Syllabus

Descrizione corso

Titolo insegnamento	Functional Mechanical Design
Codice insegnamento	47563
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IIND-02/A
Lingua	Inglese
Corso di Studio	Corso di laurea magistrale in Ingegneria Industriale Meccanica
Altri Corsi di Studio (mutuati)	
Docenti	dott. Roberto Belotti, Roberto.Belotti@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38331
Assistente	
Semestre	Primo semestre
Anno/i di corso	1
CFU	5
Ore didattica frontale	28
Ore di laboratorio	18
Ore di studio individuale	79
Ore di ricevimento previste	
Sintesi contenuti	The course aims at giving the guidelines for the functional design of automatic machines, in particular taking into account mechanical efficiency. Criteria and methods to analyze and choose mechanical devices, design motion laws and to evaluate the best system to minimize the energy dissipation in electromechanical systems will be addressed.
Argomenti dell'insegnamento	• Introduction to functional design, classification of the mechanisms and motion systems. • Basic concepts and definitions. Mechanical efficiency,

	performance, energy efficiency and energy savings in automatic machines. Direct/reverse energy flow and motor–load systems. • Mechanical components for transferring and transforming energy. Classification based on function, working principle as well as performance and efficiency. • Optimization aimed at improving the quality of motion and efficiency. • Energy storage systems and energy recovery. Classification (working principle and scope of use). • Classification of motion laws implemented in automatic machines. Analysis of the main requirements in the design of a motion law and its optimization.
Parole chiave	machine dynamics, mechanical transmission, efficiency, trajectory planning, electric motor
Prerequisiti	None.
Insegnamenti propedeutici	
Modalità di insegnamento	Frontal lectures, hand-calculation exercises, computer-assisted exercises.
Obbligo di frequenza	Strongly recommended.
Obiettivi formativi specifici e risultati di apprendimento attesi	1. Knowledge and Understanding: • Understand the kinematic and dynamic properties of mechanism for the transmission of motion; • Understand the properties of the most common trajectories and their influence on the machine dynamics 2. Applying knowledge and understanding: • Evaluate and select the proper transmission system considering mechanical and energy efficiency; • Identify the main components of transmission systems and sources of inefficiency 3. Making judgments: • Select and design an effective motion law under different working conditions and targets; • Choose suitable combination of mechanical and electric components for energy transformation and transfer 4. Communication skills:

	• Ability to structure and prepare scientific and technical documentation 5. Learning skills: • Ability to independently build upon the knowledge acquired during the study course by reading and understanding scientific and technical documentation.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	- Formative assessment: In-class exercises: continuosly in exercise courses; Learning outcomes assessed: 1, 2, 3, 4, 5; - Summative assessment: Written exam: 3 hours; Learning outcomes assessed: 1, 2, 3, 4, 5.
Criteri di valutazione	The written examination will include both theoretical questions and numerical exercises to show ability to solve problems handled in this course. Written examination: Theoretical knowledge (35%) Correctness of methods (30%) Correctness in solution (30%) Appropriate use of units (5%).
Bibliografia obbligatoria	Slides provided to the students after each lecture and notes taken by students during lecture.
Bibliografia facoltativa	A collection of suggested readings from various sources will be announced during the course. Such sources will be papers, manuals, technical notes, and excerpts from textbooks, including • Biagiotti, Luigi, and Claudio Melchiorri. *Trajectory planning for automatic machines and robots*. Springer Science & Business Media, 2008. • Norton, Robert L. *Kinematics and dynamics of machinery*. McGraw Hill Higher Education, 2009. • Filizadeh, S. *Electric Machines and Drives: Principles, control, modelling and simulation*. CRC Press, 2013.
Altre informazioni	
Obiettivi di Sviluppo	Energia rinnovabile e accessibile, Lotta contro il cambiamento

Sostenibile (SDGs)	climatico, Utilizzo responsabile delle risorse