International Summer University 2024 Course: The Composite Materials Level: Undergraduate /Bachelor and Graduate/ Master

Learning objectives (also taking into account students' soft skill competences):

- Become familiar with the advantages and limitations of fiber reinforced composites in comparison with conventional structural materials.
- Use stress-strain linear elastic constituitive relations in structure analysis, including isotropic, anisotropic, orthotropic, and transverse isotropic relations.
- Understand coordinate transformation of stress, strain, stiffness and compliance matrices
- Understand various theoretical methods for predicting effective elastic properties and their relative advantages and limitations.
- Use strength-based failure theories to determine the onset of failure in composite materials.
- Determine the elastic behavior of multidirectional laminates
- Understand the importance of fracture mechanics and the shortcomings of strengthbased failure theories.

Learning contents:

- Introduction Terminology, Role of Constituents, Fabrication Techniques, Types of Composites, Mechanics of Materials Review
- Lamina (Composite) Stress-Strain Relationships
- Strength of Composite Materials
- Laminate Analysis
- Micromechanics
- Fracture of Composite Materials
- Mechanical Testing of Composite Materials

Skills enhanced include:

- Communication
- Problem solving and analytical thinking
- Teamwork and collaboration

Teaching methods	 Flipped classroom. Pre-recorded video lectures, in-class problem solving
Requirements/prerequisites	 Textbook: Principles of Composite Material Mechanics, 4th edition by Ronald F. Gibson (ISBN: 978-1-4987-2069-4) Materials: Engineering Calculator
Recommended literature	None

Examination	 Homework: 20% Quizzes: 15% Exams: 40% Final Exam (TBD): 25%
Max. participants	25
Language of lecture	English
Promoter of the module	
Module instructor/Home university	Dr. Joseph Washington University of Maryland Baltimore County, USA
Hours all in all a) Time spent in classroom b) Time spent outside classroom	Hours all in all: 150 hours a) 60 hours b) 90 hours: Time for preparation: 45 hours, Time for literature studies: 45 hours
ECTS-Credits	5

