Syllabus

Descrizione corso

Titolo insegnamento	Design with Composite Materials
Codice insegnamento	47564
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IIND-03/C
Lingua	Inglese
Corso di Studio	Corso di laurea magistrale in Ingegneria Industriale Meccanica
Altri Corsi di Studio (mutuati)	
Docenti	dr. ing. Karl Peter Leibenguth, KarlPeter.Leibenguth@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/47569
Assistente	
Semestre	Primo semestre
Anno/i di corso	2
CFU	5
Ore didattica frontale	28
Ore di laboratorio	18
Ore di studio individuale	79
Ore di ricevimento previste	
Sintesi contenuti	Achieving an understanding of composite materials as an important technical means beyond structural applications; to be able to select material combinations based on the external load acting on the object; to get acquainted with different approaches to composite material design with an additional perspective on nature and biological inspired approaches; to gain knowledge on how to characterize composite materials and to assess their failure in operation to derive design optimizations.
Argomenti	1. General introduction to composites and their history

dell'insegnamento	2. Materials in composite technology 3. Technical applications going beyond the structural use 4. Production and processing technologies 5. Interfaces and surfaces 6. Behaviour of composites: lab v. operational conditions 7. Design and construction a. Classical toolsets b. Biomimetics and nature-inspired approaches c. Optimization technologies d. Material selection strategies 8. Joining technologies 9. Destructive and non-destructive characterization 10. Failure assessments and their impact on design 11. Recycling and sustainability considerations.
Parole chiave	
Prerequisiti	Basic material science, construction and production technologies, experimental physics.
Insegnamenti propedeutici	
Modalità di insegnamento	Lecture and exercise.
Obbligo di frequenza	Not mandatory but strongly recommended.
Obiettivi formativi specifici e risultati di apprendimento attesi	Learning outcomes (ILO): 1. Knowledge and understanding: Students should know the theoretical background of diverse composite materials from materials, processing, calculation, and design perspective 2. Applying Knowledge and understanding: Students should be able to discern the different properties and production methods of the basic material classes from those of composite materials. They should be able to select and use basic calculation methods to determine composite behaviour from data of the constituent materials. 3. Making judgments: Students should be able to critically decide when to employ composite materials in component/product design, how to experimentally assess their properties and how to use failure cases analyses as a means to improve designs.

	4. Communication skills: Students should be able to present results of the exercises and contributions to discussions/own talks in appropriate technical/scientific language. 5. Learning skills Students should be able to autonomously search and critically appraise technically relevant data, publications and case studies.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	- Formative assessment: In-classe exercises: 9x120 minutes; ILOs assessed: 1, 2, 3, 4, 5. - Summative assessment: 100% written exam: 2 hours; ILOs assessed: 1, 2, 3, 4.
Criteri di valutazione	Performance in written exam.
Bibliografia obbligatoria	T.W. Clyne et al., "An Introduction to Composite Materials", Cambridge University Press, 3rd ed., 2019, ISBN 978-0-521-86095-6 K.K. Chawla, "*Composite Materials – Science and Engineering*", Springer, 4th ed., 2019, ISBN 978-3-030-28982-9 M.F. Ashby, "*Materials Selection in Mechanical Design*", Butterworth-Heinemann, 5th ed., 2017, ISBN 978-0-08-100599-6
Bibliografia facoltativa	J. Rösler et al., "*Mechanisches Verhalten der Werkstoffe*", Vieweg+Teubner, 3rd ed., 2008, 978-3-8351-0240-8 M.F. Ashby, "*Materials and the Environment – Eco-informed Material Choice*", Butterworth-Heinemann, 3rd ed., 2021, ISBN 978-0-12-821521-0 C. Mattheck, "Design in Nature – Learning from Trees", Springer, 1st ed., 1998, ISBN 978-3-642-58747-4

Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	