

ISET-2990: RELIABILITY CENTERED MAINTENANCE

Cuyahoga Community College

Viewing: ISET-2990 : Reliability Centered Maintenance

Board of Trustees:

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Academic Term:

Fall 2024

Subject Code

ISET - Integrated Systems Engineering

Course Number:

2990

Title:

Reliability Centered Maintenance

Catalog Description:

Advanced concepts and principles of best practices of the maintenance function within an organization. Preventative and predictive maintenance technology, reports and implementation strategies are explored. Reliability Centered Maintenance RCM concepts covered include maintenance approaches, leadership, and management, change management, workflow structures, work classifications, spare parts inventory management concepts, KIPs and performance measurement, Total Productive Management TPM, 5S, 6S, Kaizen, Kaban, visual workspace.

This course will include a Lean Six Sigma White Belt and prepare students to pass the Yellow Belt Lean Six Sigma exam.

Credit Hour(s):

3

Lecture Hour(s):

2

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

ISET-2200 Industrial Motor Controls or concurrent enrollment; or ISET-1310 Mechanical Power Transmissions or concurrent enrollment; or ISET-1320 Fundamentals of Fluid Power or concurrent enrollment.

Outcomes

Course Outcome(s):

Contrast how different maintenance benchmarks, organizational cultures, and leadership styles promote creating a reliable culture.

Objective(s):

1. Contrast maintenance best practices, benchmarks, and their purpose.
2. Contrast organizational cultures and leadership styles and how they relate to creating a reliability culture.

Course Outcome(s):

Evaluate the decision-making process that leads the execution of maintenance approaches, the selection of Computerized Maintenance Management Systems (CMMS systems), job prioritization, planning and scheduling.

Objective(s):

1. Evaluate maintenance approaches and their purpose and role in the maintenance function.
2. Evaluate how maintenance management systems fit into any given organizational and maintenance culture in different ways.
3. Evaluate the different types of work classifications and their role in the overall maintenance function.

4. Utilize criticality assessments to assist in evaluating job and equipment prioritization.
5. Evaluate different planning and scheduling for day-to-day maintenance tasks as well as turnarounds and shutdowns.

Course Outcome(s):

Analyze Predictive Maintenance (PdM) reports and determine appropriate corrective maintenance for given discrepancies.

Objective(s):

1. Analyze InfraRed IR inspections and reports and determine appropriate course of action.
2. Analyze vibration analysis and reports and determine appropriate course of action, i.e. laser shaft alignments.
3. Analyze lubrication analysis and reports and determine appropriate course of action.

Course Outcome(s):

Appraise inventory management strategies and techniques for minimizing cost, increasing efficiency, and accuracy.

Objective(s):

1. Appraise the emerging technologies in inventory management including scanning reordering and storage.
2. Appraise the methods of inventory control as it pertains to volume as well as inventory condition.

Course Outcome(s):

Conduct Key Performance Indicators (KPIs) analysis that relate to reliability maintenance including Mean Time To Repair (MTTR), Mean Time To Failure (MTTF), Failure Mode Effects Analysis (FMEA), and Root Cause Failure Analysis (RCFA).

Objective(s):

1. Conduct Mean Time Between Failure and Mean Time To Failure and identify the difference.
2. Conduct a Failure Mode Effects Analysis (FMEA) and a Root Cause Effects Analysis.

Course Outcome(s):

Interpret advantages of operator-driven reliability and industrial workplace optimization such as Lean Manufacturing, Total Productive Maintenance, 6S, and Kaizen.

Objective(s):

1. Interpret advantages of operator-driven reliability and Lean Manufacturing practices.
2. Interpret advantages of Total Productive Maintenance (TPM).
3. Interpret advantages of 6S and Kaizen.

Course Outcome(s):

Evaluate and consider maintenance optimization, performance and workforce management methods.

Objective(s):

1. Evaluate maintenance optimization strategies including Reliability Centered Maintenance (RCM) and Condition Based Maintenance (CBM).
2. Consider how communication and workforce management strategies are driven by the diverse workforce, both culturally and generationally.

Methods of Evaluation:

1. Completion of homework assignment
2. Written and/or verbal quizzes covering homework and in class demonstrations

3. Demonstration of application of procedures and methods
4. Final Project

Course Content Outline:

1. Maintenance Best Practices
 - a. Best Practices
 - b. Reliability Benchmarks
 - c. World Class Benchmarks in Reliability
2. Culture and Leadership
 - a. Leadership styles
 - b. Change Management
 - c. Strategic framework
 - i. Vision statements
 - ii. Mission statements
 - iii. Corporate goals
 - d. Creating a reliability culture
 - e. Measures of leadership and management performance
3. Understanding Maintenance
 - a. Maintenance role in the organization
 - b. Maintenance Approaches
 - i. Run to Failure RTF
 - ii. Risk Based maintenance RBM
 - iii. Reliability Centered Maintenance RCM
 - iv. Operator Based Maintenance OBM
 - v. Total Productive maintenance TPM
 - c. Maintenance Management Systems CMMS and EAM
 - i. Capabilities and drawbacks to a variety of software systems
 - d. Maintenance assessment and improvement
4. Work Management: Planning and Scheduling
 - a. Workflow Roles
 - b. Work Classification
 - i. Proactive Work
 - ii. Reactive work
 - iii. Corrective Maintenance CM
 - iv. Condition Based Maintenance CBM
 - v. Preventative Maintenance PM
 - vi. Predictive Maintenance PdM
 - vii. Prescriptive Maintenance PrcM
 - c. Prioritization
 - i. Asset Criticality Analysis
 - ii. Job priority codes
 - d. Planning Process
 - e. Scheduling Process
 - f. Turnarounds and Shutdowns
5. Preventative Maintenance Concepts
 - a. InfraRed IR inspections and reports
 - b. Vibration analysis and reports
 - c. Laser shaft alignments
 - d. Lubrication analysis and reports
6. Materials, Parts, and Inventory Management
 - a. Physical Layout and storage Equipment
 - b. Deciding what to carry in inventory ABC analysis
 - c. Optimizing tools and techniques
 - i. CMMS systems and automatic re-order and scanning methods
 - ii. Vendor managed inventory
 - iii. Inventory control
 - iv. Cycle counts
 - d. Measures of Performance

- i. Inventory total cost
 - ii. Inventory turnover ration
- 7. Measuring and Designing Reliability and Maintainability KPI
 - a. Defining and measuring reliability and other terms
 - i. Mean time to Repair MTTR
 - ii. Meantime Between Failure MTBF
 - b. Designing and building for maintenance and reliability
 - i. Failure Mode Effects Analysis FMEA
 - ii. Root Cause Failure Analysis RCFA
- 8. Operator Driven Reliability
 - a. Lean Manufacturing
 - b. Operations roles in the maintenance function
 - c. Total Productive Maintenance TPM
 - i. 8 Pillars
 - ii. Implementation
 - d. Workplace organization
 - i. 5S and 6S
 - ii. Kaizen
 - iii. Kaban
 - e. Overall equipment effectiveness
 - f. Measures of performance
- 9. Maintenance Optimization
 - a. Understanding failures and maintenance strategies
 - b. Reliability Centered Maintenance RCM
 - c. Condition Based Maintenance CBM
 - d. Other Strategies
- 10. Managing Performance
 - a. Identifying performance measures
 - b. Data collection and data quality
 - c. Benchmarking and benchmarks
- 11. Workforce Management
 - a. Employee lifecycle
 - b. Understanding the generation gap
 - c. Communication skills
 - d. People development
 - e. Resource management and organizational structure
 - f. Measures of performance
- 12. Problem-Solving and Improvement Tools
 - a. Six Sigma and quality tools
 - b. Lean tools
 - c. Improvement strategies and practices
 - d. Defect elimination
- 13. Standards, Standardization, and Certification
 - a. Codes, standards, and standardization
 - b. Management process standards
 - c. Implementing asset management and other standards
 - d. Benefits of standards
- 14. Current Trends and Practices
 - a. Sustainability, energy management, and the green initiative
 - b. Safety management
 - c. Risk and project management
 - d. Industry 4.0 and the factory of the future

Resources

John Moubray. *Reliability-Centered Maintenance*. 3rd. New York, NY: Industrial Press Inc., 2020.

The Council for Six Sigma Certification. *Lean Six Sigma White Belt Certification Training Manual*. June 2018. Buffalo, WY: Harmony Living, LLC, 2018.

The Council for Six Sigma Certification. *Lean Six Sigma Yellow Belt Certification Training Manual*. June 2018. Buffalo, WY: Harmony Living, LLC,

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