



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2021/2022
MASTER'S DEGREE (MSC)	MECHANICAL ENGINEERING
SUBJECT	INDUSTRIAL DESIGN AND CAD TECHNIQUES
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20933-Attività formative affini o integrative
CODE	17603
SCIENTIFIC SECTOR(S)	ING-IND/15
HEAD PROFESSOR(S)	NIGRELLI VINCENZO Professore a contratto in Univ. di PALERMO quiescenza
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	NIGRELLI VINCENZO Wednesday 10:00 - 12:00 Ufficio Nigrelli DI Edificio 8, I piano. Durante l'emergenza sanitaria, il ricevimento si svolgerà on line su piattaforma TEAMS stanza "Ricevimento Nigrelli". Il codice di accesso verrà fornito su richiesta per e-mail, prenotando il ricevimento.

DOCENTE: Prof. VINCENZO NIGRELLI

PREREQUISITES	None
LEARNING OUTCOMES	<p>Knowledge and understanding: After the course, students will know and will be able to understand:</p> <ul style="list-style-type: none">• problems related to the modeling and the graphical communication of design ideas;• methodologies to analyze and solving, in an original way, designing and product development problems;• problems related to product responsibility and green design. <p>Applying knowledge and understanding: Students will be able to use, in a suitable way, different methodologies of: modeling, graphic representation, innovative conceptual design, concepts selection and project management.</p> <p>Making judgements Students will be able to interpret data at their disposal and to use the most appropriate modeling methodologies. They will be able to integrate knowledge and handling complex systems, as well as making judgments based on incomplete or limited information, also including remarks on social and ethical responsibilities correlated to the product design and development.</p> <p>Communication skills Students will be able to communicate with competence and propriety of language, their conclusions to experts and not, as well as communicating the knowledge and the reasoning about CAD modeling, representation and graphic communication techniques, complex problems of conceptual design</p> <p>Learning skills Students, at the end of the course, will know the main techniques of CAD modeling, fundamental part of a modern design process. Moreover, they will have skills that allow them to autonomously investigate complex problems such as, for example, the green design for the development of new products.</p>
ASSESSMENT METHODS	<p>Final examination is structured in an oral test, with at least two questions, and the presentation of the conceptual design of a simple product made during the course exercises.</p> <p>The aim is to evaluate the mastery of the skills and the disciplinary knowledge of the course as well as the language skill, the autonomy of judgements, the communication skills and the capability of analysis and application of knowledge.</p> <p>Evaluation Criteria Rating: Excellent; mark: 30-30/L; Outcome: excellent knowledge of all arguments, excellent communication skill, good analytical ability, the student is able to apply knowledge to solve the proposed problems Rating: Very good; mark: 27-29; Outcome: good mastery of all arguments, good communication skill, the student is able to apply knowledge to solve the proposed problems Rating: Good; mark: 24-26; Outcome: basic knowledge of the main arguments, discrete communication skill, with limited ability to independently apply the knowledge to the solution of the proposed problems Rating: Satisfactory; mark: 21-23; Outcome: not full mastery, but low knowledge, of the main arguments, satisfactory communication skill, poor ability to independently apply the acquired knowledge Rating: Adequate; mark: 18 -20; Outcome: minimal basic knowledge of the main arguments and of the technical language, very poor or no ability to independently apply the acquired knowledge Rating: Insufficient; mark: <= 17; Outcome: inadequate knowledge of the contents of the arguments of the course</p>
EDUCATIONAL OBJECTIVES	<p>After the course, students:</p> <ul style="list-style-type: none">- will be able to create solid models and surfaces through the use of commercial software, such as Rhinoceros, SolidWorks, Solid Edge, etc..;- will have the knowledge, the comprehension skills and the ability to analyze and to solve problems related to the: design and product development, innovative conceptual design, selection of concepts and project management; they will be able, also, to comment on social and ethical responsibilities correlated to the product design and development. <p>Moreover, students will be able to perform the function of consulting engineer, in order to develop structured procedures for the product design and development.</p>
TEACHING METHODS	Lectures and exercises in the classroom, exercises in laboratories.
SUGGESTED BIBLIOGRAPHY	<p>- Ulrich K.T., Eppinger S.D., Filippini R. "Product Design and Development" McGraw Hill - ISBN: 9781260043655.</p> <p>Per approfondimenti: - Pahl, G., Beitz, W., Feldhusen, J., Grote, K.H. "Engineering Design a</p>

sistematic approach" Springer Verlag 2007
 - Shah J.J., Mantyla M.; Parametric and feature-based CAD/CAM. John Wiley & Sons, ultima edizione.

SYLLABUS

Hrs	Frontal teaching
1	Introduction to modeling techniques
2	Parametric geometry representation method
6	CAD tools
2	Virtual Reality: overview and main characteristics
2	Engineering case studies
2	Collateral design activities. Introduction to the product design and development. Development processes and organizations: the generic development process; the conceptual design: the initial process; adapting the generic product development process; organization for product development
3	Product planning process. Identifying customer needs. Product specifications; target and final ones.
6	Concept generation; decompose a complex problem into simpler; critical subproblems; functional chart; concept classification tree and combination table. Design processes, Problem-solving techniques. Concept selection:concept screening; concept scoring. Concept testing. Product architecture: definition; product changes and variety; platform planning. Product prototyping. Rapid prototyping. Reverse engineering.
2	Product architecture. Industrial design. Design for manufacturing. Product development costs. Estimating the product development costs by Use Value Analysis (UVA) method
3	Projects management: project phases and design structure matrix. Gantt charts. PERT charts. Critical path. Accelerating projects. Estimating project status. Postmortem project evaluation.
2	Product responsibility. Patents and intellectual property. How to papent an invention. Brand. Know-how and industrial secrecy. Engineering ethical principles. A strategy to solve ethical problems.
3	Green design: Design for Environment; fundamentals and goals of the green design. Estimating the product lyfe cicle. The weighted sum method. Techniques to reduce the environmental impact. Environment respect labeling.
Hrs	Practice
4	Parametric geometry representation and CAD systems
4	Engineering case studies
2	Development processes and organizations. Product planning process. Concept design of a product: identifying customer needs. target and finalproduct specifications
4	Concept design of a product: concept generation. design processes, problem-solving techniques. concept selection:concept screening; concept scoring. concept testing. product architecture. product prototyping. rapid prototyping. reverse engineering. design process and virtual reality.
2	Concept design of a product:: product architecture. industrial design. design for manufacturing. product development costs. estimating the product development costs
2	Projects management. Gantt charts. PERT charts. Critical path. Accelerating projects. Estimating project status. Postmortem project evaluation.
2	Product responsibility and related laws. Fundamentals of the green design. Estimating the product lyfe cicle. The weighted sum method. Techniques to reduce the environmental impact.