



**FIFTH SEMESTER**  
**'CYBER FORENSICS**  
**&**  
**INFORMATION SECURITY'**





## **CYBER FORENSICS**

<b>Course Code:</b>	475001
<b>Course Title</b>	Cyber Forensics
<b>No. of Credits</b>	10 (TH:6,T:0,P:8)

**COURSE OUTCOMES:** By the end of this course, the student will be able to-

1. Understand and analyze the forensics in pc and in computer network.
2. Analyze the forensics evidences after the attack.
3. Report and document the attack.
4. Learn investigation tools and techniques, analysis of data to identify evidence, technical aspects & legal aspects

## **COURSE CONTENTS**

### **1. Introduction to Cyber Forensics**

- 1.1 What is Cyber Forensics?
- 1.2 Forensics Investigation Process
- 1.3 Digital Evidence
- 1.4 Cybercrime
- 1.5 Case studies
- 1.6 Challenges in investigating Cybercrimes

### **2. Windows Forensics**

- 2.1 Digital Evidence in Windows
- 2.2 Artifacts: Volatile, Non-volatile Evidence
- 2.3 File System

### **3. Linux Forensics**

- 3.1 Popular Linux Distributions
- 3.2 File System
- 3.3 Forensic Process for Linux Systems & Artifacts

### **4. Anti-forensics Practices**

- 4.1 Data Wiping and Shredding
- 4.2 Data hiding & Steganography
- 4.3 Anti-Forensics Detection Techniques

### **5. Network Forensics**

- 5.1 Forensic Footprint
- 5.2 Seizure of Networking Devices
- 5.3 Network Forensic Artifacts

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

1. Application of Cyber forensic.
2. Correct way of collection and analysis of Cyber forensic evidences in Windows and Linux.
3. Exercise Anti-Forensics Detection Techniques used in cyber forensics.

**List of Practicals:**

1. Create evidence image using FTK Imager tool
2. Using Autopsy Tool to analyze the evidence image and generate report
3. Recover deleted files from a Windows system using Recuva recovery tool
4. Use Regshot tool to take two Registry snapshots and then compare them
5. Using linuxfdisk command for Partitions Listing
6. Create a memory dump image of Linux system using LiME tool
7. Raw Image Analysis with „The Sleuth Kit“ tool
8. Encrypt some files on your system using VeraCrypt utility
9. Hide some data of your choice into a picture using SilentEye utility
10. Use Stegdetect tool (Linux) to analyze an image for steganographic content

## **REFERENCE BOOKS:**

1. Practical Cyber Forensics An Incident-Based Approach to Forensic Investigations, Niranjana Reddy, APRESS
2. CYBER FORENSICS, A Field Manual for Collecting, Examining & Preserving Evidence of Computer Crimes, 2nd Edition, Albert J. Marcella, Jr. Doug Menendez, Auerbach Publications

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## **DATA SCIENCES : DATA WAREHOUSING AND DATA MINING**

<b>Course Code:</b>	435005
<b>Course Title</b>	Data Sciences:Data Warehousing and Data Mining
<b>No. of Credits</b>	10 (TH:6,T:0,P:8)

**COURSE OUTCOMES:** By the end of this course, the student will be able to:

1. Understand the fundamental concepts, motivation and importance of data mining.
2. Apply data preprocessing techniques, including data quality assessment, reduction, transformation, cleaning, and integration.
3. Design and implement data warehouses, utilizing data cube modeling and computation for online analytical processing.
4. Analyze patterns, associations, and correlations in data, utilizing efficient mining methods and evaluating their applications.
5. Develop classification models using various techniques, such as decision tree induction, Bayesian methods and rule-based classification.
6. Apply cluster analysis to identify structures in data, employing different clustering approaches and outlier detection techniques.

## **COURSE CONTENTS**

### **1. Introduction**

Importance, Basic Definitions, Data Types, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining, Concept of Data Visualization, Major Tasks in Data Preprocessing, Data Transformation, Data Cleaning and Data Integration

### **2. Data Warehousing & On-line Analytical Processing (Overview Only)**

Data Warehouse basic concepts, Data Warehouse Design and Usage, Data Warehouse Implementation.

### **3. Patterns, Associations And Correlations**

Mining Frequent Patterns, Basic Concepts of Association, Applications of frequent pattern and associations.

### **4. Classification**

Basic Concepts, Brief Introduction of various classification methods, Basic Idea of Techniques used to Improve Classification Accuracy,

### **5. Cluster Analysis**

Basic Concept of Cluster Analysis, Clustering Structures, Basic concept of web mining.

**PRACTICAL OUTCOMES** : At the end of this course, the student will be able to:

1. Set up and populate a functional data warehouse environment, complete with a schema designed using either star or snowflake schemes.
2. Cleanse and preprocess a dataset, while also building and evaluating the accuracy of a decision tree model.
3. Mine association rules and frequent patterns from transactional data, and analyze their significance and potential real-world applications.
4. Implement clustering and classification algorithms, compare their performance metrics, and create visualizations to identify patterns.
5. Apply web mining techniques to extract useful information from web data and create data visualizations for further insights.

**List of Practicals:**

1. Set up a basic data warehouse environment using a DBMS and load sample data.
2. Cleanse and preprocess a dataset by handling missing values and outliers.
3. Implement a decision tree classifier for a dataset and evaluate its accuracy.
4. Mine association rules from transactional data and analyse their significance.
5. Perform clustering analysis using the k-means algorithm and visualize results.
6. Create data visualizations to identify patterns and insights in a dataset.
7. Explore web mining techniques and extract useful information from web data.
8. Design a data warehouse schema using star or snowflake scheme and populate it.
9. Mine frequent patterns from a dataset and discuss their real-world applications.
10. Implement and compare multiple classification algorithms, evaluating their performance.

**Reference Books :**

1. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, Pearson Education
3. AmiteshSinha, Data Warehousing, Thomson Learning, India.
4. Xingdong Wu, Vipin Kumar, the Top Ten Algorithms in Data Mining, CRC Press, UK.

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**‘Elective 1-1’  
FUNDAMENTAL OF CLOUD COMPUTING**

<b>Course Code:</b>	435004
<b>Course Title</b>	Fundamental of Cloud Computing
<b>No. of Credits</b>	5 (TH:5,T:0,P:0)

**COURSE OUTCOMES :** At the end of the course student will be able to-

1. Understand the fundamental concepts, motivation, and importance of data mining.
2. Apply data preprocessing techniques, including data quality assessment, reduction, transformation, cleaning, and integration.
3. Design and implement data warehouses, utilizing data cube modeling and computation for online analytical processing (OLAP).
4. Analyze patterns, associations, and correlations in data, utilizing efficient mining methods and evaluating their applications.
5. Develop classification models using various techniques, such as decision tree induction, Bayesian methods, and rule-based classification.
6. Apply cluster analysis to identify structures in data, employing different clustering approaches and outlier detection techniques.

## **COURSE CONTENTS**

### **1. Cloud Computing: An Overview**

- 1.1 Introduction to Cloud Computing, its key Characteristics.
- 1.2 Classification of Cloud Service Models, Basic Idea of various Cloud Support Services viz.- DSaaS, AaaS, DaaS, SecaaS, IAMaaS, MaaS.
- 1.3 Benefits, Limitations, and Concerns associated with Cloud Computing.

### **2. Cloud : Services & Standards**

- 2.1 Classification of basic cloud service providers.
- 2.2 Brief Introduction of other services available over cloud- IBM Smart Cloud, EMC IT, Microsoft Windows Azure, Salesforce Service Cloud: Knowledge as a Service, Amazon Simple Queue Service (SQS)
- 2.3 Cloud, Standards and Management (Overview only)

### **3. Cloud Reference Frameworks**

- 3.1 Introduction
- 3.2 Characteristic features of cloud reference frameworks, common standards for cloud reference framework, brief introduction of any cloud reference framework.

### **4. Virtualization**

- 4.1 Basic concept of virtualization, its various types, advantages, limitations of virtualization.

## **5. Cloud Networks & Security**

5.1 Introduction

5.2 Characteristics of Cloud Networks

5.3 Classification of Cloud Networks

5.4 Basic Architecture of Cloud Networks

5.5 Cloud Security: Introduction, Basic Characteristics,  
Issues and Challenges

### **References :**

1. Encyclopedia of Cloud Computing by San Murugesan, Irena Bojanova, Wiley
2. Cloud Computing: A Practical Approach by Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, The McGraw Hill
3. Cloud Computing For Dummies, 2nd Edition by Daniel Kirsch, Judith Hurwitz
4. [https://www.tutorialspoint.com/cloud\\_computing/index.htm](https://www.tutorialspoint.com/cloud_computing/index.htm)

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**‘Elective 1-2’**  
**RENEWABLE ENERGY TECHNOLOGIES**

<b>Course Code:</b>	435008
<b>Course Title</b>	Renewable Energy Technologies
<b>No. of Credits</b>	5 (TH:5,T:0,P:0)

**COURSE OUTCOMES :** At the end of the course, the student will be able to:

1. Understand present and future energy scenario of the world.
2. Understand various methods of solar energy harvesting.
3. Identify various wind energy systems.
4. Evaluate appropriate methods for Bio energy generations from various Bio wastes.
5. Identify suitable energy sources for a location.

## **COURSE CONTENTS**

### **Unit - I : Introduction :**

World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilization; Renewable Energy Scenario in India and around the World; Potentials; Achievements/Applications; Economics of renewable energy systems.

### **Unit - II : Solar energy :**

Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

### **Unit - III : Wind Energy :**

Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

### **Unit - IV : Bio-Energy :**

Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.

### **Unit - V : Other Renewable Energy Sources (Brief Idea Only):**

Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

**Reference Books :**

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B. Natarajan, P. Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

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**‘Elective 2-1’  
TOTAL QUALITY MANAGEMENT**

<b>Course Code:</b>	455005
<b>Course Title</b>	Total Quality Management
<b>No. of Credits</b>	5 (TH:5,T:0,P:0)

**COURSE OUTCOMES :** After completion of this course the students are able to:

1. Develop an understanding on quality management philosophies and frameworks
2. Develop in-depth knowledge on various tools and techniques of quality management
3. Learn the applications of quality tools and techniques in both manufacturing and service industry
4. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.
5. Emerging concepts for quality and Taguchi optimization technique for off-line

## **COURSE CONTENTS**

### **Unit - I : Introduction :**

Definition of quality, dimensions of quality, quality planning, quality costs, basic concepts of total quality management, historical review, principles of TQM, Role of senior management, quality statements.

### **Unit - II : Total Quality Management Principles**

Customer satisfaction – customer perception of quality, customer complaints, service quality, customer retention, employee involvement – motivation, empowerment, teams, recognition and reward, performance appraisal, benefits, continuous process improvement – Juran trilogy, PDSA cycle, 5s, kaizen.

### **Unit - III : Total Quality Management Tools**

Bench marking – reasons to benchmark, bench marking process, Basic idea of Quality Function Deployment (QFD).

### **Unit - IV : Quality Systems**

Quality Auditing - Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Requirements and Benefits.

### **Unit - V : Statistical Process Control (SPC)**

The seven tools of quality, overview of central tendency and dispersion, population and sample, process capability, concept of six sigma.

**Text & Reference Books:**

1. Total Quality Management, M.P. Poonia & S.C. Sharma, Khanna Publishing House, 2018.
2. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
3. Quality Control and Applications by Housen & Ghose
4. Industrial Engineering Management by O.P. Khanna.

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**‘Elective 2-2’  
MULTIMEDIA TECHNOLOGIES**

<b>Course Code:</b>	435006
<b>Course Title</b>	Multimedia Technologies
<b>No. of Credits</b>	5 (TH:5,T:0,P:0)

**COURSE OUTCOMES :** At the end of the course, the student will be able to:

1. Understand the foundation and concepts of multimedia, including hardware, software, operating systems, and communication systems.
2. Apply compression techniques to reduce the file size of multimedia content while maintaining acceptable quality.
3. Utilize desktop publishing tools and software to create visually appealing multimedia content.
4. Create multimedia animations and special effects using 2D and 3D animation techniques.
5. Apply digital imaging techniques within the context of multimedia production to enhance visual elements.
6. Develop multimedia applications using programming languages and frameworks to create interactive and engaging multimedia experiences.

## **COURSE CONTENTS**

### **Unit - 1 : Introduction to Multimedia**

Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems, Multimedia communication system

### **Unit - 2 : Basic Compression Techniques Video and Audio Data Compression Techniques –**

Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265

### **Unit - 3 : Content Development and Distribution (Basic Idea Only)**

Desktop publishing Software (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash)

### **Unit - 4 : Introduction to Digital Imaging**

Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia

### **Unit - 5 : Introduction to Multimedia Programming and Applications**

**Note :-** The faculty is advised to give the basic idea of any one of the following softwares: Coral Draw, Photoshop, Page maker.

**Reference Books:**

1. An Introduction to Multimedia Authoring, A. Eliens
2. Fundamentals of Multimedia, Prentice Hall/Pearson, Zenian Li & Mark S. Drew.
3. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

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**‘Open Elective 1-1’  
INTERNET OF THINGS**

<b>Course Code:</b>	435002
<b>Course Title</b>	Internet of Things
<b>No. of Credits</b>	4 (TH:4,T:0,P:0)

**COURSE OUTCOMES:** By the end of this course, students will be able to:

1. Understand the fundamental concepts and principles of the Internet of Things (IoT) and its applications.
2. Design and develop IoT architectures, considering scalability, security, and interoperability.
3. Implement IoT solutions using relevant hardware platforms, software frameworks, and programming languages.
4. Apply data collection and analytics techniques to extract insights from IoT systems.
5. Analyze and evaluate the challenges and ethical considerations related to privacy, security, and data governance in IoT deployments.
6. Explore emerging trends and applications of IoT, such as smart cities, industrial IoT, healthcare, and agriculture.

## **COURSE CONTENTS**

### **Unit 1:**

- 1.1 Introduction to IoT
- 1.2 Sensing elements
- 1.3 Actuation methods

### **Unit - 2 :**

- 2.1 Basics of IoT Networking
- 2.2 Communication Protocols
- 2.3 Sensor networks

### **Unit - 3 :**

- 3.1 Introduction to Basic Arduino programming
- 3.2 Integration of Sensors/Actuators to Arduino

### **Unit - 4 :**

- 4.1 Implementation of IoT with Raspberry Pi (Overview Only)
- 4.2 Data Handling Analytics

### **Unit - 5 :**

- 5.1 Case Studies of IoT applications (any one example) in the field of :
  - 5.1.1 Agriculture
  - 5.1.2 Healthcare
  - 5.1.3 Activity Monitoring

## References:

1. "Internet of Things (A Hands-on Approach)" by Arshdeep Bahga and Vijay Madisetti.
2. "IoT Solutions in Microsoft's Azure IoT Suite" by Scott Klein and Paolo Patierno.
3. "Raspberry Pi IoT Projects: Prototyping Experiments for Makers" by John C. Shovic and Jeff Chang.
4. "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" by David Hanes and Gonzalo Salgueiro.
5. "Practical Internet of Things with MQTT and RabbitMQ" by Anand Vemuri.
6. [https://nptel.ac.in/noc/individual\\_course.php?id=noc17-cs22](https://nptel.ac.in/noc/individual_course.php?id=noc17-cs22)
7. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
8. Internet of Things by Dr. Jeeva Jose, Khanna Publishing House (Edition 2017)
9. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill

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**‘Open Elective 1-2’  
SMART SYSTEMS**

<b>Course Code:</b>	435007
<b>Course Title</b>	Smart Systems
<b>No. of Credits</b>	4 (TH:4,T:0,P:0)

**COURSE OUTCOMES:** After completion of this course students are able to:

- Identify and understand the working of sensors.
- Understand the concept of interfacing different sensors with MCU.
- Explain control techniques and standard for data transfer over the internet.
- Select packaging technology.

## **COURSE CONTENTS**

### **1. Introduction to Sensor Devices**

Basic idea of various sensor devices: Piezoresistive pressure sensor, Accelerometer, Capacitive Sensors, Microphone, Resonant Sensor and Vibratory Gyroscope, Low-Power, Low Voltage Sensors, Nano Sensors.

### **2. Interfacing Sensor Information and MCU**

Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital conversion, Sensor Interface Techniques, Sensor Integration.

### **3. Control Techniques and Standards**

Basic Sensor Control Techniques (Basic Idea Only),  
Brief Introduction of Various Standards used for Sensor controlling.

### **4. Communication For Smart Sensors**

Wireless Data Communications- RF Sensing, Telemetry, Automotive Protocols, Industrial Networks Home Automation, MCU Protocols.

### **5. Testing and Reliability Implications of Smart Sensors**

Reliability Implications, Testing Smart Sensors- HVAC Sensor Chip

**Suggested Books:**

1. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
3. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall.

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## SUMMER INTERNSHIP-II

<b>Course Code:</b>	AS501
<b>Course Title</b>	Summer Internship - II
<b>No. of Credits</b>	3 (TH:0,T:0,P:0)

Summer Internship provides an invaluable opportunity for students pursuing their Diploma in Engineering to gain real-world experience and exposure to various industrial production units and commercial activities related to their field of study. This program aims to bridge the gap between theoretical knowledge and practical application, equipping students with the necessary skills and expertise to thrive in the branch related industry.

At the end of the **Fourth semester**, students will undertake a minimum **6-week** Summer Internship, scheduled during the semester break following the Fourth Semester examinations. The respective Heads of Departments (HoDs) and experienced faculty members will guide and assist students in securing suitable training opportunities that align with their specialization. Each student will have a personalized training schedule developed in collaboration with the training providers, ensuring a comprehensive and enriching learning experience.

Before starting their training, students will receive a comprehensive briefing about the organizational setup, product range, manufacturing processes, and significant machinery and materials used in the training organization. This preliminary understanding will enhance their engagement and productivity during the internship.

To ensure a fruitful learning experience, faculty members will supervise students during their training in the industry or field organization. Each teacher will mentor a small group of 4-5 students, providing personalized attention and guidance. Students will be encouraged to maintain daily reports in their diaries, which will assist them in composing their final training report and presentation.

The evaluation process for the Summer Internship will include both internal and external assessments, as per the study and evaluation scheme of the **Fifth Semester**. During the viva-voce/presentation examination, students' understanding of materials, industrial processes, practices in the industry, and problem-solving abilities will be assessed. The evaluation will also focus on their application of knowledge and skills in real-life situations.

**The components of evaluation will comprise:**

- (a) Punctuality and regularity: 15%**
- (b) Initiative in learning new things: 15%**
- (c) Relationship with peers and colleagues: 10%**
- (d) Summer Internship report: 25%**
- (e) Viva-Voce: 35%**

We believe that this Summer Internship program will be a transformative experience for our students, empowering them to excel in their future careers and make meaningful contributions to the Engineering industry. The collaborative efforts of our experienced faculty members and industry partners will ensure that students gain valuable insights and practical skills during this immersive learning journey.

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## **MAJOR PROJECT-I**

<b>Course Code:</b>	AS502
<b>Course Title</b>	Major Project - I
<b>No. of Credits</b>	1 (TH:0,T:0,P:2)

The evaluation of Major Project-I will be conducted to assess students' understanding, application, and presentation of their chosen project topic. The following evaluation criteria will be used to measure their performance:

**1. Project Identification (10%):**

- Clarity and relevance of the chosen project topic.
- Demonstration of understanding of the industry or community needs addressed by the project.
- Adequate justification for selecting the particular project topic.

**2. Project Proposal (10%):**

- Comprehensive description of project objectives and scope.
- Logical and well-structured methodology for project execution.
- Feasibility of the proposed project, considering available resources.

**3. Literature Review (10%):**

- Thoroughness of the research conducted in relevant academic and professional sources.
- Critical analysis of existing literature, identifying gaps and potential contributions of the project.

**4. Feasibility Study (10%):**

- Evaluation of the project's practicality and viability.
- Assessment of potential risks and proposed mitigation strategies.

**5. Project Planning (20%):**

- Detailed project plan, including timeline, milestones, and resource allocation.
- Realistic budgeting and cost management strategies.

**6. Proposal Presentation (30%):**

- Clarity and effectiveness of communication during the presentation.
- Ability to address questions and defend the project proposal confidently.
- Professionalism and engagement with the panel and audience.

**7. Overall Impression (10%):**

- Demonstrated commitment and effort throughout the project.
- Creativity and innovation in problem-solving.
- Adherence to project management principles and best practices.

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