SCHEDA DELL'INSEGNAMENTO (SI)

"GREEN MANUFACTURING AND SUSTAINABILITY"

SSD ING-IND/16

DENOMINAZIONE DEL CORSO DI STUDI: INGEGNERIA MECCANICA PER LA PROGETTAZIONE E LA PRODUZIONE

ANNO ACCADEMICO 2022 - 2023

INFORMAZIONI GENERALI - DOCENTE

DOCENTE: ANTONELLO ASTARITA
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INFORMAZIONI GENERALI - ATTIVITÀ

ANNO DI CORSO: I o II
PERIODO DI SVOLGIMENTO, SEMESTRE: I
CFU: 9

INSEGNAMENTI PROPEDEUTICI (se previsti dal Regolamento del CdS)

"None"

EVENTUALI PREREQUISITI

"None"

OBIETTIVI FORMATIVI

The objective of the teaching is to give students an in-depth knowledge of metrics and enabling technologies for the ecological transition of manufacturing processes. The aim of the course is to introduce students to the paradigm of life cycle thinking and sustainable production.

RISULTATI DI APPRENDIMENTO ATTESI (DESCRITTORI DI DUBLINO)

Conoscenza e capacità di comprensione

The course aims to provide students with the knowledge and methodological tools necessary to analyze the environmental impact and sustainability of manufacturing processes. These tools will allow students to understand the causal connections between the manufacturing technologies adopted and the environmental impact associated with the production of a given product. Students will be able to grasp the environmental implications of the introduction of new technologies and to analyze the consequences, in terms of sustainability, of variations in the production process.
Students will be able to illustrate the metrics and enabling technologies for sustainability and will be able to understand the environmental implications of all production processes.

Capacità di applicare conoscenza e comprensione

The student will be able to carry out an LCA (life cycle assessment) analysis using commercial software and following the regulations in force, the student will also be able to assess the environmental impact and sustainability of a given manufacturing process. The student will be able to "rethink" processes and products to increase the sustainability of manufacturing processes.

PROGRAMMA-SYLLABUS

Green Manufacturing: Introduction to green manufacturing, basic principles and metrics. Enabling Technologies.
Sustainability: Definition of sustainability (environment, economy, society). Concept of sustainable production: methodologies, metrics and enabling technologies. Reporting for sustainability, legislation, sustainability assessment and report.
Life cycle assessment: Introduction to LCA (features, history and applications). LCA methodology (aims and scope definition, data inventory, impact assessment and results analysis). Analysis LCA, LCIA, LCC, SLCA. Applications on manufacturing systems.
Materials for the environment: sustainability of materials, materials life cycle, eco-audit of materials, end of life management.
Advanced manufacturing systems: classification and sustainability of different manufacturing systems, introduction to Industry 4.0, sustainability of manufacturing systems.

MATERIALE DIDATTICO

M.P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, Fourth Edition, Global Edition; Gershwin, Stanley B. Manufacturing Systems Engineering. Prentice Hall, 1993; Dornfeld D., Green Manufacturing, Springer 2013; Hauschild, Rosenbaum, Olsen, Life Cycle Assessment Theory and Practice, Springer 2018; Sustainability in manufacturing; OpenLCA user guide; Materials and Environment, 3rd edition, Ashby. Appunti delle lezioni.

MODALITÀ DI SVOLGIMENTO DELL'INSEGNAMENTO-MODULO

The teaching will be organized as follows: about 60% of the hours will be used for lectures, about 35% for laboratory activities and 5% for seminars on specific topics held by specially invited scholars. Specialized software will be used for LCA analysis.

VERIFICA DI APPRENDIMENTO E CRITERI DI VALUTAZIONE

a) **Modalità di esame:**
Nel caso di ***insegnamenti integrati*** *l'esame deve essere unico.*

L'esame si articola in prova	
scritta e orale	
solo scritta	
solo orale	
discussione di elaborato progettuale	
Oral exam and discussion of a project work	X

b) Modalità di valutazione:
A weight of 60% will be attributed to the oral exam and 40% to the discussion of the project.