

Syllabus

Syllabus

Titul dl curs	Finite Element Analysis (FEA)
Codesc dl curs	47556
Titul suplementar	
SSD	IIND-03/A
Lingaz	Inglese
Curs de laurea	Corso di laurea magistrale in Ingegneria Industriale Meccanica
D'autri cursc de laurea (cursc deberieda)	
Dozenc	prof. Franco Concli, Franco.Concli@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/34279
Assistent didatich	
Semester	Secondo semestre
Ann/Agn de stude	1
Credic universitars	5
Ores de insegnament	28
Ores de laboratore	18
Ores de stude individual	79
Ores de riceviment prevedudes	15
Ressumè di contegnus	The course introduces the theoretical background of the Finite Element Method in order to promote a critical and aware approach to its application in machine design. It also provides exposure practical design cases to encourage understanding of the broader implications of design. The course introduces the finite element method (FEM) for the analysis of solid structural problems. The background of the finite element method and its solution procedures for linear analysis will be provided and the different type of elements will be introduced.

Argomenc dl curs	• Introduction to FEM: the method of displacements applied to FEM • Formal Procedure For FEM: discretization, Shape functions, displacement, strain, stress, stiffness matrix, solution, recovery of results. • Bar, Simple Beam, 2D and 3D Beam Element. Property and limitations of beam elements • Plane Elements, Plane stress and plane strain, linear and quadratic triangular and quadrilateral elements. Properties and limitations of plane elements • Isoperimetric elements. Properties, limitations • Solid Elements, linear and quadratic test and hex elements. Solid of Revolution. Properties, limitations. • Theory of Plates and Shells. Finite elements for plates and shells • Theory of composite laminate materials. Orthotropy. Finite elements for orthotropic laminated composite materials Nonlinear analyses, contact analysis, large deformation analysis, modal analysis and structural instability analysis will also be addressed.
Paroles clef	FEA
Prerequisic aconsiés	None.
Cursc propedeutics	
Modalité de enseignament	Frontal lectures, exercises, labs, projects, etc.
Oblianza de frecuencia	Recommended
Obietifs formatifs y competenzes da arjonje	Intended Learning Outcomes (ILO) By the end of the course, students should be able to: Knowledge and understanding: 1. Know the theoretical bases of the Finite Element Method for the solution of structural problems Applying knowledge and understanding: Know how to apply FEA to practical design cases in the field of stress analysis for machine design. Making judgements: 3. Critically analyze the results of FEA simulation, discuss their

	accuracy, on the basis of the mesh and elements properties 4. Define a FEM model with a tradeoff between the accuracy and the computational effort Communication skills: 5. Prepare a technical report describing the design application, expose and discuss it at the oral exam Ability to learn: 6. Ability to autonomously extend the knowledge acquired.
Obietifs formatifs y competenzes da arjonje (informazions suplementares)	
Sort de ejam	- Formative assessment: In class exercises: 9x120 minutes; ILOs assessed: 2, 3, 4; - Summative assessment: 50% written exam questions; ILOs assessed: 1, 2. 50% report and oral discussion, weighted as follows: Quality of the technical report (30%), correctness of the results (20%) Oral discussion (50%); ILOs assessed: 3,4, 5, 6.
Criters de valutazion	The final mark will be obtained combining the evaluations of the written test and of the oral examination.
Bibliografia obligatora	Lecture notes and documents for exercise will be available on OLE.
Bibliografia aconsieda	Olek C Zienkiewicz, Robert L Taylor, J.Z. Zhu, The Finite Element Method: Its Basis and Fundamentals, Seventh Edition (ENG) Robert D. Cook, Finite Element modeling for stress analysis, L Wiley & Sons, 1995 (ENG)
Deplù informazions	
OSS	Innovazione e infrastrutture, Istruzione di qualità