HSNC Board's
# Smt. Chandibai Himathmal Mansukhani College
(Autonomous)
(Affiliated to the University of Mumbai )
University College Code : 217-JD Office : T14

HYDERABAD (SIND)
NATIONAL COLLEGIATE BOARD

Estd. 1965

Principal : Dr. Manju Lalwani Pathak

Ref No: CHM (A) AC/C/01/2025
Date: 18th June 2025

## CIRCULAR

The immediate attention of all concerned is invited to this office Circular No. CHM (A) AC 05/2025 dated 19th May, 2025 regarding the Choice Based and Credit Based Syllabus (CBCS) for all subjects of F.Y.B.Sc. & T.Y.B.Sc. in Computer Science SEM - I & SEM – V respectively.

It is hereby communicated that the recommendations of the syllabus made by the Ad-hoc Board of Studies in Computer Science coordinated by the Dean, Faculty of Applied Sciences in the meeting of Academic Council held on 23rd May, 2025 vide item No. 2.1, have been accepted and subsequently passed.

In accordance, therewith, the syllabus as per the CBCS has been brought into force with effect from the academic year 2025 – 2026 and accordingly the same is attached for reference and is available on the College's website www.chmcollege.in

Ulhasnagar - 421 003
18th June, 2025

**Dr. Manju Lalwani Pathak**
Principal & Chairperson, Academic Council

Copy forwarded for information to:-

1) The Dean, Faculty of Humanities.
2) The Chairperson, Ad-hoc Board of Studies.
3) The Controller of Examination.
4) The Registrar

HSNC Board's

**Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar**

**(Autonomous)**

**Affiliated to the University of Mumbai**

# T. Y. B. Sc. (Computer Science)

## (Self-Financing Course)

## Semester – V

**Choice Based and Credit Based syllabus**
**with effect from the Academic Year 2025-2026**

## PREAMBLE

The revised and restructured T.Y.B.Sc. Computer Science syllabus is designed to provide a comprehensive understanding of core computer science concepts, aligned with current industry demands and student aspirations. It aims to develop theoretical knowledge, practical skills, and competencies needed for success in the evolving tech landscape.

**Key Components:**

- **Core Modules:** These include foundational and advanced topics such as Artificial Intelligence, Cyber and Information Security, Data Science, and Cloud Computing, with an emphasis on computational thinking, problem-solving, and analytical skills.
- **Skill Enhancement Electives:** Students can specialize in areas like web development, cybersecurity, data mining, game programming, ethical hacking, and more, allowing customization based on career goals.
- **Generic Electives:** Interdisciplinary courses that broaden academic exposure beyond the core and electives.
- **Project Work:** Practical assignments and real-world projects promote application of knowledge, innovation, and creativity.
- **Assessment:** A combination of written exams, practical tasks, project evaluations, and presentations ensures a well-rounded evaluation of student performance.

The curriculum is industry-relevant, student-centric, and nation-focused, aiming to prepare graduates for roles in software development, data analysis, research, or further studies. Contributions from academic and industry experts have been incorporated to enhance the program's quality and relevance.

## PROGRAMME SPECIFIC OUTCOME (PSOs)

**PSO 1:** Graduates will be equipped with strong knowledge in key computer science areas, enabling them to develop effective software and system solutions.

**PSO 2:** Graduates will gain practical experience to apply theoretical knowledge in areas like ethical hacking, software testing, and server administration.

**PSO 3:** Graduates will gain specialized expertise aligned with their career goals and industry demands through skill enhancement and elective courses.

**PSO 4:** Graduates will possess computational thinking, analytical skills, and creativity, preparing them for research, innovation, and advanced studies in emerging areas of computer science.

**PSO 5:** Graduates will effectively convey technical information to both technical and non-technical audiences across various professional environments.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Artificial Intelligence

**with effect from**
**Academic Year 2025-2026**

## Title: Artificial Intelligence
## Course Code: CHM(A)USCS501

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course introduces the foundational concepts and core techniques of Artificial Intelligence (AI), guiding students through key topics such as intelligent agents, problem-solving strategies, knowledge representation, reasoning, machine learning, and probabilistic models. Emphasizing both theory and practical application, the course equips students with the skills needed to design, develop, and implement intelligent systems capable of making informed decisions. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Theory + Practicum + Teaching methods (Lectures, Problem Solving, Discussion, Presentation, Case Study, Simulations, Interdisciplinary Approach, etc.) |
| 4 | **Credit** | 3 Credits |
| 5 | **Hours allotted** | 38 Hours |
| 6 | **Marks allotted** | 75 Marks |
| 7 | **Course Objectives:**<br><br>1. Grasp the fundamental concepts, historical evolution, and current advancements in the field of Artificial Intelligence.<br>2. Understand the architecture of intelligent agents and how they interact with their environments.<br>3. Explore various problem-solving methods, including both uninformed and informed search algorithms.<br>4. Learn and apply techniques of knowledge representation and reasoning to address complex real-world challenges.<br>5. Acquire a solid foundation in machine learning, focusing on core techniques such as classification, regression, and ensemble methods. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1:** Demonstrate understanding of the fundamental principles and core concepts of Artificial Intelligence.<br>**LO2:** Design and evaluate intelligent agents tailored to specific environments and tasks and apply appropriate problem-solving algorithms to address a variety of problems. | |

| | |
|---|---|
| | **LO3:** Develop and utilize knowledge representation models and reasoning techniques to infer new insights.<br>**LO4:** Implement and assess machine learning algorithms, focusing on classification and regression tasks.<br>**LO5:** Understanding the foundations of Generative AI and explore its applications in creating content such as text, images etc. |
| 9 | **Syllabus**<br>**UNIT I:**<br>• **Introduction to AI and Intelligent Agents:**<br>➢ **What Is AI:** Foundations, History and State of the Art of AI<br>➢ **Intelligent Agents:** Agents and Environments, Nature of Environments, Structure of Agents.<br>➢ **Problem Solving by searching:** Problem-Solving Agents, Uninformed Search Strategies, Informed (Heuristic) Search Strategies<br>**UNIT II:**<br>• **Knowledge Representation, Reasoning, and Machine Learning**<br>➢ **Knowledge Representation and Reasoning:** Knowledge Representation and different forms, Reasoning, Planning, Uncertainty in Knowledge Fuzzy Logic & Fuzzification<br>➢ **Machine Learning**: Forms of Learning, Parametric & Non-Parametric Models, Classification, Regression, Regularization, Decision Trees, SVM, Artificial Neural Networks, Ensemble Learning, Boosting, K-NN, Gradient Descent<br>**UNIT III:**<br>• **Probabilistic Models, Unsupervised Learning, and Reinforcement Learning, Introduction to Generative AI**<br>➢ **Probabilistic models:** Naive Bayes Classifier<br>➢ **Unsupervised Learning**: Concept of Unsupervised learning, Association Rule Mining<br>➢ **Reinforcement learning:** Concept of Reinforcement learning, Q-Learning, Hidden Markov Model<br>➢ **Introduction to Generative AI:** Concept of Generative AI. Evolution from traditional AI to generative models. Introduction to Generative Models: GANs, VAEs, Diffusion Models, Flow model and Transformers (e.g. GPT). Applications of Generative AI. |

**10** **Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 75 marks Time: 02:30 hours**

Format of Question Paper

| | **All Questions are compulsory** | | |
|---|---|---|---|
| **Question** | **Based on** | **Options** | **Marks** |
| Q.1) | Unit I | Any 4 out of 6 | 20 |
| Q.2) | Unit II | Any 4 out of 6 | 20 |
| Q.3) | Unit III | Any 4 out of 6 | 20 |
| Q.4) | Unit I, II and III | Any 5 out of 6 | 15 |
| | | | **Total 75** |

**Internal Examination: Continuous Evaluation - 25 marks**

| | **Assessment / Evaluation** | **Marks** |
|---|---|---|
| 1. | **Mid-Term Class Test –**<br>It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment)<br>The test should have 15 MCQ's which should be solved in a time duration of 30 minutes. | 15 |
| 2. | **Assignment/ Case study/ Presentations -**<br>Assignment / Case Study Report / Presentation can be uploaded on any learning management system. | 10 |
| | **Total:** | **25** |

**11** **REFERENCES:**


1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson, 2010.
2. Artificial Intelligence: Foundations of Computational Agents, David L Poole,Alan K. Mackworth, 2nd Edition, Cambridge University Press ,2017.
3. Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017 3) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2013.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Artificial Intelligence - Practical

**with effect from**
**Academic Year 2025-2026**

## Title: Artificial Intelligence - Practical
## Course Code: CHM(A)USCSP501

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course introduces the foundational concepts and core techniques of Artificial Intelligence (AI), guiding students through key topics such as intelligent agents, problem-solving strategies, knowledge representation, reasoning, machine learning, and probabilistic models. Emphasizing both theory and practical application, the course equips students with the skills needed to design, develop, and implement intelligent systems capable of making informed decisions. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Practical |
| 4 | **Credit** | 1 Credit |
| 5 | **Hours allotted** | 30 Hours |
| 6 | **Marks allotted** | 50 Marks |
| 7 | **Course Objectives**:<br><br>1. Grasp the fundamental concepts, historical evolution, and current advancements in the field of Artificial Intelligence.<br>2. Understand the architecture of intelligent agents and how they interact with their environments.<br>3. Explore various problem-solving methods, including both uninformed and informed search algorithms.<br>4. Learn and apply techniques of knowledge representation and reasoning to address complex real-world challenges.<br>5. Acquire a solid foundation in machine learning, focusing on core techniques such as classification, regression, and ensemble methods. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1: Implement Key AI and ML Algorithms** – Gain hands-on experience with algorithms like DFS, A*, Decision Trees, SVM, and Neural Networks.<br>**LO2: Evaluate Model Performance** – Analyze and compare the accuracy, efficiency, and effectiveness of various machine learning models. | |

| | |
|---|---|
| | **LO3: Apply Data Mining Techniques** – Discover patterns and associations in data using methods like association rule mining.<br>**LO4: Explore Generative AI** – Develop and assess AI models that generate human-like text and images based on prompts.<br>**LO5: Use Industry Tools** – Demonstrate the use of modern AI tools and frameworks like OpenAI and TensorFlow in real-world applications. |
| 9 | **Syllabus**<br><br>**Practical 1. Iterative Depth First Search and A* Search**<br>a) Implement the Iterative Depth First Search algorithm to solve the same problem.<br>b) Implement the A* Search algorithm for solving a pathfinding problem.<br>c) Compare the performance and efficiency of both algorithms.<br>**Practical 2. Decision Tree Learning**<br>a) Implement the Decision Tree Learning algorithm to build a decision tree for a given dataset.<br>b) Evaluate the accuracy and effectiveness of the decision tree on test data.<br>c) Visualize and interpret the generated decision tree.<br>**Practical 3. Feed Forward Backpropagation Neural Network**<br>a) Implement the Feed Forward Backpropagation algorithm to train a neural network.<br>b) Use a given dataset to train the neural network for a specific task.<br>c) Evaluate the performance of the trained network on test data.<br>**Practical 4. Support Vector Machines (SVM)**<br>a) Implement the SVM algorithm for binary classification.<br>b) Train an SVM model using a given dataset and optimize its parameters.<br>c) Evaluate the performance of the SVM model on test data and analyze the results.<br>**Practical 5. Adaboost Ensemble Learning**<br>a) Implement the Adaboost algorithm to create an ensemble of weak classifiers.<br>b) Train the ensemble model on a given dataset and evaluate its performance.<br>c) Compare the results with individual weak classifiers.<br>**Practical 6. Naive Bayes' Classifier**<br>a) Implement the Naive Bayes' algorithm for classification.<br>b) Train a Naive Bayes' model using a given dataset and calculate class probabilities.<br>c) Evaluate the accuracy of the model on test data and analyze the results.<br>**Practical 7. K-Nearest Neighbors (K-NN)**<br>a) Implement the K-NN algorithm for classification or regression.<br>b) Apply the K-NN algorithm to a given dataset and predict the class or value for test data.<br>c) Evaluate the accuracy or error of the predictions and analyze the results.<br>**Practical 8. Association Rule Mining**<br>a) Implement the Association Rule Mining algorithm (e.g., Apriori) to find frequent item-sets.<br>b) Generate association rules from the frequent item-sets and calculate their support<br>c) and confidence. |

d) Interpret and analyze the discovered association rules.

**Practical 9. Generative AI**

a) Implement a generative model to generate human-like text based on a user-defined prompt.

b) Implement a generative model to generate an image based on a user-defined text prompt.

c) Evaluate the effectiveness and quality of the generated text and image based on the user's input, assessing coherence, relevance, and accuracy in representation.

**Practical 10. Demo of OpenAI/TensorFlow Tools**

a) Explore and experiment with OpenAI or TensorFlow tools and libraries.

b) Perform a demonstration or mini-project showcasing the capabilities of the tools.

c) Discuss and present the findings and potential applications.

**10**

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 50 marks Time: 02:00 hours**

Format of Question Paper

| Sr. No. | Details | Marks |
|---|---|---|
| 1. | Practical | 40 |
| 2. | Journal | 05 |
| 3. | Viva | 05 |
| | **Total:** | **50** |

**Note:**

- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam
- The final submission and evaluation of journal in electronic form using a Learning Management System / Platform can be promoted by department.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Information and Network Security

**with effect from**
**Academic Year 2025-2026**

## Title: Information and Network Security
## Course Code: CHM(A)USCS502

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course offers a comprehensive exploration of the principles and methods essential to computer and network security. Students will delve into a wide range of security topics, such as encryption techniques, public-key cryptography, key management, message authentication, digital signatures, and authentication protocols. The course also covers network security measures, web security protocols, intrusion detection systems. Through a combination of theoretical learning and practical exercises, students will gain the expertise needed to analyze, design, and implement secure systems while effectively safeguarding against security threats. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Theory + Practicum + Teaching methods (Lectures, Problem Solving, Discussion, Presentation, Case Study, Simulations, Interdisciplinary Approach, etc.) |
| 4 | **Credit** | 3 Credits |
| 5 | **Hours allotted** | 38 Hours |
| 6 | **Marks allotted** | 75 Marks |
| 7 | **Course Objectives:**<br>1. Introduce students to the core principles, models, and mechanisms underlying computer and network security.<br>2. Explore a variety of encryption techniques, such as symmetric and public-key cryptography, while analyzing their strengths, limitations, and practical applications.<br>3. Investigate different authentication techniques and key management systems designed to ensure secure communication and prevent unauthorized access.<br>4. Understand the methods and protocols for message authentication, digital signatures, and authentication protocols used in secure communication systems.<br>5. Examine network security strategies, including IP security, web security protocols (e.g., SSL/TLS), End-to-End Encryption (E2EE), intrusion detection systems. | |

| | |
|---|---|
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1:** Analyze and assess current security trends, identify potential attacks, and propose effective countermeasures based on the OSI security framework.<br>**LO2:** Apply traditional encryption methods, such as substitution and transposition ciphers, to securely encrypt and decrypt data while evaluating their effectiveness and security risks.<br>**LO3:** Implement and demonstrate public-key cryptography techniques, including RSA, to securely exchange keys and establish encrypted communication channels.<br>**LO4:** Design and implement robust authentication protocols, such as message authentication codes (MACs) and digital signatures, ensuring data integrity and preventing repudiation. non-repudiation.<br>**LO5:** Evaluate and deploy security mechanisms like IP security, SSL/TLS for web security, and intrusion detection systems to safeguard networks and systems against unauthorized access and threats. |
| 9 | **Syllabus**<br>**UNIT I:**<br>• **Introduction**: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms<br>• **Classical Encryption Techniques**: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers<br>• **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, The RSA Algorithm<br><br>**UNIT II:**<br>• **Key Management:** Public-Key Cryptosystems, Key Management, Diffie-Hellman Key Exchange.<br>• **Message Authentication and Hash Functions:** Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC.<br>• **Digital Signatures and Authentication:** Digital Signatures, Authentication Protocols, Digital Signature Standard.<br>• **Authentication Applications:** Kerberos, X.509 Authentication, Public-Key Infrastructure. |

**UNIT III:**

- **Electronic Mail Security:** Pretty Good Privacy, S/MIME.
- **Securing Messaging Applications with End-to-End Encryption:** Introduction to Messaging App Security, Definition and working principle of E2EE. E2EE vs. Transport Layer Encryption (e.g., TLS). Features of End-to-End Encryption (E2EE).
- **Cryptographic Algorithms Used in E2EE:** Symmetric Encryption (AES), Asymmetric Encryption such as RSA, Elliptic Curve Cryptography (ECC) and Hash Functions & MACs.
- **IP Security:** Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management
- **Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction
- **Intrusion:** Intruders, Intrusion Techniques, Intrusion Detection

**10**

**Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 75 marks Time: 02:30 hours**

Format of Question Paper

| | **All Questions are compulsory** | | |
|---|---|---|---|
| **Question** | **Based on** | **Options** | **Marks** |
| Q.1) | Unit I | Any 4 out of 6 | 20 |
| Q.2) | Unit II | Any 4 out of 6 | 20 |
| Q.3) | Unit III | Any 4 out of 6 | 20 |
| Q.4) | Unit I, II and III | Any 5 out of 6 | 15 |
| | | | **Total 75** |

**Internal Examination: Continuous Evaluation- 25 marks**

| | **Assessment / Evaluation** | **Marks** |
|---|---|---|
| 1. | **Mid-Term Class Test –**<br>It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment)<br>The test should have 15 MCQ's which should be solved in a time duration of 30 minutes. | 15 |
| 2. | **Assignment/ Case study/ Presentations -**<br>Assignment / Case Study Report / Presentation can be uploaded on any learning management system. | 10 |
| | **Total** | **25** |

| | |
|---|---|
| 11 | **REFERENCES:**<br>1. Cryptography and Network Security: Principles and Practice 7th edition, William Stallings, Pearson<br>2. Cryptography and Network, 2nd edition, Behrouz A Fourouzan, Debdeep Mukhopadhyay, TMH.<br>3. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill. |

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

# Title: Information and Network Security - Practical

**with effect from**
**Academic Year 2025-2026**

## Title: Information and Network Security – Practical
## Course code: CHM(A)USCSP502

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course offers a comprehensive exploration of the principles and methods essential to computer and network security. Students will delve into a wide range of security topics, such as encryption techniques, public-key cryptography, key management, message authentication, digital signatures, and authentication protocols. The course also covers network security measures, web security protocols, intrusion detection systems. Through a combination of theoretical learning and practical exercises, students will gain the expertise needed to analyze, design, and implement secure systems while effectively safeguarding against security threats. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Practical |
| 4 | **Credit** | 1 Credit |
| 5 | **Hours allotted** | 30 Hours |
| 6 | **Marks allotted** | 50 Marks |
| 7 | **Course Objectives:**<br>1. Introduce students to the core principles, models, and mechanisms underlying computer and network security.<br>2. Explore a variety of encryption techniques, such as symmetric and public-key cryptography, while analyzing their strengths, limitations, and practical applications.<br>3. Investigate different authentication techniques and key management systems designed to ensure secure communication and prevent unauthorized access.<br>4. Understand the methods and protocols for message authentication, digital signatures, and authentication protocols used in secure communication systems.<br>5. Examine network security strategies, including IP security, web security protocols (e.g., SSL/TLS), End-to-End Encryption (E2EE), intrusion detection systems. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1: Apply Classical and Modern Cryptographic Techniques:** Students will be able to design and implement classical encryption methods (Substitution, Transposition) and modern cryptographic algorithms (RSA, AES) to ensure data confidentiality and integrity.<br>**LO2: Implement Secure Communication Protocols:** Students will configure secure communication protocols like SSL/TLS and IPsec to protect data transmission across networks and understand certificate management and session security. | |

| | |
|---|---|
| | **LO3: Ensure Data Authentication and Integrity**: Students will implement Message Authentication Codes (MACs) and Digital Signature algorithms to validate message authenticity and integrity in digital communications.<br>**LO4: Deploy Network Security Measures:** Students will be able to configure and manage security mechanisms such as Firewalls, Intrusion Detection Systems (IDS), and rule-based traffic filtering to detect and prevent unauthorized access or attacks.<br>**LO5: Demonstrate Key Management and Exchange Skills:** Students will implement secure key exchange mechanisms (e.g., Diffie-Hellman) and understand the principles of end-to-end encryption to protect information in transit across insecure networks. |
| 9 | **Syllabus**<br><br>**Practical 1.** **Implementing Substitution and Transposition Ciphers:** Design and implement algorithms to encrypt and decrypt messages using classical substitution and transposition techniques.<br>**Practical 2.** **RSA Encryption and Decryption:** Implement the RSA algorithm for public-key encryption and decryption, and explore its properties and security considerations.<br>**Practical 3.** **Message Authentication Codes:** Implement algorithms to generate and verify message authentication codes (MACs) for ensuring data integrity and authenticity.<br>**Practical 4.** **Digital Signatures:** Implement digital signature algorithms such as RSA-based signatures, and verify the integrity and authenticity of digitally signed messages.<br>**Practical 5.** **Key Exchange using Diffie-Hellman:** Implement the Diffie-Hellman key exchange algorithm to securely exchange keys between two entities over an insecure network.<br>**Practical 6.** **IP Security (IPsec) Configuration:** Configure IPsec on network devices to provide secure communication and protect against unauthorized access and attacks.<br>**Practical 7.** **Web Security with SSL/TLS:** Configure and implement secure web communication using SSL/TLS protocols, including certificate management and secure session establishment.<br>**Practical 8.** **Intrusion Detection System:** Set up and configure an intrusion detection system (IDS) to monitor network traffic and detect potential security breaches or malicious activities<br>**Practical 9.** **End-to-End Encryption:** Implement cryptographic algorithms such as RSA and AES to demonstrate End-to-End Encryption (E2EE), ensuring message confidentiality and integrity.<br>**Practical 10.** **Firewall Configuration and Rule-based Filtering:** Configure and test firewall rules to control network traffic, filter packets based on specified criteria, and protect network resources from unauthorized access |

| | |
|---|---|
| **10** | **Scheme of Examination and Assessment Pattern**<br>Paper – 50 Marks<br>**External Examination: Semester End External - 50 marks Time: 02:00 hours**<br>Format of Question Paper |

| Sr. No. | Details | Marks |
|---|---|---|
| 1. | Practical | 40 |
| 2. | Journal | 05 |
| 3. | Viva | 05 |
| | **Total:** | **50** |

**Note:**

- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam.
- The final submission and evaluation of journal in electronic form using a Learning Management System / Platform can be promoted by department.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Linux Server Administration

**with effect from**
**Academic Year 2025-2026**

## Title: Linux Server Administration
## Course Code: CHM(A)USCS5031

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course delivers a thorough understanding of Linux server administration, covering essential topics such as different Linux distributions, software management, user and group administration, file systems, core system services, networking, and security. Students will also delve into advanced internet services. Through practical hands-on exercises and real-world case studies, students will enhance their skills and gain valuable experience in managing Linux servers effectively. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Theory + Practicum + Teaching methods (Lectures, Problem Solving, Discussion, Presentation, Case Study, Simulations, Interdisciplinary Approach, etc.) |
| 4 | **Credit** | 3 Credits |
| 5 | **Hours allotted** | 38 Hours |
| 6 | **Marks allotted** | 75 Marks |
| 7 | **Course Objectives:**<br>1. Develop a comprehensive understanding of the fundamental principles and concepts in Linux server administration.<br>2. Acquire practical skills for managing users, groups, and file systems within a Linux environment.<br>3. Learn to configure and secure key network services, such as DNS, FTP, Apache web server, SMTP, POP, IMAP, and SSH.<br>4. Gain expertise in advanced network administration, including NFS, Samba, DFS, NIS, LDAP, DHCP, MySQL, LAMP applications, file services, email services, chat applications, and VPN. | |

| | |
|---|---|
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1:** Demonstrate expertise in managing software packages and repositories within a Linux system.<br>**LO2:** Configure and oversee user accounts, groups, and permissions efficiently in a Linux environment.<br>**LO3:** Set up and secure key network services, such as DNS, FTP, and web servers.<br>**LO4:** Design and administer advanced network services like NFS, Samba, and LDAP to facilitate effective file sharing and user authentication.<br>**LO5:** Apply troubleshooting techniques to identify and resolve common issues in Linux server administration. |
| 9 | **Syllabus**<br>**UNIT I:**<br>• **Introduction:** Technical Summary of Linux Distributions, Managing Software.<br>• **Single-Host Administration:** Booting and shutting down processes. File Systems, Process of configuring.<br>• **Networking and Security:** TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security.<br>• **Backup, Scheduling, and Log Management: B**ackup types, tools, and scheduling, automates tasks (with cron and system), Manage logs (with journalctl and logrotate).<br><br>**UNIT II:**<br>• **Internet Services:** Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMPT), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network authentication system (Kerberos), Security.<br><br>**UNIT III:**<br>• **Network and Application Services:** Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host configuration Protocol (DHCP), MySQL, LAMP Applications, File Services, Email Services, Chat applications, Virtual Private Networking. |

**10** **Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 75 marks Time: 02:30 hours**

Format of Question Paper

| | **All Questions are compulsory** | | |
|---|---|---|---|
| **Question** | **Based on** | **Options** | **Marks** |
| Q.1) | Unit I | Any 4 out of 6 | 20 |
| Q.2) | Unit II | Any 4 out of 6 | 20 |
| Q.3) | Unit III | Any 4 out of 6 | 20 |
| Q.4) | Unit I, II and III | Any 5 out of 6 | 15 |
| | | **Total** | **75** |

**Internal Examination: Continuous Evaluation- 25 marks**

| | **Assessment / evaluation** | **Marks** |
|---|---|---|
| 1. | **Mid-Term Class Test –**<br>It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment).<br>The test should have 15 MCQ's which should be solved in a time duration of 30 minutes. | 15 |
| 2. | **Assignment/ Case study/ Presentations -**<br>Assignment / Case Study Report / Presentation can be uploaded on any learning management system. | 10 |
| | **Total:** | **25** |

**11** **REFERENCES:**


1. Linux Administration: A Beginner's Guide, Wale Soyinka, Seventh Edition, McGraw-Hill Education, 2016
2. Ubuntu Server Guide, Ubuntu Documentation Team, 2016
3. Mastering Ubuntu Server, Jay LaCroix, PACKT Publisher, 2016

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

# Title: Linux Server Administration - Practical

**with effect from**
**Academic Year 2025-2026**

## Title: Linux Server Administration-Practical

## Course code: CHM(A)USCSP5031

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course delivers a thorough understanding of Linux server administration, covering essential topics such as different Linux distributions, software management, user and group administration, file systems, core system services, networking, and security. Students will also delve into advanced internet services. Through practical hands-on exercises and real-world case studies, students will enhance their skills and gain valuable experience in managing Linux servers effectively. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Practical |
| 4 | **Credit** | 1 Credit |
| 5 | **Hours allotted** | 30 Hours |
| 6 | **Marks allotted** | 50 Marks |
| 7 | **Course Objectives:**<br><br>1. Develop a comprehensive understanding of the fundamental principles and concepts in Linux server administration.<br>2. Acquire practical skills for managing users, groups, and file systems within a Linux environment.<br>3. Learn to configure and secure key network services, such as DNS, FTP, Apache web server, SMTP, POP, IMAP, and SSH.<br>4. Gain expertise in advanced network administration, including NFS, Samba, DFS, NIS, LDAP, DHCP, MySQL, LAMP applications, file services, email services, chat applications, and VPN. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1: System Administration and Configuration Proficiency** Students will be able to perform essential Linux system administrative tasks such as user management, service configuration, network settings, log management, and automation through scheduling and backup strategies.<br>**LO2: Network Services Setup and Management** Students will gain hands-on experience in installing, configuring, and managing core network services such as NTP (time | |

| | |
|---|---|
| | synchronization), DNS (domain resolution), DHCP (dynamic IP allocation), and SSH (remote server access), across Linux and Windows environments.<br>**LO3:** **Server-Side Protocols and Authentication Management** Students will be able to configure secure authentication mechanisms and directory services using LDAP, NIS, and SSH, enabling centralized user and service management in networked environments.<br>**LO4:** **File and Resource Sharing Across Platforms** Students will be equipped to configure and manage file sharing systems using NFS (for Unix/Linux) and Samba (for Windows/Linux interoperability), facilitating effective cross-platform resource sharing.<br>**LO5:** **Database and Web-based Interface Configuration** Students will be able to install and configure database servers (MySQL) and use web-based administration tools like phpMyAdmin and phpLDAPadmin, enhancing their ability to manage backend services via graphical interfaces. |
| 9 | **Syllabus**<br>**Practical 1.** Implementation of Linux Backup, Scheduling, and Log Management<br>**Practical 2.** **Initial settings:** Add a User, Network Settings, change to static IP address, Disable IPv6 if not needed, Configure Service, display the list of services which are running. Stop and turn OFF auto-start setting for a service if you don't need it, Sudo Settings<br>**Practical 3.** Configure NP Server (NTPd), Install and configure NTPd, Configure NTP Client (Ubuntu and Windows)<br>**Practical 4.** **SSH Server:** Password Authentication Configure SSH server to manage a server from the remote computer, SSH Client: (Ubuntu and Windows)<br>**Practical 5.** Install DNS server BIND, Configure DNS server which resolves domain name or IP address, Install BIND 9, Configure BIND, Limit ranges You allow to access if needed.<br>**Practical 6.** Configure DHCP Server, Configure DHCP (Dynamic Host Configuration Protocol) Server, Configure NFS server to share directories on your NFS, Configure NFS Client. (Ubuntu and Windows Client OS)<br>**Practical 7.** Configure LDDAP Server, Configure LDAP Server in order to share users' accounts in your local networks, Add LDAP User Accounts In the networks. Install phpLDAPadmin to operate LDAP server via Web browser.<br>**Practical 8.** Configure NIS Server in order to share users; accounts in your local networks, Configure NIS Client to bind NIS Server.<br>**Practical 9.** Install MySQL to configure database server, Install phpMyAdmin to operate MySQL on web browser from Clients.<br>**Practical 10.** Install Samba to share folders or files between Windows and Linux |

| | |
|---|---|
| **10** | **Scheme of Examination and Assessment Pattern**<br>Paper – 50 Marks<br>**External Examination: Semester End External - 50 marks Time: 02:00 hours**<br>Format of Question Paper |

| Sr. No. | Details | Marks |
|---|---|---|
| 1. | Practical | 40 |
| 2. | Journal | 05 |
| 3. | Viva | 05 |
| | **Total:** | **50** |

**Note:**

- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam.
- The final submission and evaluation of journal in electronic form using a Learning Management System / Platform can be promoted by department.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Cyber Forensics

**with effect from**
**Academic Year 2025-2026**

## Title: Cyber Forensics

## Course Code: CHM(A)USCS5041

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course offers a foundational exploration of computer forensics, emphasizing the investigation and examination of digital evidence across diverse environments. Students will engage with core concepts of digital investigations, learn procedures for handling crime scenes, and become proficient in data acquisition techniques. The course also includes in-depth coverage of forensic tools and software used in analyzing evidence from computers, networks, mobile devices, and emails. Emphasis is placed on both technical processes and effective forensic reporting. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Theory + Practicum + Teaching methods (Lectures, Problem Solving, Discussion, Presentation, Case Study, Simulations, Interdisciplinary Approach, etc.) |
| 4 | **Credit** | 3 Credits |
| 5 | **Hours allotted** | 38 Hours |
| 6 | **Marks allotted** | 75 Marks |
| 7 | **Course Objectives:**<br>1. To introduce the key principles and methodologies used in computer forensic investigations.<br>2. To develop the ability to perform systematic digital investigations and follow proper forensic procedures.<br>3. To build expertise in collecting, preserving, and analyzing evidence from multiple digital sources and formats.<br>4. To familiarize students with a range of professional forensic tools and technologies.<br>5. To understand investigative methods for network-related incidents, email forensics, and mobile device analysis. | |

| | |
|---|---|
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br><br>**LO1:** Explain the core theories, tools, and practices involved in computer forensic investigations.<br>**LO2:** Conduct digital evidence acquisition and analysis using standardized and lawful procedures.<br>**LO3:** Utilize a variety of forensic tools to investigate and interpret digital artifacts.<br>**LO4:** Carry out effective forensic investigations on networks, email systems, and mobile devices.<br>**LO5:** Prepare detailed forensic reports that present investigation findings clearly and accurately. |
| 9 | **Syllabus**<br><br>**UNIT I:**<br>• **Introduction:** six A's of Digital Forensics, Digital Investigations and Evidence, Digital Crime Scene Investigation Process.<br>• **Computer Investigations:** Preparing a Computer Investigation, Taking a Systematic Approach, Procedures for Corporate High-Tech Investigations, Understanding Data Recovery Workstations and Software.<br>• **Data Acquisition:** Storage Formats for Digital Evidence, Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions.<br><br>**UNIT II:**<br>• **Processing Crime and Incident Scenes:** Identifying Digital Evidence, Preparing for a Search, Securing a Computer Incident or Crime Scene, Seizing Digital Evidence at the Scene, Storing Digital Evidence.<br>• **Current Computer Forensics Tools:** Evaluating Computer Forensics Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools.<br>• **Computer Forensics Analysis and Validation:** Determining What Data to Collect and Analyze, Validating Forensic Data, Addressing Data-Hiding Techniques, Performing Remote Acquisitions.<br>• **Recovering Graphics Files:** Recognizing a Graphics File, Locating and Recovering Graphics Files, Identifying Unknown File Formats.<br><br>**UNIT III:**<br>• **Network Forensics and Live Acquisitions:** Network Forensics Overview, Performing Live Acquisitions, Developing Standard Procedures for Network Forensics, Using Network Tools.<br>• **E-mail Investigations:** Role of E-mail in Investigations, Investigating E mail Crimes and Violations, Using Specialized E-mail Forensics Tools. |

- **Cell Phone and Mobile Device Forensics:** Overview, Acquisition Procedures for Cell Phones and Mobile Devices.
- **Report Writing for Investigations:** Importance of Reports, Guidelines for Writing Reports, Generating Report Findings with Forensics Software Tools.

**10**

**Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 75 marks Time: 02:30 hours**

Format of Question Paper

| | **All Questions are compulsory** | | |
|---|---|---|---|
| **Question** | **Based on** | **Options** | **Marks** |
| Q.1) | Unit I | Any 4 out of 6 | 20 |
| Q.2) | Unit II | Any 4 out of 6 | 20 |
| Q.3) | Unit III | Any 4 out of 6 | 20 |
| Q.4) | Unit I, II and III | Any 5 out of 6 | 15 |
| | | | **Total 75** |

**Internal Examination: Continuous Evaluation- 25 marks**

| | **Assessment / evaluation** | **Marks** |
|---|---|---|
| 1. | **Mid-Term Class Test –**<br>It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment)<br>The test should have 15 MCQ's which should be solved in a time duration of 30 minutes. | 15 |
| 2. | **Assignment/ Case study/ Presentations -**<br>Assignment / Case Study Report / Presentation can be uploaded on any learning management system. | 10 |
| | | **Total 25** |

**11**

**REFERENCES:**


1. Bill Nelson,Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations", course technology,6th edition.
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics",Tata McGrawHill

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Cyber Forensics - Practical

**with effect from**
**Academic Year 2025-2026**

## Title: Cyber Forensics – Practical
## Course code: CHM(A)USCSP5041

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course offers a foundational exploration of computer forensics, emphasizing the investigation and examination of digital evidence across diverse environments. Students will engage with core concepts of digital investigations, learn procedures for handling crime scenes, and become proficient in data acquisition techniques. The course also includes in-depth coverage of forensic tools and software used in analyzing evidence from computers, networks, mobile devices, and emails. Emphasis is placed on both technical processes and effective forensic reporting. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Practical |
| 4 | **Credit** | 1 Credit |
| 5 | **Hours allotted** | 30 Hours |
| 6 | **Marks allotted** | 50 Marks |
| 7 | **Course Objectives:**<br>1. To introduce the key principles and methodologies used in computer forensic investigations.<br>2. To develop the ability to perform systematic digital investigations and follow proper forensic procedures.<br>3. To build expertise in collecting, preserving, and analyzing evidence from multiple digital sources and formats.<br>4. To familiarize students with a range of professional forensic tools and technologies.<br>5. To understand investigative methods for network-related incidents, email forensics, and mobile device analysis. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br>**LO1: Perform Volatile and Non-Volatile Data Extraction:** Demonstrate the ability to extract and analyze volatile data such as active processes, registry information, and network connections from memory dumps using forensic tools. | |

| | |
|---|---|
| | **LO2: Create and Validate Forensic Images:** Apply industry-standard tools like FTK Imager or EnCase Imager to create forensic disk images, verify their integrity, and conduct structured analysis for evidence extraction.<br>**LO3: Conduct Network and System Activity Analysis:** Utilize tools such as Wireshark and Sysinternals Suite to capture and interpret network packets and monitor system processes, memory, and disk activity for forensic investigation.<br>**LO4: Execute File Recovery and Steganography Detection:** Recover deleted files using manual and tool-based methods, and identify hidden data within digital files through steganographic analysis to uncover concealed evidence.<br>**LO5: Investigate Digital Artifacts from Mobile, Email, and Web Browsers:** Perform forensic examinations on mobile devices, emails, and web browsers to retrieve logs, trace user activity, and detect anomalies or tampering for investigation. |
| 9 | **Syllabus**<br><br>**Practical 1. Analyze the memory dump of a running computer system.**<br>a) Extract volatile data, such as open processes, network connections, and registry information.<br><br>**Practical 2. Creating a Forensic Image using FTK Imager/Encase Imager:**<br>a) Creating Forensic Image<br>b) Check Integrity of Data<br>c) Analyze Forensic Image<br><br>**Practical 3. Data Acquisition:**<br>a) Perform data acquisition using:<br>b) USB Write Blocker + Encase Imager<br>c) SATA Write Blocker + Encase Imager.<br>d) Falcon Imaging Device<br><br>**Practical 4. Capturing and analyzing network packets using Wireshark (Fundamentals):**<br>a) Identification the live network<br>b) Capture Packets<br>c) Analyze the captured packets<br><br>**Practical 5. Using Sysinternals tools for Network Tracking and Process Monitoring:**<br>a) Check Sysinternals tools<br>b) Monitor Live Processes<br>c) Capture RAM<br>d) Capture TCP/UDP packets<br>e) Monitor Hard Disk<br>f) Monitor Virtual Memory<br>g) Monitor Cache Memory |

**Practical 6. Recovering and inspecting deleted files**

a) Check for Deleted Files
b) Recover the Deleted Files
c) Analyzing and inspecting the recovered files
d) Perform this using recovery option in ENCASE and also Perform manually through command line

**Practical 7. Steganography Detection**

a) Detect hidden information or files within digital images using steganography analysis tools.
b) Extract and examine the hidden content.

**Practical 8. Mobile Device Forensics**

a) Perform a forensic analysis of a mobile device, such as a smartphone or tablet.
b) Retrieve call logs, text messages, and other relevant data for investigative purposes.

**Practical 9. Email Forensics**

a) Analyze email headers and content to trace the origin of suspicious emails.
b) Identify potential email forgeries or tampering.

**Practical 10. Web Browser Forensics**

a) Analyze browser artifacts, including history files, bookmarks, and download records.
b) Analyze cache and cookies data to reconstruct user-browsing history and identify visited websites or online activities.
c) Extract the relevant log or timestamp file, analyze its contents and interpret the timestamp data to determine the user's last internet activity and associated details.

**10**

**Scheme of Examination and Assessment Pattern**

Paper – 50 Marks

**External Examination: Semester End External - 50 marks Time: 02:00 hours**

Format of Question Paper

| Sr. No. | Details | Marks |
|---|---|---|
| 1. | Practical | 40 |
| 2. | Journal | 05 |
| 3. | Viva | 05 |
| | **Total: 50** | |

**Note:**

- Minimum 80% practical from each core subjects are required to be completed.
- Certified Journal is compulsory for appearing at the time of Practical Exam.
- The final submission and evaluation of journal in electronic form using a Learning Management System / Platform can be promoted by department.

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Project Management

**with effect from**
**Academic Year 2025-2026**

# Title: Project Management

## Course Code: CHM(A)USCS5051

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | This course offers an in-depth understanding of project management principles and practices, equipping students with the tools to effectively plan, execute, monitor, and close projects. It covers a wide range of topics including project selection, time and cost management, quality assurance, risk analysis, resource management, and procurement strategies. Students will also explore advanced topics such as Agile methodologies, digital project environments, stakeholder communication, and ethical governance in projects. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Theory + Practicum + Teaching methods (Lectures, Problem Solving, Discussion, Presentation, Case Study, Simulations, Interdisciplinary Approach, etc.) |
| 4 | **Credit** | 3 Credits |
| 5 | **Hours allotted** | 38 Hours |
| 6 | **Marks allotted** | 75 Marks |
| 7 | **Course Objectives:**<br>1. To provide a comprehensive foundation in project management concepts, processes, and knowledge areas.<br>2. To enable students to develop project plans covering scope, time, cost, and quality.<br>3. To introduce various project management frameworks including Agile, Waterfall, PRINCE2, and PMBOK.<br>4. To build competencies in managing resources, risks, and procurement in real-world project environments.<br>5. To explore advanced project management topics such as technology-enabled project coordination, virtual team management, and ethical project governance. | |
| 8 | **Learning Outcomes:**<br>After successful completion of this course, students will be able to:<br>**LO1: Understand and Apply Project Management Principles:** Grasp key project management methodologies and apply them across various phases of a project. | |

| | |
|---|---|
| | **LO2: Initiate and Plan Projects Effectively:** Use selection techniques to create project charters, stakeholder plans, schedules, budgets, and quality controls.<br>**LO3: Manage Project Execution and Resources:** Oversee risks, human resources, procurement, and ensure efficient coordination of project activities.<br>**LO4: Utilize Agile Methods in Modern Contexts:** Implement Agile tools and practices for managing projects in dynamic, digital, and fast-paced environments.<br>**LO5: Ensure Ethical Conduct and Effective Communication:** Communicate clearly with stakeholders, resolve conflicts, and uphold ethical and governance standards in project execution. |
| 9 | **Syllabus**<br>**UNIT I:**<br>**Foundations of Project Management**<br>• **Introduction to Project Management:** Definition and characteristics of a project, Importance of project management, Project management processes and knowledge areas.<br>• **Project Management Frameworks:** Definition and Importance of Frameworks, Overview of Popular Frameworks: Agile, Waterfall, PRINCE2, PMBOK<br>• **Project Selection, Initiation and scope Management:** Project selection criteria and methods, Project initiation and charter development, Stakeholder identification and analysis, Scope planning and definition, Work Breakdown Structure (WBS) development, Scope verification and change control.<br>• **Project Time & Cost Management:** Activity definition and sequencing, estimating activity durations and resources, Developing the project schedule, Schedule control and monitoring, Cost estimation techniques, Budget development and monitoring, Earned Value Management (EVM), Cost control and analysis<br><br>**UNIT II:**<br>**Project Execution and Control**<br>• **Project Quality & Risk Management:** Quality planning and standards, Quality assurance and control, Process improvement and Six Sigma concept, Risk Management-Risk identification and assessment, Risk response planning, Risk monitoring and control<br>• **Project Resource & Procurement Management:** Team development and roles, Staffing, training, and motivation, Conflict resolution and communication management, Procurement planning and contract types, Solicitation, source selection, and contract administration, Vendor management and relationship building<br>• **Project Integration Management:** Project integration processes and activities, change management and project closure, Lessons learned and knowledge transfer.<br><br>**UNIT III:**<br>**Advanced Topics in Project Management**<br>• **Agile Project & Management in the Digital Age:** Agile principles and methodologies, |

Agile project planning and execution, Managing iterative and incremental development, Role of technology in project management, Virtual teams and distributed project management, Tools and software for project planning and collaboration

- **Effective People Management in Projects:** Leadership styles and characteristics, Team building and motivation techniques, Emotional intelligence in project management, Stakeholder identification and analysis, Stakeholder engagement and communication strategies, Conflict resolution and negotiation skills
- **Project Governance and Ethics:** Project governance structures and accountability, Ethical considerations in project management, Professional responsibility and codes of conduct

**10**

**Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 75 marks Time: 02:30 hours**

Format of Question Paper

| | **All Questions are compulsory** | | |
|---|---|---|---|
| **Question** | **Based on** | **Options** | **Marks** |
| Q.1) | Unit I | Any 4 out of 6 | 20 |
| Q.2) | Unit II | Any 4 out of 6 | 20 |
| Q.3) | Unit III | Any 4 out of 6 | 20 |
| Q.4) | Unit I, II and III | Any 5 out of 6 | 15 |
| | | | **Total 75** |

**Internal Examination: Continuous Evaluation- 25 marks**

| | **Assessment / evaluation** | **Marks** |
|---|---|---|
| 1. | **Mid-Term Class Test –**<br>It should be conducted using any learning management system such as Moodle (Modular object-oriented dynamic learning environment)<br>The test should have 15 MCQ's which should be solved in a time duration of 30 minutes. | 15 |
| 2. | **Assignment/ Case study/ Presentations -**<br>Assignment / Case Study Report / Presentation can be uploaded on any learning management system. | 10 |
| | | **Total 25** |

**11**

**REFERENCES:**


1. Project Management for Business and Technology, 3rd edition, Pearson Education. John M. Nicholas, 2000
2. Information Technology Project Management, by Jack T. Marchewka, 4th Wiley India 2013.
3. A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Sixth Edition 6th Edition, Project Management Institute, 2017

| | |
|---|---|
| | 4. Introduction to Software Project Management by Adolfo Villafiorita · 2016, CRC press, e book format.<br>5. Project Management Professional Workbook, Claudia M. Baca, Patti M. Jansen, Sybex Publication, 2013<br>6. Project Management, by S. J. Mantel, J. R. Meredith and etal.,1st edition, Wiley India, 2009. |

**Smt. Chandibai Himathmal Mansukhani College**
**(Autonomous)**

# Third Year B. Sc.
# (Computer Science)

**Semester- V**

## Title: Project Work – I

**with effect from**
**Academic Year 2025-2026**

## Title: Project Work – I
## Course Code: USCSP505

| Sr. No. | Heading | Particulars |
|---|---|---|
| 1 | **Description the Course:** | The Project Work as part of B.Sc. Computer Science program provides students with practical experience in applying their knowledge and skills to real-world projects, emphasizing hands-on experience in industry-standard project practices. It focuses on project development, implementation, and deployment using computer science principles and techniques. Students will work individually or in teams to design, develop, and present a substantial software project, gaining exposure to real-life project scenarios. It also covers project planning, requirements gathering, software design, coding, testing, debugging, documentation, and project management, following industry best practices. Through these projects, students will enhance their problem-solving abilities, gain proficiency in software development methodologies, and strengthen their practical skills in computer science. |
| 2 | **Vertical** | -- |
| 3 | **Type** | Practical |
| 4 | **Credit** | 2 Credits |
| 5 | **Hours allotted** | 50 Hours |
| 6 | **Marks allotted** | 100 Marks |
| 7 | **Course Objectives:**<br>1. **Apply Interdisciplinary Knowledge:** Use concepts and skills from multiple domains to solve real-world problems effectively.<br>2. **Gain Practical Software Development Experience:** Engage in the complete software development life cycle, from analysis to deployment.<br>3. **Understand Industry Standards and Ethics:** Adopt global IT practices, professional ethics, and workplace norms for career readiness. | |

| | |
|---|---|
| | 4. **Develop Teamwork and Project Management Skills:** Enhance collaboration, communication, and leadership abilities for effective team-based project execution.<br>5. **Create Professional Technical Documentation:** Produce clear, accurate, and industry-aligned documentation to support software solutions. |
| **8** | **Learning Outcomes:**<br><br>**LO1:** Utilize modern tools, programming languages, and development frameworks effectively.<br>**LO2:** Analyze and solve real-world problems using structured methodologies and logical thinking.<br>**LO3:** Demonstrate time management, resource allocation, and task prioritization skills in project execution.<br>**LO4:** Adhere to professional ethics and industry standards throughout the project lifecycle.<br>**LO5:** Reflect critically on project outcomes to identify areas for improvement and future development. |
| **9** | **Syllabus**<br><br>**Project Types:**<br><br>a) **Developing a solution for a real-life problem:** In this case, the project focuses on addressing an existing requirement for a computer-based solution that has practical applications. The project should successfully implement the different stages of the system development life cycle. Examples: Secure Online Banking System, Machine Learning-based Disease Diagnosis System, Cloud-based Document Management System.<br>b) **Innovative Product Development:** These projects involve exploring and developing a computer-based solution with a unique and innovative utility. Examples: Cybersecurity Monitoring and Threat Detection System, Machine Learning-powered Predictive Maintenance System for Industrial Equipment, IoT-based Smart Energy Management System.<br>c) **Research-Level Project:** These projects involve conducting research and development to explore advanced technologies and solve complex problems. Examples: Deep Learning-based Image Recognition System for Medical Imaging, Cloud Computing Infrastructure Optimization for Big Data Processing, Data Science-driven Predictive |

Analytics for Sales Forecasting. The methodology and reporting of such projects may vary based on the project supervisor's guidance.

**Tools & Technologies:**

In the project work, students are granted complete freedom to select platforms, tools, and programming languages without any imposed restrictions. This approach encourages creativity, flexibility, and exploration of various technologies. By prioritizing open-source technologies, students can leverage a vast array of resources and community support. Commonly employed tools include IDEs, version control systems (e.g., Git), programming languages (e.g., Python, Java, etc.), databases (e.g., MySQL), and web frameworks (e.g., Django, Ruby on Rails, etc.). The evaluation process focuses on the project's content and implementation rather than the specific tools chosen, ensuring a fair assessment of the students' skills and problem-solving abilities.

**Project Guide:**

Assigning a project guide to each project or group is a mandatory requirement to ensure the successful completion of the project work. The guide plays a crucial role as a mentor and technical expert, providing invaluable support and guidance to students. They are expected to facilitate effective communication and teamwork, review project proposals, assign schedules, and monitor progress on a regular basis. Additionally, guides are expected to offer timely feedback, provide guidance on project planning and implementation strategies, evaluate the quality of work, and promote professionalism and ethical conduct. Their expertise and involvement are essential in helping students navigate challenges, make informed decisions, and achieve their project goals effectively.

**Project Team Size**: 1 – 2 members

**Project Proposal**: The project proposal is a mandatory document that serves as a foundation for the project. It helps students define their project idea, receive early evaluation and feedback, establish clear communication with the project guide, and take ownership of the project's successful execution. A formal proposal ensures systematic and professional project planning, fostering critical thinking, effective communication, and project management skills. The proposal provides a roadmap and increases the chances of a successful outcome. Before initiating a project, it is mandatory to submit a project proposal for approval. **The original duly approved project proposal should be attached to the final project report**. The project proposal for UG computer science projects should include the following contents:

- Title
- Introduction
- Objectives: Clearly state the objectives of the project. What specific goals do you aim to achieve?
- Scope
- Methodology
- Tools and Technologies
- Timeline
- Resources
- Expected Outcomes
- References

**Project Report:**

The Certified Copy of **Hard Bound Project Report** must adhere to the following guidelines: **No of Copies:** Team Size + 1 (College / Department Copy).The project report should include the following

- Title Page (Sample attached in Appendix)
- Certificate (Sample attached in Appendix)
- Declaration (Sample attached in Appendix)
- Acknowledgement
- Table of Contents
- Original Copy of approved Project Proposal
- Self-attested copy of Plagiarism Report from any open-source tool.
- Chapters / Sections depending upon the type of project
- List of Tables and/or List of Figures
- References (IEEE / Springer format)
- Glossary
- Appendices (Survey datasheets / Questionnaires, etc.)

- The text of the report should be set in 12 pt, Times New Roman font, and single-spaced.
- Chapter headings should be centered, written in 20 pt, Times New Roman font, bold, and in all caps.
- These guidelines ensure a standardized format for the project report, promoting clarity and readability.

10

**Scheme of Examination and Assessment Pattern**

Paper – 100 Marks

**External Examination: Semester End External - 100 marks Time: 03:00 hours**

The evaluation of the project will include a viva voce, which will assess the project based on the following parameters:

| Sr. No. | Details | Marks |
|---|---|---|
| 1. | **Documentation:** The completeness, accuracy, and professionalism of the project documentation, including the project report and supporting materials, will be considered. | 30 |
| 2. | **Quality of the Project:** The overall quality of the project, including its design, implementation, and user experience, will be evaluated | 15 |
| 3. | **Working of the Project:** The functionality and performance of the project will be assessed to determine how well it meets the specified requirements and objectives. | 20 |
| 4. | **Project Presentation:** The clarity, organization, and effectiveness of the project presentation will be evaluated | 15 |
| 5. | **Viva:** The viva voce session will provide an opportunity for the student to demonstrate their knowledge and understanding of the project, as well as to answer questions and engage in a discussion with the evaluators. | 20 |
| | | **Total: 100** |

**Note:** Certified Copy of **Hard Bound Project Report** Journal is compulsory for appearing at the time of Practical Exam.

**Department of B.Sc. (Computer Science):**

| Sr. No. | Name of the Faculty | Designation and College | Signature |
|---|---|---|---|
| 1. | Ms. Ritika Sachdev | Assistant Professor, Smt. CHM College, Ulhasnagar | |
| 2. | Ms. Lata Bhatia | Assistant Professor, Smt. CHM College, Ulhasnagar | |
| 3. | Ms. Razia Khan | Assistant Professor, Smt. CHM College, Ulhasnagar | |
| 4. | Ms. Gauri Hallale | Assistant Professor, Smt. CHM College, Ulhasnagar | |

**Name & Signature of the Ad-hoc BoS Chairperson: Ms. Ritika Sachdev**

**Name & Signature of the Dean: Ms. Ritika Sachdev**

SMT. CHANDIBAI HIMATHMAL MANSUKHANI COLLEGE ★ ULHASNAGAR 4.