UNIVERSITÀ DEGLI STUDI DI PALERMO

SCHOOL	POLYTECHNIC SCHOOL
ACADEMIC YEAR	2016/2017
SECOND CYCLE (7TH LEVEL) COURSE	AEROSPACE ENGINEERING
SUBJECT	PROCESS DESIGN
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20907-Attività formative affini o integrative
CODE	10069
SCIENTIFIC SECTOR(S)	ING-IND/16
HEAD PROFESSOR(S)	BUFFA GIANLUCA Ricercatore a tempo determinato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**BUFFA GIANLUCA** Tuesday 11:00 13:00 ufficio Friday 11:00 12:00 ufficio

DOCENTE: Prof. GIANLUCA BUFFA

TEACHING METHODS	Frontal classes, practical classes
ASSESSMENT METHODS	The evaluation will be based on an interview. The interview aims to assess the competences and the knowledge learnt during the course. The questions will verify: acquired knowledge; elaboration capability; talking capability; ability to build autonomous connections not bound to the referring textbooks; capability to produce autonomous evaluations inherent the course topics; capability to understand the applications connected with the discipline areas; capability to connect the discipline topics with the referring professional and technological context. The final assessment is on a 30 basis according to the criteria reported below: 30-30+: excellent knowledge of the topics, excellent language and vocabulary, good analytical capability, the student is able to apply knowledge to solve the proposed problems 26-29: Good management of the topics, nice language and vocabulary, the student is able to apply knowledge to solve the proposed problems 24-25: basic knowledge of the topics, fair language and vocabulary, limited capability to apply autonomously knowledge to solve the proposed problems 21-23: the student does not show full management of the main topics while possessing the knowledge, satisfactorily language and vocabulary, poor capability to apply autonomously the acquired knowledge 18-20: minimal basic knowledge of the main topics and of the technical language and vocabulary, poor or no capability to apply autonomously the acquired knowledge. The exam will be not passed if the student will show a not acceptable knowledge of the topics.
LEARNING OUTCOMES	Knowledge and understanding ability The student, at the end of the teaching course, will have acquired knowledge on the main issues related to the Computer Assisted Engineering (CAE) of the main bulk and sheet forming manufacturing processes. In particular, the student will be able to understand and evaluate the influence of the main geometrical and technological process parameters on the mechanical behavior of the final parts. Ability to apply knowledge and understanding The student will be able to use the mathematical and computer science tools needed for the correct choice of the main process parameters in manufacturing processes of metals. In particular, the student will be able to use the commercial softwares for numerical simulation of manufacturing processes most used in the industrial and academic fields. He will be able to evaluate the influence of a given parameter on the characteristics of the produced part. He will be able to explain the reasons for the selected design. Judging autonomy The student will be able to evaluate the single manufacturing process even characterized by different features with respect to the one studied. Finally, using the simulation softwares, he will be able to understand the design strategy leading to the production of a given component and to evaluate its effectiveness. Communication ability The student will acquire the ability to communicate the main issues related to the CAE of manufacturing processes. He will be able to discuss the choice of the most suited simulation software for a given application. Finally, he will be able to highlight problems and issues related to the choice of the mathematical formulation of the proposed problem, identifying possible solutions leading to the solving of the mechanical problem. Learning ability The student will have learnt the main numerical simulation techniques aimed to the CAE of bulk and sheet forming processes. Additionally, he will have acquired the skills and expertise needed to use the main commercial software for numerical simulation of manufacturing processes.
EDUCATIONAL OBJECTIVES	Provide the tools needed for the CAE of manufacturing processes through Finished Element Method (FEM) based numerical simulation. Highlight the influence of the design strategy on the main features and mechanical characteristics of the final parts.
PREREQUISITES	In order to understand the topics and to easily achieve the learning goals of the teaching course, the student must be confident with the following subjects: Manufacturing Technology – Complements of Manufacturing Technology.
SUGGESTED BIBLIOGRAPHY	Dispense del corso

SYLLABUS

Hrs	Frontal teaching
3	Plasticity theory
3	Updated Eulerian approach

SYLLABUS

Hrs	Frontal teaching
2	Pure Eulerian approach
4	Lagrangian approach: solid formulation
3	Pure/updated Lagrangia approach
3	Dynamic equilibrium equations
3	The contact problem
2	Bulk processes
2	Springback analysis
5	Thermo-mechanical coupled problem
3	Ductile fracture
3	Artificial intelligence tools

Hrs	Practice
2	Introdution to DEFORM 2D: UPSETTING
2	DEFORM 2D: extrusion
2	DEFORM 2D: flat rolling
2	Introduction to LS DYNA: axisimmetric drawing
2	LS DYNA: rectangular drawing
2	LS DYNA: SPRINGBACK
2	LS DYNA: Complex parts with drawbead - DRAWING, TRIMMING, SPRINGBACK
2	Introduction to DEFORM 3D: themo-mechanical simulation
2	DEFORM 3D: forging
2	DEFORM 3D: fracture criteria in extrusion and forging
2	Complex simulations: FRICTION STIR WELDING
2	Complex simulations: multi phasic materials forging