

MNE8119: SUSTAINABLE GREEN MANUFACTURING

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Sustainable Green Manufacturing

Subject Code

MNE - Mechanical Engineering

Course Number

8119

Academic Unit

Mechanical Engineering (MNE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to introduce and explain the design concepts, methods, tools and some technologies, and operations of sustainable lean and green manufacturing systems and processes. It also covers the assessment, audit, design and maintenance of sustainable green manufacturing products, processes, service systems, and leads towards the entire greening process of multi-lifecycle manufacturing operations, factories and their supply chains.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the design concepts methods, tools, the key technologies and the operation of sustainable green manufacturing.		x	x	
2	Apply the principles, techniques and methods to customize the learned generic concepts to meet the needs of a particular industry/enterprise.			x	x
3	Identify the strategies for the purpose of satisfying a set of given sustainable green manufacturing requirements.			x	
4	Design the rules and processes to meet the market need and the green manufacturing requirements by selecting and evaluating suitable technical managerial / project management and supply chain management schemes.			x	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	Large class activities: Lectures on the topics of the keyword syllabus.	1, 2	2 hrs/week

2	Tutorial	Group work activities: Group projects are given to students for the investigation in relation to the CILOs. Students will discuss the projects during the tutorial period. The group assessment is based on the group presentation and the group report.	1, 2, 3, 4	1 hr/week
3	Self study	Individual work activities: Students are required to carry out self study on webs and search appropriate technical and managerial information/ data in conjunction with the lecturing materials to accomplish a set of given requirements. The work of the self study will be presented as an individual report for assessment.	1, 2, 3, 4	(20 hours)

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Group presentation & report	1, 2, 3, 4	25	5% of the marks is based on the presentation and 20% is based on the report of the softcopy of PPT.
2	Individual report	1, 2, 3, 4	25	20% of the marks is based on the accomplishment of satisfying the given requirements and 5% is based on the write-up of peer Assessment.
3	Examination	1, 2, 3, 4		

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

0

Minimum Examination Passing Requirement (%)

0

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

- 1.1 Ability to explain in detail the design concepts and the operations of the sustainable green manufacturing systems.
- 1.2 Ability to identify the strategies in satisfying a set of given requirements to a green manufacturing enterprise.
- 1.3 Capacity for applying accuracy methods to design and manufacture green products.

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

Group presentation & report (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to explain in detail and with accuracy methods of inquiry useful in analysing to develop sustainable green strategy and the design of a manufacturing enterprise for greener environment.

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

Individual report (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

3.1 Capacity for self-directed learning on webs and search appropriate information/data in conjunction with the lecturing materials to accomplish a set of given requirements.

3.2 Ability to assess the teamwork.

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

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

1.1 Ability to explain in detail the design concepts and the operations of the sustainable green manufacturing systems.

1.2 Ability to identify the strategies in satisfying a set of given requirements to a green manufacturing enterprise.

1.3 Capacity for applying accuracy methods to design and manufacture green products.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure

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Assessment Task

Group presentation & report (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to explain in detail and with accuracy methods of inquiry useful in analysing to develop sustainable green strategy and the design of a manufacturing enterprise for greener environment.

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Part III Other Information**Keyword Syllabus**

Challenges of green manufacturing. Drivers of green manufacturing. Introduction to lean sustainable green manufacturing. Design for Environment. Eco-design. WEEE & RoSH. Recycling and Remanufacturing. Life Cycle Assessment. Environmental Impact Assessment. Industrial Ecology. Industrial Symbiosis. Sustainable Engineering. Humanity and Technology. Analytical methods and computational assessment and design tools for evaluating and designing green manufacturing sustainability processes, requirements, and risks. The sustainable lean and green audit process. International green manufacturing standards and compliance. Green rapid prototyping and rapid manufacturing. Green flexible automation. Green collaboration processes via the Internet. Alternative energy resources. Globally green manufacturing supply chains and logistic networks. Sustainable green manufacturing system design and project management. International industrial and research case studies from the USA, Europe, Japan, Hong Kong, China and elsewhere.

Reading List**Compulsory Readings**

Title	
1	N.A.

Additional Readings

Title	
1	Edited by: David Dornfeld. “Green Manufacturing: Fundamentals and Applications” Springer. 2013.
2	Nand K. Jha: “Green Design and Manufacturing for Sustainability” . CRC Press. 2015.
3	Edited by: J. Paulo Davim “Green manufacturing processes and systems” . Springer. 2013.
4	T.E. Graedel & B.R. Allenby “Industrial Ecology and sustainable engineering” Pearson Education, Inc. 2010.
5	David T. Allen & David R. Shonnard “Sustainable Engineering: Concepts, Design and Case Studies” Prentice Hall; 1st Edition. 2012.
6	Gerald Jonker & Jan Harmsen “Engineering for Sustainability: A Practical Guide for Sustainable Design” . Elsevier. 2012.