



FONDAMENTI DI MECCANICA E STATICA

12 CFU - 1° Semester

Teaching Staff

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Office Hours: Lunedì 9:00-11:00, studio n. 358, DFA. Monday 9:00 a.m. - 11:00 a.m., Room 358, DFA. Martedì 9:00-11:00, SDS Architettura (SR), solo su prenotazione con 48 h di anticipo MINIME.

LEARNING OBJECTIVES

▪ STATICA

The module of Statics aims at delivering students the basic knowledge of the mechanics of structures, in view of the future courses of Mechanics of Structures and Design of Structures.

In particular, as shown below in the contents of the course, after dealing with the basic topics regarding the equilibrium, the statics and kinematics of rigid bodies, several plane structural typologies subjected to forces were analyzed (beams, frames, articulated systems, arches).

Such structures will be classified, characterized on the basis of a kinematic analysis, and the reactions and the force on the structure will be obtained.

Finally, a part of the course will be devoted to topics which will be applied in future courses with reference to the stress and strain analyses. In particular, the geometric properties of plane figures will be inferred.

▪ FISICA

Allow students to understand the scientific basis of modern technologies commonly used in professional practice and research.

COURSE STRUCTURE

▪ STATICA

DETAILED COURSE CONTENT

▪ STATICA

1. Theory of vectors and graphic statics (see the website of the course)

Polygon of forces, decomposition of a force along two assigned directions, definition of moment, resultant force and moment of a system of forces, equivalent system of forces, central axis, funicular polygon.

2. Cardinal equations of the statics (A. Greco, Scienza delle Costruzioni, Aracne Editrice, 2012)

Definition of rigid body; the principles of dynamics; equilibrium with respect to translation and rotation, graphic method, analytical and graphic applications.

3. Statics and kinematics of restrained rigid bodies (A. Greco, Scienza delle Costruzioni, Aracne Editrice, 2012)

Definition of restraint; static and kinematic characterization of external restraints; kinematics of rigid bodies; absolute centre of rotation; statically determined, statically indetermined and ill-conditioned systems; graphic and analytical evaluation of reactions for statically determined rigid bodies, uniaxial problems, bi-dimensional problems, forces, indefinite equilibrium equations, static and kinematic characterization of internal restraints, articulated systems, internal reactions, equilibrium of articulated systems, graphic method, symmetric systems, kinematic analysis of articulated systems, virtual displacement, relative centre of rotation, kinematic chains, Chasles and Kennedy's theorems, static-kinematic duality, virtual work principle for rigid bodies, computation of reaction and forces with the virtual work principle, applications.

4. Statically determined structural typologies (A. Greco, Scienza delle Costruzioni, Aracne Editrice, 2012)

Truss systems; node equilibrium method, Ritter's section method, il metodo dell'equilibrio ai nodi; il metodo della sezione di Ritter; Gerber beams, arches, physical reality and structural modelling.

5. Geometry of areas (materiale didattico fornito nella pagina del corso)

Center of gravity of discrete and continuous systems, graphic and analytical assessment, static moment, moment of inertia, Huygens's theorem, principal axes of inertia, central ellipse of inertia, pole and anipole with respect to the central ellipse of inertia, central core or inertia, application to common sections.

▪ FISICA

Physics will be presented to the students not as a collection of abstract formulas and ideas, as it is often perceived by students like those that are graduating in "Architecture", but as a tool for understanding the world around us and as a cultural basis for mastering and properly use modern advanced technologies now in daily use.

TEXTBOOK INFORMATION

▪ **STATICA**

1) A. Greco, Scienza delle Costruzioni, Aracne Editrice, 2012

2) E. Viola. Esercitazioni di scienza delle costruzioni - vol.1: strutture isostatiche e geometria delle masse. Pitagora, 1977.

▪ **FISICA**

Any book is accepted, provided is university level one. The concepts developed in this course are indeed independent from the Author views or research as we are dealing with well established classical physics subjects.

Anyway, the course will more closely follow these textbooks:

Fisica, Alonso-Finn, English and Spanish edition available at Addison-Wesley

Physics2000, HR Huggins, Moose Mountain Digital Press, available at www.physics2000.com

Fisica, P. Mazzoldi, M. Nigro, C. Voci, SES (italian)

Problemi di Fisica Generale, Rosati- Casali, CEA (Italian)
