

SYE6014: ASSET AND MAINTENANCE MANAGEMENT

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Asset and Maintenance Management

Subject Code

SYE - Systems Engineering

Course Number

6014

Academic Unit

Systems Engineering (SYE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Students are expected to have either some working experience in management or taken management equivalent course(s)

Equivalent Courses

SEEM6014 Asset and Maintenance Management (offered until 2021/22) / ADSE6014 Asset and Maintenance Management (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

In this course, students will explore strategies to ensure the quality and maintainability of critical industrial assets and manufacturing processes. Emphasis will be placed on non-destructive testing and structural health monitoring techniques, which are essential for evaluating asset health without compromising functionality. Students will learn to select appropriate methods for assessing the condition and quality of various industrial assets. Additionally, they will gain skills in designing effective measurement and testing platforms for conducting comprehensive quantitative analyses. This course equips students with the knowledge to optimize asset performance and longevity through informed maintenance management practices.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Recognise the importance of maintenance and engineering asset management to manufacturing, public utilities, transportations and building services,	15	x		
2	Understand the philosophies and international compliance on maintenance and engineering asset management,	10	x		
3	Use of common condition monitoring, fault diagnosis, non-destructive testing and structural health monitoring in maintenance and engineering asset management,	50		x	
4	Formulate reliable and cost-effective managerial strategy for selected equipment/process operating in a particular kind of public utility and industry.	25		x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures have 30 hours. The content of lectures will roughly follow the topics covered in the Section of Keyword Syllabus with case studies for illustration purpose.	1, 2, 3, 4	30 hours/sem

2	Demonstrations & Summaries (small class)	Demonstrations and preparation of Summaries have 3 hours. In this activity, typical kinds of system and device for conducting physical asset health monitoring and maintenance that are related to the first three CILOs will be demonstrated to students in the concerned laboratory. After the demonstrations, questions and discussion items will be given to students. Each student must participate in discussions and submit a short summary for each demonstration. Comments will be received from the course examiner and colleagues. Marks will be given to each student based on his/her responses to comments, the content of the summary and the eagerness in discussion.	1, 2, 3	3 hours/sem
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3	Term Project Presentation & Discussion (large class)	It includes the show case of samples of the term project and a presentation to highlight the achievement of the term project. To accomplish these activities, the students will form groups with a size of around 3 students per group. Duration the course, a term project, which focused on CILOs 3 and 4, must be accomplished by each group. For the term project, each group is required to develop an effective strategy in maintenance and engineering asset management for a given type of equipment/ process operating in a particular kind of public utility and industry. A group report to describe the structure and the expected achievements of the designed strategy must be submitted. A group report to describe the structure and the expected achievements of the designed system must be submitted. A presentation will be held to highlight and demonstrate the student achievements in the term project so that comments can be given to further improve the designed strategy for performing asset and maintenance management to the selected industrial case.	3, 4	6 hours/sem
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Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Homework Assignments	3, 4	30	-	Yes
2	Demonstrations and Summaries	1, 2, 3	10	-	Yes

3	Term Project' s Presentation and Report	3, 4	10	-	Yes
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Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

An overall mark of at least 40% in order to be considered for a pass grade.

Assessment Rubrics (AR)**Assessment Task**

1. Homework Assignments (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

The assessment of the home assignments will depend on the degree of achievement on CILOs 3 and 4, which include theoretical calculation and computer coding to solve non-destructive testing and structural health monitoring problems for critical assets and processes.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

2. Demonstrations & Summaries (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

The assessment of each submitted summary will be based on the degree of achievement on CILOs 1, 2 and 3. The portions of marks given are 1) the design and the style of submitted summary (10%), 2) the background and theory of each demonstrated AI method (20%), 3) the quality of the given comments and observations (20%) and 4) the proof on understanding the demonstrations by given the suitable answer and discussion to each designed question stated in each submitted summary (50%)

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

3. Term Project' s Presentation and Report (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

The assessment is depended on the degree of achievement on CILO 3&4. It includes the preparation, the style and the clarity of presentation as well as the response to the comments asked during the presentation and lectures. Students will submit report for each presentation.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

4. Final Exam (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Students acquire the basics of common condition monitoring, fault diagnosis, non-destructive testing, and structural health monitoring in maintenance and engineering asset management. Gain an understanding of reliable and cost-effective managerial strategies for selected equipment/process operating in a particular kind of public utility and industry.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

1. Homework Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

The assessment of the homework assignments will depend on the degree of achievement on CILOs 3 and 4, which include the theoretical calculation and computer coding to solve non-destructive testing and structural health monitoring problems for critical assets and processes.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

2. Demonstrations & Summaries (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

The assessment of each submitted summary will be based on the degree of achievement on CILOs 1, 2 and 3. The portions of marks given are 1) the design and the style of submitted summary (10%), 2) the background and theory of each demonstrated AI method (20%), 3) the quality of the given comments and observations (20%) and 4) the proof on understanding the demonstrations by given the suitable answer and discussion to each designed question stated in each submitted summary (50%)

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

3. Term Project and Report (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

The assessment is depended on the degree of achievement on CILO 3&4. It includes the preparation, the style and the clarity of presentation as well as the response to the comments asked during the presentation and lectures. Students will submit report for each presentation.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

4. Final Exam (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Students acquire the basics of common condition monitoring, fault diagnosis, non-destructive testing, and structural health monitoring in maintenance and engineering asset management. Gain an understanding of reliable and cost-effective managerial strategies for selected equipment/process operating in a particular kind of public utility and industry.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate/Basic

Failure

(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

- International Compliance on Engineering Asset Management
- Sensors and Diagnostics for Asset and Maintenance Management

- Non-destructive Testing for Asset and Process Monitoring
- AI for Fault Diagnosis of Semiconductor Manufacturing
- Structural Health Monitoring (SHM)
- Industrial Maintenance Decision Making
- Industrial Case Studies and Demonstrations

Reading List

Compulsory Readings

Title	
1	NIL

Additional Readings

Title	
1	Asset Management — Overview, Principles and Terminology ISO (the International Organization for Standardization) Standards - ISO 55000:2014(E)
2	The Institute of Asset Management, PAS 55-1 and 55-2: Asset Management British Standards Institute, (ISBN 0-580-42765 X)
3	Jardine, A. and Tsang A., Maintenance, Replacement, and Reliability – Theory and Applications, Taylor & Francis, (ISBN 0-8493-3966-9)
4	Kelly A, Maintenance Management Auditing: in search of Maintenance Management Excellence, Industrials Press, New York, (TS192.K425)
5	Mather D., CMMS (Computerized Maintenance Management System): A Time Saving Implementation Process, CRC Press.
6	Mobley, R., Higgins, L., and Wikoff D., Maintenance Engineering Handbook, McGraw Hill, (TS192.M335)
7	Levitt, J., Complete Guide to Preventive and Predictive Maintenance, Industrial Press, (TS192.L4667 2003)
8	Koller G., Risk Assessment and Decision Making in Business and Industry – a Practical Guide, CRC Press, 1999 (ISBN 0-8439-0268-4)
9	International Journal of Strategic Engineering Asset Management, www.inderscience.com
10	Engineering Asset Management Review, www.springer.com/engineering
11	Journal of Quality in Maintenance Engineering (e-journal), ISSN 1355-2511, http://ejournals.ebsco.com/Journal2.asp?JournalID=101232
12	The Asset Journal, Asset Management Council, (e-journal), ISSN 1834-3864
13	Maintenance Management (video recording, 9 records), TS192.M345/pt.1-9