characters of Java - Object-Oriented Programming: Encapsulation, Inheritance, Polymorphism, Overriding – Exception Handling in Java - Multi-threading: Thread Life Cycle, Synchronization, Daemon Threads - Graphical User Interface (GUI): Introduction to Swing, Swing Components & Layout Managers - Difference between Swing and AWT Components.

**UNIT II JAVA COLLECTIONS, PACKAGES AND DISTRIBUTED NETWORKING** **9**

Collection Framework: Overview of List, Set, Map - Packages & Interfaces: Creating and Using Packages, Implementing Interfaces, Interface vs Abstract Class - Java Networking: Inet Address, Socket Programming, TCP/UDP Communication - Remote Method Invocation (RMI): Overview of the RMI, Advantages of RMI, RMI Architecture, Developing RMI Applications, Parameters in RMI - Java Virtual Machine Internals - Java Serialization.

**UNIT III EVENT HANDLING AND APPLETS** **9**

Applets: HTML Applet Tags, Life Cycle, Graphics Handling – Event Handling: The Delegation Event Model, Event Classes & Listeners - Mouse and Keyboard Event Handling - Advanced GUI Events: Action Events, Focus Events, and Window Events.

**UNIT IV WEB DEVELOPMENT WITH SERVLETS, JSP AND SPRINTBOOT** **9**

JDBC Basics: JDBC Vs ODBC, Types of JDBC Drivers, Basic operations on JDBC – Servlets : Features of Servlets, Servlet lifecycle, Request & Response Handling, Steps to run the servlet program – Session Management: Cookies Vs Session, Database Connectivity with JDBC using Servlet - Java Server Pages (JSP): Syntax, Directives, Implicit Objects - Spring Boot Basics: Introduction to Spring Boot, Annotations (@RestController, @Autowired, @Service, @Repository) - Building a Simple REST API with Spring Boot.

**UNIT V ENTERPRISE JAVA AND ADVANCED TOPICS** **9**

Enterprise JavaBeans (EJB): Types – Session Beans, Entity Beans, Message-Driven Beans - Java Messaging Service (JMS)- Java Naming and Directory Interface (JNDI) – Hibernate ORM: Introduction, Configuration, CRUD Operations - Spring Boot – Database Integration (Spring Data JPA).

**Total Hours: 45**

**TEXT BOOKS:**

1. Uttam K. Roy, "Advanced Java Programming", Oxford University Press, 2015.

2. Herbert Schildt, "Java – The Complete Reference",12th edition, McGraw Hill, 2022.

**REFERENCES:**

1. Avvanna Hegadyal, "Advanced Java Programming", Bluerose Publishers, 2024

2. Anshuman Mishra, "Mastering Advanced Java Programming: JDBC, Swing, JSP, Servlets, and EJB", 2024.

3. Sagayaraj, Denis, Karthik and Gajalakshmi, "Java Programming for Core and Advanced Learners", University Press, 2018.

4.Dr. Ashwin Metha and Sarika Shah, "Advanced Java for Students", The X team, Published by SPD Pvt. Ltd, 2012.

**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106105084/
2. https://www.coursera.org/learn/advanced-java-certification-course

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand core Java features, OOP principles, multithreading, and GUI development using Swing.
2. Develop client/server applications using Java networking and distributed computing concepts.
3. Implement event handling mechanisms and applet programming for interactive GUI applications.
4. Apply JDBC, servlets, cookies, and session management for web-based applications
5. Utilize JSP and JavaBeans technologies for dynamic web application development.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | L | - | H | M | L |
| CO2 | M | H | H | M | L | - | H | H | M |
| CO3 | M | M | H | M | M | - | H | M | L |
| CO4 | H | H | H | M | M | M | H | H | M |
| CO5 | H | M | H | M | H | M | H | H | H |

## Artificial Intelligence and Machine Learning

**Semester I** **Hours of Instruction/week: 3**
**25MITC04** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To describe the fundamentals of Artificial Intelligence
2. To illustrate the Knowledge Representation in Artificial Intelligence
3. To relate Machine Learning concepts, Supervised Learning and Unsupervised Learning

**UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE** **9**

Definition of Artificial Intelligence – Learning Systems – Knowledge Representation and Reasoning – Planning – Knowledge Acquisition – Intelligent Search – Logic Programming – Soft Computing – Branches and Applications of Artificial Intelligence.

**UNIT II KNOWLEDGE REPRESENTATION** **9**

Knowledge Management: Value of Knowledge Management – Categories of Knowledge. Types of Knowledge: Declarative Knowledge – Procedural Knowledge. Knowledge Representation: Approaches – Issues. Knowledge Base

**UNIT III MACHINE LEARNING** **9**

Why Machine Learning – History of Machine Learning – Timeline of Machine Learning – Types of Problems in Machine Learning. Aspects: Inputs to Training – Learning Systems. Machine Learning Applications and Examples.

**UNIT IV SUPERVISED LEARNING** **9**

Support Vector Machines – Inductive Logic Programming – Case-based Reasoning – Ensemble Classifiers – Nearest Neighborhood – Fuzzy Network: Fuzzy Systems – Info Fuzzy Networks – Fuzzy Neural Systems. Case Studies: Word Model – SVM, Education Loans – K-Nearest Neighbors.

**UNIT V UNSUPERVISED LEARNING** **9**

Types of Unsupervised Learning – Challenges in Unsupervised Learning – Clustering: K-Means, Agglomerative, DBSCAN, Comparing and evaluating Clustering Algorithms. Summary of Clustering Methods – Data Compression – Principal Component Analysis.

**Total Hours: 45**

**TEXT BOOKS:**


1. Vinod Chandra S.S, Anand Hareendran S, "Artificial Intelligence and Machine Learning", PHI Learning Private Limited, 2014
2. Andreas C.Muller, Sarah Guido "Introduction to Machine Learning with Python", O'Reily, 2017.


**REFERENCES:**


1. Paul Wilmot, "Machine Learning – An Applied Mathematics Introduction", Panda Ohana, 2019.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2016.
3. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education, 2013


**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://onlinecourses.swayam2.ac.in/cec21_cs08/preview
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
4. https://www.coursera.org/learn/machine-learning

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Locate the Branches and Applications of Artificial Intelligence
2. Explain Knowledge Management
3. Discover problems in Machine Learning
4. Estimate Support Vector Machines and Fuzzy Networks
5. Evaluate Clustering Algorithms

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | M | L | H | M | L |
| CO2 | H | M | M | M | H | M | M | H | M |
| CO3 | H | H | H | M | M | L | H | M | H |
| CO4 | H | H | H | M | M | L | H | H | H |
| CO5 | H | H | H | M | M | L | H | H | H |

## Elective I: Cloud Computing

**Semester I** **Hours of Instruction/week: 3**
**25MITC05A** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To understand cloud computing concepts, service models, major providers, and their benefits and challenges.
2. To explore virtualization, containerization, and cloud architecture for scalable and efficient resource management.
3. To analyse cloud security challenges, governance frameworks, and advanced security solutions.

**UNIT I INTRODUCTION TO CLOUD COMPUTING** **9**

Definition and Characteristics of Cloud Computing - Evolution of Cloud Computing - Benefits and Challenges of Cloud Computing - Cloud Computing Usage Scenarios and Applications - Business Models in Cloud Computing – Cloud Deployment Models: Private, Public, Hybrid and Multi-Cloud – Key Issues in Cloud Computing – Open Source Platforms : Eucalyptus - Nimbus - Open Nebula, Cloud Simulation Tool : CloudSim.

**UNIT II CLOUD SERVICES AND PROVIDERS** **9**

**Cloud Service Models:** Software as a Service - Platform as a Service - Infrastructure as a Service - Database as a Service - Monitoring as a Service – Communication as a Service. **Cloud Service Providers** – Google Cloud: Google App Engine, Google Kubernetes, Amazon Web Services: Amazon EC2, S3, Lambda, Microsoft Azure : Virtual Machines, Blob Storage, Sales force : CRM as a Cloud Service.

**UNIT III VIRTUALIZATION & CONTAINERIZATION** **9**

Need for Virtualization in Cloud Computing – Advantages and Disadvantages of Virtualization – Types of Virtualization: System Virtual Machines, Process Virtual Machines, Virtual Machine Properties – Virtualization Techniques: Interpretation and Binary Translation, High Level Language Virtual Machines – Hypervisors: Type 1 – Xen, KVM, Type 2 - VMWare, Virtual Box, Hyper-V. Introduction to Containerization : Concept of Containers vs. Virtual Machines, Docker vs. VMs

**UNIT IV CLOUD INFRASTRUCTURE & ADVANCED CLOUD CONCEPTS** **9**

Architectural Design of Compute and Storage Clouds: Layered Cloud Architecture Development, Design Challenges – Resource Management in Cloud: Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources - Emerging Cloud Trends: Multi-Cloud Strategy, Edge Computing vs. Fog Computing, Cloud-Native Architecture: Introduction to Microservices & Serverless Computing.

**UNIT V CLOUD SECURITY** 9

Cloud Security Fundamentals : Cloud Security Overview, Risks and Challenges in Cloud Computing – Cloud Security Governance and Compliance : Security Governance and Compliance (GDPR, ISO 27001, NIST), Risk Management and Threat Mitigation – Cloud Security Architecture and Monitoring: Cloud Security Architecture Design, Intrusion Detection in Cloud Environments – Data and Application: Data Security & Privacy, Application Security in the Cloud, Virtual Machine & Hypervisor Security - Identity Management and Access Control – Zero Trust Security Model in Cloud Computing - Autonomic Security & AI-based Security Solutions.

**Total Hours: 45**

**TEXT BOOKS:**

1. Judith Hurwitz, Daniel Kirsch, "Cloud Computing for Dummies" (Wiley India Edition), 2nd Edition, July 2020 (UNIT-I & II)

2. John Ritting house & James Ransome, "Cloud Computing Implementation Management and Strategy",CRC Press, 2010.(UNIT-II).

3. RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, 'Mastering Cloud Computing", 2nd Edition, TMGH, 2024.

4. Erl, Thomas., Monroy, Eric. Cloud Computing: Concepts, Technology, Security, and Architecture. United Kingdom: Pearson Education, 2023. (UNIT IV

5. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010. (UNIT-V)

**REFERENCES:**

1. Sandeep Bhowmik, "Cloud Computing", Cambridge University Press, 2017.

2. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More", Jones & Bartlett Learning, 2012.

3. John R. Vacca, "Cloud Computing Security – Foundation and Challenges", 2nd Edition, CRC Press, 2020.

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://www.coursera.org/browse/information-technology/cloud-computing
3. https://cloud.google.com/learn/training?hl=en

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Assess various cloud computing models, deployment strategies, and service offerings.
2. Compare various cloud service models and analyze the offerings of major cloud service providers.
3. Describe virtualization, hypervisors, and containerization concepts, and differentiate between virtual machines and containers.
4. Analyze cloud infrastructure, resource management techniques, and emerging cloud trends.
5. Evaluate cloud security risks, compliance frameworks, security architectures, and modern security solutions.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | - | - | H | M | L |
| CO2 | M | H | H | M | - | - | H | H | M |
| CO3 | M | H | H | M | - | - | H | H | M |
| CO4 | H | H | H | M | - | M | H | H | H |
| CO5 | H | M | H | M | H | M | H | H | H |

## Elective I: High Performance Computing

**Semester I** **Hours of Instruction/week: 3**
**25MITC05B** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To understand parallel computing concepts and HPC architectures.
2. To develop parallel programming skills using MPI, OpenMP, and CUDA.
3. To explore advanced HPC topics like clustering, GPU acceleration, and storage.

**UNIT I – FOUNDATIONS OF PARALLEL COMPUTING** **9**

Era of Computing - Introduction to Parallel Computing - Multiprocessors and Multicomputer Architectures - Scalar vs. Vector Processing - Multivector and Superscalar Machines - Pipelined Processors - SIMD Computers - Conditions for Parallelism & Types of Parallelism: ILP, PLP, LLP - Memory Hierarchy & Performance Metrics in HPC - Program Partitioning and Scheduling

**UNIT II HIGH PERFOMANCE AND CLUSTER COMPUTING ARCHITECTURES** **9**

Introduction to High Performance Computing - Scalable Parallel Computer Architectures - Parallel Programming Models: Shared vs. Distributed Memory Models – Cluster Computing: Architecture & Components - Cluster Middleware & SSI (Single System Image) - Resource Management & Scheduling in HPC - MPI (Message Passing Interface) Introduction & Usage - Heterogeneous HPC Architectures

**UNIT III CLUSTER MANAGEMENT, NETWORKING & STORAGE** **9**

Fault Tolerance in HPC: Fault Detection & Recovery - Load Balancing & Job Scheduling in HPC Clusters - Introduction to High-Speed Networks: InfiniBand, RDMA, MPI over Ethernet - Parallel File Systems: Lustre, GPFS, Hadoop Distributed File System - Software RAID & Parallel File Systems in HPC

**UNIT IV GPU PROGRAMMING WITH CUDA & ACCELERATED COMPUTING** **9**

Introduction to CUDA Architecture - CUDA Parallelism Model & Memory Hierarchy - CUDA-C Basics & Parallel Programming - Thread Cooperation & Execution Efficiency - CUDA Memory Optimization (Shared Memory, Coalesced Access) - CUDA Streams & Asynchronous Execution - CUDA on Multi-GPU Systems - Comparing CUDA with OpenCL & HIP for GPU Programming

**UNIT V – OPENCL, OPENMP, & HETEROGENEOUS COMPUTING** **9**

Introduction to OpenCL - OpenCL Setup - Basic OpenCL - Advanced OpenCL - Parallel Programming with OpenCL - OpenMP: Introduction to OpenMP - OpenMP Directives for Parallel Computing - Comparing MPI vs. OpenMP vs. OpenCL - Task-based Parallelism & Multi-threading Models in HPC - Future Trends: FPGA, Quantum Computing, Exascale HPC

**Total Hours: 45**

**TEXT BOOKS:**

1. Rajkumar Buyya, High Performance Cluster Computing: Architectures and Systems, Vol.1 Pearson Education, 1999.

2. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, CRC Press, 2010.

3. Thomas Sterling and Matthew Anderson, "High Performance Computing: Modern Systems and Practices", Morgan Kaufmann, 2018.

**REFERENCES:**


1. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill International Editions, 3rd Edition, 2015.

2. Jason Sanders and Edward Kandrot, "CUDA by Example: An Introduction to General-Purpose GPU Programming", Addison-Wesley Professional, 2010

3. Peter S. Pacheco, "An Introdution to Parallel Programming", 2nd Edition, Morgan Kaufmann Publishers, 2021


**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106/108/106108055/

2. https://nptel.ac.in/courses/106/105/106105033/

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand parallel computing fundamentals and HPC architectures.
2. Develop parallel programs using OpenMP, MPI, and CUDA.
3. Evaluate performance of HPC systems and optimize execution.
4. Manage cluster computing environments with scheduling and fault tolerance.
5. Apply GPU and heterogeneous computing techniques for high-performance tasks.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | H | L | - | H | M | L |
| CO2 | M | H | H | M | L | - | H | H | M |
| CO3 | M | H | H | H | M | - | H | H | M |
| CO4 | H | H | H | M | M | M | H | H | H |
| CO5 | H | M | H | M | H | M | H | H | H |

## Elective I: Parallel and Distributed Computing

**Semester I** **Hours of Instruction/week: 3**
**25MITC05C** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To understand the fundamental principles, architectures, and performance metrics of parallel and distributed computing systems.
2. To develop proficiency in parallel programming models, including shared memory and distributed memory
3. To explore GPU programming, big data frameworks, and fault-tolerant techniques for designing high-performance computing solutions

**UNIT I–INTRODUCTION TO PARALLEL AND DISTRIBUTED COMPUTING 9**

Introduction to Parallel and Distributed Computing: Latency vs. Bandwidth - Applications and Challenges in Parallel and Distributed Computing - Types of Architectures and Flynn's Taxonomy - Basic Terminology: Cores, Nodes, Threads, Processes - Performance Metrics: Speedup, Efficiency, Overhead, Strong & Weak Scaling - Amdahl's Law, Gustafson's Law - Memory Concepts: Cache, Principle of Locality - Programming Models in Parallel and Distributed Computing.

**UNIT II DISTRIBUTED COMPUTING AND MESSAGE PASSING 9**

Distributed Computing Concepts: Distributed Memory and Communication - Message Passing Interface (MPI) - Asynchronous vs. Synchronous Computation/Communication - Concurrency Control and Fault Tolerance in Distributed Systems - Distributed Programming with OpenMPI.

**UNIT III PARALLEL COMPUTING AND SHARED MEMORY PROGRAMMING 9**

Parallel Computing Models - Shared Memory Architecture -Data Parallelism vs. Task Parallelism - Synchronization Mechanisms (Locks, Semaphores, Monitors) - Concurrent Data Structures - Shared Memory Programming - Multithreading and Synchronization Programming with PThreads, OpenMP, and TBB.

**UNIT IV GPU PROGRAMMING AND HETEROGENEOUS COMPUTING 9**

GPU Architecture and Programming Models - CUDA and OpenCL Programming Models - Basic GPU Concepts: Threads, Blocks, Grids - GPU Memory Hierarchy - Thread Scheduling, Warps, and Control Divergence - Memory Coalescing in GPUs - CUDA Libraries: CuBLAS, CuFFT

**UNIT V – ADVANCED TOPICS IN PARALLEL AND DISTRIBUTED COMPUTING 9**

Parallel and Distributed Storage Systems: Parallel File Systems - Google File System, HDFS, Distributed Shared Memory and Consistency Models - Big Data and Emerging Technologies: Apache Hadoop - DFS, MapReduce, Spark for Parallel Data Processing, AI/ML Acceleration with Distributed Systems - Security and Fault Tolerance: Failure Models and Recovery Strategies, Security Challenges in Distributed Systems

**Total Hours: 45**

**TEXT BOOKS:**

1. Maurice Herlihy , Nir Shavit, Victor Luchangco, Michael Spear, "The Art of Multiprocessor Programming", 2nd Edition, Morgan Kaufmann Publishers, 2020.
2. Calvin Lin, Larry Synder, "Principles of Parallel Programming", First Edition, Addison-Wesley, 2008.
3. Andrew S. Tanenbaum & Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall, 2017.

**REFERENCES:**

1. AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003.
2. Kai Hwang, Jack Dongarra & Geoffrey C. Fox, "Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet (DCC)", 2012.
3. Peter S. Pacheco, "An Introdution to Parallel Programming", 2nd Edition, Morgan Kaufmann Publishers, 2021.
4. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, 3rd Edition, Morgann Kaufmann, 2016.
5. George Coulouris, Jean Dollimore, and Tim Kindberg , "Distributed Systems: Concepts and Design", 5th Edition, Pearson Education, 2012.

**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106/106/106106107/
2. https://hpc.llnl.gov/documentation/tutorials/introduction-parallel-computing-tutorial
3. https://www.coursera.org/learn/introduction-high-performance-computing

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Explain the fundamental concepts, architectures, and performance evaluation metrics of parallel and distributed computing.
2. Analyze distributed computing principles, including message passing, concurrency control, and fault tolerance.
3. Evaluate shared memory programming models, synchronization mechanisms, and parallel computing paradigms.
4. Understand GPU architectures, CUDA/OpenCL programming models, and memory management techniques in heterogeneous computing.
5. Assess the role of distributed storage, big data frameworks, and fault tolerance mechanisms in parallel and distributed computing.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | - | - | H | M | L |
| CO2 | M | H | H | M | - | - | H | H | M |
| CO3 | M | H | H | M | - | - | H | H | M |
| CO4 | H | H | H | M | - | M | H | H | H |
| CO5 | H | M | H | M | H | M | H | H | H |

## Advanced Java Programming – Practical I

**Semester I** **Hours of Instruction/week: 4**
**25MITC06** **No. of credits: 2**

**COURSE OBJECTIVES:**

1. To design and develop interactive GUI applications and client-server communication systems using Java technologies such as AWT, Swing, TCP, UDP, and multicast.
2. To implement database connectivity and perform operations using JDBC, Hibernate ORM, and Spring Data JPA while integrating with web and enterprise applications.
3. To apply advanced Java frameworks, including RMI, Servlets, JSP, JavaBeans, and Spring Boot, for building scalable web services and enterprise solutions.

**List of Programs**

1. Java Applet program demonstrating basic graphics and text rendering.
2. Java AWT based application that listens for item selection using AWT ItemListener.
3. Java AWT program using ActionListener to handle button clicks.
4. Simple GUI application development using Swing components.
5. Java Multithreading Program to demonstrate Thread Lifecycle and Synchronization.
6. Java program for retrieving IP Address using InetAddress.
7. Java Program for TCP Client-Server Communication
8. Java program for UDP Client-Server Communication.
9. Java program for multicasting messages using MulticastSocket.
10. Java RMI Application for Message Transfer.
11. Java program for mouse and keyboard event handling.
12. Java program for handling advanced GUI events (Action Events, Focus Events, Window Events).
13. Java program to store, delete and update data in a database with the support of JDBC-ODBC connectivity.
14. Java Servlet Program for Request Handling and to Implement GET and POST methods to process user input and display responses dynamically.
15. Java Servlet Program to demonstrate session management using cookies.
16. JSP Program to implement form data validation.
17. JSP program for demonstrating creation and accessing Java Beans.
18. REST API development using Spring Boot and return JSON responses
19. Hibernate CRUD Application to perform Insert, Update, Delete, and Fetch operations using Hibernate ORM.
20. Java Spring Boot Database Connectivity using Spring Data JPA.

**Total Hours: 60**

**WEB REFERENCES:**

1. https://docs.oracle.com/javase/tutorial/
2. https://dev.java/learn/
3. https://www.w3schools.com/java/
4. https://spring.io/
5. https://www.javaguides.net/

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Design and develop GUI applications using AWT, Swing, and event-handling mechanisms.
2. Implement client-server communication using TCP, UDP, and multicast networking concepts.
3. Perform database operations using JDBC and integrate databases with Java applications.
4. Develop web applications using Servlets, JSP, JavaBeans, and session management techniques.
5. Build RESTful web services using Spring Boot and Hibernate ORM for enterprise applications.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | M | M | L | - | H | M | L |
| CO2 | H | H | H | M | - | - | H | H | M |
| CO3 | H | H | H | M | M | - | H | H | H |
| CO4 | H | H | H | H | M | M | H | H | H |
| CO5 | H | H | H | H | H | M | H | H | H |

**Artificial Intelligence and Machine Learning – Practical II**

**Semester I** **Hours of Instruction/week: 6**

**25MITC07** **No.of credits: 3**

**COURSE OBJECTIVES:**

1. To introduce the basic concepts and techniques of Machine Learning and the need of Machine Learning techniques in real-world problems.
2. To provide understanding of various Machine Learning algorithms and the way to evaluate performance of the Machine Learning algorithms.
3. To apply Machine Learning to learn, predict and classify the real-world problems in the Supervised Learning paradigms as well as discover the Unsupervised Learning paradigms of Machine Learning.

**List of programs**

1. Implementation of Python Libraries for ML application such as Pandas and Matplotlib.
    a. Create a Series using pandas and display
    b. Access the index and the values of our Series
    c. Compare an array using Numpy with a series using pandas
    d. Define Series objects with individual indices
    e. Access single value of a series
    f. Load datasets in a Data frame variable using pandas

    Usage of different methods in Matplotlib.
2. Demonstrate various data pre-processing techniques for the dataset. Write a python program to compute
    a. Reshaping the data,
    b. Filtering the data,
    c. Merging the data
    d. Handling the missing values in datasets
    e. Feature Normalization: Min-max normalization
3. Implement Linear Regression in Python
4. Implement Logistic Regression in Python
5. Implement Support Vector Machine in Python
6. Implement K-Nearest Neighbors algorithm in Python
7. Implement Ensemble Classifier implementation in Python
8. Implement Decision Trees using Python
9. Implement Naive Bayes Classifier using Python
10. Implement Random Forest using Python
11. Implement K-means clustering Implementation Python
12. Implement Agglomerative Clustering using Python
13. Implement DBSCAN algorithm using Python
14. Implement Principal Component Analysis in Python
15. Implement Gradient Boosting in Python

**Total Hours: 90**

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://www.coursera.org/learn/ai-for-everyone
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
4. https://www.coursera.org/browse/data-science/machine-learning

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1.Utilize Python Libraries for Data Analysis and Visualization

2.Understand the basic concepts of Machine Learning and the need of Machine Learning techniques in real-world problems

3. Implement Data Pre-processing Techniques

4. Develop and Evaluate Machine Learning Models

5. Apply Unsupervised Learning and Dimensionality Reduction Techniques

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | M | M | L | L | H | M | M |
| CO2 | H | H | H | H | M | M | H | H | H |
| CO3 | H | H | H | H | M | M | H | H | H |
| CO4 | H | H | H | H | M | M | H | H | H |
| CO5 | H | H | H | H | M | M | H | H | H |

## Professional Development Course I

## Full Stack Web Development using MERN

**Semester I** **Hours of Instruction: 30**

**25MITPD1**

**UNIT I** **7**

**Web Development Fundamentals:** Introduction to HTML, semantic HTML, and common tags, CSS basics: styling, layout models (Flexbox, Grid), Responsive design and CSS frameworks, JavaScript fundamentals: variables, data types, functions, and DOM manipulation, HTTP/HTTPS, requests & responses, and common HTTP methods

**Practices:**

- Build a simple web page using semantic HTML tags
- Create a responsive layout using Flexbox and Grid
- Write a JavaScript function to dynamically manipulate DOM elements
- Implement an interactive form validation using JavaScript
- Create a small webpage showcasing different HTTP methods using JavaScript

**UNIT II** **6**

**Front-End Development with React.js:** Introduction to React.js and component-based architecture, Understanding props and state, Functional vs. class components, React Router for navigation, State management using Redux

**Practices:**

- Build a React component that uses state to display dynamic content
- Implement React Router to navigate between different pages in a React app
- Create a simple to-do list using React with add, update, and delete functionality
- Use Redux to manage the global state of a small application
- Build a simple weather app that fetches and displays data using an API

**UNIT III** **6**

**Back-End Development with Node.js and Express:** Introduction to Node.js and its event-driven architecture, Asynchronous programming: callbacks, promises, async/await, Express.js framework: routing and middleware, Creating RESTful APIs and handling HTTP requests/responses.

**Practices:**

- Create a basic Node.js server using Express to handle GET requests
- Implement a POST API endpoint in Express to handle form submissions
- Create a RESTful API with Express handling GET, POST, PUT, and DELETE requests

**UNIT IV** **6**

**Database Management and Full-Stack Integration :** Introduction to MongoDB and Mongoose, Performing CRUD operations in MongoDB, Integrating React.js with Node.js and Express.js,Connecting frontend and backend for full-stack applications.

**Practices:**

- Set up MongoDB with Mongoose and perform CRUD operations on a sample data model
- Build a full-stack application integrating React.js with Node.js and MongoDB
- Implement API calls in React to fetch data from a backend server
- Develop a simple blog application where users can post, update, and delete posts

**UNIT V** **5**

**Authentication, Deployment, and Testing (1 Hour):** JWT authentication: user login and access control, Securing routes using JWT middleware, Deploying full-stack applications

**Practices:**

- Implement JWT authentication in a Node.js application for user login and access control
- Protect certain API routes using JWT authentication middleware in Express
- Deploy a full-stack application (React + Node.js) on a cloud platform

**Total Hours: 30**

## Deep Learning

**Semester II** **Hours of Instruction/week: 4**
**25MITC08** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. To introduce the fundamental concepts of deep learning and neural networks, including perceptrons, feed-forward networks, and their limitations.
2. To explore training techniques for deep neural networks, such as gradient descent, backpropagation, and methods to prevent overfitting
3. To provide hands-on experience with TensorFlow, convolutional neural networks, and deep reinforcement learning for solving complex real-world problems.

**UNIT I INTRODUCTION TO DEEP LEARNING AND NEURAL NETWORKS 12**

What is Deep Learning - Why Deep Learning. The mechanics of Machine Learning -The Neuron - Expressing Linear Perceptrons as Neurons– Feed-Forward Neural Networks - Linear Neurons and their Limitations.

**UNIT II TRAINING FEED-FORWARD NEURAL NETWORKS 12**

Gradient Descent - The Delta Rule and Learning Rates - Gradient Descent with Sigmoidal Neurons - The Back Propagation Algorithm - Stochastic and Minibatch Gradient Descent - Test Sets - Validation Sets and Overfitting – Preventing Overfitting in Deep Neural Networks.

**UNIT III NEURAL NETWROKS IN TENSORFLOW 12**

What is TensorFlow - How does TensorFlow compare to Alternatives? TensorFlow Variables – Operations – Placeholder Tensors – Sessions in TensorFlow – Navigating Variable Scopes and Sharing Variables – Specifying the Logistic Regression Model in TensorFlow.

**UNIT IV CONVOLUTIONAL NEURAL NETWORKS 12**

Neurons in Human Vision – Shortcomings of Feature Selection – Filters and Feature Maps – Full Description of the Convolutional Layer – Max Pooling – Full Architectural Description of Convolution Networks – Image Processing Pipelines– Accelerating Training with Batch Normalization – Visualizing Learning in Convolutional Networks.

**UNIT V DEEP REINFORCEMENT LEARNING 12**

What is Reinforcement Learning – Markov Decision Processes – Explore Versus Exploit – Policy Versus Value learning – Pole-Cart with Policy Gradients – Creating an Agent – Building the Model and Optimizer – Sampling Actions – Keeping Track of History – Policy Gradient Main Function.

**Total Hours: 60**

**TEXT BOOKS:**


1. Nikhil Buduma and Nicholas Lacascio, "Fundamentals of Deep Learning",O'Reilly Media, 2017.
2. Francois Chollet, "Deep Learning with Python", Manning, 2018.


**REFERENCES:**


1. Ian Goodfellow,YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Josh Patterson,Adam Gibson , Aaron Courville, "Deep Learning – A Practitioner's Approach", O'Reilly Media, 2017.
3. Jeff Heaton, "Artificial Intelligence for Humans Volume 3: Deep Learning and Neural Networks", Heaton Research, 2015.

**WEB REFERENCES:**

1. http://neuralnetorksanddeeplearning.com
2. https://www.datacamp.com/community/tutorials/deep-learning-python
3. http://www.deeplearning.net/tutorial/
4. http://deeplearning.stanford.edu/tutorial
5. https://medium.com/tensorflow/mit-deep-learning-basics-introduction
6. https://www.classcentral.com/course/swayam-deep-learning-iitkgp-13988
7. https://www.edureka.co/blog/deep-learning-with-python/
8. https://www.eckovation.com/course/deep-learning-certification-course
9. https://www.zapmeta.co.in/?q=deep+learning+free+course
10. https://www.apdaga.com/2019/03/coursera-neural-networks-and-deep-learning

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand the principles of deep learning, neural networks, and their significance in machine learning applications
2. Implement and train feed-forward neural networks using gradient descent and backpropagation techniques.
3. Develop deep learning models using TensorFlow and apply them to various computational tasks.
4. Design and optimize convolutional neural networks for image processing and feature extraction.
5. Analyze and implement deep reinforcement learning models using Markov Decision Processes and policy gradients

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | L | H | M | L | H | M | M | L |
| CO2 | H | M | M | H | H | H | M | L | L |
| CO3 | H | H | H | H | H | H | H | L | L |
| CO4 | H | H | H | H | H | H | M | L | H |
| CO5 | H | H | H | H | H | H | M | M | H |

## Web Programming with Open Source Technologies

**Semester II** **Hours of Instruction/week: 3**
**25MITC09** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To provide fundamental knowledge of web development using open-source technologies such as HTML, CSS, PHP, Python, MySQL, and MongoDB.
2. To enable students to design and develop dynamic, interactive, and database-driven web applications
3. To equip students with hands-on experience in integrating front-end and back-end technologies for full-stack web development

**UNIT I HTML AND CSS** 9

Basics of HTML Page Structure- Text Formatting, Tables, Headers, Lists, Forms -Linking Pages & Embedding Images- Introduction to CSS & Syntax: Types: Inline, Internal & External Stylesheets - CSS Selectors & Properties; Background & Text Formatting, Font Control & Styling - Box Model & Layout Management: Borders, Padding, Margin Properties, Display, Positioning & Aligning Elements - Working with Lists, Tables, and Images

**UNIT II PHP** 9

Basic Syntax of PHP – programming in web environment - Common PHP Script Elements - Using Variables - Constants – Data types - Operators; Statements – Flow Control functions – Dates and Times - Working with Arrays -Using Functions – Object oriented Programming in PHP - String Manipulation and Regular Expression - File and Directory Handling – Validating Forms

**UNIT III PYTHON** 9

Introduction - Variables - Data types – Strings - Operators – Control Statements - Loops - Sequences: Lists – Tuples - Sets – Dictionaries - Object oriented Programming in Python-files and Exceptions

**UNIT IV MySQL** 9

Data Types - Primary Keys and Auto Increment Fields – Operators - Create Database and Tables – MYSQLQueries: Select; insert; update; delete; limit, Aggregate functions; Soring; Joins- Establishing and Closing a Connection - Connecting PHP and Python with MySQL: Inserting; Updating; deleting; Soring and Searching records in MySQL database

**UNIT V MONGODB** 9

Introduction to MongoDB: key features, MongoDB Core tools, MongoDB Data types, Creating and Dropping Database, Creating and Dropping collections, MongoDB Documents: Inserting, Querying, Updating and Deleting Documents – Limiting Records-Sorting Records – MongoDB Aggregation. Connecting MongoDB with Python: Inserting; Updating; deleting; and Searching Documents in MongoDB database

**Total Hours: 45**

**REFERENCES:**


1. Chris DiBona, Danese Cooper and Mark stone O"Reilly,"Open Sources 2.0-The Continuing Evolution", First Edition, 2005.
2. Elliot White III, Jonathan.D.Eisenhamer, "PHP 5 in practice" pearson Education,2007

3. Mark Lutz, O"Reilly, "Programming Python 4E", 2011
4. Paul Du Bois,O"ReillyPublishers,"My SQL- Cookbook",Second Edition, 2010

**WEB REFERENCES:**

1. https://swayam.gov.in/nd2_aic20_sp32/preview
2. https://swayam.gov.in/nd2_aic20_sp33/preview

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Develop well-structured web pages using HTML and CSS with proper formatting, styling, and layout management
2. Utilize MongoDB for NoSQL database operations, including inserting, updating, deleting, and querying documents
3. Implement dynamic web applications using PHP and Python, incorporating variables, control structures, functions, and object-oriented programming concepts.
4. Design and manage relational databases using MySQL and perform CRUD operations using PHP and Python.
5. Integrate front-end and back-end technologies to develop interactive, database-driven web applications.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | M | M | M | H | H | M | M |
| CO2 | H | H | H | M | M | H | H | H | M |
| CO3 | H | H | H | M | M | H | H | H | H |
| CO4 | H | H | H | M | M | H | H | H | H |
| CO5 | H | H | H | M | H | H | H | H | H |

## Digital Image Processing

**Semester II** **Hours of Instruction/week: 3**
**25MITC10** **No.of credits : 3**

**COURSE OBJECTIVES:**

1. Explain the principles and applications of digital image processing & Python libraries.
2. Explore image transformation, enhancement, restoration, and compression techniques.
3. Apply various segmentation approaches for digital image analysis.

**UNIT I DIGITAL IMAGE FUNDAMENTALS** **9**

Introduction-applications-Steps in digital image processing – components of the image processing system, Elements of Visual Perception, Light and the electromagnetic spectrum, Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models RGB, CMY, HIS. Python libraries for Image processing OpenCV, Pillow, Scikit-image, NumPy, Matplotlib

**UNIT II IMAGE TRANSFORMATION & ENHANCEMENT** **9**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters- Color image transformation and enhancement

**UNIT III IMAGE RESTORATION** **9**

Image Restoration – Image degradation model and restoration process, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Linear, Position Invariant Degradation -Inverse Filtering – Wiener filtering-Geometric Mean Filter

**UNIT IV IMAGE COMPRESSION** **9**

Fundamentals of compression– Image Compression models – Error Free Compression – Variable Length Coding – Huffman coding – Arithmetic coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Transform coding - JPEG and MPEG coding

**UNIT V IMAGE SEGMENTATION** **9**

Morphological processing- erosion and dilation- opening and closing- Morphological algorithms- Boundary Extraction, Region Filling- Extraction of connected components- Covex Hull-Thinning-Thickening-Skeleton-Pruning- Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging.

**Total Hours: 45**

**TEXT BOOK:**

1. Gonzalez R.C and Woods R. E, "Digital image processing "Addison Wesley
2. Anil K Jain Fundamentals of Digital image processing, Prentice Hall

**REFERENCES:**

1. Dr. Manish Kashyap, "Digital Image Processing Using Python: A comprehensive guide to the fundamentals of digital image processing", BPB Publications,2025
2. Sandipan Dey, Hands-On Image Processing with Python
3. S.Annadurai and R.Shanmugalakshmi," Fundamentals of Digital Image Processing", Pearson Education.

**WEB REFERENCES:**

1. https://archive.nptel.ac.in/courses/117/105/117105135/
2. https://nptel.ac.in/courses/117105079

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand the principles and application of digital image processing and python libraries.
2. Gain knowledge of various image transformation and enhancement techniques.
3. Evaluate various image restoration techniques.
4. Analyse various compression techniques and standards.
5. Use different segmentation approaches to digital image processing.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | M | L | H | M | L |
| CO2 | H | H | M | M | H | L | H | H | M |
| CO3 | H | H | H | M | M | L | H | H | M |
| CO4 | H | H | H | H | H | L | H | H | H |
| CO5 | H | H | H | H | H | M | H | H | H |

## Elective II: Generative AI

**Semester II** **Hours of Instruction/week: 4**
**25MITC11A** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. Understand the fundamentals of Generative AI, including key concepts, differences from Discriminative AI, and the generative modeling framework.
2. Explore techniques and models for Generative AI, including prompt engineering, RNNs, LSTMs, GANs, VAEs, Transformer models, and diffusion models.
3. Analyze the applications, challenges, and future of Generative AI, focusing on responsible AI, ethical considerations, and emerging advancements in generative modeling.

**UNIT I INTRODUCTION TO GENERATIVE AI** **12**

Discriminative vs. Generative AI – Uses – Importance. Advances in Machine Learning - The Rise of Generative Modeling - The Generative Modeling Framework.

**UNIT II PROMPT ENGINEERING** **12**

Prompt Creation -Writing effective prompts -Techniques for using text prompts: Zero shot and few-shot prompt techniques – Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought - Benefits of using text prompts - Challenges in generating meaningful and coherent prompts.

**UNIT III GEN AI MODELS** **12**

Basics of Sequential data processing – Building blocks of Generative AI - Recurrent Neural Networks – Long Short-Term Memory (LSTM) Networks - Generative Adversarial Networks (GANs) - Variational Autoencoders (VAEs) – Transformer–based Models - Diffusion models- Applications.

**UNIT IV PLATFORMS FOR GENERATIVE AI** **12**

Introduction to Platforms – Features of platforms – Capabilities -Applications - Pre-trained Models - Challenges – Generation of Text to Text – Generation of Text to Image – Text to Code Generation – Explainable AI – Benefits – Use cases.

**UNIT V LIMITATIONS & FUTURE OF GENERATIVE AI** **12**

Limitations of Generative AI – Issues and concerns – Considerations for Responsible Generative AI – Economic Implications – Social Implications – Future and professional Growth of Generative AI. Advances in Image Generation: ProGAN - SAGAN – BigGAN – StyleGAN. Applications of Generative Modeling.

**Total Hours: 60**

**TEXT BOOKS:**


1. "Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology", Altaf Rehmani
2. "Introduction to Generative AI" , Numa Dhamani, Kindle Edition, 2024
3. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016.
4. Hands-on Generative Adversarial Networks with Keras, Rafael Valle. Packt Publisher, 2019
5. Generative AI in Practice:Bernad Marr, Wiley,March 2024

**REFERENCES:**


1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
2. "Generative AI in Software Development: Beyond the Limitations of Traditional Coding" Jesse Sprinter, 2024
3. Deep Learning: Teaching Machines to Paint, Write, Compose and Play, David Foster, 2023. 2nd edition. O'Reilly Media, Inc.


**WEB REFERENCES:**

1. https://onlinecourses.swayam2.ac.in/nou25_ma05/preview
2. https://onlinecourses.swayam2.ac.in/imb24_mg116/preview

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Explain the principles and significance of Generative AI
2. Create and optimize effective AI prompts using various prompt engineering techniques to improve model outputs
3. Analyse and apply different Generative AI architectures
4. Utilize AI platforms to generate and manipulate text, images, and code
5. Assess the ethical and social implications of Generative AI

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | L | L | H | M | L |
| CO2 | M | H | H | M | L | M | H | H | M |
| CO3 | H | M | H | M | L | M | H | M | H |
| CO4 | M | H | H | H | L | H | H | H | H |
| CO5 | M | L | M | M | H | H | M | H | M |

## Elective II: Natural Language Processing

**Semester II** **Hours of Instruction/week: 4**
**25MITC11B** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. Understand the fundamentals of Natural Language Processing (NLP), including language modeling, grammar structures, and challenges in processing Indian languages.
2. Explore key NLP techniques, such as word-level analysis, syntactic parsing, text classification, sentiment analysis, and information retrieval models.
3. Analyze and implement advanced NLP applications, including machine translation, lexical resources, and ethical considerations in language processing.

**UNIT I INTRODUCTION** **12**

What is Natural Language Processing? Origins of NLP, Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications. Language Modeling: Statistical Language Model - N-gram model (unigram, bigram), Paninion Framework, Karaka theory.

**UNIT II WORD LEVEL ANALYSIS** **12**

Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of Speech Tagging. Syntactic Analysis: Context-Free Grammar, Constituency, Top-down and Bottom-up Parsing, CYK Parsing.

**UNIT III TEXT CLASSIFICATION AND SENTIMENT ANALYSIS** **12**

Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked Example, Optimizing for Sentiment Analysis, Naive Bayes for Other Text Classification Tasks, Naive Bayes as a Language Model.

**UNIT IV INFORMATION RETRIEVAL** **12**

Design Features of Information Retrieval Systems, Information Retrieval Models - Classical, Non-classical, Alternative Models of Information Retrieval - Custer model, Fuzzy model, LSTM model, Major Issues in Information Retrieval. Lexical Resources: WordNet, FrameNet, Stemmers, Parts-of-Speech Tagger, Research Corpora.

**UNIT V MACHINE TRANSLATION** **12**

Language Divergences and Typology, Machine Translation using EncoderDecoder, Details of the Encoder-Decoder Model, Translating in Low-Resource Situations, MT Evaluation, Bias and Ethical Issues.

**Total Hours: 60**

**TEXT BOOKS:**


1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.
2. Daniel Jurafsky, James H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2023.

**REFERENCES:**


1. Akshay Kulkarni, Adarsha Shivananda, "Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019.
2. T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024.
3. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer Academic Publishers.


**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc23_cs45/preview
2. https://www.coursera.org/specializations/natural-language-processing

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Apply the fundamental concept of NLP, grammar-based language model and statistical-based language model
2. Model morphological analysis using Finite State Transducers and parsing using context-free grammar and different parsing approaches
3. Develop the Naïve Bayes classifier and sentiment analysis for Natural language problems and text classifications
4. Apply the concepts of information retrieval, lexical semantics, lexical dictionaries such as WordNet, lexical computational semantics, distributional word similarity
5. Identify the Machine Translation applications of NLP using Encode and Decoder.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | L | L | H | M | L |
| CO2 | H | M | H | M | L | M | H | M | M |
| CO3 | H | H | H | M | L | M | H | H | M |
| CO4 | M | H | H | H | L | H | H | H | H |
| CO5 | M | M | M | H | L | H | H | H | H |

## Elective II: Large Language Model

**Semester II** **Hours of Instruction/week: 4**
**25MITC11C** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. Understand the fundamentals of Large Language Models (LLMs), including language representation learning, architectures, and limitations.
2. Explore advanced techniques in LLMs, such as prompt engineering, retrieval-augmented generation (RAG), fine-tuning, and evaluation metrics.
3. Analyze ethical concerns and challenges in LLMs, including bias, fairness, and strategies for mitigating biases in language model development.

**UNIT I INTRODUCTION TO LARGE LANGUAGE MODELS (LLMs)** **12**

Language Representation Learning: Neural Network Language Representations - Contextualized Language Representations - Limitations of LLMs. Interpretation – Behavioral Probes - Structural Probes - Probing Classifiers.

**UNIT II LLM ARCHITECTURE** **12**

- Unveiling the Power of Words. Diving into different LLM architectures: BERT (Bidirectional Encoder Representations trom Trans- formers) and its applications, exploring other notable LLM architectures (e.g.GPT-3, TS), Mixture of Experts (MoE), various benchmarks to evaluate LLMs.

**UNIT III PROMPT ENGINEERING** **12**

Introduction to prompt, examples of prompt, prompt engineering, prompt techniques, zero shot, one shot, few-shot learning, a chain of thought prompting, ReAct Prompting, self-consistency, Tree of thought, LLM based Agents, Large Action Models (LAMs)

**UNIT IV PERFORMANCE FINE-TUNING** **12**

Understanding Retrieval and vector, vector storage: vector indexing, vector libraries, vector databases, Loading and retrieving in Lang Chain Document loaders, Retrievers in Lang Chain. Fine-tuning: Quantization PEFT, Full-Fine-tuning vs LoRA vs QLoRA, Fine-Timing LLMs lor different down- stream tasks

**UNIT V LLM EVALUATION METRICS** **12**

Understanding the challenges of bias and fairness in LLMs. Exploring techniques for mitigating bias in LLM development and evaluation, considering prompt design and data selection for RAG Models: RAGAS

**Total Hours: 60**

**TEXT BOOKS:**


1. Understanding Large Language Models: Towards Rigorous and Targeted Interpretability Using Probing Classifiers and Self-Rationalisation, Jenny Kunz, 2024
2. Ben Auffarth, "Generative AI with LangChain: Build large language model (LLM) apps with Python, ChatGPT, and other LLMs" by Packt Publishing, 2023
3. Jay Alammar, Maarten Grootendorst, "Hands-On Large Language Models", by O'Reilly, 2023


**REFERENCES:**


1. David Foster, "Generative Deep Learning", O'Reilly, 2020.

2. Lewis Tunstall, Leandro von Werra & Thomas Wolf, "Natural Language Processing with Trans- formers", 2022
3. Sebastian Raschka, "Build a Large Language Model (From Scratch)", ISBN 9781633437166

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc25_cs45/preview
2. https://www.coursera.org/learn/introduction-to-large-language-models

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand the Fundamentals of LLMs
2. Analyze LLM Architectures
3. Apply Prompt Engineering Techniques
4. Implement Retrieval-Augmented Generation (RAG) and Fine-Tuning
5. Evaluate and Mitigate Bias in LLMs

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | L | L | H | M | L |
| CO2 | H | L | H | M | L | M | H | M | H |
| CO3 | M | H | H | M | L | M | H | H | M |
| CO4 | M | H | H | H | L | H | H | H | H |
| CO5 | M | M | M | H | H | H | M | H | H |

**Web Programming with Open Source Technologies - Practical III**

**Semester II** **Hours of Instruction/week: 4**

**25MITC12** **No.of credits: 2**

**COURSE OBJECTIVES:**

1. To provide hands-on experience in developing web applications using open-source technologies such as HTML, CSS, PHP, Python, MySQL, and MongoDB
2. To enable students to design, develop, and integrate front-end and back-end web applications with database connectivity for real-world scenarios
3. To develop problem-solving skills in web programming by implementing conditional statements, loops, functions, and data processing techniques in PHP and Python

**List of Programs:**

1. Create a Personal Profile Page with HTML Basics & Text Formatting
2. Design a Student Registration Form with Forms & Tables
3. Create multiple HTML pages and link them together and embed an image on the page
4. Style a Blog Page by applying CSS styles to an HTML page and use Inline, Internal, and External CSS
5. Create a Responsive Image Gallery with CSS Grid & Flexbox
6. Use of conditional and looping statements in PHP
7. File manipulation using PHP
8. Creation of sessions and cookies
9. Creating forms and form validation using PHP
10. Insertion, Updation and Deletion of rows in MYSQL tables using PHP
11. Searching of data and sorting by different criteria using PHP and MySQL
12. Joining tables using PHP and MySQL
13. Use of Functions in Python
14. String manipulation using python
15. File manipulation using python
16. Plotting graphs using python
17. Insertion, Updation and Deletion of rows in MYSQL tables using Python
18. Searching of data and sorting by different criteria using Python and MySQL
19. Insertion, Updation and Deletion of rows in Mongo DB using Python
20. Searching of data using Python and Mongo DB

**Total Hours: 60**

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Design and develop web pages using HTML and CSS with proper styling, linking, and responsive layouts.
2. Implement interactive and dynamic web applications using PHP with session management, form validation, and database connectivity
3. Perform CRUD operations in MySQL and MongoDB using PHP and Python for efficient data management
4. Utilize Python for data processing, file handling, string manipulation, and graph plotting in web applications
5. Develop integrated web solutions by combining front-end and back-end technologies with structured programming concepts

**CO-PO Mapping and Matrix**

| CO / PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | M | M | M | H | H | M | M |
| CO2 | H | H | H | M | M | H | H | H | M |
| CO3 | H | H | H | M | M | H | H | H | H |
| CO4 | H | H | H | M | M | H | H | H | H |
| CO5 | H | H | H | M | H | H | H | H | H |

## Digital Image Processing - Practical IV

**Semester II** **Hours of Instruction/week: 6**
**25MITC13** **No. of credits : 3**

**COURSE OBJECTIVES:**

1. To understand and implement fundamental digital image processing techniques such as image transformations, filtering, and enhancement.
2. To develop proficiency in image restoration, compression, and segmentation techniques using OpenCV and Python libraries.
3. To apply deep learning techniques for image classification and recognition, integrating convolution neural networks (CNNs).

**List of programs**

1. Program to read, display, and save an image using OpenCV.
2. Program to perform image sampling and quantization.
3. Program to convert an image between RGB, HSV, and grayscale color spaces and extract image components (Red, Green, and Blue channels).
4. Program to perform image transformations: scaling, rotation, and translation.
5. Program to perform image annotation by adding bounding boxes, text labels, and shapes.
6. Program to perform gray level transformations: log, power-law, negative transformation, and bit-plane slicing, and display them in subplots.
7. Program to enhance image contrast using histogram equalization.
8. Program to perform image smoothing using averaging and Gaussian filtering.
9. Program to perform image sharpening using high-pass filtering.
10. Program to perform Fourier transform and frequency domain filtering (Ideal, Butterworth, and Gaussian filters).
11. Program to add noise (Gaussian, Salt & Pepper, Speckle, and Poisson) to an image.
12. Program to remove noise using mean, order statistics, and adaptive filters.
13. Program to implement inverse filtering and Wiener filtering techniques.
14. Program to perform image compression techniques.
15. Program to segment an image using global and adaptive thresholding.
16. Program to perform morphological operations: erosion, dilation, opening, and closing.
17. Program to detect and draw contours on an image.
18. Program to extract connected components using morphological processing.
19. Program to implement region-based segmentation using region growing and splitting-merging techniques.
20. Program to implement a deep learning-based image classification model using CNN.

**Total Hours: 90**

**WEB REFERENCES:**

1. https://onlinecourses.swayam2.ac.in/nou23_cs15/preview

**COURSE OUTCOMES:**

**On successful completion of the course, the student will be able to**

1. Implement basic image processing operations such as reading, displaying, and transforming images using OpenCV.
2. Apply various filtering techniques for noise removal, image smoothing, and sharpening in both spatial and frequency domains.
3. Perform image restoration and enhancement using inverse filtering, histogram equalization, and morphological operations.
4. Implement image segmentation techniques including thresholding, contour detection, and region-based segmentation.

5. Develop and evaluate a deep learning-based image classification model using Convolutional Neural Networks (CNNs)..

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | L | L | M | L | H | M | L |
| CO2 | H | H | M | M | H | L | H | H | M |
| CO3 | H | H | H | M | H | L | H | H | H |
| CO4 | M | H | H | H | H | M | H | H | M |
| CO5 | M | H | H | H | H | H | H | H | H |

## Quantum Computing

**Semester III** **Hours of Instruction/week: 4**
**25MITC14** **No. of credits: 4**

**COURSE OBJECTIVES:**

1. Understand quantum computing principles, contrast with classical computing, and explore superposition, entanglement, and interference.
2. Design and simulate quantum computations using quantum gates, circuits, and error correction techniques.
3. Analyse real-world applications of quantum computing and assess future challenges.

**UNIT I Introduction to Quantum Computing** **12**

Introduction to Quantum Computing, Classical vs. Quantum Computing, History and Evolution of Quantum Computing, Quantum Mechanics Fundamentals (Superposition, Entanglement, Interference), Qubits vs. Classical Bits, Bloch Sphere Representation, Quantum Gates & Circuits

**UNIT II Quantum Gates and Circuit Model** **12**

Single-qubit gates (Pauli matrices, Hadamard, Phase shift), multi-qubit gates (CNOT, Toffoli), Building quantum circuits, Basic quantum circuit diagrams, and simulation tools

**UNIT III Quantum Algorithms** **12**

Overview of quantum algorithms and complexity, Deutsch-Jozsa, Simon's algorithm, Grover's search algorithm fundamentals, Shor's algorithm introduction (conceptual overview)

**UNIT IV Quantum Error Correction and Noise** **12**

Challenges in quantum decoherence and error sources, Basic error correction codes (bit-flip, phase-flip, Shor code), Fault-tolerant quantum computing concepts, Practical aspects: noise in quantum circuits

**UNIT V Applications & Future of Quantum Computing** **12**

Cryptography and Quantum Key Distribution (QKD), Quantum Machine Learning & AI, Quantum Computing in Drug Discovery & Optimization, Quantum Networking & Teleportation, Challenges and Future Directions in Quantum Computing, Ethical and Security Concerns.

**Total Hours: 60**

**TEXT BOOK:**


1. Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2000.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, "An Introduction to Quantum Computing", Oxford University Press,2007.


**REFERENCES:**


1. Phillip Kaye, Raymond Laflamme, Michele Mosca, "An Introduction to Quantum Computing", Oxford University Press,2007.
2. Mermin N.D, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007. 3
3. Hirvensalo M, "Quantum Computing", Springer, 2001.
4. Eleanor Rieffel & Wolfgang Polak – "Quantum Computing: A Gentle Introduction", MIT Press,2014
5. Jack D. Hidary "Quantum Computing: An Applied Approach", 2nd edition, Springer International Publishing 2021

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc21_cs103/preview
2. https://archive.nptel.ac.in/courses/106/106/106106232

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Explain quantum computing fundamentals, including quantum mechanics principles and qubit representation.
2. Demonstrate quantum gates and circuits and construct basic quantum circuits using simulators.
3. Analyse quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's for computational advantages.
4. Evaluate quantum error correction techniques and propose effective error mitigation methods.
5. Assess quantum computing applications in cryptography, AI, drug discovery, and networking.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | L | M | - | - | H | M | - |
| CO2 | H | H | M | M | - | - | H | M | - |
| CO3 | H | H | H | H | - | - | H | H | M |
| CO4 | M | H | H | H | M | - | H | H | H |
| CO5 | M | H | H | H | H | H | H | H | H |

## Internet of Things

**Semester III** **Hours of Instruction/week: 4**
**25MITC15** **No.of credits: 4**

**COURSE OBJECTIVES:**

1. To gain insight about the architecture and enabling technologies of Internet of Things.
2. To understand and use the microcontroller and various sensors.
3. To develop simple IoT Applications for different domains

**UNIT I: Introduction to IOT & Basic Electronics for IoT** **12**

**Introduction to IoT**: Enabling technologies of IoT - AI and Machine Learning - Physical and logical design of IoT - IOT Architecture - IoT levels and deployment templates – Application domains of IoT: Home automation – Environment –Industry – Agriculture – Transportation - Health care.

**Basic electronic components and power elements**: Electric Charge, Resistance, Current and Voltage – Resistors, Capacitors, Diodes, LED, Potentiometer, circuit boards - Analog and digital circuits – Microcontrollers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation

**UNIT II: Arduino IDE & Types of Sensors** **12**

**Arduino IDE:** Installation and Set-up - Programming Fundamentals with C using Arduino IDE Program Structure in C - Basic Syntax - Data Types / Variables / Constants - Operators, Conditional Statements and Loops - Using Arduino C Library functions.

**Working with Arduino:** LED and Switch - Data acquisition with IOT Devices - Understanding the Inputs from Sensors - Temperature Sensors – Ultrasonic Sensor - Humidity sensor - IR Sensor – PIR Sensor - Accelerometer and vibration sensor. Understanding the Outputs through Actuators - Activating LED Lights - Activating Relays - Activating Buzzer - Running DC Motors - Running Stepper Motors and Servo Motors.

**UNIT III: Medical Sensors & Data Communication from IOT devices** **12**

**Introduction to Medical Sensors**: Body Temperature Sensor - Blood Pressure Sensor - Airflow sensor - Patient position sensor - Pulse and oxygen in blood sensor (SPO2) - Galvanic skin response sensor using Communication Devices to transfer data from IOT Devices - WIFI data transfer – Remote Communication to cloud/external application

**UNIT IV: Cloud for IoT** **12**

IoT with cloud – Challenges- Selection of Cloud service Provider for IoT Applications: An Overview – Introduction to Fog Computing – Cloud computing: Security Aspects

**UNIT V: Applications Building with IoT** **12**

**Case Studies:** Smart Healthcare- Elderly Fall detection with IoT sensors, IoT based Application to Monitor Water Quality, Smart Retail, IoT based Smart Driver Assistance Systems.

**Total Hours: 60**

**TEXT BOOKS:**

1. Arshdeep Bahga, Vijay Madisetti, 'Internet of Things: A Hands-On Approach', Universities Press, 2015
2. Boris Adryan, Dominik Obermaier, Paul Fremantle, 'The Technical Foundations of IoT', Artech Houser Publishers, 2017

3.Michael Margolis, "Arduino Cookbook" 2nd Edition, O'Reilly Media, 2012.
4.Marco Schwartz, 'Internet of Things with ESP8266', Packt Publishing, 2016.

**REFERENCES:**

1. Charles Platt, "Make Electronics – Learning by discovery", O'Reilly Media, 2015.
2.Michael Miller, " The Internet of Things", Pearson India, 2015.
3. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2015.

**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106/105/106105166/

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Learn the importance of smart objects and smart environment.
2. Understand and use the microcontroller and various sensors
3. Create programs using Arduino IDE and extract data
4. Understand Security and Cloud Integration
5. Learn Cloud integration and security aspects.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | H | M | M | H | H | H | M |
| CO2 | H | H | M | M | M | H | H | M | H |
| CO3 | M | H | M | M | L | M | M | M | H |
| CO4 | M | M | M | M | M | H | H | M | L |
| CO5 | M | M | M | M | L | L | M | L | L |

## Big Data Analytics

**Semester III** **Hours of Instruction/week: 4**
**25MITC16** **No.of credits : 4**

**COURSE OBJECTIVES:**

1. Explore Big Data fundamentals, analytical processes, and the Hadoop ecosystem, including HDFS.
2. Understand MapReduce programming, serialization, and the differences between Pig and Hive frameworks.
3. Apply tools and techniques to solve real-world Big Data problems.

**UNIT I INTRODUCTION TO HADOOP AND BIG DATA ANALYTICS** **12**

**Introduction to big data:** Data, Characteristics of data and Types of digital data, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data

**Big data analytics:** Overview of business intelligence, Data Science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

**UNIT II INTRODUCTION TO HADOOP** **12**

Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator), Interacting with Hadoop Ecosystem

**UNIT III INTRODUCTION TO MAPREDUCE PROGRAMMING** **12**

Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression, Real-time applications using MapReduce, Data serialization and working with common serialization formats, Big data serialization formats

**UNIT IV INTRODUCTION TO HIVE AND PIG** **12**

**HIVE:** Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive.

**PIG:** Introduction to Pig, The Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Piggy Bank, Word Count Example using Pig , Pig at Yahoo!, Pig versus Hive

**UNIT V SPARK** **12**

Introduction to data analytics with Spark, What is Apache Spark, A Unified Stack, Downloading Spark, Spark's Python and Scala Shells, Core Spark concepts, Programming with RDDS, RDD Basics, RDD Operations, Passing functions to Spark, Working with key/value pairs, Data Partitioning, Loading and Saving your Data, File Formats

**Total Hours: 60**

**REFERENCES:**


1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley
2. Learning Spark: Lightning-Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, O'Reilly Media, Inc.
3. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
4. Chris Eaton, Dirkderooset al. , "Understanding Big Data", McGraw Hill, 2012.

5. Tom White, "HADOOP: The Definitive Guide", O Reilly 2012.
6. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.

**WEB REFERENCES:**

1. http://www.bigdatauniversity.com/
2. https://www.coursera.org/courses?query=big%20data%20analytics

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Analyze the difference between structured, semi-structured and unstructured data.
2. Summarize the challenges of big data and how to deal with them.
3. Recognize the significance of NoSQL databases.
4. Formulate about Hadoop Ecosystem and MapReduce programming.
5. Distinguish between Pig and Hive and other frameworks.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | L | M | L | - | - | - | M | - | - |
| CO2 | H | H | M | M | - | M | H | M | M |
| CO3 | M | H | H | - | M | - | - | - | M |
| CO4 | H | - | M | H | - | M | - | H | H |
| CO5 | - | M | H | M | M | - | M | - | - |

## Elective III: Block Chain Technology

**Semester III** **Hours of Instruction/week: 3**
**25MITC17A** **No .of credits: 3**

**COURSE OBJECTIVES:**

1. To understand the concepts of block chain technology
2. To understand the consensus and hyper ledger fabric in block chain technology.
3. To understand conceptual elements for Distributed Ledger Technology.

**UNIT I: Introduction to Block Chain** **9**

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, Signature Hash chain to Block chain-Basic consensus mechanisms.

**UNIT II: Block Chain Protocols & Designs** **9**

Consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block Chains-Design goals-Consensus protocols for Permissioned Block chains.

**UNIT III: Hyper Ledger Fabric Components** **9**

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II: -Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

**UNIT IV: Block Chain Financial Management** **9**

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital Markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

**UNIT V: Block Chain Privacy & Security** **9**

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

**Total Hours: 45**

**TEXT BOOKS:**

1. Mark Gates, "Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates 2017.
2. Bashir, I. (2020). Mastering Blockchain: A Deep Dive Into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More - Third Edition, United Kingdom: Packt Publishing.
3. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies", O'Reilly Media, Inc. 2014.

**REFERENCES:**

1. Treccani, A., Lipton, A. (2021). Blockchain And Distributed Ledgers: Mathematics, Technology, And Economics - First Edition, Singapore: World Scientific Publishing Company.

**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106105184/

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Learn the concepts of blockchain technology.
2. Understand the Block chain consensus protocols.
3. Gain a knowledge in Hyper ledger fabric components of block chain
4. Understand how blockchain technology using in Finance sector
5. Learn Cryptography in block chain

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | M | L | M | L | M |
| CO2 | H | L | M | L | L | M | M | L | M |
| CO3 | H | M | H | M | L | L | L | M | L |
| CO4 | M | H | M | H | M | L | H | H | M |
| CO5 | M | L | M | L | M | L | L | M | L |

## Elective III: Information Security

**Semester III** **Hours of Instruction/week: 3**
**25MITC17B** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To obtain knowledge about attacks, encryption techniques and algorithms.
2. To understand mathematical concept, various key distribution techniques.
3. To acquire in-depth knowledge on various security applications like Electronic, IP and Web security.

**UNIT I: CONVENTIONAL AND MODERN ENCRYPTION** **9**

Services – Attacks – Classical Encryption Techniques: Substitution Techniques; Transposition Techniques; Steganography -Block ciphers and the data encryption standard: Block Cipher Principles; Data Encryption Standard (DES); Block Cipher Design Principles; Advanced Encryption Standard (AES) – Block Cipher Operations: Multiple Encryption and Triple DES- Modes of operation.

**UNIT II: PUBLIC KEY ENCRYPTION** **9**

Number Theory concepts: Fermat & Euler Theorem; Euclid Algorithm – RSA Algorithm – Elliptic Curve Cryptography – Diffie Hellman Key Exchange

**UNIT III: AUTHENTICATION AND SECURITY PRACTICE** **9**

Message Authentication and Hash function - Authentication Requirements; Authentication Functions; Message Authentication Codes - MACs Based on Hash Functions: HMAC; MACs Based on Block Ciphers: DAA and CMAC; Authenticated Encryption: CCM and GCM- Digital Signature and Authentication Protocols

**UNIT IV: NETWORK AND INTERNET SECURITY I** **9**

Authentication Application: Kerberos; x.509 authentication service – Electronic Mail security: PGP; S/MIME – IP Security – Web Security

**UNIT V: NETWORK AND INTERNET SECURITY II** **9**

System Security: Intruders and Intrusion – Malicious Software – Firewalls – Trusted systems – Wireless Security - Mobile Device Security – Cloud Security

**Total Hours: 45**

**REFERENCES:**

1. William Stallings, "Cryptography & Network Security", Pearson Education, New Delhi 2005.
2. 2. C.Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks – Architecture and Protocols, Pearson Education, Second Edition.

**WEB REFERENCES:**

1. https://nptel.ac.in/courses/106/106/106106129/
2. https://nptel.ac.in/courses/106/105/106105162/

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Explore about attacks and gain ideas of handling it
2. Establish a view about mathematical concepts and key distribution methods.

5. Develop knowledge in detail and ensure ideas about wireless, Mobile device and Cloud security.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | H | - | L | M | - | M | - | M |
| CO2 | M | M | - | L | M | - | M | - | M |
| CO3 | M | H | - | M | H | M | M | - | M |
| CO4 | H | H | - | M | H | M | M | - | M |
| CO5 | H | H | - | H | H | M | M | - | M |

## Elective III: Ethical Hacking

**Semester III** **Hours of Instruction/week: 3**
**25MITC17C** **No. of credits: 3**

**COURSE OBJECTIVES:**

1. To learn to break into a network using various hacking tools.
2. To assess the state of the network
3. To analyse an organization's security posture

**UNIT I: Introduction to Hacking** **9**

**Principles of Hacking:** Introduction to Hacking - Principles of Ethical Hacking - Hacking Methodologies - Role of Ethical Hacker - Scope & limitations - Cyber Threats and Attacks - Hacking tools and techniques - Types of Hackers – Benefits of Ethical Hacking – Networks: LAN, MAN, WAN, PAN

**UNIT II: Penetration Testing & vulnerability assessment** **9**

**Overview of Penetration Testing / Vulnerability Assessment:** Penetration testing - White box testing - Black box testing - Grey box testing - Network penetration testing - Concept of PT - Phases - Vulnerability Assessment by Penetration testing – Levels of Vulnerability Assessment

**UNIT III: Viruses and Malwares** **9**

**Viruses and Malwares:** Introduction to Malware - Types of Malware Attacks - Viruses – worms - Trojans - Ransomware - Spywares - Adware - OS Level Attacks and Counter Measures - Malware Analysis – Spyware

**UNIT IV: Hacking Cyber Attacks** **9**

**Cyber Attacks:** SQL Injection: Reflected XSS, Stored XSS , DOM based XSS - DOS Attacks - Session Hijacking : Brute force HTTPS encryption , secure cookies - System Hacking - Social Engineering - Cryptojacking

**UNIT V: Introduction to Cryptography** **9**

**Cryptography:** Fundamentals of Cryptography - Encryption - Decryption - Types of Cryptography - Digital Signature, SSL, TLS - Cryptography Attacks - Digital Signatures - Authentication - Authorisation - DES - AES - MD5 - RSA

**Total Hours: 45**

**TEXT BOOKS:**

1. Diego Rodrigues , " KALI LINUX ETHICAL HACKING " , 2024 Edition
2. Abhinav Ojha , " Beginners Guide to Ethical Hacking and Cyber Security " , Khanna Publishers , 2023
3. Rishalin Pillay , Mohammed Abutheraa , " Ethical Hacking Workshop " , Packt Publishing, Limited , 2023

**REFERENCES:**

1. DANIEL. GRAHAM , "Ethical Hacking - A Hands-on Introduction to Breaking In " , No Starch Press , 2021

2. Thirumalesh , "The Complete Ethical Hacking Book - A Comprehensive Beginner's Guide to Learn and Master in Ethical Hacking " , OrangeBooks Publication , 2022

**WEB REFERENCES:**

1. https://www.coursera.org/learn/ethical-hacking-essentials-ehe

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Understand the different ethical hacking techniques.
2. Discover the vulnerabilities, loophole on web server and system.
3. Apply the knowledge of ethical hacking to perform tasks.
4. Prepare a vulnerability assessment and penetration test for a network
5. Execute a penetration test using standard hacking tools in an ethical manner.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | L | M | L | M | L | M |
| CO2 | H | L | M | L | L | M | M | L | M |
| CO3 | H | M | H | M | L | L | L | M | L |
| CO4 | M | H | M | H | M | L | H | H | M |
| CO5 | M | L | M | L | M | L | L | M | L |

## Internet of Things – Practical V

**Semester III** **Hours of Instruction/week: 4**
**25MITC18** **No. of credits: 2**

**COURSE OBJECTIVES:**

1. To correlate the graduates to get updated with a basic knowledge of electronics and Microprocessors.
2. To correlate how to analysis the IoT and to understand the ARDUINO Hardware and Software platform.
3. To infer security aspects of IoT and where the applications of IoT can be deployed.

**List of programs**

1. Controlling the Light Emitting Diode (LED) with a push button.
2. Interfacing the Traffic Signal with the Arduino.
3. Design a business advertisement using LCD Display.
4. Directional Control of the DC motor using Arduino.
5. Interfacing of temperature sensor LM35 with Arduino.
6. Interfacing Servo Motor with Ultrasonic Sensor.
7. Interfacing of the Active Buzzer with IR Sensor.
8. Interface the LED with Ultrasonic Sensor.
9. Build a Real time Implementation of Smart House.
10. Interfacing of the DHT 11 sensor with Node MCU and send a data to Cloud Storage.
11. Find a Object in the Restricted Area using PIR Sensor.
12. Control the Speed of the Stepper Motor using Arduino.
13. Interface the Servo Motor with 3X4 Keypad.
14. Create a Thinkspeak Cloud Storage Account.
15. Develop an Alarm System using RTC and Buzzer.

**Total Hours: 60**

**WEB REFERENCES:**

1.https://onlinecourses.swayam2.ac.in/ntr24_ed01/preview?utm_source=chatgpt.com

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Illustrate the architectural framework of IoT
2. Explain the concepts of IoT
3. Gain the knowledge to communicate with cloud Storage.
4. Focus the IoT Arduino microcontroller hardware and Software.
5. Understand the development board by using sensors.

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | M | - | M | - | - | H | M | - | H |
| CO2 | H | M | H | M | - | H | M | - | M |
| CO3 | - | - | M | - | - | - | M | M | L |
| CO4 | H | H | M | M | - | H | M | - | M |
| CO5 | H | M | M | - | - | H | M | - | L |

## Data Visualization – Practical VI

**Semester III** **Hours of Instruction/week: 6**
**25MITC19** **No.of credits: 3**

**COURSE OBJECTIVES:**

1. To equip students with hands-on experience in using data visualization tools like Tableau and Looker Studio for effective data analysis and reporting.
2. To enable students to apply data aggregation, filtering, joining, and blending techniques to analyze datasets efficiently.
3. To develop skills in creating interactive dashboards, advanced visualizations, and calculated fields to derive meaningful insights from data.

**List of Programs:**

**TABLEAU**

1. Creating and Configuring a Tableau Workbook
    a. Install Tableau Public, connect to a dataset, and configure data sources.
2. Exploring Data Aggregation Techniques
    a. Use SUM, AVG, COUNT, COUNT DISTINCT, MIN, MAX, MEDIAN, VARIANCE, and STANDARD DEVIATION on a dataset.
3. Data Connections and Extracts
    a. Connect to a text file and an Excel file, create an extract, apply extract filters, and update the extract.
4. Joining and Blending Data
    a. Perform an inner join and an outer join between two datasets. Use data blending to combine different sources.
5. Applying Filters in Tableau
    a. Implement different filters (basic, extract, quick, context, condition, data source, and top filters) on a dataset.
6. Creating and Using Calculated Fields
    a. Build numeric, string, date, and table calculations to analyze the dataset
7. Building Hierarchies, Groups, and Sets
    a. Create a hierarchy for geographic data, group similar categories, and define a dynamic set for category.
8. Visualizing Data with Charts
    a. Create bar, line, pie, bubble, bump, waterfall, bullet, area, and Pareto charts using a provided dataset.
9. Working with Maps in Tableau
    a. Design a heat map and a tree map to visualize geographic data.
10. Create Advanced Visualizations with Box Plot, Scatter Plot, and Histogram

**LOOKER STUDIO**

1. Connect to the Datasets from Google Sheets or CSV files and create a simple report by add a title, text descriptions, and a basic table displaying sample data.
2. Build Interactive Dashboards by Adding interactive elements like dropdowns and sliders, custom calculated fields
3. Create different Charts and Graphs to visualize data, Use Filters and Controls by Adding a date range control and Implement dropdown filters for specific
4. Blending Data Sources to Combine data from connectors
5. Visualize data using Geo Maps and Heatmaps

**Total Hours: 90**

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Install, configure, and work with Tableau Public and Looker Studio to connect and analyze datasets
2. Implement various data aggregation techniques, calculated fields, and filters to manipulate and interpret data.
3. Perform data joining, blending, and extraction to integrate multiple data sources for comprehensive analysis.
4. Design interactive dashboards and visualizations, including maps, heatmaps, and different types of charts, for effective data storytelling.
5. Apply advanced data visualization techniques, such as scatter plots, histograms, and Pareto charts, to extract insights and support decision-making

**CO-PO Mapping and Matrix**

| CO /PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | H | M | M | M | H | H | M | M |
| CO2 | H | H | H | M | M | H | H | H | M |
| CO3 | H | H | H | M | M | H | H | H | H |
| CO4 | H | H | H | M | M | H | H | H | H |
| CO5 | H | H | H | M | H | H | H | H | H |

## Software Project Management (Self Study)

**Semester III** **Hours of Instruction/week: 2**
**25MITC21** **No .of credits: 2**

**COURSE OBJECTIVES:**

1. To define basics of software project management
2. To understand the software evaluation, costing and estimation techniques
3. To experiment Risk Management and software quality management

**UNIT I SOFTWARE PROJECT MANAGEMENT CONCEPTS** **6**

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, identify activity risks, and Allocate resources

**UNIT II SOFTWARE EVALUATION AND COSTING** **6**

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, Structured methods

**UNIT III SOFTWARE ESTIMATION TECHNIQUES** **6**

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model

**UNIT IV RISK MANAGEMENT** **6**

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring

**UNIT V SOFTWARE QUALITY MANAGEMENT** **6**

TQM, Six Sigma, Software Quality: defining software quality, External Standards, Comparison of project management software's: dot Project, Launch pad, openProj. Case study: PRINCE2

**Total Hours: 30**

**TEXT BOOKS:**


1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw-Hill Publications, Fifth Edition 2012


**REFERENCES:**


1. S. A. Kelkar," Software Project Management" PHI, New Delhi, Third Edition ,2013.
2. Richard H.Thayer "Software Engineering Project Management,": IEEE Computer Society
3. Futrell, "Quality Software Project Management", Pearson Education India, 2008

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc19_cs70/preview
2. https://www.coursera.org/courses?query=software%20project%20management

**COURSE OUTCOMES:**

On successful completion of the course, the student will be able to

1. Describe the basics of project planning
2. Relate and apply project evaluation and approach
3. Extend the software estimation to project planning
4. Demonstrate how to manage risk and resource allocation
5. Infer the software quality

**CO-PO Mapping and Matrix**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | M | M | M | L | M | H | M | M |
| CO2 | H | H | H | M | M | M | H | M | H |
| CO3 | H | H | H | H | M | M | H | H | H |
| CO4 | H | H | H | H | M | H | H | H | H |
| CO5 | H | H | H | H | H | H | H | H | H |