MANAGEMENT ENGINEERING (LM54)

(Lecce - Università degli Studi)

Teaching ADVANCED TECHNOLOGIES IN MANUFACTURING

GenCod A004632

Owner professor Antonio DEL PRETE

Teaching in italian ADVANCED TECHNOLOGIES IN MANUFACTURING

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SSD code ING-IND/16

Reference course MANAGEMENT ENGINEERING

Course type Laurea Magistrale

Credits 9.0

Teaching hours Ore-Attivita-frontale: 81.0

For enrolled in 2022/2023

Taught in 2023/2024

Course year 2

Language INGLESE

Curriculum Advanced Manufacturing and Operations Management

Location Lecce

Semester Primo-Semestre

Exam type Orale

Assessment Voto-Finale

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION

The course aims to deepen the aspects of object innovation in production technologies applied in the manufacturing sector with particular reference to the transformation of metallic materials for the production of high value-added products.
The materials/technologies solutions mainly used for realization of high performance products (both in terms of requirements and quality) will be discussed. The aspects related to the "Workability of materials by chip removal technologies" will be treated with particular reference to optimization of Material Removal Rate (MRR) according to the level of wear detected. The main elements that characterize the Additive Manufacturing technologies will be provided. The processes by plastic deformation will be analyzed, in particular the hot ones (forging, super plastic forming). The problem of defining performance materials as a function of microstructure will be addressed. The unconventional cold forming technologies of sheet metal, such as tube and sheet hydroforming, will be analyzed. Lastly, welding technologies and non-destructive testing for verification of product quality will be tackled. The base elements related to Smart Manufacturing (intended as an integrated approach: smart products, smart operators, smart workstations) and Cyber Physical Systems (CPS) will be provided. Numerical exercises and laboratory experiences will be carried out, in order to familiarize with the physical quantities that characterize machining operations and learn finite element simulation tools of chip removal and forging processes.

REQUIREMENTS

It is necessary to have passed Mechanical Technology exam. Knowledge of Technical Industrial Design exam is useful.

COURSE AIMS

* Knowledge of metal materials and processes for their transformation.
* Basic knowledge for the characterization of superalloys.
* Basic knowledge for characterization and use of Additive Manufacturing technologies.
* Basic knowledge for finite element simulation of chip removal and forging processes.

TEACHING METHODOLOGY

Frontal Lessons and Practice Exercises

ASSESSMENT TYPE	The exam consists of two tests: -in the first test (written - about one hour), the student must solve a task related to the topics covered during the course; the test aims to determine student's ability to perform autonomously calculations related to the physical quantities that characterize the machining processes discussed during the course. -in the second test (oral - which starts immediately after the written test) the student discusses both the written and other contents of the course, illustrating their level of knowledge and understanding of the topics covered and in order to make relevant cinematic and dynamic analysis.

FULL SYLLABUS

- Critical analysis of materials/processes by comparison with the reference context.
- Exercises on the topics covered.
- Machinability by chip removal of materials for aeronautical application.
- Exercises on the topics covered.
- Hot workability of metallic materials: Forging.
- Deepening on metallurgy of metallic materials and their microstructure.
- Jointing technologies: welding.
- Super plastic forming technology.
- Additive Manufacturing technology.
- Finite element simulation techniques for machining by chip removal and forging and their application to case studies.
- Non-destructive quality control technologies.
- Overview of Smart Manufacturing (Smart Product, Smart Operator, Smart Workstation).
- Overview of Cyber Physical Systems.

REFERENCE TEXT BOOKS	- Class Notes - F.C. Campbell, *Manufacturing Technology for Aerospace Structural materials*, First Edition, Elsevier, 2006