Syllabus

Descrizione corso

Titolo insegnamento	Advanced topics on machine design
Codice insegnamento	47555
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IIND-03/A
Lingua	Inglese
Corso di Studio	Corso di laurea magistrale in Ingegneria Industriale Meccanica
Altri Corsi di Studio (mutuati)	
Docenti	prof. Franco Concli, Franco.Concli@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/34279
Assistente	
Semestre	Secondo semestre
Anno/i di corso	1
CFU	5
Ore didattica frontale	32
Ore di laboratorio	12
Ore di studio individuale	81
Ore di ricevimento previste	
Sintesi contenuti	The course aims to introduce the design mind-set 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. Students will learn, in the first module, fundamental concepts and methodologies for understanding and modelling mechanical systems. In the second module, the theory of numerical finite element methods is introduced. Emphasis is given to practical applications, especially considering the advantages achievable with the latest

	technologies.
Argomenti dell'insegnamento	PART 1: Material behavior and basic concepts 1. Principle of virtual work 2. Force Method for the solution of Hyperstatic Structures 3. Multi-axial fatigue criteria a. Critical plane concepts 4. Low cycle fatigue of materials a. Masing Hp. b. Ramberg-Osgood eq. c. Neuber Hp. d. Basquin-Coffin-Manson eq. e. Loading spectra PART 2: Machine Elements 5. Shafts and shaft components a. Interference fits (shaft-hub connection) b. Deflections 6. Gears a. Failure modes (bending - pitting - micro pitting - scuffing) b. Gear types (spur - helical - bevel - worm) c. Gear configurations (parallel axis, orthogonal axis, planetary) d. Synthetic factors (sizing) e. Strength calculation (ISO 6336) f. Gear stiffness (Deformation under load) g. Examples of gearboxes (motorcycle and car transmissions) 7. Bolted connections (screwed joints) a. Pretension b. Tearing c. Sheet yielding 8. Welded connections a. Pressure vessel.
Parole chiave	Machine elements
Prerequisiti	Machine Design.
Insegnamenti propedeutici	
Modalità di insegnamento	The topics are presented by the professor by means of Power Point presentations or the blackboard. A selection of the material presented in class as well as online resources and useful material will be available in the OLE database/.

	Further deepening material will be supplied or recommended by the teacher.
Obbligo di frequenza	Recommended
Obiettivi formativi specifici e risultati di apprendimento attesi	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 realize the technical drawing of the system. Communication skills: 5) Oral communication skills (technical language) Learning skills: 6) Ability to autonomously extend the knowledge acquired.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	- Formative assessment In class and exercises and activities (2,3,4) - Summative assessment The assessment of the course is: • Written exam 3/4 exercises • Oral Exam Open-ended questions - Theoretical knowledge (40%) - Ability to provide examples/applications of the theoretical concepts (30%)

	- Ability to establish relationships between topics (20%) - Mastery of language (also with respect to teaching language) (10%).
Criteri di valutazione	The final mark will be obtained combining the evaluations of the final written test and of the oral examination.
Bibliografia obbligatoria	Lecture notes and documents for exercise will be available on the reserve collections There is no single textbook that covers the entire course. The course material is collected from various sources that will be announced during the course. A selection of the material presented in class and useful material will be available in the course reserve collection database.
Bibliografia facoltativa	R.S.KHURMI AND J.K. GUPTA, A Textbook of Machine Design, S Chand (ENG) Shigley's Mechanical Engineering Design, McGraw-Hill (ENG) G. NIEMANN, H. WINTER, Maschinenelemente, Springer (GER) P. HAEFELE, L. ISSLER, H. RUOSS, fertigkeitslehre – Grundlagen, Springer (GER) P. DAVOLI, M. FILIPPINI, C. GORLA, A. LO CONTE, Lezioni sugli organi di macchine, Politecnica (ITA) P. DAVOLI, A. BERNCASCONI, M. FILIPPINI, S. FOLETTI, Comportamento meccanico dei materiali, McGraw-Hill (ITA)
Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	Innovazione e infrastrutture, Istruzione di qualità