Syllabus

Descrizione corso

Titolo insegnamento	Scambio Termico e di Massa
Codice insegnamento	42617
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	IIND-07/A
Lingua	Inglese
Corso di Studio	Corso di laurea professionalizzante in Tecnologie del Legno
Altri Corsi di Studio (mutuati)	
Docenti	dr. ing. Martin Heinrich Spitzner, MartinH.Spitzner@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/14260
Assistente	
Semestre	Primo semestre
Anno/i di corso	1
CFU	3
Ore didattica frontale	30
Ore di laboratorio	0
Ore di studio individuale	45
Ore di ricevimento previste	9
Sintesi contenuti	• Heat and mass (moisture) transport through opaque and transparent elements of the building envelope • Thermal and hygric building physics • Fourier's law, Transmission, Radiation, Ventilation • Calculation and verification methods (both hands-on and numerical simulation) • Thermal bridges • Technical standards and norms • Measurements and test procedures • heat gain, heat loss, surface temperature, water vapour

	diffusion, air humidity, air exchange, mould prevention, room temperature, thermal comfort.
Argomenti dell'insegnamento	
Parole chiave	
Prerequisiti	Availability of standards (e.g. pdfs on your smart phone) under "compulsory readings" during the lectures.
Insegnamenti propedeutici	
Modalità di insegnamento	Frontal lectures, exercises, labs, student coursework and presentations.
Obbligo di frequenza	Attendance Not compulsory but recommended. 15% of the grading of the course will be based on course work and short student presentations (including pdf hand-outs generated) during the lectures and/or laboratory hours. The students will get "extra points" which count to the grand total points in the written exam of the course. This makes it easier for them to achieve a good mark. However, even without presentations, students can still reach full points in the written exam.
Obiettivi formativi specifici e risultati di apprendimento attesi	Learn, understand, calculate and evaluate the principles and processes of heat and mass transfer, especially for use in building materials, components and buildings. The practical correlations required for the thermal-hygric-energetic evaluation of (building) materials, component structures and buildings are taught, as well as the physical processes behind them. The physical principles also apply to relevant processes in general engineering and production. The laboratory hours are used to see the building physics lab of the university, to demonstrate and understand measurements of physical properties relevant for heat and mass transport in materials and building components, and (if possible - tbd) to set up und conduct easy laboratory experiments regarding these material and construction behaviours. Also, part of the lab hours are dedicated to working through calculation examples in order to deepen the understanding of the equations shown in the lectures. DD1: Knowledge and understanding The students have developed and have demonstrated knowledge and understanding of physical processes in materials and building components with respect to heat and mass transfer. This includes

	the relevant rules and calculations for heat transport, energy efficiency in buildings, moisture transport, moisture protection in building materials, building components and buildings. DD2: Applying knowledge and understanding The students can apply their knowledge and understanding professionally, and can solve problems and questions regarding heat and mass transport and energy efficiency. DD3: Making judgements The students have the ability to gather and interpret relevant data (thermal and hygric parameters of materials, building components and building materials; climatic data) and rate the performance of the material or the component or buuilding accordingly and against current benchmarks. DD4: Communication skills The students can communicate the principles of heat and mass trasnsfer, and their application in buildings, to both specialist and non-specialist audiences. DD5: Ability to learn The students have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	Assessment Course work & oral presentations throughout the course & Hand-out (slides; pdf files to be handed in for distribution to all participants. Written test (ca. 1 hour) an the end or after the course. 15% of the grading of the course will be based on course work and short student presentations (including pdf hand-outs generated) during the lectures and/or laboratory hours. The students will get "extra points" for the presentations which count to the grand total points in the written exam of the course. This makes it easier for them to achieve a good mark. However, even without presentations, students can still reach full points by the written exam.
Criteri di valutazione	Written test (ca. 1 hour) an the end or after the course. The written test can give up to 100% of the points for awarding marks.

	However, students can "earn" up to 15% extra points by oral student presentations during the course hours and the lab hours, which count into the 100% of the written test. The contents of the oral presentations is to be handes out to all participants as pdf files with the slides. Admission to the written test open for all participants (attending and non-attending). Extra points for presentations only available for attending students. Relevant for assessment: • written test: correct calculations, clarity of answers, ability to summarize, evaluate, and establish relationships between topics, general understanding of the topics which had been teached. Knowledge and understanding of physical processes and relevant calculations. Judgement of performance of materials and components. Identification and discussion of problem-solving and improvement techniques. Knowledge of relevant standards. • student presentations: ability to work out a given topic, quality and correctness of presentation, ability to summarize in own words, hand-out (pdf). Judgement of performance of materials and components. Identification and discussion of problem-solving and improvement techniques.
Bibliografia obbligatoria	• (UNI) EN ISO 6946 • (UNI) EN ISO 10456 • (UNI) EN ISO 13788
Bibliografia facoltativa	• books by Prof. Cristina Benedetti (UniBz) on building physics, thermal bridges etc. • Spitzner M. H., Sprengard C: Winterlicher Wärmschutz. Kapitel in: Kalksandstein-Planungshandbuch, 2018. Downloadbar unter www.kalksandstein.de/bv_ksi/downloads (in German) In Deutsch, Englisch and Italiano, see University library: • Pfundstein M., Gellert R., Spitzner M. H., Rudolphi A.: Materiali isolanti. Edizione italiana a cura di Enrico de Angelis. ISBN: 978-88-598-0391-1. Milanofiori Assago (MI): UTET Scienze Tecniche, Wolters Kluwer Italia S.r.l., 2009, Seiten 77 – 92. • Pfundstein M., Gellert R., Spitzner M. H., Rudolphi A.: Insulating Materials – Principles, Materials, Applications. ISBN: 978-3-7643-8654-2. Basel: Birkhäuser, 2008, Seiten

	77 – 92. • Pfundstein M., Gellert R., Spitzner M. H., Rudolphi A.: Dämmstoffe – Grundlagen, Materialien, Anwendungen. ISBN: 978-3-920034-18-8. München: Institut für internationale Architektur-Dokumentation GmbH & Co. KG, 2007. Ca. Seiten 77 – 92.
Altre informazioni	Software used: Excel spreadsheets. (probably:) Numerical simulation software for thermal bridges and/or for summer-time room temperature (Windows, free student licence, in English), to be distributed during the course.
Obiettivi di Sviluppo Sostenibile (SDGs)	