Module DDM 4203 – Advanced Strength of Materials

1	**Module Number** 4203	**Study Programme** DDM	**Semester** 1	**Offered in** ☒WS ☐ SS	**Duration** 1 Semester	**Module Type** compulsory	**Workload (h)** 180	**ECTS Points** 6
2	**Courses**		**Teaching and Learning Forms**		**Contact Time**		**Self-Study Time**	**Language**
					(SWS)	**(h)**	**(h)**	English
	a) Lightweight Design		Lecture		4	60	90	
	b) Advanced Finite Element Method		Lecture with Laboratory		2	30		

3 Learning Outcomes and Competences

Once the module has been successfully completed, the students can …

Knowledge and Understanding

- Understand the sequence of a linear finite element analysis.
- Understand in depth the concept of nodes, integration points and interpolation functions.
- Understand the influence of various factors on the lightweight potential of a structure.

Use, Application and Generation of Knowledge

Use and Transfer

- Apply the finite element method to analyse the deformation and stress/strain state of a structure.
- Apply lightweight design concepts in relation to materials and shapes.
- Analyse the failure behaviour of technical sandwich structures.

Scientific Innovation

- Optimize sandwich structures for minimum weight under different side conditions.
- Improve the weight-to-load ratio of structures.

Communication and Cooperation

- Interpret the results of a numerical simulation and a lightweight optimization and draw admissible conclusions.
- Present technical contents and discuss them.
- Communicate and cooperate within the group in order to find adequate solutions for the task at hand.

Scientific Self-Conception/ Professionalism

- Justify solutions theoretically and methodically.
- Reflect and assess the abilities of group members.

4 Contents

a) Lightweight Design: Principles and objectives of lightweight design; One-dimensional members (Bars and Beams); Plates and shells; Stability problems; Selected examples of lightweight design

b) Advanced Finite Element Method: Theoretical background of FEM, fundamental equations, numerical accuracy and convergence, applications and influence of boundary conditions, nonlinearity (material); lab exercises

5 Participation Requirements

Compulsory: Fundamentals of strength of materials, materials science, engineering mechanics, design and finite element method

Recommended: NA

6 Examination Forms and Prerequisites for Awarding ECTS Points

Advanced Strength of Materials: Written exam, 120 minutes, graded

Advanced Finite Element Method: Individual semester project, not graded

7 Further use of Module

NA

8	**Module Manager and Full-Time Lecturer** Responsible: Prof. Dr.-Ing. Andreas Öchsner Lecturer: Prof. Dr.-Ing. Andreas Öchsner, D.Sc.
9	**Literature** Lecture Documents; textbook references will be given in the lecture
10	**Last Updated** 18.04.2021