



Design of Composite Aerospace Structures

(Design of Composite Aerospace Structures)

Degree program: Mechanical Engineering diploma degree (Dipl.-Ing.)

Program module: MB-LRT-09 - Faserverbundkonstruktion von Luft- und Raumfahrzeugen
(Design of Composite Aerospace Structures)

Course Objectives:

The main aim of the course is to provide basic knowledge on the use of composite materials in aerospace structures. This includes fundamentals of the mechanics of fibrous composites, design principles and applications.

After the course students should be able

- to understand the difference in the mechanical behaviour of anisotropic and classical materials used in aerospace structures,
- to design and analyse composite laminates based on requirements typical for aerospace applications

and

- to apply more complex design tools which include analysis methods such as advanced failure and damage tolerance criteria as well as models to predict stability failure.

Course Topics:

The course includes following topics:

- Introduction to composite materials used in aerospace structures
- Aerospace applications of composite materials
- Micro mechanics
- Classical laminate theory
- Failure criteria
- Stress concentrations
- Buckling
- Damage tolerance of aerospace structures
- Design procedures
- Design examples of aerospace structures

The course includes a compulsory design project.

Class Schedule: 5 hours per week (2h lectures, 2h exercises, 1h design project)

Credits: 7 ECTS credit points (7LP)

Offered: in spring/summer term (*Sommersemester*: April - July)

Prerequisites:

Basic courses in *structural mechanics* and *aerospace materials*

Course Material:

The course material can be found at:

<https://tu-dresden.de/ing/maschinenwesen/ilr/ift/studium/sose/cas>

Download instructions are provided in the course. The laminate analysis code eLamX² is available at:

<https://tu-dresden.de/ing/maschinenwesen/ilr/ift/elamx2/elamx>

Further reading:

Kassapoglou, Ch.

Design and Analysis of Composite Structures: With Applications to Aerospace Structures, John Wiley & Sons Ltd., Chichester, UK, 2nd Ed., 2013

Schürmann, H.

Konstruieren mit Faser-Kunststoff-Verbunden, Springer-Verlag, Berlin/Heidelberg, 2nd ed., 2007

Daniel, I.M.; Ishai, O.

Engineering Mechanics of Composite Materials, Oxford University Press, 2005

Baker, A.A.; Dutton, S.; Kelly, D.,

Composite Materials for Aircraft Structures, AIAA Education Series, Reston, USA, 2nd ed., 2004

Berthelot, J.-M.

Composite Materials – Mechanical Behaviour and Structural Analysis, Springer-Verlag, New York, USA, 1999

Zenkert, D.

The Handbook of Sandwich Construction, EMAS, Cradley Heath, UK, 1997

Niu, M.C.Y.

Composite Airframe Structures, Technical Book Company, Los Angeles, 1996

Zagainov, G.I.; Lozino-Lozinski, G.E.

Composite Materials in Aerospace Design, Chapman & Hall, London, 1996

Evaluation Method: Written examination (2 hours) & design project report

Language: The lecture is given in German