



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
MASTER'S DEGREE (MSC)	CHEMICAL ENGINEERING
SUBJECT	CONSTRUCTION OF EQUIPMENT FOR THE PROCESSING INDUSTRY
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20911-Attività formative affini o integrative
CODE	21883
SCIENTIFIC SECTOR(S)	ING-IND/14
HEAD PROFESSOR(S)	PANTANO ANTONIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	PANTANO ANTONIO Tuesday 10:00 12:00 Ufficio Prof. A. Pantano Friday 11:00 13:00 Ufficio Prof. A. Pantano

<p>PREREQUISITES</p>	<p>Mechanics of solids, Theory of structures.</p>
<p>LEARNING OUTCOMES</p>	<ul style="list-style-type: none"> • Knowledge and understanding Knowledge of the methodological-operational aspects of materials mechanics, construction science and machine construction; Ability to understand, develop and apply ideas and concepts with originality. • Ability to apply knowledge and understanding Ability to use the knowledge of mathematics and basic sciences to interpret and describe simple problems of structural engineering and materials in the mechanical field; Ability to identify, formulate and solve problems concerning the resistance of materials and mechanical components, using the methodologies of construction science and mechanics of materials; Ability to design mechanical components to meet resistance, durability and cost requirements; Ability to operate in compliance with laws and regulations and safety requirements, taking due account, in a balanced way, of costs and benefits and the socio-environmental impact of the proposed solutions; Decision-making skills concerning the choice of materials, test methods, calculation techniques and simplification of problems, aimed at mechanical design. • Autonomy of judgment Autonomy in collecting and interpreting data useful for determining judgments; Autonomy in devising innovative solutions; • Communication skills Ability to present and discuss problems and needs of resistance and safety of components and systems and of choice of building materials. • Learning skills Knowing how to complete the preparation in the field of teaching topics also through individual study.
<p>ASSESSMENT METHODS</p>	<p>The oral exam consists of an interview, aimed at establishing the possession of the disciplinary skills and knowledge required by the course, the ability to contextualize and expose. The evaluation is expressed out of thirty. The candidate will have to answer at least four questions posed orally, on all the parts of the program, with reference to the recommended texts. The final exam aims to assess whether the student has knowledge and understanding of the topics, has acquired interpretative competence and autonomy of judgment of concrete cases. The sufficiency threshold will be reached if the student demonstrates knowledge and understanding of the topics at least in general terms and minimum applicative skills in order to solve concrete cases. He will also have to possess expository and argumentative skills such as to allow the transmission of his knowledge to the examiner. Below this threshold, the examination will be insufficient. The more, however, the examiner with his argumentative and expository skills manages to interact with the examiner, and the more his knowledge and application skills go into the detail of the discipline being tested, the more the evaluation will be positive. The maximum score is obtained if the verification establishes the full possession of the following three aspects: a capacity for judgment able to describe emerging and/or little explored aspects of the discipline; a strong ability to highlight the impact of the course contents within the sector/discipline in which the contents are registered; finally, a mastery in the ability to represent innovative ideas and/or solutions within the professional, technological or socio-cultural context of reference. As regards the verification of the exposition skills, there is a minimum evaluation in the event that the candidate demonstrates a language property adequate to the professional context of reference but this is not sufficiently articulated, while the maximum evaluation can be achieved by who demonstrates full mastery also of technical language.</p> <p>In summary, the final evaluation will be graded according to the following grid of judgments.</p> <p>Excellent: 30-30 cum laude Excellent knowledge of the topics, excellent language properties, very good analytical skills, the student is able to apply the knowledge to effectively address the required problems.</p> <p>Very good: 26-29 Good mastery of the topics, full ownership of language, the student is able to apply the knowledge to adequately address the required problems.</p> <p>Good: 24-25 Basic knowledge of the main topics, good language properties, with limited ability to autonomously apply the knowledge to the solution of the required problems.</p> <p>Satisfactory: 21-23 He does not have full mastery of the main topics but has some knowledge of them, satisfactory language properties, poor ability to independently apply the acquired knowledge.</p> <p>Sufficient: 18-20</p>

	Minimum basic knowledge of the main topics and technical language, very little or no ability to independently apply the acquired knowledge. Insufficient: 0-17 Negative result, the student demonstrates that he has not achieved the minimum learning outcomes required for the course.
EDUCATIONAL OBJECTIVES	The adequate knowledge of the methodological-operational aspects related to the topics covered by the course and the ability to use this knowledge to interpret and describe engineering problems.
TEACHING METHODS	Teaching takes place in the first half of the second year and consists of lectures and numerical exercises.
SUGGESTED BIBLIOGRAPHY	Dispense del corso. Libro dal titolo "Progetto e Costruzione di Macchine"; autori: Shigley, Budynas, Nisbett; editore: McGraw-Hill Education, III edizione ISBN: 9788838668241 IV edizione ISBN: 9788838696350

SYLLABUS

Hrs	Frontal teaching
3	Introduction to the course. Properties of materials. Mechanical tests.
1	Stress concentration factors and methods of determination.
2	Criteria of resistance of materials. Safety factor.
2	Thermal stress and strain.
1	Contact stresses.
5	Pressurized cylinders: equations of equilibrium and compatibility, trend of tensions, hooping of cylinders for high pressures.
6	Fatigue behavior: Wohler Diagram; Factors modifying the endurance limit; Effect of medium stress; Safety coefficients; variable amplitude cycles.
2	Elastic-plastic behavior: Bauschinger effect. Softening and hardening, fracture behavior. The linear elastic fracture mechanics: Stress Intensity Factor; toughness; fracture verification calculations. Propagation of fatigue defects; Paris law.
3	Fasteners: Resistance of bolted joints in static load and fatigue; Concentration of the stress.
3	Welding: Types of joints; primary and secondary shear; design formulas. strength calculations.
1	General information on the connections between mechanical elements: plugs, bolts, spline shafts, keys, feathers.
4	Axles and shafts: fatigue to static and rotating bending and torsion; Sodeberg method; Gough and Pollard Criterion; driveshafts; design formulas.
3	Springs: leaf springs, helical springs, torsion bar springs; static strength and fatigue calculations.
2	Rolling bearings: Selection criteria; Bearing life; Reliability.
1	Lubrication: Stribeck results, Petroff relation, Reynolds theory; lubricants.
1	Plain bearings.
2	Gaskets. Seals.
Hrs	Practice
12	Practical examples on the topics of the lectures