AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching ADVANCED TECHNOLOGIES AND ADDITIVE MANUFACTURING FOR AEROSPACE

GenCod A006162

Owner professor TERESA PRIMO

Reference professors for teaching
Antonio DEL PRETE, TERESA PRIMO

Teaching in italian ADVANCED TECHNOLOGIES AND ADDITIVE

Teaching ADVANCED TECHNOLOGIES AND ADDITIVE MANUFACTURING FOR

SSD code ING-IND/16

Reference course AEROSPACE ENGINEERING
Course type Laurea Magistrale

Credits 9.0

Teaching hours Front activity hours: 81.0

For enrolled in 2022/2023

Taught in 2023/2024

Course year 2

Language ENGLISH

Curriculum CURRICULUM AEROSPACE TECHNOLOGY

Location Brindisi

Semester Second Semester

Exam type Oral

Assessment Final grade

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

BRIEF COURSE DESCRIPTION

The course aims to deepen the aspects related to manufacturing technologies applied in aeronautical constructions, with particular reference to the materials selection and application and the related transformation technologies. Materials/technologies solutions will mainly be used for the construction of airframe and motor structures. The aspects related to the optimization theory applied to the aerospace manufacturing will be presented. The study and the classification of light alloys for aeronautical application, as well as superframes for airframe and motor application, will be addressed. In particular, the main aspects related to the metallurgy and workability of Alluminum alloys and Nickel and Titanium superalloys will be studied taking into account the comparison with real applications. Moreover, the course aims to provide an overview of Additive Manufacturing processes, explain their underlying physical principles, discuss current research and an appreciation for why AM is so important to many branches of industry. In order to take maximum advantage from the capabilities of additive metal technology in the most economical way, will be studied how to design for this technology by following its principles. At the same time, the aspects relating to the design for additive metal manufacturing (DFAM) concept and, the act of integrating product design and additive manufacturing principles into one activity, will be illustrated. Laboratory exercises will be carried out by 3D printer with FFF (Fused Filament Fabrication) and Wax Jet Printing technology, in addition to laboratory exercises that will be focused on tools for the finite element simulation of additive processes.

REQUIREMENTS

You must have passed the Examination of Mechanical Technology. The contents of the Industrial Design Drawing and knowledge of Technical Industrial Design are also useful.

COURSE AIMS

During and a the end of the course, the student should be able to acquire:
- An in-depth knowledge of materials for aeronautical application and processes for their transformation;
- A basic knowledge of the Finite Element manufacturing processes simulation with specific focus on machining and forging.

TEACHING METHODOLOGY	Classroom lessons
ASSESSMENT TYPE	Oral, in which the student discusses theory and practical contents of the course.
FULL SYLLABUS	- Further research on the metallurgy of light alloys, Nickel superalloys and Titanium alloys. - Super Plastic Forming technology. - Classification of additive manufacturing processes. - Overview of existing manufacturers and their specific equipment. - Additive manufacturing technologies for metallic materials: METAL POWDER, METAL WIRE, METAL SHEETS. - Powder Fusion Mechanisms (solid-state sintering, chemically-induced binding, liquid-phase sintering, full melting). - AM technologies for plastic component production (powder, solid and liquid material). - Design for Additive Manufacturing, Additive Manufacturing Process Steps. - Additive manufacturing technologies and applications in the aerospace industry. - Finite element simulation techniques for additive manufacturing and its application to case studies. Small time remodeling is possible between the subjects treated according to the course progress.
REFERENCE TEXT BOOKS	[1] F.C. Campbell, Manufacturing Technology for Aerospace Structural materials, First Edition, Elsevier, 2006 [2] M. Donachie, S. Donachie, SuperAlloys a Technical Guide, UniSalento, Second Edition, ASM International, 2002. [3] Additive Manufacturing - Innovations, Advances, and Applications, T.S. Srivatsan, T.S. Sudarshan. [4] Course handouts.