UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Architettura
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	INDUSTRIAL DESIGN
SUBJECT	STRUCTURE CALCULATION FOR INDUSTRIAL DESIGN
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10647-Attività formative affini o integrative
CODE	01740
SCIENTIFIC SECTOR(S)	ICAR/08
HEAD PROFESSOR(S)	TERRAVECCHIA SILVIO SALVATORE — Ricercatore a tempo determinato — Univ. di PALERMO ZITO MARIANNA — Ricercatore — Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	8
INDIVIDUAL STUDY (Hrs)	136
COURSE ACTIVITY (Hrs)	64
PROPAEDEUTICAL SUBJECTS	04872 - MATHEMATICS
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**TERRAVECCHIA SILVIO SALVATORE** Monday 10:00 13:00 In presenza presso Dipartimento di Ingegneria, Area Strutture, Piano terra (Ex Laboratori DICAM). Thursday 10:00 13:00 In presenza presso Dipartimento di Ingegneria, Area Strutture, Piano terra (Ex Laboratori DICAM). **ZITO MARIANNA** Monday 11:00 13:00 Dipartimento di Ingegneria. Sezione strutture. Piano terra (ingresso accanto alla scala F4). Ufficio 11.Previa prenotazione da effettuarsi almeno due giorni prima. Thursday 11:00 13:00 Dipartimento di Ingegneria. Sezione strutture. Piano terra (ingresso accanto alla scala F4). Ufficio 11.Previa prenotazione da effettuarsi almeno due giorni prima.

DOCENTE: Prof. SILVIO SALVATORE TERRAVECCHIA- *Lettere M-Z*

PREREQUISITES	Knowledge of the basic physical quantities and their units of measurement in the international system. Scalar and vector quantities. Sum, difference and vector product. Elements of differential and integral calculus. Elements of analytic geometry.
LEARNING OUTCOMES	Knowledge and understanding: The course aims to provide students with the analytical methods and fundamental tools for understanding the behavior of structures. Applying acquired knowledge and understanding: The learner will be able to identify structures, formalize their behavior through physical and mathematical models, analyze and solve them with scientific rigor and critical approach. Making judgments: learners will acquire individual skills of judgment enabling them to identify solutions and intervention strategies to the problems they will tackle in professional practice. Communication skills: learners will be able to express themselves with appropriate language and to communicate clearly and effectively the results of their work. Learning skills: learners must be able to acquire information contained in texts written in formalized and scientific language.
ASSESSMENT METHODS	The learning assessment is conducted both at the global and at the individual level. At the global level, the learning assessment is achieved by means of classroom discussions and seminars (during which students must solve, individually or in group, exercises and problems) and laboratory activities (at the end of which students can optionally furnish a design work report on a simple industrial design structure). At the individual level, the learning assessment is based on an ongoing and a final test structured in order to evaluate the knowledge and understanding of the topics covered during the course and the acquired proficiency to solve real problems. Both tests are in written form. The ongoing test is carried out in the specific period indicated in the didactic calendar. Students have a time of 1,5 hours to solve an exercise based on the main topic of the first part of the course: the statically determined structures. Marks are in the range 0-15. The test is passed when the student demonstrates to clearly know how to use the mathematical instruments for the solution of a structural problem and reaches a score of at least 10. The final test, if the student already passed the ongoing test, consists on a second written test. Students have one hour to solve an exercise on the topics of the second part of the course: axial, bending and shearing stresses in beams and structural safety. Marks are in the range 0-12. The test is passed when the student demonstrates to be able to use the physical-mathematical instruments in order to understand the behavior of the structure under analysis and reaches a score of at least 8. Students who furnish the report on an industrial object receive an additional score from 1 to 5. The final score, expressed in thirties, is obtained adding the scores of the ongoing test, the final test, and the eventual design work report. Students who didn't pass the ongoing test must face a final test where they will find two exercises, based on the same topics of the first and second part of the course, respectively. The time to solve both exercises is 2,5 hours and the exam is passed when the student reaches at least the minimum scores in both exercises (10 and 8, respectively). The final score, expressed in thirties, is obtained adding the scores of the final test and the eventual design work report. The design work report, not compulsory, must be handed over no later than one week after the end of lessons, independently of the round chosen by the student for the final test. Exercises are thought in order to test the expected learning outcomes and to verify: a)the acquired knowledge, b)the ability to elaborate such notions and apply them to specific examples. Both for attending and non-attending students, the final score is assigned in thirties according to the following scheme: 30 and 30 cum laude: excellent knowledge of all the topics, good analytical ability; the student is able to apply the acquired knowledge to solve the proposed problems 26-29: good knowledge of all the subjects, good analytical ability; the student is able to apply the acquired knowledge to solve the proposed problems 24-25: basic knowledge of the main topics, with limited ability to independently apply the acquired knowledge to solve the proposed problems 21-23: limited knowledge of the main topics, with limited ability to independently apply the acquired knowledge to solve the proposed problems 18-20: minimal knowledge of the main topics, very little or no ability to independently apply the acquired knowledge. Insufficient: the student does not have an acceptable knowledge of the contents of all the taught topics.

EDUCATIONAL OBJECTIVES	The course Calculation of structures for Industrial Design, being the only structural course, must harmonize two different needs. The first need – typical of a basic course – is to introduce students to the study of structures, providing those mathematical, conceptual and methodological tools required to ensure the understanding of the fundamental contents. The second need – typical of more advanced courses and according to the educational objectives of the degree course, characterized by a strong orientation towards the application of knowledge and skills to the design processes of industrial products – is to provide students with the tools necessary to identify structures, formalize their behavior and analyze them with a critical and scientific approach.
TEACHING METHODS	In order to achieve the educational objectives of the course and facilitate students' learning, an agile and synthetic teaching approach is used, mainly based on the practical aspects and articulated in lectures, tutorials, seminars and laboratory activities where students are actively involved. The theoretical discussion of the various topics is carried out in order to highlight the essential concepts and allow students to achieve a full understanding. In order to furnish a tangible and indispensable support to the theoretical discussion, many examples and applications are proposed and solved both during lessons and practice time or seminars. Seminars and laboratory activities are designed to deepen the theoretical concepts and overcome eventual difficulties, clarify doubts, encourage group work for solving the proposed problems, facilitate the learning, arouse students' interest and improve their study method.
SUGGESTED BIBLIOGRAPHY	A. Campanella, "Introduzione alla Meccanica delle strutture per il Design", Aracne ed., 2014. C. Comi e L. Corradi Dell'Acqua, "Introduzione alla Meccanica Strutturale", McGraw-Hill, 2003. A. Carpinteri, "Structural Mechanics Fundamentals", CRC Press, 2014. M. Zito “Appunti di Calcolo di strutture per il Disegno Industriale”, dispensa, 2019.

SYLLABUS

Hrs	Frontal teaching
8	Kinematics of rigid bodies. Degrees of freedom. Equilibrium of rigid bodies. Supports and supports reactions.
8	Internal forces: axial force, shearing force, bending moment. Diagrams of internal forces.
10	Geometric properties of plane areas. Theory of beams.

Hrs	Practice
6	Kinematics of rigid bodies. Degrees of freedom. Equilibrium of rigid bodies. Supports and supports reactions.
6	Internal forces: axial force, shearing force, bending moment. Diagrams of internal forces.
6	Geometric properties of plane areas. Applications on the Theory of beams.

Hrs	Workshops
16	Production of a design work report on the calculus of a simple structure for the industrial design, through application of the knowledge acquired during the course.

Hrs	Others
2	Statically determined structures: evaluation of support reactions and diagrams of internal forces (seminar activity).
2	Applications on the Theory of beams (seminar activity).

DOCENTE: Prof.ssa MARIANNA ZITO- *Lettere A-L*

PREREQUISITES	Knowledge of the basic physical quantities and their units of measurement in the international system. Scalar and vector quantities. Sum, difference and vector product. Elements of differential and integral calculus. Elements of analytic geometry.
LEARNING OUTCOMES	Knowledge and understanding: The course aims to provide students with the analytical methods and fundamental tools for understanding the behavior of structures. Applying acquired knowledge and understanding: The learner will be able to identify structures, formalize its behavior through physical and mathematical models, analyze them and solve them with scientific rigor and critical approach. Making judgments: learners will acquire independent skills of judgment enabling them to identify solutions and intervention strategies to the problems they will tackle in professional practice. Communication skills: learners will be able to express themselves with a command of language and to communicate clearly and effectively the results of their work. Learning skills: learners must be able to acquire information contained in written texts with formalized language and science.
ASSESSMENT METHODS	The learning assessment is conducted both at the global and at the individual level. At the global level, the learning assessment is achieved by means of classroom discussions and seminars (during which students must solve, individually or in group, exercises and problems) and laboratory activities (at the end of which students can optionally furnish a design work report on a simple industrial design structure). At the individual level, the learning assessment is based on an ongoing and a final test structured in order to evaluate the knowledge and understanding of the topics covered during the course and the acquired proficiency to solve real problems. Both tests are in written form. The ongoing test is carried out in the specific period indicated in the didactic calendar. Students have a time of 1,5 hours to solve an exercise based on the main topic of the first part of the course: the statically determined structures. Marks are in the range 0-15. The test is passed when the student demonstrates to clearly know how to use the mathematical instruments for the solution of a structural problem and reaches a score of at least 10. The final test, if the student already passed the ongoing test, consists on a second written test. Students have one hour to solve an exercise on the topics of the second part of the course: axial, bending and shearing stresses in beams and structural safety. Marks are in the range 0-12. The test is passed when the student demonstrates to be able to use the physical-mathematical instruments in order to understand the behavior of the structure under analysis and reaches a score of at least 8. Students who furnish the report on an industrial object receive an additional score from 1 to 5. Both for attending and non attending students, the final score, expressed in thirties, is obtained adding the scores of the ongoing test, the final test, and the eventual design work report. Students who didn't pass the ongoing test must face a final test where they will find two exercises, based on the same topics of the first and second part of the course, respectively. The time to solve both exercises is 2,5 hours and the exam is passed when the student reaches at least the minimum scores in both exercises (10 and 8, respectively). Both for attending and non attending students, the final score, expressed in thirties, is obtained adding the scores of the final test and the eventual design work report. The design work report, not compulsory, must be handed over no later than one week after the end of lessons, independently of the round chosen by the student for the final test. Exercises are thought in order to test the expected learning outcomes and to verify: a)the acquired knowledge, b)the ability to elaborate such notions and apply them to specific examples. The final score is assigned in thirties according to the following scheme: 30 and 30 cum laude: excellent knowledge of all the topics, good analytical ability; the student is able to apply the acquired knowledge to solve the proposed problems 26-29: good knowledge of all the subjects, good analytical ability; the student is able to apply the acquired knowledge to solve the proposed problems 24-25: basic knowledge of the main topics, with limited ability to independently apply the acquired knowledge to solve the proposed problems 21-23: limited knowledge of the main topics, with limited ability to independently apply the acquired knowledge to solve the proposed problems 18-20: minimal knowledge of the main topics, very little or no ability to independently apply the acquired knowledge.

	Insufficient: the student does not have an acceptable knowledge of the contents of all the taught topics.
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8	Internal forces: axial force, shearing force, bending moment. Diagrams of internal forces.
10	Geometric properties of plane areas. Theory of beams.

Hrs	Practice
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6	Internal forces: axial force, shearing force, bending moment. Diagrams of internal forces.
6	Geometric properties of plane areas. Applications on the Theory of beams.

Hrs	Workshops
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Hrs	Others
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