Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Advanced Finite Element Methods
Course code	46056
Scientific sector	ING-IND/14
Degree	PhD in Advanced Systems Engineering (free choice)
Semester	1st
Year	I
Academic year	2022/2023
Credits	3
Modular	NO

Total lecturing hours	30
Attendance	Preferrable
Prerequisites	None
Course page	

Specific educational objectives	The course aims to introduce the design mindset and the main methods for the design of mechanical systems, to provide exposure to the practice of design through application and to encourage understanding of the broader implications of design.

Lecturer	Prof. Franco Concli Email: Franco.Concli@unibz.it Franco Concli / Free University of Bozen-Bolzano (unibz.it)
Scientific sector of the lecturer	ING-IND/14
Teaching language	English
Office hours	After consultation and agreement with the lecturer
Teaching assistant *(if any)*	
Office hours	
List of topics covered	The course introduces the finite element method FEM for the analysis of solid structural problems. • Bar, Simple Beam, 2D and 3D Beam Element. • Plane Elements, Plane stress and plane strain, linear and quadratic triangular and quadrilateral elements. Properties and limitations of plane elements • Solid Elements, linear and quadratic tet and hex elements. Nonlinear analyses, contact analysis, large deformation analysis, and modal analysis analysis will be addressed. Students will apply the above-mentioned approaches to the design of real mechanical components. In particular a practical case study will be developed by the

	students in the application part and a report will issued. The report will be object of discussion in the exam.
Teaching format	Frontal lectures, exercises, projects, etc.

Learning outcomes	Intended Learning Outcomes (ILO) By the end of the course, students should be able to: 4/5 Knowledge and understanding 1. Handle the analysis methods used in structural design of mechanical systems. Applying knowledge and understanding 2. Know how to face a new project of a mechanical system starting from its functional design. Making judgements 3. Identify the critical zones and the corresponding stress states of all components of a mechanical system, under service loading conditions. 4. Choose the geometry and materials able to satisfy the requirements of each component in terms of strength, deformation, fatigue life, and so on and realizing the technical drawing of the system. Communication skills 5. Oral communication skills (technical language) Ability to learn 6. Ability to autonomously extend the knowledge acquired
Assessment	**Formative assessment:** In class exercises **ILOs assessed:** 2, 3, 4 **Form:** Oral exam–theory **%:** 50 **ILOs assessed:** 1, 2, 3, 4, 5, 6
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final mark will be assigned based on the discussion of the project.

Required readings	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)
Supplementary readings	